FROG LEVEL VOLUNTEER RESCUE SQUAD

ENVIRONMENTAL SITE ASSESSMENT – PHASE 2 Ruther Glen, Virginia



PREPARED FOR:

Caroline County

P.O. Box 424

Bowling Green, Virginia 22427

September, 2016



DAA Project Number: 20113-229B

ENVIRONMENTAL SITE ASSESSMENT PHASE 2

FROG LEVEL VOLUNTEER RESCUE SQUAD 29415 RICHMOND TURNPIKE RUTHER GLEN, VIRGINIA, 22546

DAA PROJECT NO. 20113-229B

We (the undersigned) declare that, to the best of our professional knowledge and belief, we meet the definition of *"Environmental Professional*" as defined in Section 312.10 of 40 CFR 312.

The undersigned have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. The undersigned have developed and performed the "*all appropriate inquiries*" in general conformance with the standards and practices set forth in 40 CFR Part 312.

Draper Aden Associates prepared this document, including all attachments, in accordance with (1) generally accepted standards of environmental practice and (2) an agreement between Draper Aden Associates and Caroline County. In accepting this report, Caroline County acknowledges that the liability incurred by Draper Aden Associates is limited to the fees paid to Draper Aden Associates to perform the subject task and that claims are restricted to Caroline County



Leonard N. Ford, Jr. (PhD, PG) Environmental Program Manager

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ENVIRONMENTAL SITE ASSESSMENT PHASE 2

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DAA PROJECT NO. 20113-229B

1.0 SUMMARY

Draper Aden Associates (DAA) has conducted a Phase 2 Environmental Site Assessment of property identified as 29415 Richmond Turnpike, Ruther Glen (Frog Level), Caroline County, Virginia, 22546 (tax map parcel 102-2-2). Salient results of the study are summarized in this SECTION.

During August, 2016, DAA constructed two temporary groundwater monitoring wells at the subject property, checked for the presence of "*free product*" and "*sheen*," obtained groundwater samples from the two monitoring wells, and chemically analyzed the samples for (1) total petroleum hydrocarbons (gasoline range) and (2) a broad spectrum of volatile organic compounds (which included both common constituents of gasoline and common chlorinated solvents).

DAA did *not* observe a *free-product layer* floating on samples of groundwater obtained from the air-water interface in either well. DAA did *not* observe a petroleum-like *sheen* on samples of groundwater obtained from either well.

The laboratory observed *total petroleum hydrocarbons*, in the *gasoline range* (TPH-GRO), in the sample of groundwater obtained from well MW-01: 0.34 mg/liter. The laboratory observed TPH-GRO in the sample of groundwater obtained from well MW-02: 0.29 mg/liter.

The reported concentrations of TPH-GRO in both wells are *less than 1.0 mg/liter*, which is the level at which DEQ may be inclined to require further action. DEQ is *not* likely to require further action at facilities where there is *no free product* and the concentration of TPH-GRO is *less than 1.0 mg/liter*.

The laboratory observed *acetone* in the samples obtained from both MW-01 (45.30 μ g/liter) and MW-02 (15.90 μ g/liter). In both instances, the concentrations of *acetone* in groundwater are less than the risk-based screening level for acetone in tap water (14,000 μ g/liter).

Based upon the results of chemical analyses of two samples, the presence of *acetone* in groundwater does *not* appear to represent a significant risk to human health.

The laboratory observed *methyl ethyl ketone (2-butanone)* in the sample obtained from MW-02 (19.10 μ g/liter). The concentration of *methyl ethyl ketone* in groundwater is less than the risk-based screening level for *methyl ethyl ketone* in tap water (5,600 μ g/liter).

Based upon the results of chemical analyses of two samples, the presence of *methyl ethyl ketone* in groundwater does *not* appear to represent a significant risk to human health.

The laboratory observed *di-isopropyl ether* in the sample obtained from MW-02 (6.51 μ g/liter). The concentration of *di-isopropyl ether* in groundwater is less than the risk-based screening level for *di-isopropyl ether* in tap water (1,500 μ g/liter).

Based upon the results of chemical analyses of two samples, the presence of *di-isopropyl ether* in groundwater does *not* appear to represent a significant risk to human health.

The laboratory observed *one gasoline constituent* in well MW-01: *n-butyl benzene* (1.07 μ g/liter). The laboratory observed *eight gasoline constituents* in well MW-02 (TABLE 1).

The concentrations of *seven* of the *eight* gasoline constituents are less than the risk-based screening levels for those constituents in tap water (TABLE 1).

The concentration of one of the *eight* gasoline constituents (*naphthalene*, 1.16 μ g/liter) is greater than the risk-based screening level for tap water, but less than the risk-based screening level for groundwater in a commercial setting.

Based upon the results of chemical analyses of two samples, the presence of *gasoline constituents* in groundwater, in this commercial setting, does *not* appear to represent a significant risk to human health.

Virginia Underground Storage Tank Regulations require that owners of UST systems report suspected released of petroleum products to the Virginia Department of Environmental Quality (DEQ). In this case, the County is *not* the current owner of either the property or the former UST system; therefore, the County is *not* obligated to report these findings to DEQ. It is incumbent upon the current owner of the former UST system (in this instance, the current owner of the subject property) to report these findings to the Virginia DEQ.

Based upon the findings presented herein, the probability that DEQ would require the responsible party to perform corrective action (remediation) for the release of gasoline at this property may be deemed relatively low. Nonetheless, the only way to know with certainty what actions DEQ might choose to take, were DEQ to be advised of the subject release, would be for the responsible party to notify DEQ of the release described herein.

2.0 BACKGROUND

During 2015, Draper Aden Associates conducted a Phase 1 Environmental Site Assessment of the subject property, which revealed conditions that, in our opinion, warranted further assessment. Based upon the information contained in the Phase 1 study, we found a reasonable probability that constituents of gasoline may be present in groundwater underlying the subject property.

In order to further evaluate the environmental risk associated with the acquisition of this property, we developed a strategy for groundwater sampling and chemical analysis at the subject site. More specifically, the goal of the subject study was to determine if regulated chemical constituents are present in groundwater underlying the subject property and, if so, help assess the risk associated with acquisition of the subject property under existing conditions.

Toward meeting those goals, DAA proposed to construct two temporary groundwater monitoring wells at the subject property, check for the presence of "*free product*" and "*sheen*," obtain groundwater samples from the two monitoring wells, and chemically analyze the samples for (1) total petroleum hydrocarbons (gasoline range) and (2) a broad spectrum of volatile organic compounds (to include both common constituents of gasoline and common chlorinated solvents).

3.0 FIELD PROCEDURES

Information concerning field methods is presented in this SECTION.

In order to determine if groundwater underlying the property is contaminated, Draper Aden Associates proposed to chemically analyze groundwater samples for gasoline and for a variety of "volatile organic compounds" that are commonly encountered in commercial-industrial settings (including selected constituents of gasoline).

3.1 Well Construction

On July 27, 2016, DAA visited the residence located at 29415 Richmond Turnpike and measured the depth to the water table (16.8 feet below grade) in a water supply well, having a diameter of approximately three feet, in order to prepare specifications for subsequent drilling and well construction. DAA then selected proposed locations of two temporary groundwater monitoring wells, at the subject property.

Comment. While requesting permission from the resident of 29415 Richmond Turnpike, to measure the depth to the water table in his well, the resident indicated that he remembered underground storage tanks having been removed from the subject property. During 2015, he observed County and DAA personnel conducting a subsurface study in order to locate any remaining underground storage tanks on the subject property, and he did *not* think any gasoline tanks would be discovered. Information obtained from the resident may be deemed "*hearsay*;" however, the information provided by the resident is consistent with the results of the subsurface investigation that was conducted during 2015.

On August 17, 2016, Fishburne Drilling advanced two borings at the subject property using a Geoprobe with direct push drilling methods, as directed by DAA.

A professional geologist (Ford) supervised drilling and well construction, and observed the condition of geologic samples obtained during drilling. During drilling at well MW-02, both the supervising geologist and the driller noted a slight petroleum-like odor emanating from the open borehole.

At each location, Fishburne Drilling constructed a monitoring well within the open borehole, using manufactured well screen and riser pipe having an inner diameter of one inch. The annulus was then backfilled using manufactured well sand to a point above the screened interval. The remaining annulus was backfilled using bentonite pellets.

The approximate locations of each well are shown on FIGURE 2 (APPENDIX 1).

3.2 Groundwater Sampling

Upon completing construction of the two monitoring wells, DAA allowed approximately four days before obtaining groundwater samples for chemical analysis, in order to allow conditions in the subsurface to stabilize.

On August 21, 2016, DAA returned to the property in order to observe conditions in the wells and to obtain samples of groundwater for chemical analysis.

Upon arriving at the property, DAA measured the depth to the water table in each well, and the total depth of each well. Measured depths below grade (that is, corrected for well stickup) are given as follows:

well	depth to water	total well depth
MW-01	5.3 feet	23.3 feet
MW-02	5.3 feet	23.5 feet

Using polyethylene bailers, DAA then obtained samples of groundwater from the air-water interface in each well, and inspected the samples for the presence of a "free-product" layer of gasoline. DAA did *not* observe a free product layer floating on the samples of groundwater obtained from either well.

DAA then placed the groundwater samples into beakers, in order to determine if any petroleum-like sheen could be observed. DAA did *not* observe a petroleum-like sheen on the groundwater obtained from either well.

DAA then completed purging each well prior to obtaining samples for chemical analysis. Groundwater samples were placed in glass vials having Teflon septa, then placed beneath ice in an insulated container.

A Chain-of-Custody was initiated at each well at the time the samples were obtained and accompanied the samples until the laboratory accepted their custody.

4.0 RESULTS OF CHEMICAL ANALYSES

The results of chemical analyses are summarized on TABLE 1 (APPENDIX 2) and described in this SECTION.

The concentrations of specific chemical constituents observed in the groundwater samples are compared to EPA Region III Risk-Based Screening Levels (RSLs) (TABLE 2, APPENDIX 2) and Virginia DEQ Voluntary Remediation Program (VRP) risk-based screening levels for groundwater in a restricted (commercial / industrial) setting (TABLE 3, APPENDIX 2).

The laboratory certificate-of-analysis is presented in APPENDIX 3.

4.1 Total Petroleum (Gasoline)

Air, Water & Soil Laboratories (AWS) analyzed two groundwater sample for *total petroleum hydrocarbons*, in the *gasoline range* (TPH-GRO), using EPA Method 8015C (gas chromatography).

- The laboratory observed TPH-GRO in the sample obtained from well MW-01: 0.34 *mg/liter*.
- The laboratory observed TPH-GRO in the sample obtained from well MW-02: 0.29 *mg/liter*.

The reported concentrations of TPH-GRO in both wells are *less than 1.0 mg/liter*, which is the level at which DEQ may be inclined to require further action. DEQ is *not* likely to require further action at facilities where there is *no free product* and the concentration of TPH-GRO is *less than 1.0 mg/liter*.

4.2 Volatile Organic Compounds

Air, Water & Soil Laboratories (AWS) analyzed two groundwater sample for 69 volatile organic compounds using EPA Method 8260B (gas chromatography-mass spectrometry). The targeted compounds include many constituents of gasoline and commonly used solvents.

The laboratory observed *acetone* in the samples obtained from both MW-01 (45.30 µg/liter) and MW-02 (15.90 µg/liter).

In both instances, the concentrations of *acetone* in groundwater are less than the risk-based screening level for acetone in tap water (14,000 μ g/liter).

Based upon the results of chemical analyses of two samples, the presence of *acetone* in groundwater does *not* appear to represent a significant risk to human health.

The source of the *acetone* is *not* determined. *Acetone* is commonly used as a solvent, and is also used in many analytical laboratories, but is *not* a typical constituent of gasoline.

The laboratory observed *methyl ethyl ketone (2-butanone)* in the sample obtained from MW-02 (19.10 µg/liter).

The concentration of *methyl ethyl ketone* in groundwater is less than the risk-based screening level for *methyl ethyl ketone* in tap water (5,600 μ g/liter).

Based upon the results of chemical analyses of two samples, the presence of *methyl ethyl ketone* in groundwater does *not* appear to represent a significant risk to human health.

The source of the *methyl ethyl ketone* is *not* determined. *Methyl ethyl ketone* is commonly used as a solvent, and is also used in many analytical laboratories, but is *not* a typical constituent of gasoline.

• The laboratory observed *di-isopropyl ether* in the sample obtained from MW-02 (6.51 $\mu g/liter$).

The concentration of *di-isopropyl ether* in groundwater is less than the risk-based screening level for *di-isopropyl ether* in tap water (1,500 μ g/liter).

Based upon the results of chemical analyses of two samples, the presence of *di-isopropyl ether* in groundwater does *not* appear to represent a significant risk to human health.

The source of the *di-isopropyl ether* is *not* determined. *Di-isopropyl ether* is commonly used as a solvent, but was historically added to *gasoline* as an *oxygenate*.

The laboratory observed *one gasoline constituent* in well MW-01: *n-butyl benzene* (1.07 μg/liter).

The laboratory observed *eight gasoline constituents* in well MW-02 (TABLE 1).

The concentrations of *seven* of the *eight* gasoline constituents are less than the risk-based screening levels for those constituents in tap water (TABLE 1).

The concentration of one of the *eight* gasoline constituents (*naphthalene*, 1.16 μ g/liter) is greater than the risk-based screening level for tap water, but less than the risk-based screening level for groundwater in a commercial setting.

Based upon the results of chemical analyses of two samples, the presence of *gasoline constituents* in groundwater, in this commercial setting, does *not* appear to represent a significant risk to human health.

The presence of gasoline constituents in groundwater is attributed to a release of gasoline from previously existing UST systems at the property.

4.3 Technical Discussion

The results of chemical analyses indicate that gasoline was, at some time, released to the subject property.

During the 1990s, air quality regulations required that gasolines be "*reformulated*" to achieve significant reductions of vehicle emissions of ozone-forming and certain toxic pollutants. The Reformulated Gasoline (RFG) standards mandated the use of oxygen additives (known as "*oxygenates*"), to increase the combustion efficiency of gasoline.

As shown on the TABLE (APPENDIX 2), a variety of *alcohols* and *ethers* have been used as oxygenates in gasoline, including the one *ether* compound (*di-isopropyl ether*) that was detected in the groundwater sample obtained from the well nearest to the pump island (MW-02). Of the various ether compounds that have been used as gasoline additives, MTBE has been the most widely used; however, the laboratory did *not* detect MTBE in groundwater samples obtained from either monitoring well.

