

# **Appendix A**

## **Hazardous Materials Report**

Route 606 Widening Project



**SUBSURFACE INVESTIGATION REPORT  
Route 606, Between I-95 and Route 1  
VDOT Project Number 0606-088-654, C501: UPC#105464  
Thornburg, Spotsylvania County, Virginia**

*September 13, 2017*

**Prepared for:**

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**Subject: Subsurface Investigation Report  
Route 606, Between I-95 and Route 1  
VDOT Project Number 0606-088-654, C501: UPC#105464  
Cardno Project Number VFR048**

Dear Mr. Diallo:

Cardno has completed the attached *Subsurface Investigation Report* for the proposed Route 606 (Mudd Tavern Road) improvement project located between Interstate 95 and Route 1 in Thornburg (Spotsylvania County), Virginia. The Virginia Department of Transportation (VDOT) requested this investigation as part of the preliminary engineering prior to construction activities. For this investigation, Cardno established boreholes to investigate potential petroleum and volatile organic compound (VOC) impacts to subsurface media at:

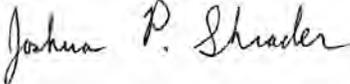
- 5409 Mudd Tavern Road, currently a 7-11 fuel station;
- 5124 Mudd Tavern Road, currently a Citgo fuel station;
- 5123 Mudd Tavern Road, currently an Exxon fuel station;
- 5117 Mudd Tavern Road, currently a Shell fuel station; and
- 5116 Mudd Tavern Road, currently a Valero fuel station.

Cardno appreciates the opportunity to provide you with these environmental services. If you have any questions or require further information, please contact the undersigned.

Sincerely,



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Enclosures

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# 1 Introduction

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Cardno has completed a *Subsurface Investigation Report* (SIR) for the proposed Route 606 (Mudd Tavern Road) improvement project between Interstate 95 and Route 1 in Thornburg (Spotsylvania County), Virginia (see the **Vicinity Map, Appendix A**). The project will involve the construction of passing and turn lanes within the project corridor.

VDOT requested this *Subsurface Investigation Report* (SIR) to evaluate several petroleum fuelling stations along Route 606 for potential petroleum product contamination in the project corridor. The properties investigated during SIR activities are depicted in **Figure 1 and Figure 2** in **Appendix B**.

## 1.1 Proposed Road Improvements

- The project corridor is located on the portion of Mudd Tavern Road that runs west to east between its interchange with Route 1 and I-95 to the east.
- **Figures 1 and 2, Appendix B** are based on the VDOT PFI Plans for the subject corridor. The improvements involve the construction additional travel and turning lanes on Mudd Tavern Road in addition to a proposed expansion of the existing right-of-way. Medians have also been proposed to separate the west and eastbound lanes of Mudd Tavern Road.
- A new connector road between Route 1 and Dan Bell Lane is proposed to the north of the existing Route 606 alignment. The orientation of this proposed road is depicted on the **Vicinity Map** located in **Appendix A**.
- The preliminary PFI Plans did not have any drainage improvement or cut/fill lines. However, proposed right-of-way (R/W) lines were apparent on the plans. For the most part the largest portion of proposed R/W is located on the north side of Mudd Tavern Road. The new proposed R/W is as much as 50 feet from the edge of the current roadway.

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# 2 Previous Studies

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Cardno previously evaluated Recognized Environmental Conditions (RECs) on the project corridor and completed the report entitled *Route 606 and I-95 Memorandum* (June 23, 2014). The 2014 report identified these five sites that are studied in this investigation as having a potential concern based on a review of regulatory files, site history and property inspections. Based on the current plans these five sites of concern (7-Eleven, Citgo, Exxon, Shell and Valero) were investigated for this project and are depicted on **Figures 1-2** in **Appendix B** and the photographs in **Appendix C**. All the properties had potential concerns due to petroleum use/storage on-site. During the sampling investigation, all sites except the 7-Eleven property were evaluated along the proposed frontage R/W and/or proposed construction features. The 7-Eleven site was evaluated across the entire property due to the potential for the property being a total take. The following is a summary of the site history and potential concerns for each property.