Whereas the use of such oxygenates was not mandated until the late 1990s, MTBE has been used (in the United States) in gasoline since 1979, to replace tetraethyl lead and to increase its effective octane rating, thereby helping to prevent engine knocking. It is our understanding that most gasoline refiners were inclined to choose MTBE, instead of other ether oxygenates, because of its favorable blending characteristics and lower cost.

The apparent absence of MTBE suggests that the source of the *di-isopropyl ether* observed in well MW-02 was gasoline that was released from the UST systems. Conversely, the reported concentration of *di-isopropyl ether* is greater than the concentrations of all other gasoline constituents observed in the groundwater sample (with the exception of *n-propyl benzene* = 5.42 $\mu g/liter$), which suggests that the presence of *di-isopropyl ether* may be attributed to its use on the property as a solvent, rather than its presence as a constituent of gasoline.

Regardless of the source of the *di-isopropyl ether*, the concentration of *di-isopropyl ether* in MW-02 (6.51 $\mu g/liter$) is less than the risk-based screening level for *di-isopropyl ether* in tap water (1,500 $\mu g/liter$). The presence of *di-isopropyl ether* in groundwater, therefore, does *not* appear to represent a significant risk to human health.

4.4 Regulatory Considerations

According to the Code of Virginia (§ 62.1-44.34:9. Powers and Duties of Board), "*The Board is responsible for carrying out the provisions of this article and compatible provisions of federal acts and is authorized to*:

9. Require the owner or operator of an underground storage tank who is the responsible person for the release to undertake corrective action for any release of petroleum or any other regulated substance when the Board determines that such corrective action will be done properly and promptly by the owner or operator of the underground storage tank from which the release occurs, regardless of when the release occurred; or undertake corrective action for any release of petroleum or any other regulated substance into the environment from an underground storage tank if such action is necessary, in the judgment of the Board, to protect human health and the environment."

Based upon that authority, Virginia UST Regulations (9VAC25-580-190. Reporting of Suspected Releases) state:

"Owners and operators of UST systems must report to the board within 24 hours and follow the procedures in 9VAC25-580-210 for any of the following conditions:

1. The discovery by owners and operators or others of released regulated substances at the UST site or in the surrounding area (such as the presence of free product or vapors in soils, basements, sewer and utility lines, and nearby surface water)"

In this case, the County is *not* the current owner of the property or the former UST system; therefore, the County is *not* required to report these findings to the Virginia DEQ. It is incumbent upon the current owner of the former UST system (in this instance, the current owner of the subject property) to report these findings to the Virginia DEQ.

Based upon the findings presented herein, the probability that DEQ would require the responsible party to perform corrective action (remediation) for the release of gasoline at this property may be deemed relatively low. Nonetheless, the only way to know with certainty what actions DEQ might choose to take, were DEQ to be advised of the subject release, would be for the responsible party to notify DEQ of the release described herein.

5.0 INNOCENT LANDOWNER DEFENSE

The subject study was conducted in order to assist future owners in qualifying for the innocent landowner defense to Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; Superfund) liability by performing "*all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice* (42 USC §9601(35)(B))."

The purpose of such an environmental site assessment is to help identify the presence of any recognized environmental conditions on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property.

For the purposes of this study, the term "*regulated substance*" means an element, compound, mixture, solution, or substance that, when released into the environment, may present substantial danger to the public health or welfare, or the environment. The term "*regulated substance*" includes and is limited to:

- any substance defined in Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980
- any substance regulated as a hazardous waste under Subtitle C of the Resource Conservation and Recovery Act (RCRA) of 1976
- petroleum, including crude oil or any fraction thereof, that is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute). The term "petroleum" includes petroleum and petroleum-based substances comprised of a complex blend of hydrocarbons derived from crude oil through processes of separation, conversion, upgrading, and finishing (such as motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, used oils).

6.0 TECHNICAL LIMITATIONS

The findings presented in this report are based upon information provided to us by others, our direct observations, and our professional judgment. To the best of our knowledge, information provided by others is true and correct, unless otherwise noted; however, Draper Aden Associates is *not* responsible for the accuracy of information provided by others.

Our on-site observations pertain only to specific locations at specific times on specific dates. Our observations and conclusions do *not* reflect variations in surface or subsurface conditions that may exist between observed locations, in unexplored areas of the subject property, in areas obscured by existing conditions (such as vegetation and collapsed structures), or at times other than those represented by our observations.

It is the responsibility of the client to notify the appropriate government agencies of our findings, as may be required by law. It is *not* the responsibility of Draper Aden Associates to report these findings to any federal, state, and/or local agency.

APPENDIX 1

FIGURES

PHOTOGRAPHS

Contraction of the second	J.Co	
	Lorne	S S CO
	10	Joseph Con
	J.J.	Sho g
	188	F
Haleys 2064 BM 205 204 600	10 1.15	NE
Landing		
approximate location of subject property	500RCE:	Hanover (1969) photorevised 1985
Vicinity Topographic Map [1985] Client Caroline County	SCALE:	[not shown]
FacilityFormer Frog Level Volunteer Rescue SquadLocation29415 Richmond Turnpike, Ruther Glen, 22546ProjectEnvironmental Site Assessment	DAA NO.	20113-229
Draper Aden Associates Engineering • Surveying • Environmental Services Richmond, VA 23228 804-264-2226 Fax804-264-8773	DESIGNED DRAWN CHECKED DATE	LNF BHH LNF 08-22-16

<image/> <image/> <image/>	<image/>
Monitoring Well Locations	SCALE: [not shown]
Client Caroline County Facility Former Frog Level Volunteer Rescue Squad	
Location 29415 Richmond Turnpike, Ruther Glen, 22546 Project Environmental Site Assessment	DAA NO. 20113-229B
Draper Aden Associates Engineering • Surveying • Environmental Services Bigo Villa Park Drive Richmond, VA 23228 804-264-2228 Fax 804-264-8773	DESIGNED LNF DRAWN BHH CHECKED LNF DATE 08-22-16

Project: Frog Level. Phase 2 ESA.



P1. View to northwest.



APPENDIX 2

TABLES

TABLE 1

CLIENT: CAROLINE COUNTY FACILITY: FORMER FROG LEVEL VOLUNTEER RESCUE SQUAD LOCATION: 29415 RICHMOND TURNPIKE, RUTHER GLEN, VIRGINIA PROJECT: ENVIRONMENTAL SITE ASSESSMENT

RESULTS OF CHEMICAL ANALYSES GROUNDWATER DATE SAMPLED: 08-21-16

					trip	method		EPA	tap water	GW commercial	
constituent	CAS Registry No.	units	MW-01	MW-02	blank	blank	RL	MCL	RSL	VRP	source
acetone	67-64-1	µg/liter	45.30	15.90	<	<	10.0	none	14,000	11,878,330	solvent
methyl ethyl ketone (2-butanone)	78-93-3	µg/liter	<	19.10	<	<	10.0	none	5,600	941,000	solvent
di-isopropyl ether	108-20-3	µg/liter	<	6.51	<	<	5.0	none	1,500	none	solvent / gasoline
butyl benzene, n-	104-51-8	µg/liter	1.07	2.70	<	<	1.0	none	1,000	none	gasoline
butyl benzene, sec -	135-98-8	µg/liter	<	1.34	<	<	1.0	none	2,000	none	gasoline
isopropyl benzene (cumene)	98-82-8	µg/liter	<	1.92	<	<	1.0	none	450	373	gasoline
isopropyl toluene, 4 - (p-)	99-87-6	µg/liter	<	2.68	<	<	1.0	none	none	none	gasoline
naphthalene	91-20-3	µg/liter	<	1.16	<	<	1.0	none	0.17	73.05	gasoline
propyl benzene, n -	103-65-1	µg/liter	<	5.42	<	<	1.0	none	660	1,020	gasoline
trimethyl benzene, 1,2,4 -	95-63-6	µg/liter	<	2.87	<	<	1.00	none	15	12.2	gasoline
trimethyl benzene, 1,3,5 -	108-67-8	µg/liter	<	3.31	<	<	1.00	none	120	none	gasoline
analyte	CAS Registry No.	unite	MW-01	MW-02			PI				comment
	cho Registry No.	unto									oonmon
TPH-GRO		ma/liter	0.34	0.29	<	<	0.10				
-					1	• · · · · · · · · · · · · · · · · · · ·					

TPH-GRO - total petroleum hydrocarbons (gasoline range organic compounds)

RL - laboratory reporting limit

RSL - EPA Regional Screening Level - tap water (updated November, 2015)

VRP - Virginia Voluntary Remediation Program - screening level - groundwater - unrestricted (residential) use (updated July, 2014)

none - not established / not listed

TABLE 2

CLIENT: CAROLINE COUNTY FACILITY: FORMER FROG LEVEL VOLUNTEER RESCUE SQUAD LOCATION: 29415 RICHMOND TURNPIKE, RUTHER GLEN, VIRGINIA PROJECT: ENVIRONMENTAL SITE ASSESSMENT

EPA REGION 3

RISK-BASED SCREENING LEVELS

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice); c = cancer; n = noncancer; n = noncancer; * = where n SL < 100X c SL; ** = where n SL < 10X c SL; SL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information	Contaminant	Screening Levels	Protection of Ground Water SSLs	
SFO (mg/kg-day)' k e IUR e k RfD _o k e RfC _i RfC _i k e v o muta- muta- fill GIABS ABS (mg/kg- fill) 1 y (mg/kg-day)' y (mg/kg- fill) y (mg/kg- fill) gen GIABS ABS (mg/kg- fill)	Analyte CAS No.	Resident Soil Industrial Soil Resident Air Industrial Air Tapwater MCL (mg/kg) key (mg/kg) key (ug/m ³) key (ug/l)	Risk-based MCL-based SSL SSL (mg/kg) key (mg/kg)	
9.0E-01 I 3.1E+01 A V 1 1.1E+0	acetone 67-64-1	6.1E+04 n 6.7E+05 nms 3.2E+04 n 1.4E+05 n 1.4E+04 n	2.9E+00 n	
6.0E-01 I 5.0E+00 I V 1 2.8E+0	methyl ethyl ketone (2-butanone) 78-93-3	2.7E+04 n 1.9E+05 nms 5.2E+03 n 2.2E+04 n 5.6E+03 n	1.2E+00 n	
7.0E-01 P V 1 2.3E+0	di-isopropyl ether 108-20-3	2.2E+03 n 9.4E+03 ns 7.3E+02 n 3.1E+03 n 1.5E+03 n	3.7E-01 n	
5.0E-02 P V 1 1.1E+0	butyl benzene, n- 104-51-8	3.9E+03 ns 5.8E+04 ns 1.0E+03 n	3.2E+00 n	
1.0E-01 X V 1 1.5E+0	butyl benzene, sec- 135-98-8	7.8E+03 ns 1.2E+05 nms 2.0E+03 n	5.9E+00 n	
1.0E-01 I 4.0E-01 I V 1 2.7E+0	isopropyl benzene (cumene) 98-82-8	1.9E+03 ns 9.9E+03 ns 4.2E+02 n 1.8E+03 n 4.5E+02 n	7.4E-01 n	
3.4E-05 C 2.0E-02 I 3.0E-03 I V 1 0.13	naphthalene 91-20-3	3.8E+00 c* 1.7E+01 c* 8.3E-02 c* 3.6E-01 c* 1.7E-01 c*	5.4E-04 c*	
1.0E-01 X 1.0E+00 X V 1 2.6E+0	propyl benzene 103-65-1	3.8E+03 ns 2.4E+04 ns 1.0E+03 n 4.4E+03 n 6.6E+02 n	1.2E+00 n	
7.0E-03 P V 1 2.2E+0	trimethyl benzene, 1,2,4- 95-63-6	5.8E+01 n 2.4E+02 ns 7.3E+00 n 3.1E+01 n 1.5E+01 n	2.1E-02 n	
1.0E-02 X V 1 1.8E+0	trimethyl benzene, 1,3,5- 108-67-8	7.8E+02 ns 1.2E+04 ns 1.2E+02 n	1.7E-01 n	
EPA Region 3 - RSL November, 2015				

TABLE 3

CLIENT: CAROLINE COUNTY FACILITY: FORMER FROG LEVEL VOLUNTEER RESCUE SQUAD LOCATION: 29415 RICHMOND TURNPIKE, RUTHER GLEN, VIRGINIA PROJECT: ENVIRONMENTAL SITE ASSESSMENT

> VIRGINIA DEQ VOLUNTARY REMEDIAITON PROGRAM GROUNDWATER SCREENING LEVELS

		Tier III	Tier III
		RESIDENTIAL	COMMERCIAL
		Groundwater	Groundwater
		Screening Level	Screening Level
constituent	CAS No.	ug/L	ug/L
acetone	67-64-1	2,828,174	11,878,330
methyl ethyl ketone (2-butanone)	78-93-3	224,155	941,450
di-isopropyl ether	108-20-3	not established	not established
butyl benzene, n-	104-51-8	not established	not established
butyl benzene, sec-	135-98-8	not established	not established
isopropyl benzene (cumene)	98-82-8	89	373
isopropyl toluene	99-87-6	not established	not established
naphthalene	91-20-3	17.39	73.05
propyl benzene, n-	103-65-1	243	1,020
trimethyl benzene, 1,2,4-	95-63-6	3	12.2
trimethyl benzene, 1,3,5 -	108-67-8	not established	not established

Oxygenate Summary

Compound Name	Other Name	Sources	Solubility (mg/L)	Boiling Point (°C)	Methods	Rep. Limit (ppbv)
Methanol	Wood Alcohol	Natural gas, coal, or biomass (wood)	miscible	64-65	EPA TO-14A/15	50
Ethanol	Grain Alcohol	Ethylene or biomass (corn)	miscible	78-79	EPA TO-14A/15	2.0
Tertiary-butyl alcohol	ТВА	Breakdown product of MTBE	miscible	82-83	EPA TO-14A/15	2.0
Methyl tertiary-butyl ether	MTBE	Methanol and isobutylene	43,000 - 54,300	55-56	EPA TO-3, EPA TO-14A/15	2.0
Ethyl tertiary butyl ether	ETBE	Ethanol and isobutylene	26,000	69-71	EPA TO-14A/15	2.0
Diisopropyl ether	DIPE		2,039 - 9,000	68-69	EPA TO-14A/15	2.0
Tertiary-amyl methyl ether	TAME	Methanol and isoamylene	20,000	85-86	EPA TO-14A/15	2.0

Sources: www.epa.gov/swerust1/oxygenat/oxytable.htm, www.chevron.com, www.epa.gov/otaq/rfg.htm, www.arb.ca.gov/cbg/cbg.htm, www.chemfinder.com

APPENDIX 3

LABORATORY CERTIFICATE-OF-ANALYSIS



Certificate of Analysis

Final Report

Laboratory Order ID 16H0505

Client Name:	Draper Aden Associates-Richmond	Date Received:	August 22, 2016 9:50
	8090 Villa Park Dr.	Date Issued:	September 1, 2016 14:06
	Richmond, VA 23228	Project Number:	20113-229 B
Submitted To:	Leonard Ford Jr.	Purchase Order:	

Client Site I.D.: Frog Level Rescue Squad

Enclosed are the results of analyses for samples received by the laboratory on 08/22/2016 09:50. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

E0 701415

Ted Soyars Laboratory Manager

End Notes:

The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

This report shall not be reproduced except in full without the expressed and written approval of an authorized representative of Air Water & Soil Laboratories, Inc.









Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06			
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B			
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:				
	ANALYTICAL REPORT FOR SAMPLES					

Laboratory Order ID 16H0505

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-01	16H0505-01	Ground Water	08/21/2016 16:30	08/22/2016 09:50
MW-02	16H0505-02	Ground Water	08/21/2016 16:50	08/22/2016 09:50
Trip Blank	16H0505-03	Ground Water	08/08/2016 08:30	08/22/2016 09:50



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06				
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B				
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:					
Laboratory Order ID: 16H0505							
Client Site I.D.:	Frog Level Rescue Squad Laboratory C	Purchase Order: Prder ID: 16H0505					

Laboratory Sample ID:

16H0505-01

MW-01 Sample I.D.

08/21/2016 16:30 Date/Time Sampled:

				Reporting		Sample Prep	Analysis	
Parameter	Samp ID	Method	Result Qual	Limit	D.F.	Date/Time	Date/Time	Analyst
Volatile Hydrocarbons by GC								
TPH-Volatiles (GRO)	01	SW8015C	0.34 mg/L	0.10	1	08/22/16 17:25	08/22/16 17:25	LAO
Volatile Organic Compounds	by GCMS							
1,1,1,2-Tetrachloroethane	01	SW8260B	<0.40 ug/L	0.40	1	08/23/16 11:27	08/23/16 11:27	JDW
1,1,1-Trichloroethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,1,2,2-Tetrachloroethane	01	SW8260B	<0.40 ug/L	0.40	1	08/23/16 11:27	08/23/16 11:27	JDW
1,1,2-Trichloroethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,1-Dichloroethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,1-Dichloroethylene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,1-Dichloropropene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2,3-Trichlorobenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2,3-Trichloropropane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2,4-Trichlorobenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2,4-Trimethylbenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2-Dibromo-3-chloropropane (DBCP)	01	SW8260B	<4.00 ug/L	4.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2-Dibromoethane (EDB)	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2-Dichlorobenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2-Dichloroethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,2-Dichloropropane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,3,5-Trimethylbenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,3-Dichlorobenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,3-Dichloropropane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
1,4-Dichlorobenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
2,2-Dichloropropane	01	SW8260B	<2.00 ug/L	2.00	1	08/23/16 11:27	08/23/16 11:27	JDW
2-Butanone (MEK)	01	SW8260B	<10.0 ug/L	10.0	1	08/23/16 11:27	08/23/16 11:27	JDW
2-Chlorotoluene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06						
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B						
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:							
Laboratory Order ID: 16H0505									
Analytical Res	suits								

Sample I.D. MW-01

Laboratory Sample ID:

16H0505-01

Date/Time Sampled: 08/21/2016 16:30

				Reporting	1	Sample Prep	Analysis	
Parameter	Samp ID	Method	Result Qu	al Limit	D.F.	Date/Time	Date/Time	Analyst
Volatile Organic Compounds	by GCMS							
2-Hexanone (MBK)	01	SW8260B	<5.00 ug/L	5.00	1	08/23/16 11:27	08/23/16 11:27	JDW
4-Chlorotoluene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
4-Isopropyltoluene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
4-Methyl-2-pentanone (MIBK)	01	SW8260B	<5.00 ug/L	5.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Acetone	01	SW8260B	45.3 ug/L	10.0	1	08/23/16 11:27	08/23/16 11:27	JDW
Benzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Bromobenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Bromochloromethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Bromodichloromethane	01	SW8260B	<0.50 ug/L	0.50	1	08/23/16 11:27	08/23/16 11:27	JDW
Bromoform	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Bromomethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Carbon disulfide	01	SW8260B	<10.0 ug/L	10.0	1	08/23/16 11:27	08/23/16 11:27	JDW
Carbon tetrachloride	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Chlorobenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Chloroethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Chloroform	01	SW8260B	<0.50 ug/L	0.50	1	08/23/16 11:27	08/23/16 11:27	JDW
Chloromethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
cis-1,2-Dichloroethylene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
cis-1,3-Dichloropropene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Dibromochloromethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Dibromomethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Dichlorodifluoromethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Di-isopropyl ether (DIPE)	01	SW8260B	<5.00 ug/L	5.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Ethylbenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Hexachlorobutadiene	01	SW8260B	<0.80 ug/L	0.80	1	08/23/16 11:27	08/23/16 11:27	JDW
lodomethane	01	SW8260B	<10.0 ug/L	10.0	1	08/23/16 11:27	08/23/16 11:27	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06					
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B					
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:						
Laboratory Order ID: 16H0505								

MW-01 Sample I.D.

Laboratory Sample ID:

16H0505-01

08/21/2016 16:30 Date/Time Sampled:

				Reporting		Sample Prep	Analysis	
Parameter	Samp ID	Method	Result Qua	al Limit	D.F.	Date/Time	Date/Time	Analyst
Volatile Organic Compounds	by GCMS							
Isopropylbenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
m+p-Xylenes	01	SW8260B	<2.00 ug/L	2.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Methylene chloride	01	SW8260B	<4.00 ug/L	4.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Methyl-t-butyl ether (MTBE)	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Naphthalene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
n-Butylbenzene	01	SW8260B	1.07 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
n-Propylbenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
o-Xylene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
sec-Butylbenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Styrene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
tert-Butylbenzene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Tetrachloroethylene (PCE)	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Toluene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
trans-1,2-Dichloroethylene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
trans-1,3-Dichloropropene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Trichloroethylene	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Trichlorofluoromethane	01	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Vinyl acetate	01	SW8260B	<10.0 ug/L	10.0	1	08/23/16 11:27	08/23/16 11:27	JDW
Vinyl chloride	01	SW8260B	<0.50 ug/L	0.50	1	08/23/16 11:27	08/23/16 11:27	JDW
Xylenes, Total	01	SW8260B	<3.00 ug/L	3.00	1	08/23/16 11:27	08/23/16 11:27	JDW
Surr: 1,2-Dichloroethane-d4	01	SW8260B	104 %	70-120)	08/23/16 11:27	08/23/16 11:27	JDW
Surr: 4-Bromofluorobenzene	01	SW8260B	101 %	75-120)	08/23/16 11:27	08/23/16 11:27	JDW
Surr: Dibromofluoromethane	01	SW8260B	100 %	80-119)	08/23/16 11:27	08/23/16 11:27	JDW
Surr: Toluene-d8	01	SW8260B	98.0 %	85-120)	08/23/16 11:27	08/23/16 11:27	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06						
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B						
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:							
Laboratory Order ID: 16H0505									
ample I.D. MW-02	esuits	Laboratory S	ample ID: 16H05	05-02					

MW-02 Sample I.D.

08/21/2016 16:50 Date/Time Sampled:

				Reporting	1	Sample Pren	Analysis	
Parameter	Samp ID	Method	Result C	Qual Limit	D.F.	Date/Time	Date/Time	Analyst
Volatile Hydrocarbons by GC								
TPH-Volatiles (GRO)	02	SW8015C	0.29 mg/L	0.10	1	08/22/16 17:48	08/22/16 17:48	LAO
Volatile Organic Compounds	by GCMS							
1,1,1,2-Tetrachloroethane	02	SW8260B	<0.40 ug/L	0.40	1	08/23/16 11:50	08/23/16 11:50	JDW
1,1,1-Trichloroethane	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,1,2,2-Tetrachloroethane	02	SW8260B	<0.40 ug/L	0.40	1	08/23/16 11:50	08/23/16 11:50	JDW
1,1,2-Trichloroethane	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,1-Dichloroethane	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,1-Dichloroethylene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,1-Dichloropropene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2,3-Trichlorobenzene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2,3-Trichloropropane	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2,4-Trichlorobenzene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2,4-Trimethylbenzene	02	SW8260B	2.87 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2-Dibromo-3-chloropropane (DBCP)	02	SW8260B	<4.00 ug/L	4.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2-Dibromoethane (EDB)	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2-Dichlorobenzene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2-Dichloroethane	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,2-Dichloropropane	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,3,5-Trimethylbenzene	02	SW8260B	3.31 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,3-Dichlorobenzene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,3-Dichloropropane	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
1,4-Dichlorobenzene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
2,2-Dichloropropane	02	SW8260B	<2.00 ug/L	2.00	1	08/23/16 11:50	08/23/16 11:50	JDW
2-Butanone (MEK)	02	SW8260B	19.1 ug/L	10.0	1	08/23/16 11:50	08/23/16 11:50	JDW
2-Chlorotoluene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06					
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B					
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:						
Laboratory Order ID: 16H0505								

Sample I.D. MW-02

Laboratory Sample ID:

16H0505-02

Date/Time Sampled: 08/21/2016 16:50

				Repo	rting		Sample Prep	Analysis	
Parameter	Samp ID	Method	Result	Qual Lir	nit [D.F.	Date/Time	Date/Time	Analyst
Volatile Organic Compounds	by GCMS								
2-Hexanone (MBK)	02	SW8260B	<5.00 ug/L	5.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
4-Chlorotoluene	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
4-Isopropyltoluene	02	SW8260B	2.68 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
4-Methyl-2-pentanone (MIBK)	02	SW8260B	<5.00 ug/L	5.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Acetone	02	SW8260B	15.9 ug/L	10	0.0	1	08/23/16 11:50	08/23/16 11:50	JDW
Benzene	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Bromobenzene	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Bromochloromethane	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Bromodichloromethane	02	SW8260B	<0.50 ug/L	0.	50	1	08/23/16 11:50	08/23/16 11:50	JDW
Bromoform	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Bromomethane	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Carbon disulfide	02	SW8260B	<10.0 ug/L	10	0.0	1	08/23/16 11:50	08/23/16 11:50	JDW
Carbon tetrachloride	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Chlorobenzene	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Chloroethane	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Chloroform	02	SW8260B	<0.50 ug/L	0.	50	1	08/23/16 11:50	08/23/16 11:50	JDW
Chloromethane	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
cis-1,2-Dichloroethylene	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
cis-1,3-Dichloropropene	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Dibromochloromethane	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Dibromomethane	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Dichlorodifluoromethane	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Di-isopropyl ether (DIPE)	02	SW8260B	6.51 ug/L	5.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Ethylbenzene	02	SW8260B	<1.00 ug/L	1.0	00	1	08/23/16 11:50	08/23/16 11:50	JDW
Hexachlorobutadiene	02	SW8260B	<0.80 ug/L	0.8	80	1	08/23/16 11:50	08/23/16 11:50	JDW
Iodomethane	02	SW8260B	<10.0 ug/L	10	0.0	1	08/23/16 11:50	08/23/16 11:50	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06						
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B						
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:							
Laboratory Order ID: 16H0505									
Analytical Results									

MW-02 Sample I.D.

Laboratory Sample ID:

16H0505-02

08/21/2016 16:50 Date/Time Sampled:

				Reporting		Sample Prep	Analysis	
Parameter	Samp ID	Method	Result Qua	l Limit	D.F.	Date/Time	Date/Time	Analyst
Volatile Organic Compounds	by GCMS							
Isopropylbenzene	02	SW8260B	1.92 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
m+p-Xylenes	02	SW8260B	<2.00 ug/L	2.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Methylene chloride	02	SW8260B	<4.00 ug/L	4.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Methyl-t-butyl ether (MTBE)	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Naphthalene	02	SW8260B	1.16 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
n-Butylbenzene	02	SW8260B	2.70 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
n-Propylbenzene	02	SW8260B	5.42 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
o-Xylene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
sec-Butylbenzene	02	SW8260B	1.34 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Styrene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
tert-Butylbenzene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Tetrachloroethylene (PCE)	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Toluene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
trans-1,2-Dichloroethylene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
trans-1,3-Dichloropropene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Trichloroethylene	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Trichlorofluoromethane	02	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Vinyl acetate	02	SW8260B	<10.0 ug/L	10.0	1	08/23/16 11:50	08/23/16 11:50	JDW
Vinyl chloride	02	SW8260B	<0.50 ug/L	0.50	1	08/23/16 11:50	08/23/16 11:50	JDW
Xylenes, Total	02	SW8260B	<3.00 ug/L	3.00	1	08/23/16 11:50	08/23/16 11:50	JDW
Surr: 1,2-Dichloroethane-d4	02	SW8260B	100 %	70-120		08/23/16 11:50	08/23/16 11:50	JDW
Surr: 4-Bromofluorobenzene	02	SW8260B	100 %	75-120		08/23/16 11:50	08/23/16 11:50	JDW
Surr: Dibromofluoromethane	02	SW8260B	100 %	80-119		08/23/16 11:50	08/23/16 11:50	JDW
Surr: Toluene-d8	02	SW8260B	98.5 %	85-120		08/23/16 11:50	08/23/16 11:50	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06						
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B						
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:							
Laboratory Order ID: 16H0505									

Trip Blank

Sample I.D.