## 2.1 7-Eleven Fuel Station (5409 Mudd Tavern Road)

The 7-Eleven site is situated on the northeast corner of Route 606 (Mudd Tavern Road) and Route 1 (Jefferson Davis Highway) (see **Figure 1, Appendix B** and **Photos 1-2, Appendix C**). The active convenience store/fuel station contains underground storage tanks (USTs). PC# 1992-0442 was issued because of a surface spill less than 25-gallons of gasoline that occurred during a fuel transfer from a

tanker truck. The spill was mitigated by the fueling company and the case was closed with no further action. PC# 2003-3205 was issued after petroleum odors were noted in a tank basin monitoring well during a December 2002 environmental site assessment (ESA). Four monitoring wells were installed as presented in a *Site Characterization Report (SCR)* prepared by Triad Engineering, Inc. of Winchester, Virginia in May 2003. Of the four monitoring wells, only MW-2 contained detectable concentrations of petroleum constituents. The PC# was closed with no further action required. PC# 1985-0223 was also identified on the database for petroleum in a roadside ditch during sanitary sewer repair near this site. However, the file contained limited information (notes) with no map or a report. The source was not confirmed and the case closed. Attached to the same 7-Eleven building complex is a former dry cleaning business named Top Dry Cleaners. Dry cleaners are established RECs because these businesses use solvents such as perchloroethene (PCE) during their operations. Lastly, a car wash exists on the property north of the 7-Eleven, which contains an oil/water separator.

## 2.2 Citgo Fuel Station (5124 Mudd Tavern Road)

The Citgo site is situated south of Route 606 (Mudd Tavern Road) and west of I-95 (see **Figure 2, Appendix B and Photos 3-4, Appendix C**). The site is currently listed with a 6,000-gallon and 12,000-gallon kerosene UST, a 10,000-gallon and 12,000-gallon diesel UST, a 12,000-gallon gasoline UST and a 12,000-gallon fuel oil UST. A *Limited Risk Assessment* (December 1994) was completed for the site in response to PC# 1990-1636 after a McDonalds located north of the site reported dangerous levels of gasoline vapors through the sanitary line. Tank tightness tests were requested by DEQ for all surrounding fuel facilities. A faulty line valve was discovered, but lines tested tight. A site check was performed for the site and the case closed with no further action.

## 2.3 Exxon Fuel Station (5123 Mudd Tavern Road)

The Exxon site is situated north of Route 606 (5123 Mudd Tavern Road) and west of I-95 (see **Figure 2, Appendix B and Photos 5-6, Appendix C**). The site includes a store, two 6,000-gallon gasoline, an 8,000-gallon gasoline and a 10,000-gallon gasoline UST. A 1,000-gallon used oil tank is listed as permanently out of use. PC#1990-0561 was issued to the site after the McDonalds reported dangerous levels of gasoline vapors through the sanitary line. During the same time frame, a leak in the supreme gasoline line between the pump on the underground storage tanks and the service island was indicated through tightness testing. A *SCR* (1992) was prepared to delineate the presence of free product. A Corrective Action Plan (CAP) was requested with periodic dual phase extraction events, which began in 1997. Minimal free product thickness continued to persist in the tank field area. Based on the duration of the case, DEQ altered the endpoints from < 0.01 feet in the site monitoring wells to the maximum extent practicable. The case was closed with no further action. PC#2005-3305 was issued to the site after a release from a remote fill line and was monitored in conjunction with PC#1990-0561. The case was closed in 2006. A *Phase II Environmental Site Assessment Report* (August 2009) was prepared to evaluate RECs for the site. A total of eight monitoring wells were installed. No free product conditions were encountered; however dissolved phase petroleum concentrations were detected. Levels were reported to DEQ, but previous PCs remain closed.

## 2.4 Shell Station (5117 Mudd Tavern Road)

The Shell site is situated north of Route 606 (5117 Mudd Tavern Road) and west of I-95 (see **Figure 2, Appendix B and Photos 7-8, Appendix C**). The site includes a Dairy Queen, store, a 10,000-gallon diesel, an 8,000-gasoline, two 10,000-gallon gasoline and a 12,000-gallon gasoline UST. PC#1990-1638 was issued to the site after the McDonalds reported dangerous levels of gasoline vapors through the sanitary line. However, when reviewing the records at the DEQ, all reports except one report for the case were missing from the files. A report entitled *Site, Risk, and Remediation Assessment for Stuckey's*

*Pecan Shoppe* (May 28, 1991) indicated in October 1990 that USTs were removed from the site and new USTs placed in another area on the property. Approximately 500 tons of contaminated soils were removed from the old tank pit and were staged for aeration and treatment. A subsurface investigation was conducted to better define the plume. A total of three monitoring wells were installed. No significant petroleum contaminated soils were found outside the former tank pit. No free product was detected, but dissolved phase contamination was indicated. Case closed with no further action.