Laboratory Sample ID:

16H0505-03

08/08/2016 08:30 Date/Time Sampled:

				Reporti	ng	Sample Prep	Analysis	
Parameter	Samp ID	Method	Result Qu	ual Limit	D.F.	Date/Time	Date/Time	Analyst
Volatile Hydrocarbons by GC								
TPH-Volatiles (GRO)	03	SW8015C	<0.10 mg/L	0.10	1	08/22/16 14:23	08/22/16 14:23	LAO
Volatile Organic Compounds	by GCMS							
1,1,1,2-Tetrachloroethane	03	SW8260B	<0.40 ug/L	0.40	1	08/23/16 11:03	08/23/16 11:03	JDW
1,1,1-Trichloroethane	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,1,2,2-Tetrachloroethane	03	SW8260B	<0.40 ug/L	0.40	1	08/23/16 11:03	08/23/16 11:03	JDW
1,1,2-Trichloroethane	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,1-Dichloroethane	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,1-Dichloroethylene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,1-Dichloropropene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2,3-Trichlorobenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2,3-Trichloropropane	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2,4-Trichlorobenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2,4-Trimethylbenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2-Dibromo-3-chloropropane (DBCP)	03	SW8260B	<4.00 ug/L	4.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2-Dibromoethane (EDB)	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2-Dichlorobenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2-Dichloroethane	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,2-Dichloropropane	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,3,5-Trimethylbenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,3-Dichlorobenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,3-Dichloropropane	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
1,4-Dichlorobenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
2,2-Dichloropropane	03	SW8260B	<2.00 ug/L	2.00	1	08/23/16 11:03	08/23/16 11:03	JDW
2-Butanone (MEK)	03	SW8260B	<10.0 ug/L	10.0	1	08/23/16 11:03	08/23/16 11:03	JDW
2-Chlorotoluene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06				
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B				
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:					
Laboratory Order ID: 16H0505							

Analytical Results

Sample I.D. Trip Blank

Laboratory Sample ID:

16H0505-03

Date/Time Sampled: 08/08/2016 08:30

Parameter	Samp ID	Method	Result Q)ual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
Volatile Organic Compounds	by GCMS								
2-Hexanone (MBK)	03	SW8260B	<5.00 ug/L		5.00	1	08/23/16 11:03	08/23/16 11:03	JDW
4-Chlorotoluene	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
4-Isopropyltoluene	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
4-Methyl-2-pentanone (MIBK)	03	SW8260B	<5.00 ug/L		5.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Acetone	03	SW8260B	<10.0 ug/L		10.0	1	08/23/16 11:03	08/23/16 11:03	JDW
Benzene	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Bromobenzene	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Bromochloromethane	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Bromodichloromethane	03	SW8260B	<0.50 ug/L		0.50	1	08/23/16 11:03	08/23/16 11:03	JDW
Bromoform	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Bromomethane	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Carbon disulfide	03	SW8260B	<10.0 ug/L		10.0	1	08/23/16 11:03	08/23/16 11:03	JDW
Carbon tetrachloride	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Chlorobenzene	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Chloroethane	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Chloroform	03	SW8260B	<0.50 ug/L		0.50	1	08/23/16 11:03	08/23/16 11:03	JDW
Chloromethane	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
cis-1,2-Dichloroethylene	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
cis-1,3-Dichloropropene	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Dibromochloromethane	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Dibromomethane	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Dichlorodifluoromethane	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Di-isopropyl ether (DIPE)	03	SW8260B	<5.00 ug/L		5.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Ethylbenzene	03	SW8260B	<1.00 ug/L		1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Hexachlorobutadiene	03	SW8260B	<0.80 ug/L		0.80	1	08/23/16 11:03	08/23/16 11:03	JDW
lodomethane	03	SW8260B	<10.0 ug/L		10.0	1	08/23/16 11:03	08/23/16 11:03	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06					
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B					
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:						
Laboratory Order ID: 16H0505								
Analytical Res	uits							

Sample I.D. Trip Blank

Laboratory Sample ID:

16H0505-03

Date/Time Sampled: 08/08/2016 08:30

Parameter	Samp ID	Method	Result Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
Volatile Organic Compounds	by GCMS							
Isopropylbenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
m+p-Xylenes	03	SW8260B	<2.00 ug/L	2.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Methylene chloride	03	SW8260B	<4.00 ug/L	4.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Methyl-t-butyl ether (MTBE)	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Naphthalene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
n-Butylbenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
n-Propylbenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
o-Xylene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
sec-Butylbenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Styrene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
tert-Butylbenzene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Tetrachloroethylene (PCE)	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Toluene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
trans-1,2-Dichloroethylene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
trans-1,3-Dichloropropene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Trichloroethylene	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Trichlorofluoromethane	03	SW8260B	<1.00 ug/L	1.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Vinyl acetate	03	SW8260B	<10.0 ug/L	10.0	1	08/23/16 11:03	08/23/16 11:03	JDW
Vinyl chloride	03	SW8260B	<0.50 ug/L	0.50	1	08/23/16 11:03	08/23/16 11:03	JDW
Xylenes, Total	03	SW8260B	<3.00 ug/L	3.00	1	08/23/16 11:03	08/23/16 11:03	JDW
Surr: 1,2-Dichloroethane-d4	03	SW8260B	98.0 %	70-120)	08/23/16 11:03	08/23/16 11:03	JDW
Surr: 4-Bromofluorobenzene	03	SW8260B	97.3 %	75-120)	08/23/16 11:03	08/23/16 11:03	JDW
Surr: Dibromofluoromethane	03	SW8260B	100 %	80-119		08/23/16 11:03	08/23/16 11:03	JDW
Surr: Toluene-d8	03	SW8260B	101 %	85-120)	08/23/16 11:03	08/23/16 11:03	JDW



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:	

- Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID Sequence ID		Calibration ID
Volatile Hydrocarbo	ons by GC	Preparation Method:	SW5030B		
16H0505-01	5.00 mL / 5.00 mL	SW8015C	BZH0569	SZH0612	AG60110
16H0505-02	5.00 mL / 5.00 mL	SW8015C	BZH0569	SZH0612	AG60110
16H0505-03	5.00 mL / 5.00 mL	SW8015C	BZH0569	SZH0612	AG60110
Volatile Organic Co	mpounds by GCMS	Preparation Method:	SW5030B		
16H0505-01	5.00 mL / 5.00 mL	SW8260B	BZH0632	SZH0664	AH60102
16H0505-02	5.00 mL / 5.00 mL	SW8260B	BZH0632	SZH0664	AH60102
16H0505-03	5.00 mL / 5.00 mL	SW8260B	BZH0632	SZH0664	AH60102



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:	

Volatile Hydrocarbons by GC - Quality Control

		Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Qual
Batch BZH0569 - SW5030B										
Blank (BZH0569-BLK1)				Prepared	& Analyzed	1: 08/22/2	016			
TPH-Volatiles (GRO)	<0.10 mg/L	0.10	mg/L							
LCS (BZH0569-BS1)				Prepared	& Analyzed	1: 08/22/2	016			
TPH-Volatiles (GRO)	1.01 mg/L	0.10	mg/L	1.00	mg/L	101	70-130			
LCS Dup (BZH0569-BSD1)				Prepared	& Analyzed	1: 08/22/2	016			
TPH-Volatiles (GRO)	1.09 mg/L	0.10	mg/L	1.00	mg/L	109	70-130	7.87	20	
Matrix Spike (BZH0569-MS1)	Sour	ce: 16H0498	3-02	Prepared	& Analyzed	1: 08/22/2	016			
TPH-Volatiles (GRO)	1.05 mg/L	0.10	mg/L	1.00	<0.10 mg/L	105	70-130			
Matrix Spike Dup (BZH0569-MSD1)	Sour	ce: 16H0498	3-02	Prepared	& Analyzed	1: 08/22/2	016			
TPH-Volatiles (GRO)	1.06 mg/L	0.10	mg/L	1.00	<0.10 mg/L	106	70-130	0.483	20	



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06			
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B			
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:				
Volatile Organic Compounds by CCMS - Quality Control						

Volatile Organic Compounds by GCMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BZH0632 - SW5030B										
Blank (BZH0632-BLK1)				Prepared	& Analyzed	d: 08/23/20	016			
1,1,1,2-Tetrachloroethane	<0.40 ug/L	0.40	ug/L		•					
1,1,1-Trichloroethane	<1.00 ug/L	1.00	ug/L							
1,1,2,2-Tetrachloroethane	<0.40 ug/L	0.40	ug/L							
1,1,2-Trichloroethane	<1.00 ug/L	1.00	ug/L							
1,1-Dichloroethane	<1.00 ug/L	1.00	ug/L							
1,1-Dichloroethylene	<1.00 ug/L	1.00	ug/L							
1,1-Dichloropropene	<1.00 ug/L	1.00	ug/L							
1,2,3-Trichlorobenzene	<1.00 ug/L	1.00	ug/L							
1,2,3-Trichloropropane	<1.00 ug/L	1.00	ug/L							
1,2,4-Trichlorobenzene	<1.00 ug/L	1.00	ug/L							
1,2,4-Trimethylbenzene	<1.00 ug/L	1.00	ug/L							
1,2-Dibromo-3-chloropropane (DBCP)	<4.00 ug/L	4.00	ug/L							
1,2-Dibromoethane (EDB)	<1.00 ug/L	1.00	ug/L							
1,2-Dichlorobenzene	<1.00 ug/L	1.00	ug/L							
1,2-Dichloroethane	<1.00 ug/L	1.00	ug/L							
1,2-Dichloropropane	<1.00 ug/L	1.00	ug/L							
1,3,5-Trimethylbenzene	<1.00 ug/L	1.00	ug/L							
1,3-Dichlorobenzene	<1.00 ug/L	1.00	ug/L							
1,3-Dichloropropane	<1.00 ug/L	1.00	ug/L							
1,4-Dichlorobenzene	<1.00 ug/L	1.00	ug/L							
2,2-Dichloropropane	<2.00 ug/L	2.00	ug/L							
2-Butanone (MEK)	<10.0 ug/L	10.0	ug/L							
2-Chlorotoluene	<1.00 ug/L	1.00	ug/L							
2-Hexanone (MBK)	<5.00 ug/L	5.00	ug/L							
4-Chlorotoluene	<1.00 ug/L	1.00	ug/L							
4-Isopropyltoluene	<1.00 ug/L	1.00	ug/L							
4-Methyl-2-pentanone (MIBK)	<5.00 ug/L	5.00	ug/L							
Acetone	<10.0 ug/L	10.0	ug/L							
Benzene	<1.00 ug/L	1.00	ug/L							
Bromobenzene	<1.00 ug/L	1.00	ug/L							
Bromochloromethane	<1.00 ug/L	1.00	ug/L							



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06			
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B			
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:				
Volatile Organic Compounds by GCMS - Quality Control						

Volatile Organic Compounds by GCMS - Quality Control

Apolito	Booult	Reporting		Spike	Source	0/ DE 0	%REC	RDD	RPD	Qual
Analyte	result		UTILS	Level	Result	70REU	LIMIS			Quai
Batch BZH0632 - SW5030B										
Blank (BZH0632-BLK1)				Prepared &	Analyzed	: 08/23/20	16			
Bromodichloromethane	<0.50 ug/L	0.50	ug/L	_						
Bromoform	<1.00 ug/L	1.00	ug/L							
Bromomethane	<1.00 ug/L	1.00	ug/L							
Carbon disulfide	<10.0 ug/L	10.0	ug/L							
Carbon tetrachloride	<1.00 ug/L	1.00	ug/L							
Chlorobenzene	<1.00 ug/L	1.00	ug/L							
Chloroethane	<1.00 ug/L	1.00	ug/L							
Chloroform	<0.50 ug/L	0.50	ug/L							
Chloromethane	<1.00 ug/L	1.00	ug/L							
cis-1,2-Dichloroethylene	<1.00 ug/L	1.00	ug/L							
cis-1,3-Dichloropropene	<1.00 ug/L	1.00	ug/L							
Dibromochloromethane	<1.00 ug/L	1.00	ug/L							
Dibromomethane	<1.00 ug/L	1.00	ug/L							
Dichlorodifluoromethane	<1.00 ug/L	1.00	ug/L							
Di-isopropyl ether (DIPE)	<5.00 ug/L	5.00	ug/L							
Ethylbenzene	<1.00 ug/L	1.00	ug/L							
Hexachlorobutadiene	<0.80 ug/L	0.80	ug/L							
lodomethane	<10.0 ug/L	10.0	ug/L							
Isopropylbenzene	<1.00 ug/L	1.00	ug/L							
m+p-Xylenes	<2.00 ug/L	2.00	ug/L							
Methylene chloride	<4.00 ug/L	4.00	ug/L							
Methyl-t-butyl ether (MTBE)	<1.00 ug/L	1.00	ug/L							
Naphthalene	<1.00 ug/L	1.00	ug/L							
n-Butylbenzene	<1.00 ug/L	1.00	ug/L							
n-Propylbenzene	<1.00 ug/L	1.00	ug/L							
o-Xylene	<1.00 ug/L	1.00	ug/L							
sec-Butylbenzene	<1.00 ug/L	1.00	ug/L							
Styrene	<1.00 ug/L	1.00	ug/L							
tert-Butylbenzene	<1.00 ug/L	1.00	ug/L							
Tetrachloroethylene (PCE)	<1.00 ug/L	1.00	ug/L							
Toluene	<1.00 ug/L	1.00	ug/L							



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06		
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B		
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:			
	Valatila Ormania Commoundo hu CC				

Volatile Organic Compounds by GCMS - Quality Control

Analyse Result Limit Units Level Result %REC Limits RPD Limit Qual Batch BZH0632 - SW5030B			Reporting		Spike	Source		%REC		RPD	
Propared & Analyzed: 08/23/2016 Jank (BZH0632-BLK1) Propared & Analyzed: 08/23/2016 rans-1.2-Dichloroethylene <1.00 ug/L 1.00 ug/L rans-1.3-Dichloropropene <1.00 ug/L 1.00 ug/L richloroethylene <1.00 ug/L 1.00 ug/L richloroethane <1.00 ug/L 1.00 ug/L Star: 2.00 ug/L 0.00 rot. Wirr 1.2.0th/oroethane 49.3 ug/L 50.0 96.7 75-120 Star: 7.5 ug/L 50.0 96.7 75-120 Star: 7.5 ug/L 50.0 96.7 75-120 Star: 7.5 ug/L 50.0 96.7 75-120 Star:	Analyte	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Qual
Blank (B2H0632-BLK1) Prepared & Analyzed: 08/23/2016 rans-1,2-Dichloroethylene <1.00	Batch BZH0632 - SW5030B										
rans-1,2-Dichloroethylene <1.00	Blank (BZH0632-BLK1)				Prepared	<u>I & Analyz</u> eo	<u>1: 08/23/20</u>	016			
rans-1,3-Dichloropropene <1.00 ug/L	trans-1,2-Dichloroethylene	<1.00 ug/L	1.00	ug/L							
Trichloroethylene <1.00 ug/L	trans-1,3-Dichloropropene	<1.00 ug/L	1.00	ug/L							
frichlorofluoromethane <1.00 ug/L	Trichloroethylene	<1.00 ug/L	1.00	ug/L							
vinyl acetate <10.0 ug/L	Trichlorofluoromethane	<1.00 ug/L	1.00	ug/L							
/inyl chloride <0.50 ug/L	Vinyl acetate	<10.0 ug/L	10.0	ug/L							
Kylenes, Total <3.00 ug/L 3.00 ug/L Surr. 1,2-Dichloroethane-d4 50.1 ug/L 50.0 98.7 75.120 Surr. 1,2-Dichloroethane-d4 50.1 ug/L 50.0 98.7 75.120 Surr. Toibromofluorobenzene 49.3 ug/L 50.0 98.7 75.120 Surr. Toibromofluorobenzene 50.1 ug/L 50.0 100 80-119 Surr. Toibromofluorobenzene 47.5 ug/L 50.0 0.0 88.7 75.120 CS (SZH0632-BS1) Prepared & Analyzed: 08/23/2016 Num 80-130 100 80-130 1,1,2Tertachloroethane 57.3 ug/L 1 ug/L 50.0 ug/L 10 80-130 1,1,2Tertachloroethane 51.0 ug/L 1 ug/L 50.0 ug/L 10.2 75-125 1,1.2Tertachloroethane 51.0 ug/L 1 ug/L 50.0 ug/L 10.2 75-125 1,1.2Tertachloroethane 54.6 ug/L 1 ug/L 50.0 ug/L	Vinyl chloride	<0.50 ug/L	0.50	ug/L							
Surr: 1,2-Dichloroethane-04 50.1 ug/L 50.0 100 70-120 Surr: 4-Bromofluorobenzene 49.3 ug/L 50.0 98.7 75-120 Surr: Toluene-08 47.5 ug/L 50.0 95.0 85-120 CS (BZH0632-BS1) Prepared & Analyzed: 08/23/2016 100 80-119 L1,1,2-Tetrachloroethane 57.3 ug/L 1 ug/L 50.0 ug/L 110 80-130 L1,1,2-Tetrachloroethane 57.3 ug/L 1 ug/L 50.0 ug/L 115 65-130 L1,2-Trichloroethane 51.0 ug/L 1 ug/L 50.0 ug/L 102 75-125 L1,1-Dichloroethane 54.6 ug/L 1 ug/L 50.0 ug/L 102 75-125 L1,1-Dichloroethane 50.5 ug/L 1 ug/L 50.0 ug/L 102 75-135 L,3-Trichlorobenzene 54.3 ug/L 1 ug/L 50.0 ug/L 101 75-135 L,2-S-Trichlorobenzene 54.3 ug/L	Xylenes, Total	<3.00 ug/L	3.00	ug/L							
Sur: 4-Bromofluorobenzene 49.3 ug/L 50.0 96.7 75-120 Sur: 7bloene-d8 47.5 ug/L 50.0 100 80-119 Sur: 7bloene-d8 47.5 ug/L 50.0 96.7 75-120 CS (BZH0632-BS1) vg/L 50.0 vg/L 100 80-130 L1,1,2-Tetrachloroethane 57.3 ug/L 1 ug/L 50.0 ug/L 110 80-130 L1,1,2-Trichloroethane 57.3 ug/L 1 ug/L 50.0 ug/L 102 75-125 L1,12-Trichloroethane 51.0 ug/L 1 ug/L 50.0 ug/L 102 75-125 L1,12-Trichloroethane 51.0 ug/L 1 ug/L 50.0 ug/L 102 75-125 L1,1D-bichoroethane 50.5 ug/L 1 ug/L 50.0 ug/L 102 75-135 L1,2-Trichloroethane 54.8 ug/L 1 ug/L 50.0 ug/L 102 75-135 L2,3-Trichlorobenzene 54.8 ug/L 1	Surr: 1,2-Dichloroethane-d4	50.1		ug/L	50.0		100	70-120			
Surr. Dibromofluoromethane 50.1 ug/L 50.0 100 80-119 Surr. Toluene-d8 47.5 ug/L 50.0 95.0 85-120 LCS (BZH0632-BS1) Preparet & Analyzet: 08/23/2014 0.4 ug/L 50.0 ug/L 110 80-130 1,1,1-Tichloroethane 57.3 ug/L 1 ug/L 50.0 ug/L 115 65-130 1,1,2-Tetrachloroethane 48.9 ug/L 0.4 ug/L 50.0 ug/L 102 75-135 1,1,2-Tetrachloroethane 54.6 ug/L 1 ug/L 50.0 ug/L 102 75-135 1,1-Dichloroethane 50.5 ug/L 1 ug/L 50.0 ug/L 102 75-135 1,1-Dichloroethane 50.4 ug/L 1 ug/L 50.0 ug/L 101 75-135 1,2,3-Trichlorobenzene 54.4 ug/L 1 ug/L 50.0 ug/L 101 75-135 1,2,4-Trichlorobenzene 54.4 ug/L 1 ug/L 50.0 ug/L 101 <td>Surr: 4-Bromofluorobenzene</td> <td>49.3</td> <td></td> <td>ug/L</td> <td>50.0</td> <td></td> <td>98.7</td> <td>75-120</td> <td></td> <td></td> <td></td>	Surr: 4-Bromofluorobenzene	49.3		ug/L	50.0		98.7	75-120			
Sur: Toluene-d8 47.5 ug/L 50.0 95.0 85-120 CS (6ZH0632-BS1) Prepared Network SU2/3/2/2/3 Network SU2/3/2/3 Network SU2/3/2/3 Network SU2/3/2/3 1,1,2-Tetrachloroethane 55.2 ug/L 0.4 ug/L 50.0 ug/L 110 80-130 1,1,2-Tetrachloroethane 48.9 ug/L 0.4 ug/L 50.0 ug/L 97.8 65-130 1,1,2-Trichloroethane 51.0 ug/L 1 ug/L 50.0 ug/L 102 75-125 1,1-Dichloroethane 54.6 ug/L 1 ug/L 50.0 ug/L 109 70-135 1,1-Dichloroethylene 50.5 ug/L 1 ug/L 50.0 ug/L 109 75-135 1,2-Dichloroethylene 54.4 ug/L 1 ug/L 50.0 ug/L 109 55-140 1,2-Dichlorobenzene 54.4 ug/L 1 ug/L 50.0 ug/L 101 75-135 1,2-Dichlorobenzene 54.4 ug/L 1 ug/L 50.0 ug/L <td< td=""><td>Surr: Dibromofluoromethane</td><td>50.1</td><td></td><td>ug/L</td><td>50.0</td><td></td><td>100</td><td>80-119</td><td></td><td></td><td></td></td<>	Surr: Dibromofluoromethane	50.1		ug/L	50.0		100	80-119			
CS (BZH0632-BS1) Preparet S Analyzed: 08/23/2014 1,1,2-Tetrachloroethane 55.2 ug/L 0.4 ug/L 50.0 ug/L 110 80-130 1,1,1-Trichloroethane 57.3 ug/L 1 ug/L 50.0 ug/L 115 65-130 1,1,2-Trichloroethane 48.9 ug/L 0.4 ug/L 50.0 ug/L 97.8 65-130 1,1,2-Trichloroethane 51.0 ug/L 1 ug/L 50.0 ug/L 102 75-125 1,1-Dichloroethane 50.5 ug/L 1 ug/L 50.0 ug/L 101 70-135 1,1-Dichloroethylene 50.5 ug/L 1 ug/L 50.0 ug/L 102 75-135 1,2-Si-Trichlorobenzene 54.3 ug/L 1 ug/L 50.0 ug/L 101 75-135 1,2-A-Trichlorobenzene 54.4 ug/L 1 ug/L 50.0 ug/L 101 75-135 1,2-Dichorobenzene 53.4 ug/L 1 ug/L 50.0 ug/L 100 65-130	Surr: Toluene-d8	47.5		ug/L	50.0		95.0	85-120			
1,1,2-Tetrachloroethane55.2 ug/L0.4ug/L50.0ug/L11080-1301,1,1-Trichloroethane57.3 ug/L1ug/L50.0ug/L11565-1301,1,2,2-Tetrachloroethane48.9 ug/L0.4ug/L50.0ug/L97.865-1301,1,2-Trichloroethane51.0 ug/L1ug/L50.0ug/L10275-1251,1-Dichloroethane54.6 ug/L1ug/L50.0ug/L10170-1301,1-Dichloroethane50.5 ug/L1ug/L50.0ug/L10275-1351,1-Dichloroethane51.0 ug/L1ug/L50.0ug/L10275-1351,1-Dichloroethane54.8 ug/L1ug/L50.0ug/L10170-1301,2,3-Trichloropenen54.3 ug/L1ug/L50.0ug/L10175-1251,2,3-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L10175-1251,2,4-Trinhethylbenzene53.4 ug/L1ug/L50.0ug/L10175-1301,2-Dibromo-3-chloropropane (DBCP)51.0 ug/L4ug/L50.0ug/L10250-1301,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10775-1301,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10780-1301,2-Dichloropropane64.8 ug/L1ug/L50.0ug/L10780-1301,2-Dichloropropane <td< td=""><td>LCS (BZH0632-BS1)</td><td></td><td></td><td></td><td>Prepared</td><td>& Analyzed</td><td>d: 08/23/20</td><td>016</td><td></td><td></td><td></td></td<>	LCS (BZH0632-BS1)				Prepared	& Analyzed	d: 08/23/20	016			
1,1,1-Trichloroethane57.3 ug/L1ug/L50.0ug/L11565-1301,1,2,2-Tetrachloroethane48.9 ug/L0.4ug/L50.0ug/L97.865-1301,1,2-Trichloroethane51.0 ug/L1ug/L50.0ug/L10275-1251,1-Dichloroethane54.6 ug/L1ug/L50.0ug/L10970-1351,1-Dichloroethylene50.5 ug/L1ug/L50.0ug/L10275-1351,1-Dichloroethylene51.0 ug/L1ug/L50.0ug/L10955-1401,2,3-Trichloropene54.4 ug/L1ug/L50.0ug/L10175-1251,2,3-Trichloropene54.4 ug/L1ug/L50.0ug/L10175-1251,2,3-Trichloropene54.4 ug/L1ug/L50.0ug/L10175-1251,2,4-Trimethylbenzene53.4 ug/L1ug/L50.0ug/L10165-1331,2,2-Trichloropopane (DBCP)51.0 ug/L4ug/L50.0ug/L10065-1301,2-Dichlorobenzene53.5 ug/L1ug/L50.0ug/L10775-1301,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10780-1201,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10780-1201,2-Dichlorobenzene54.8 ug/L1ug/L50.0ug/L10870-1301,2-Dichlorobenzene54.8 ug/L </td <td>1,1,1,2-Tetrachloroethane</td> <td>55.2 ug/L</td> <td>0.4</td> <td>ug/L</td> <td>50.0</td> <td>ug/L</td> <td>110</td> <td>80-130</td> <td></td> <td></td> <td></td>	1,1,1,2-Tetrachloroethane	55.2 ug/L	0.4	ug/L	50.0	ug/L	110	80-130			
1,1,2,2-Tetrachloroethane48.9 ug/L0.4ug/L50.0ug/L97.865-1301,1,2,-Trichloroethane51.0 ug/L1ug/L50.0ug/L10275-1251,1-Dichloroethane54.6 ug/L1ug/L50.0ug/L10970-1351,1-Dichloroethylene50.5 ug/L1ug/L50.0ug/L10170-1301,1-Dichloroethylene51.0 ug/L1ug/L50.0ug/L10275-1351,2,3-Trichlorobenzene54.3 ug/L1ug/L50.0ug/L10175-1251,2,4-Trichlorobenzene50.4 ug/L1ug/L50.0ug/L10175-1251,2,4-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L10175-1301,2,2-Dichloropopane (DBCP)51.0 ug/L4ug/L50.0ug/L10250-1301,2,Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10775-1301,2,Dichloroptopane (DBCP)51.0 ug/L4ug/L50.0ug/L10780-1201,2,Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1301,2,Dichloroptopane48.8 ug/L1ug/L50.0ug/L10780-1201,2,Dichloroptopane48.8 ug/L1ug/L50.0ug/L10670-1301,2,Dichloroptopane48.8 ug/L1ug/L50.0ug/L10780-1201,2,Dichloroptopane	1,1,1-Trichloroethane	57.3 ug/L	1	ug/L	50.0	ug/L	115	65-130			
1,1,2-Trichloroethane51.0 ug/L1ug/L50.0ug/L10275-1251,1-Dichloroethane54.6 ug/L1ug/L50.0ug/L10970-1351,1-Dichloroethylene50.5 ug/L1ug/L50.0ug/L10170-1301,1-Dichloropropene51.0 ug/L1ug/L50.0ug/L10275-1351,2,3-Trichlorobenzene54.3 ug/L1ug/L50.0ug/L10955-1401,2,3-Trichlorobenzene50.4 ug/L1ug/L50.0ug/L10175-1251,2,4-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L10165-1351,2,4-Trichlorobenzene53.4 ug/L1ug/L50.0ug/L10775-1301,2-Dibromo-3-chloropropane (DBCP)51.0 ug/L1ug/L50.0ug/L10780-1201,2-Dibromoethane (EDB)53.5 ug/L1ug/L50.0ug/L10670-1201,2-Dichloropenpane68.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropenpane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropenpane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropenpane48.8 ug/L1ug/L50.0ug/L97.575-1251,3-Dichloropenpane54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene	1,1,2,2-Tetrachloroethane	48.9 ug/L	0.4	ug/L	50.0	ug/L	97.8	65-130			
1,1-Dichloroethane54.6 ug/L1ug/L50.0ug/L10970-1351,1-Dichloroethylene50.5 ug/L1ug/L50.0ug/L10170-1301,1-Dichloropropene51.0 ug/L1ug/L50.0ug/L10275-1351,2,3-Trichlorobenzene54.3 ug/L1ug/L50.0ug/L10175-1251,2,3-Trichlorobenzene50.4 ug/L1ug/L50.0ug/L10175-1251,2,4-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L10775-1301,2,4-Trimethylbenzene53.4 ug/L1ug/L50.0ug/L10775-1301,2-Dichlorobenzene51.0 ug/L4ug/L50.0ug/L10780-1201,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1201,2-Dichloropopane63.1 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropopane48.8 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropopane48.8 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropopane48.8 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropopane48.8 ug/L1ug/L50.0ug/L97.875-1251,3-Dichlorobenzene54.5 ug/L1ug/L50.0ug/L10675-1251,3-Dichlorobenzene53.1 ug/L1<	1,1,2-Trichloroethane	51.0 ug/L	1	ug/L	50.0	ug/L	102	75-125			
1,1-Dichloroethylene50.5 ug/L1ug/L50.0ug/L10170-1301,1-Dichloropropene51.0 ug/L1ug/L50.0ug/L10275-1351,2,3-Trichlorobenzene54.3 ug/L1ug/L50.0ug/L10955-1401,2,3-Trichloropropane50.4 ug/L1ug/L50.0ug/L10175-1251,2,4-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L10065-1351,2,4-Trimethylbenzene53.4 ug/L1ug/L50.0ug/L10250-1301,2-Dichlorobropropane (DBCP)51.0 ug/L1ug/L50.0ug/L10250-1301,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10250-1301,2-Dichloropropane53.1 ug/L1ug/L50.0ug/L10780-1201,2-Dichloropropane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L97.575-1251,3-Dichlorobenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene54.5 ug/L1ug/L50.0ug/L10675-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,1-Dichloroethane	54.6 ug/L	1	ug/L	50.0	ug/L	109	70-135			
1.1-Dichloropropene51.0 ug/L1ug/L50.0ug/L10275-1351.2,3-Trichlorobenzene54.3 ug/L1ug/L50.0ug/L10955-1401.2,3-Trichloropropane50.4 ug/L1ug/L50.0ug/L10175-1251.2,4-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L10775-1301.2,4-Trinethylbenzene53.4 ug/L1ug/L50.0ug/L10250-1301.2,2-Dichoropopane (DBCP)51.0 ug/L4ug/L50.0ug/L10250-1301.2,2-Dichlorobenzene53.5 ug/L1ug/L50.0ug/L10670-1201.2,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L97.870-1301.2,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L97.575-1251.3,5-Trimethylbenzene54.5 ug/L1ug/L50.0ug/L10975-1251.3,5-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10975-1251.3,5-Trimethylbenzene54.5 ug/L1ug/L50.0ug/L10975-1251.3,5-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10975-1251.3,5-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-1251.3,5-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,1-Dichloroethylene	50.5 ug/L	1	ug/L	50.0	ug/L	101	70-130			
1,2,3-Trichlorobenzene54.3 ug/L1ug/L50.0ug/L10955-1401,2,3-Trichloropropane50.4 ug/L1ug/L50.0ug/L10175-1251,2,4-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L11065-1351,2,4-Trimethylbenzene53.4 ug/L1ug/L50.0ug/L10775-1301,2-Dibromo-3-chloropropane (DBCP)51.0 ug/L4ug/L50.0ug/L10250-1301,2-Dibromoethane (EDB)53.5 ug/L1ug/L50.0ug/L10780-1201,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1201,2-Dichloropropane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L97.575-1251,3-Dichlorobenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10975-125	1,1-Dichloropropene	51.0 ug/L	1	ug/L	50.0	ug/L	102	75-135			
1,2,3-Trichloropropane50.4 ug/L1ug/L50.0ug/L10175-1251,2,4-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L11065-1351,2,4-Trimethylbenzene53.4 ug/L1ug/L50.0ug/L10775-1301,2-Dibromo-3-chloropropane (DBCP)51.0 ug/L4ug/L50.0ug/L10250-1301,2-Dibromoethane (EDB)53.5 ug/L1ug/L50.0ug/L10780-1201,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1201,2-Dichloropropane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L97.575-1251,3-Dichlorobenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,2,3-Trichlorobenzene	54.3 ug/L	1	ug/L	50.0	ug/L	109	55-140			
1,2,4-Trichlorobenzene54.8 ug/L1ug/L50.0ug/L11065-1351,2,4-Trimethylbenzene53.4 ug/L1ug/L50.0ug/L10775-1301,2-Dibromo-3-chloropropane (DBCP)51.0 ug/L4ug/L50.0ug/L10250-1301,2-Dibromoethane (EDB)53.5 ug/L1ug/L50.0ug/L10780-1201,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1201,2-Dichloropropane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,2,3-Trichloropropane	50.4 ug/L	1	ug/L	50.0	ug/L	101	75-125			
1,2,4-Trimethylbenzene53.4 ug/L1ug/L50.0ug/L10775-1301,2-Dibromo-3-chloropropane (DBCP)51.0 ug/L4ug/L50.0ug/L10250-1301,2-Dibromoethane (EDB)53.5 ug/L1ug/L50.0ug/L10780-1201,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1201,2-Dichloropthane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropthane48.8 ug/L1ug/L50.0ug/L97.575-1251,3,5-Trimethylbenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-120	1,2,4-Trichlorobenzene	54.8 ug/L	1	ug/L	50.0	ug/L	110	65-135			
1,2-Dibromo-3-chloropropane (DBCP)51.0 ug/L4ug/L50.0ug/L10250-1301,2-Dibromoethane (EDB)53.5 ug/L1ug/L50.0ug/L10780-1201,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1201,2-Dichloroethane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloroptopane48.8 ug/L1ug/L50.0ug/L97.575-1251,3,5-Trimethylbenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,2,4-Trimethylbenzene	53.4 ug/L	1	ug/L	50.0	ug/L	107	75-130			
1,2-Dibromoethane (EDB)53.5 ug/L1ug/L50.0ug/L10780-1201,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1201,2-Dichloroethane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L97.575-1251,3,5-Trimethylbenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,2-Dibromo-3-chloropropane (DBCP)	51.0 ug/L	4	ug/L	50.0	ug/L	102	50-130			
1,2-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10670-1201,2-Dichloroethane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L97.575-1251,3,5-Trimethylbenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,2-Dibromoethane (EDB)	53.5 ug/L	1	ug/L	50.0	ug/L	107	80-120			
1,2-Dichloroethane48.9 ug/L1ug/L50.0ug/L97.870-1301,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L97.575-1251,3,5-Trimethylbenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,2-Dichlorobenzene	53.1 ug/L	1	ug/L	50.0	ug/L	106	70-120			
1,2-Dichloropropane48.8 ug/L1ug/L50.0ug/L97.575-1251,3,5-Trimethylbenzene54.5 ug/L1ug/L50.0ug/L10975-1251,3-Dichlorobenzene53.1 ug/L1ug/L50.0ug/L10675-125	1,2-Dichloroethane	48.9 ug/L	1	ug/L	50.0	ug/L	97.8	70-130			
1,3,5-Trimethylbenzene 54.5 ug/L 1 ug/L 50.0 ug/L 109 75-125 1,3-Dichlorobenzene 53.1 ug/L 1 ug/L 50.0 ug/L 106 75-125	1,2-Dichloropropane	48.8 ug/L	1	ug/L	50.0	ug/L	97.5	75-125			
1,3-Dichlorobenzene 53.1 ug/L 1 ug/L 50.0 ug/L 106 75-125	1,3,5-Trimethylbenzene	54.5 ug/L	1	ug/L	50.0	ug/L	109	75-125			
	1,3-Dichlorobenzene	53.1 ug/L	1	ug/L	50.0	ug/L	106	75-125			



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06		
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B		
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:			
	Volatilo Organic Compounds by GC	MS - Quality Contro	J		

Volatile Organic Compounds by GCMS - Quality Control

		Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Qual
Batch BZH0632 - SW5030B										
LCS (BZH0632-BS1)				Prepare	d & Analyzed	d: 08/23/2	016			
1,3-Dichloropropane	50.3 ug/L	1	ug/L	50.0	ug/L	101	75-125			
1,4-Dichlorobenzene	52.9 ug/L	1	ug/L	50.0	ug/L	106	75-125			
2,2-Dichloropropane	55.8 ug/L	2	ug/L	50.0	ug/L	112	70-135			
2-Butanone (MEK)	48.5 ug/L	10	ug/L	50.0	ug/L	96.9	30-150			
2-Chlorotoluene	55.2 ug/L	1	ug/L	50.0	ug/L	110	75-125			
2-Hexanone (MBK)	51.1 ug/L	5	ug/L	50.0	ug/L	102	55-130			
4-Chlorotoluene	53.3 ug/L	1	ug/L	50.0	ug/L	107	75-130			
4-Isopropyltoluene	55.3 ug/L	1	ug/L	50.0	ug/L	111	75-130			
4-Methyl-2-pentanone (MIBK)	52.2 ug/L	5	ug/L	50.0	ug/L	104	60-135			
Acetone	44.9 ug/L	10	ug/L	50.0	ug/L	89.8	40-140			
Benzene	51.8 ug/L	1	ug/L	50.0	ug/L	104	80-120			
Bromobenzene	53.6 ug/L	1	ug/L	50.0	ug/L	107	75-125			
Bromochloromethane	51.3 ug/L	1	ug/L	50.0	ug/L	103	65-130			
Bromodichloromethane	58.4 ug/L	0.5	ug/L	50.0	ug/L	117	75-120			
Bromoform	56.7 ug/L	1	ug/L	50.0	ug/L	113	70-130			
Bromomethane	40.5 ug/L	1	ug/L	50.0	ug/L	81.0	30-145			
Carbon disulfide	35.6 ug/L	10	ug/L	50.0	ug/L	71.1	35-160			
Carbon tetrachloride	58.1 ug/L	1	ug/L	50.0	ug/L	116	65-140			
Chlorobenzene	53.7 ug/L	1	ug/L	50.0	ug/L	107	80-120			
Chloroethane	48.4 ug/L	1	ug/L	50.0	ug/L	96.8	60-135			
Chloroform	52.9 ug/L	0.5	ug/L	50.0	ug/L	106	65-135			
Chloromethane	41.1 ug/L	1	ug/L	50.0	ug/L	82.2	40-125			
cis-1,2-Dichloroethylene	53.8 ug/L	1	ug/L	50.0	ug/L	108	70-125			
cis-1,3-Dichloropropene	49.0 ug/L	1	ug/L	50.0	ug/L	98.1	70-130			
Dibromochloromethane	59.6 ug/L	1	ug/L	50.0	ug/L	119	60-135			
Dibromomethane	55.2 ug/L	1	ug/L	50.0	ug/L	110	75-125			
Dichlorodifluoromethane	41.8 ug/L	1	ug/L	50.0	ug/L	83.6	30-155			
Ethylbenzene	54.3 ug/L	1	ug/L	50.0	ug/L	109	75-125			
Hexachlorobutadiene	54.4 ug/L	0.8	ug/L	50.0	ug/L	109	50-140			
Isopropylbenzene	54.8 ug/L	1	ug/L	50.0	ug/L	110	75-125			
m+p-Xylenes	108 ug/L	2	ug/L	100	ug/L	108	75-130			



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06		
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B		
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:			
	Volatilo Organic Compounds by GC	MS - Quality Contro	J		

Volatile Organic Compounds by GCMS - Quality Control

A	Decult	Reporting	1.1	Spike	Source		%REC	חסס	RPD	Qual
Analyte	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Qual
Batch BZH0632 - SW5030B										
LCS (BZH0632-BS1)				Prepare	d & Analyze	<u>d: 08/23/2</u>	016			
Methylene chloride	46.1 ug/L	4	ug/L	50.0	ug/L	92.2	55-140			
Methyl-t-butyl ether (MTBE)	51.8 ug/L	1	ug/L	50.0	ug/L	104	65-125			
Naphthalene	53.9 ug/L	1	ug/L	50.0	ug/L	108	55-140			
n-Butylbenzene	54.2 ug/L	1	ug/L	50.0	ug/L	108	70-135			
n-Propylbenzene	55.4 ug/L	1	ug/L	50.0	ug/L	111	70-130			
o-Xylene	55.6 ug/L	1	ug/L	50.0	ug/L	111	80-120			
sec-Butylbenzene	53.9 ug/L	1	ug/L	50.0	ug/L	108	70-125			
Styrene	56.1 ug/L	1	ug/L	50.0	ug/L	112	65-135			
tert-Butylbenzene	56.2 ug/L	1	ug/L	50.0	ug/L	112	70-130			
Tetrachloroethylene (PCE)	73.1 ug/L	1	ug/L	50.0	ug/L	146	45-150			
Toluene	52.6 ug/L	1	ug/L	50.0	ug/L	105	75-120			
trans-1,2-Dichloroethylene	50.6 ug/L	1	ug/L	50.0	ug/L	101	60-140			
trans-1,3-Dichloropropene	53.9 ug/L	1	ug/L	50.0	ug/L	108	55-140			
Trichloroethylene	50.7 ug/L	1	ug/L	50.0	ug/L	101	70-125			
Trichlorofluoromethane	48.3 ug/L	1	ug/L	50.0	ug/L	96.6	60-145			
Vinyl chloride	44.2 ug/L	0.5	ug/L	50.0	ug/L	88.3	50-145			
Surr: 1,2-Dichloroethane-d4	47.7		ug/L	50.0	ug/L	95.3	70-120			
Surr: 4-Bromofluorobenzene	50.2		ug/L	50.0	ug/L	100	75-120			
Surr: Dibromofluoromethane	49.1		ug/L	50.0	ug/L	98.1	80-119			
Surr: Toluene-d8	49.0		ug/L	50.0	ug/L	98.1	85-120			
Matrix Spike (BZH0632-MS1)	Sour	ce: 16H050	5-01	Prepared	d & Analyze	d: 08/23/2	016			
1,1,1,2-Tetrachloroethane	53.3 ug/L	0.4	ug/L	50.0	<0.4 ug/L	107	80-130			
1,1,1-Trichloroethane	55.6 ug/L	1	ug/L	50.0	<1 ug/L	111	65-130			
1,1,2,2-Tetrachloroethane	48.1 ug/L	0.4	ug/L	50.0	<0.4 ug/L	96.2	65-130			
1,1,2-Trichloroethane	50.8 ug/L	1	ug/L	50.0	<1 ug/L	102	75-125			
1,1-Dichloroethane	54.5 ug/L	1	ug/L	50.0	<1 ug/L	109	70-135			
1,1-Dichloroethylene	51.9 ug/L	1	ug/L	50.0	<1 ug/L	104	70-130			
1,1-Dichloropropene	50.3 ug/L	1	ug/L	50.0	<1 ug/L	101	75-135			
1,2,3-Trichlorobenzene	54.6 ug/L	1	ug/L	50.0	<1 ug/L	109	55-140			
1,2,3-Trichloropropane	49.3 ug/L	1	ug/L	50.0	<1 ug/L	98.6	75-125			



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06					
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B					
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:						
Volatile Organic Compounds by GCMS - Quality Control								

	Air Water and Soil Laboratories, Inc.											
Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual		
Batch BZH0632 - SW5030B												
Matrix Spike (BZH0632-MS1)	Sour	ce: 16H050	5-01	Prepare	d & Analyzed	d: 08/23/20	016					
1,2,4-Trichlorobenzene	54.6 ug/L	1	ug/L	50.0	<1 ug/L	109	65-135					
1,2,4-Trimethylbenzene	52.5 ug/L	1	ug/L	50.0	<1 ug/L	103	75-130					
1,2-Dibromo-3-chloropropane (DBCP)	52.9 ug/L	4	ug/L	50.0	<4 ug/L	106	50-130					
1,2-Dibromoethane (EDB)	51.9 ug/L	1	ug/L	50.0	<1 ug/L	104	80-120					
1,2-Dichlorobenzene	52.2 ug/L	1	ug/L	50.0	<1 ug/L	104	70-120					
1,2-Dichloroethane	50.6 ug/L	1	ug/L	50.0	<1 ug/L	101	70-130					
1,2-Dichloropropane	44.7 ug/L	1	ug/L	50.0	<1 ug/L	89.4	75-125					
1,3,5-Trimethylbenzene	53.1 ug/L	1	ug/L	50.0	<1 ug/L	106	75-125					
1,3-Dichlorobenzene	53.2 ug/L	1	ug/L	50.0	<1 ug/L	106	75-125					
1,3-Dichloropropane	49.1 ug/L	1	ug/L	50.0	<1 ug/L	98.3	75-125					
1,4-Dichlorobenzene	52.8 ug/L	1	ug/L	50.0	<1 ug/L	106	75-125					
2,2-Dichloropropane	57.2 ug/L	2	ug/L	50.0	<2 ug/L	114	70-135					
2-Butanone (MEK)	57.7 ug/L	10	ug/L	50.0	<10 ug/L	115	30-150					
2-Chlorotoluene	54.4 ug/L	1	ug/L	50.0	<1 ug/L	109	75-125					
2-Hexanone (MBK)	50.1 ug/L	5	ug/L	50.0	<5 ug/L	100	55-130					
4-Chlorotoluene	51.9 ug/L	1	ug/L	50.0	<1 ug/L	104	75-130					
4-Isopropyltoluene	53.0 ug/L	1	ug/L	50.0	<1 ug/L	105	75-130					
4-Methyl-2-pentanone (MIBK)	50.5 ug/L	5	ug/L	50.0	<5 ug/L	101	60-135					
Acetone	98.4 ug/L	10	ug/L	50.0	45.3 ug/L	106	40-140					
Benzene	49.1 ug/L	1	ug/L	50.0	<1 ug/L	98.2	80-120					
Bromobenzene	51.7 ug/L	1	ug/L	50.0	<1 ug/L	103	75-125					
Bromochloromethane	51.8 ug/L	1	ug/L	50.0	<1 ug/L	104	65-130					
Bromodichloromethane	55.4 ug/L	0.5	ug/L	50.0	<0.5 ug/L	111	75-120					
Bromoform	56.1 ug/L	1	ug/L	50.0	<1 ug/L	112	70-130					
Bromomethane	34.5 ug/L	1	ug/L	50.0	<1 ug/L	69.0	30-145					
Carbon disulfide	36.8 ug/L	10	ug/L	50.0	<10 ug/L	72.8	35-160					
Carbon tetrachloride	54.7 ug/L	1	ug/L	50.0	<1 ug/L	109	65-140					
Chlorobenzene	50.9 ug/L	1	ug/L	50.0	<1 ug/L	102	80-120					
Chloroethane	45.7 ug/L	1	ug/L	50.0	<1 ug/L	91.4	60-135					
Chloroform	52.2 ug/L	0.5	ug/L	50.0	<0.5 ug/L	104	65-135					
Chloromethane	37.3 ug/L	1	ug/L	50.0	<1 ug/L	74.6	40-125					



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06		
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B		
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:			
	Volatilo Organic Compounds by GC	MS - Quality Contro	J		

Volatile Organic Compounds by GCMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BZH0632 - SW5030B										
Matrix Spike (BZH0632-MS1)	Sou	rce: 16H050	5-01	Prepare	d & Analyze	d: 08/23/20	016			
cis-1,2-Dichloroethylene	55.0 ug/L	1	ug/L	50.0	<1 ug/L	110	70-125			
cis-1,3-Dichloropropene	47.5 ug/L	1	ug/L	50.0	<1 ug/L	95.0	70-130			
Dibromochloromethane	57.7 ug/L	1	ug/L	50.0	<1 ug/L	115	60-135			
Dibromomethane	51.0 ug/L	1	ug/L	50.0	<1 ug/L	102	75-125			
Dichlorodifluoromethane	42.1 ug/L	1	ug/L	50.0	<1 ug/L	84.3	30-155			
Ethylbenzene	50.7 ug/L	1	ug/L	50.0	<1 ug/L	101	75-125			
Hexachlorobutadiene	52.6 ug/L	0.8	ug/L	50.0	<0.8 ug/L	105	50-140			
Isopropylbenzene	51.4 ug/L	1	ug/L	50.0	<1 ug/L	102	75-125			
m+p-Xylenes	101 ug/L	2	ug/L	100	<2 ug/L	99.3	75-130			
Methylene chloride	47.8 ug/L	4	ug/L	50.0	<4 ug/L	88.9	55-140			
Methyl-t-butyl ether (MTBE)	53.5 ug/L	1	ug/L	50.0	<1 ug/L	107	65-125			
Naphthalene	56.4 ug/L	1	ug/L	50.0	<1 ug/L	112	55-140			
n-Butylbenzene	52.9 ug/L	1	ug/L	50.0	1.07 ug/L	104	70-135			
n-Propylbenzene	54.5 ug/L	1	ug/L	50.0	<1 ug/L	108	70-130			
o-Xylene	51.6 ug/L	1	ug/L	50.0	<1 ug/L	103	80-120			
sec-Butylbenzene	51.2 ug/L	1	ug/L	50.0	<1 ug/L	102	70-125			
Styrene	52.6 ug/L	1	ug/L	50.0	<1 ug/L	105	65-135			
tert-Butylbenzene	54.6 ug/L	1	ug/L	50.0	<1 ug/L	109	70-130			
Tetrachloroethylene (PCE)	67.8 ug/L	1	ug/L	50.0	<1 ug/L	136	45-150			
Toluene	48.9 ug/L	1	ug/L	50.0	<1 ug/L	97.7	75-120			
trans-1,2-Dichloroethylene	51.0 ug/L	1	ug/L	50.0	<1 ug/L	102	60-140			
trans-1,3-Dichloropropene	53.1 ug/L	1	ug/L	50.0	<1 ug/L	106	55-140			
Trichloroethylene	47.9 ug/L	1	ug/L	50.0	<1 ug/L	95.7	70-125			
Trichlorofluoromethane	47.9 ug/L	1	ug/L	50.0	<1 ug/L	95.8	60-145			
Vinyl chloride	44.6 ug/L	0.5	ug/L	50.0	<0.5 ug/L	89.2	50-145			
Surr: 1,2-Dichloroethane-d4	53.7		ug/L	50.0	ug/L	107	70-120			
Surr: 4-Bromofluorobenzene	50.6		ug/L	50.0	ug/L	101	75-120			
Surr: Dibromofluoromethane	53.3		ug/L	50.0	ug/L	107	80-119			
Surr: Toluene-d8	49.5		ug/L	50.0	ug/L	99.0	85-120			



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06		
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B		
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:			
	Volatilo Organia Compoundo by GC	MS Quality Contro	J		

Volatile Organic Compounds by GCMS - Quality Control

		Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Qual
Batch BZH0632 - SW5030B										
Matrix Spike Dup (BZH0632-MSD1)	Sour	ce: 16H050	5-01	Prepare	d & Analyzed	d: 08/23/20	016			
1,1,1,2-Tetrachloroethane	53.3 ug/L	0.4	ug/L	50.0	<0.4 ug/L	107	80-130	0.00562	30	
1,1,1-Trichloroethane	56.7 ug/L	1	ug/L	50.0	<1 ug/L	113	65-130	1.97	30	
1,1,2,2-Tetrachloroethane	48.2 ug/L	0.4	ug/L	50.0	<0.4 ug/L	96.3	65-130	0.0769	30	
1,1,2-Trichloroethane	51.6 ug/L	1	ug/L	50.0	<1 ug/L	103	75-125	1.59	30	
1,1-Dichloroethane	53.8 ug/L	1	ug/L	50.0	<1 ug/L	108	70-135	1.23	30	
1,1-Dichloroethylene	52.5 ug/L	1	ug/L	50.0	<1 ug/L	105	70-130	1.27	30	
1,1-Dichloropropene	50.4 ug/L	1	ug/L	50.0	<1 ug/L	101	75-135	0.373	30	
1,2,3-Trichlorobenzene	58.6 ug/L	1	ug/L	50.0	<1 ug/L	117	55-140	7.04	30	
1,2,3-Trichloropropane	51.6 ug/L	1	ug/L	50.0	<1 ug/L	103	75-125	4.63	30	
1,2,4-Trichlorobenzene	56.4 ug/L	1	ug/L	50.0	<1 ug/L	113	65-135	3.35	30	
1,2,4-Trimethylbenzene	54.1 ug/L	1	ug/L	50.0	<1 ug/L	107	75-130	3.01	30	
1,2-Dibromo-3-chloropropane (DBCP)	54.2 ug/L	4	ug/L	50.0	<4 ug/L	108	50-130	2.34	30	
1,2-Dibromoethane (EDB)	53.8 ug/L	1	ug/L	50.0	<1 ug/L	108	80-120	3.48	30	
1,2-Dichlorobenzene	54.0 ug/L	1	ug/L	50.0	<1 ug/L	108	70-120	3.38	30	
1,2-Dichloroethane	51.1 ug/L	1	ug/L	50.0	<1 ug/L	102	70-130	0.951	30	
1,2-Dichloropropane	48.3 ug/L	1	ug/L	50.0	<1 ug/L	96.6	75-125	7.70	30	
1,3,5-Trimethylbenzene	54.0 ug/L	1	ug/L	50.0	<1 ug/L	108	75-125	1.67	30	
1,3-Dichlorobenzene	55.1 ug/L	1	ug/L	50.0	<1 ug/L	110	75-125	3.53	30	
1,3-Dichloropropane	51.0 ug/L	1	ug/L	50.0	<1 ug/L	102	75-125	3.64	30	
1,4-Dichlorobenzene	53.7 ug/L	1	ug/L	50.0	<1 ug/L	107	75-125	1.76	30	
2,2-Dichloropropane	56.0 ug/L	2	ug/L	50.0	<2 ug/L	112	70-135	2.17	30	
2-Butanone (MEK)	62.6 ug/L	10	ug/L	50.0	<10 ug/L	125	30-150	8.20	30	
2-Chlorotoluene	54.7 ug/L	1	ug/L	50.0	<1 ug/L	109	75-125	0.687	30	
2-Hexanone (MBK)	54.4 ug/L	5	ug/L	50.0	<5 ug/L	109	55-130	8.27	30	
4-Chlorotoluene	53.8 ug/L	1	ug/L	50.0	<1 ug/L	108	75-130	3.62	30	
4-Isopropyltoluene	54.9 ug/L	1	ug/L	50.0	<1 ug/L	109	75-130	3.63	30	
4-Methyl-2-pentanone (MIBK)	54.0 ug/L	5	ug/L	50.0	<5 ug/L	108	60-135	6.54	30	
Acetone	105 ug/L	10	ug/L	50.0	45.3 ug/L	119	40-140	6.12	30	
Benzene	50.4 ug/L	1	ug/L	50.0	<1 ug/L	101	80-120	2.61	30	
Bromobenzene	52.9 ug/L	1	ug/L	50.0	<1 ug/L	106	75-125	2.27	30	
Bromochloromethane	52.7 ug/L	1	ug/L	50.0	<1 ug/L	105	65-130	1.86	30	



Certificate of Analysis

Final Report

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Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:		
	Volatile Organic Compounds by GC	CMS - Quality Contro		

Volatile Organic Compounds by GCMS - Quality Control

		Reporting		Spike	Source		%REC		RPD	
Analyte	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Qual
Batch BZH0632 - SW5030B										
Matrix Spike Dup (BZH0632-MSD1)	Sour	ce: 16H050	5-01	Prepare	d & Analyzed	d: 08/23/2	016			
Bromodichloromethane	58.1 ug/L	0.5	ug/L	50.0	<0.5 ug/L	116	75-120	4.73	30	
Bromoform	57.2 ug/L	1	ug/L	50.0	<1 ug/L	114	70-130	1.99	30	
Bromomethane	44.2 ug/L	1	ug/L	50.0	<1 ug/L	88.3	30-145	24.5	30	
Carbon disulfide	35.9 ug/L	10	ug/L	50.0	<10 ug/L	71.1	35-160	2.37	30	
Carbon tetrachloride	56.2 ug/L	1	ug/L	50.0	<1 ug/L	112	65-140	2.71	30	
Chlorobenzene	52.3 ug/L	1	ug/L	50.0	<1 ug/L	105	80-120	2.73	30	
Chloroethane	47.9 ug/L	1	ug/L	50.0	<1 ug/L	95.7	60-135	4.68	30	
Chloroform	53.2 ug/L	0.5	ug/L	50.0	<0.5 ug/L	106	65-135	1.97	30	
Chloromethane	42.1 ug/L	1	ug/L	50.0	<1 ug/L	84.3	40-125	12.1	30	
cis-1,2-Dichloroethylene	55.5 ug/L	1	ug/L	50.0	<1 ug/L	111	70-125	0.969	30	
cis-1,3-Dichloropropene	49.7 ug/L	1	ug/L	50.0	<1 ug/L	99.3	70-130	4.48	30	
Dibromochloromethane	60.3 ug/L	1	ug/L	50.0	<1 ug/L	121	60-135	4.42	30	
Dibromomethane	54.2 ug/L	1	ug/L	50.0	<1 ug/L	108	75-125	5.95	30	
Dichlorodifluoromethane	42.6 ug/L	1	ug/L	50.0	<1 ug/L	85.1	30-155	1.01	30	
Ethylbenzene	52.3 ug/L	1	ug/L	50.0	<1 ug/L	105	75-125	3.03	30	
Hexachlorobutadiene	55.8 ug/L	0.8	ug/L	50.0	<0.8 ug/L	112	50-140	5.90	30	
Isopropylbenzene	52.5 ug/L	1	ug/L	50.0	<1 ug/L	104	75-125	2.04	30	
m+p-Xylenes	103 ug/L	2	ug/L	100	<2 ug/L	102	75-130	2.51	30	
Methylene chloride	44.3 ug/L	4	ug/L	50.0	<4 ug/L	81.7	55-140	7.78	30	
Methyl-t-butyl ether (MTBE)	56.6 ug/L	1	ug/L	50.0	<1 ug/L	113	65-125	5.74	30	
Naphthalene	59.4 ug/L	1	ug/L	50.0	<1 ug/L	118	55-140	5.18	30	
n-Butylbenzene	54.3 ug/L	1	ug/L	50.0	1.07 ug/L	106	70-135	2.52	30	
n-Propylbenzene	54.6 ug/L	1	ug/L	50.0	<1 ug/L	108	70-130	0.341	30	
o-Xylene	52.8 ug/L	1	ug/L	50.0	<1 ug/L	105	80-120	2.24	30	
sec-Butylbenzene	53.4 ug/L	1	ug/L	50.0	<1 ug/L	106	70-125	4.19	30	
Styrene	54.0 ug/L	1	ug/L	50.0	<1 ug/L	108	65-135	2.52	30	
tert-Butylbenzene	54.9 ug/L	1	ug/L	50.0	<1 ug/L	110	70-130	0.473	30	
Tetrachloroethylene (PCE)	68.2 ug/L	1	ug/L	50.0	<1 ug/L	136	45-150	0.584	30	
Toluene	50.4 ug/L	1	ug/L	50.0	<1 ug/L	101	75-120	3.17	30	
trans-1,2-Dichloroethylene	50.5 ug/L	1	ug/L	50.0	<1 ug/L	101	60-140	1.06	30	
trans-1,3-Dichloropropene	53.7 ug/L	1	ug/L	50.0	<1 ug/L	107	55-140	1.16	30	



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06	
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B	
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:		
	Valatila Organia Compounds by GC	MS Quality Contro	J	

Volatile Organic Compounds by GCMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BZH0632 - SW5030B										
Matrix Spike Dup (BZH0632-MSD1)	Sour	rce: 16H050	5-01	Prepared	d & Analyze	d: 08/23/2	016			
Trichloroethylene	48.9 ug/L	1	ug/L	50.0	<1 ug/L	97.8	70-125	2.18	30	
Trichlorofluoromethane	50.4 ug/L	1	ug/L	50.0	<1 ug/L	101	60-145	4.99	30	
Vinyl chloride	46.9 ug/L	0.5	ug/L	50.0	<0.5 ug/L	93.8	50-145	5.04	30	
Surr: 1,2-Dichloroethane-d4	49.8		ug/L	50.0	ug/L	99.6	70-120			
Surr: 4-Bromofluorobenzene	49.0		ug/L	50.0	ug/L	97.9	75-120			
Surr: Dibromofluoromethane	50.2		ug/L	50.0	ug/L	100	80-119			
Surr: Toluene-d8	49.0		ug/L	50.0	ug/L	98.0	85-120			



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Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:	

Certified Analyses included in this Report

Analyte	Certifications	
SW8015C in Non-Potable Water		
TPH-Volatiles (GRO)	VELAP,NC,WVDEP	
SW8260B in Non-Potable Water		
1,1,1,2-Tetrachloroethane	NC, VELAP, WVDEP	
1,1,1-Trichloroethane	NC, VELAP, WVDEP	
1,1,2,2-Tetrachloroethane	NC, VELAP, WVDEP	
1,1,2-Trichloroethane	NC, VELAP, WVDEP	
1,1-Dichloroethane	NC, VELAP, WVDEP	
1,1-Dichloroethylene	NC, VELAP, WVDEP	
1,1-Dichloropropene	NC, VELAP, WVDEP	
1,2,3-Trichlorobenzene	NC, VELAP, WVDEP	
1,2,3-Trichloropropane	NC, VELAP, WVDEP	
1,2,4-Trichlorobenzene	NC, VELAP, WVDEP	
1,2,4-Trimethylbenzene	NC, VELAP, WVDEP	
1,2-Dibromo-3-chloropropane (DBCP)	NC, VELAP, WVDEP	
1,2-Dibromoethane (EDB)	NC, VELAP, WVDEP	
1,2-Dichlorobenzene	NC, VELAP, WVDEP	
1,2-Dichloroethane	NC, VELAP, WVDEP	
1,2-Dichloropropane	NC, VELAP, WVDEP	
1,3,5-Trimethylbenzene	NC,WVDEP	
1,3-Dichlorobenzene	NC, VELAP, WVDEP	
1,3-Dichloropropane	NC, VELAP, WVDEP	
1,4-Dichlorobenzene	NC, VELAP, WVDEP	
2,2-Dichloropropane	NC, VELAP, WVDEP	
2-Butanone (MEK)	NC, VELAP, WVDEP	
2-Chlorotoluene	NC, VELAP, WVDEP	
2-Hexanone (MBK)	NC, VELAP, WVDEP	
4-Chlorotoluene	NC, VELAP, WVDEP	
4-Isopropyltoluene	NC, VELAP, WVDEP	
4-Methyl-2-pentanone (MIBK)	NC, VELAP, WVDEP	
Acetone	NC, VELAP, WVDEP	
Benzene	NC, VELAP, WVDEP	
Bromobenzene	NC, VELAP, WVDEP	
Bromochloromethane	NC, VELAP, WVDEP	
Bromodichloromethane	NC, VELAP, WVDEP	
Bromoform	NC, VELAP, WVDEP	
Bromomethane	NC,VELAP,WVDEP	



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Certified Analyses included in this Report

Analyte	Certifications
Carbon disulfide	NC,VELAP,WVDEP
Carbon tetrachloride	NC,VELAP,WVDEP
Chlorobenzene	NC,VELAP,WVDEP
Chloroethane	NC,VELAP,WVDEP
Chloroform	NC,VELAP,WVDEP
Chloromethane	NC,VELAP,WVDEP
cis-1,2-Dichloroethylene	NC,VELAP,WVDEP
cis-1,3-Dichloropropene	NC,VELAP,WVDEP
Dibromochloromethane	NC,VELAP,WVDEP
Dibromomethane	NC,VELAP,WVDEP
Dichlorodifluoromethane	NC,VELAP,WVDEP
Di-isopropyl ether (DIPE)	NC, VELAP, WVDEP
Ethylbenzene	NC, VELAP, WVDEP
Hexachlorobutadiene	NC,VELAP,WVDEP
lodomethane	NC, VELAP, WVDEP
lsopropylbenzene	NC,VELAP,WVDEP
m+p-Xylenes	NC, VELAP, WVDEP
Methylene chloride	NC,VELAP,WVDEP
Methyl-t-butyl ether (MTBE)	NC,VELAP,WVDEP
Naphthalene	NC, VELAP, WVDEP
n-Butylbenzene	NC, VELAP, WVDEP
n-Propylbenzene	NC, VELAP, WVDEP
o-Xylene	NC, VELAP, WVDEP
sec-Butylbenzene	NC, VELAP, WVDEP
Styrene	NC, VELAP, WVDEP
tert-Butylbenzene	NC, VELAP, WVDEP
Tetrachloroethylene (PCE)	NC, VELAP, WVDEP
Toluene	NC, VELAP, WVDEP
trans-1,2-Dichloroethylene	NC, VELAP, WVDEP
trans-1,3-Dichloropropene	NC, VELAP, WVDEP
Trichloroethylene	NC, VELAP, WVDEP
Trichlorofluoromethane	NC,VELAP,WVDEP
Vinyl acetate	NC,VELAP,WVDEP
Vinyl chloride	NC,VELAP,WVDEP
Xylenes, Total	NC, VELAP, WVDEP



Certificate of Analysis

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Client Name: Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228		Date Issued:	9/1/2016 14:06		
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B		
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:			
Code	Description	Lab Number	Expires		
MdDOE	Maryland DE Drinking Water	341	12/31/2016		
NC	North Carolina DENR	495	12/31/2016		
PADEP	NELAC-Pennsylvania	001	10/31/2016		
VELAP	NELAC-Virginia Certificate #8271	460021	06/15/2017		
WVDEP	West Virginia DEP	350	11/30/2016		



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:	

Summary of Data Qualifiers

RPD Relative Percent Difference

Qual Qualifers

-RE Denotes sample was re-analyzed

D.F. Dilution Factor. Please also see the Preparation Factor in the Analysis Summary section.

TIC Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library . A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.

PCBs, Total Total PCBs are defined as the sum of detected Aroclors 1016, 1221, 1232, 1248, 1254, 1260, 1262, and 1268.

							CHAIN C	OF CUSTO	YC						
CLIENT:	Draper Aden Ass	ociates		CONSULT	TANT:						COPY	COPY COA TO CONSULTANT? not applicable			
ATTN:	Leonard "Rip" Fo	ord		ATTN:							COPYI	NVOICE TO	CONSULT	ANT?	not applicable
STREET:	2080 Villa Park D	rive		STREET:							FACILI	ΓY:			Frog Level Rescue Squad
CITY:	Richmond, Virgin	ia 23229		CITY:							LOCAT	ION:			Frog Level, Caroline County, Virginia
PHONE:	804-264-2228			PHONE:							LABOR	ATORY:			AWS Laboratories
TURN AROUND:	10-day			JOB NO.	20113 - 2	29 B						ANALYSES	REQUES	TED	
	P	RESERVATIVE						HCI	НСІ						
LAB USE ONLY SAMPLE INFORMATION		ON	сомь	GRAB	NO. OF JARS	MATRIX	volatile organic compounds (SW 8260)	TPH - GRO (SW 8015C)						COMMENTS	
LAB ID	SAMPLE ID	DATE	TIME												
	MW-01	21-Aug-16	16:30		X	5	GW	X	X						
	MW-02	21-Aug-16	16:50		X	5	GW	X	X						
	trip blank	8-Aug-16				4	DI	X	X						
												DA Frog I Recd:	Level R 08/22/	escue \$ 2016	16H0505 Squad Due: 09/06/2016
SAMPLED BY:	1 11.	21	1	PRINTED	I NAME:	Leonard	Neal Ford,	Jr.	I	NOTES:	please	provide QC	level 1 dat	a package	
RELINQUISHED BY	(:	DATE	TIME	RECEIVE	D BY:			DA	ATE	-	ГІМЕ	REASON	FOR TRA	NSPORT	
Lond n.	216	08.22.16	9:50 Am	KX	one			8-22	2-16	q.	50	deliver to	o laborator	y for analy	/ses.
_{TEMP:} 2,	3° C	pH:	1	MATRIX:	W = water	r (type not	specified)	, GW = gro	undwater,	, WW = wa	astewater	, SW = surfa	ace water,	SS = soil/s	ediment

Р	age	28	of	29
	<u> </u>			



Certificate of Analysis

Final Report

Client Name:	Draper Aden Associates-Richmond 8090 Villa Park Dr. Richmond VA, 23228	Date Issued:	9/1/2016 14:06
Submitted To:	Leonard Ford Jr.	Project Number:	20113-229 B
Client Site I.D.:	Frog Level Rescue Squad	Purchase Order:	

Sample Conditions Checklist

Samples Received at:	2.30°C
How were samples received?	Walk In
Were Custody Seals used? If so, were they received intact?	No
Are the custody papers filled out completely and correctly?	Yes
Do all bottle labels agree with custody papers?	Yes
Is the temperature blank or representative sample within acceptable limits? (above freezing to 6°C) or received on ice and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	Yes
Are all volatile organic and TOX containers free of headspace?	Yes
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	Yes
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes

Trip blank sample time of 08:30 taken from sample label. MMB 8/22/2016 11:26

APPENDIX 4

QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

Summary of Professional Experience	 23 years with firm 33 years geologic / hydrogeologic experience
	Dr. Ford is responsible for managing and conducting a wide range of environmental and geologic studies, including aquifer analyses, environmental site assessments, remediation design and implementation, and wetlands delineation/permitting.
	He has experience in conducting hydrogeologic assessment (landfills, industrial sites, RCRA facilities), pre-acquisition site assessments, and wetlands studies. Project experience has included aquifer pump testing, design and installation of groundwater monitoring networks, development of strategies for remediation of contaminated soil and water project recovery wells, analysis and interpretation of hydrogeologic data, detection, removal and sampling of asbestos as well as wetlands studies.
	For the past 16 years, Dr. Ford has been addressing environmental issues throughout Virginia and North Carolina. His work includes hydrogeologic assessments, delineation of contaminant plumes, design / implementation / management of groundwater monitoring programs, assessment of risk to human health and the environment, and/or assessment of corrective measures.
Education	 Ph.D./1981/Geology/University of California, Los Angeles M.S./1979/Geology/Virginia Polytechnic Institute and State University B.S./1976/Geology/Virginia Polytechnic Institute and State University
Certifications	♦ OSHA Hazardous Waste Operator 40 Hour (per 29CFR 1910.220)
Professional Registration(s)	Professional Geologist/1991/Virginia, No. 796
Representative Project	 hydrogeologic studies environmental impact studies
Experience	 groundwater monitoring program development / management pre-acquisition site assessments (Phase I + Phase 2)
	 site characterization studies underground + aboveground storage tanks
	 remediation of contaminated soil and groundwater
Areas of Technical Expertise	 physical stratigraphy, biostratigraphy, seismic stratigraphy, geophysical log analysis, hydrogeology, geochemistry, aquifer testing, drilling technology, well design and construction soil and groundwater sampling protocols, fate and transport of contaminants remediation technology numerical methods of data analysis - regression, correlation, analysis of variance, multivariate elegrification



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(SEE REVERSE SIDE FOR NAME AND/OR ADDRESS CHANGE)