## 2.5 Valero Station (5116 Mudd Tavern Road)

The Valero Fas Mart (formerly Amoco & Texaco) is situated south of Route 606 (5116 Mudd Tavern Road) and west of I-95 (see **Figure 2, Appendix B** and **Photos 9-10, Appendix C**). The site includes a store and three 10,000-gallon gasoline USTs. Additionally a 550-gallon heating oil, 1,000-gallon used oil, two 5,000-gallon gasoline and a 8,000-gallon gasoline UST were removed in 1990. PC# 1990-1637 was issued to the site after the McDonalds north of the site reported dangerous levels of gasoline vapors through the sanitary line. A report entitled *Addendum Site, Risk, and Remediation Assessment* (February 1991) was completed for the site to further define the extent of the petroleum hydrocarbon plume outlined in a report entitled *Multiple-Site Contamination Assessment for Texaco, Citgo and Stuckeys Service Station* (August 1990). A *Tank and Line Closure Report* (March 2000) includes the installation of test borings and ground monitoring wells. MW-1 showed measurable product thickness. A dual phase extraction pilot test was performed as part of a *Site Characterization Addendum #1 Report* (July 2000), which indicated active remediation was needed for the site by means of monthly gauging and liquid ring pump (LRP) if product was detected. Detectable product ceased in 2001, however elevated dissolved phase levels remained. The DEQ closed the case in 2003.

# 3 Subsurface Investigation Procedures

## 3.1 Soil Sampling Methods

Sampling procedures were based on guidelines from the American Society of Testing and Materials (ASTM) *Standards Related to the Phase II Environmental Site Assessment Process*. On August 1 through 3, 2017, Cardno used a combination of field analytical and laboratory methods to evaluate potential impact at the sites described above. Cardno established 16 soil boreholes (identified by address prefix) using Geoprobe® direct push technology (see **Figure 1 & 2, Appendix B**). The Geoprobe® cores were collected in 1.5-inch diameter plastic liners in approximate four-foot increments and were examined and described upon recovery (see the **Soil Boring Logs, Appendix D**). Boreholes were established to total depths ranging from approximately 4 to 20 feet below ground surface (bgs).

Composite soil samples were obtained from each interval, and a portion of each sample was placed into a sealable plastic bag for approximately 15 minutes. Each bagged sample was then field screened for its soil-vapor concentration with a photo-ionization detector (PID). The laboratory bound soil samples were packed into sterile glass jars, sealed and stored on ice. The soil boring number, date obtained, sample interval and Cardno project number were recorded on labels and attached to the corresponding sample jars.

## 3.2 Groundwater Sampling Methods

Groundwater was encountered and sampled in eight boreholes (four at 5409 Mudd Tavern Road - current 7-11 property) and one at each of the other sites of interest. These locations are shown on **Figures 1 and 2 in Appendix B**. A temporary monitoring well was constructed by inserting one-inch

diameter polyvinyl chloride (PVC) piping attached to a section of slotted (0.010-inch) screen. The temporary well was sampled by using a low flow peristaltic pump and disposable polyethylene tubing. The groundwater samples were placed into glass 40-milliliter vials and 1-Liter jars.

### 3.3 Laboratory Testing

A Chain of Custody Form accompanied all soil and groundwater samples to the laboratory. Samples were submitted to Air, Water and Soil Laboratories, Inc. (AWS) of Richmond, Virginia. Testing procedures were based on Environmental Protection Agency (EPA), *Test Methods for Evaluating Solid Wastes, SW-846, Third Edition*. Constituents of concern consisted of petroleum compounds and the constituents were tested as follows:

- Total Petroleum Hydrocarbon – Diesel Range Organics (TPH-DRO) by Method 8015C,
- TPH – Gasoline Range Organics (GRO) by Method 8015C.
- VOCs by Method 8260B.

## 4 Subsurface Investigation Results

### 4.1 Soil Analytical Results

Soil samples were selected for testing based on observations, field screen readings, and proposed construction plans. Borehole locations are shown on the **Figures 1 and 2 (Appendix B)**, and all field screen readings are presented on the soil boring logs. The sample identification contains the boring number and depth. For example, sample 5409-01 0-4 indicates: “Boring one collected from 5409 Mudd Tavern Road at a depth of zero to four feet”.

The Certificates of Analysis are provided in **Appendix E**, and the TPH data are summarized below in **Table 1**.

**Table 1 : Soil Analytical Results**

Location	Sample ID	TPH-GRO (mg/kg)	TPH-DRO (mg/kg)	PID (ppm)
7-11 (5409 Mudd Tavern Road)	5409-01 0-4	BRL	BRL	0.0
	5409-01 4-8	NT	NT	0.0
	5409-01 8-12	NT	NT	0.0
	5409-02 0-4	BRL	BRL	0.0
	5409-02 4-8	NT	NT	0.0
	5409-02 8-12	NT	NT	0.0
	5409-02 12-16	NT	NT	0.0
	5409-03 0-4	BRL	BRL	0.0
	5409-03 4-8	NT	NT	0.0
	5409-03 8-10	NT	NT	0.0
	5409-04 0-4	<b>72.8</b>	<b>3,970</b>	0.0
	5409-04 4-8	BRL	<b>37.9</b>	0.0
	5409-04 8-12	NT	NT	0.0
	5409-04 12-16	NT	NT	0.0
	5409-04 16-20	NT	NT	0.0
	5409-05 0-4	NT	NT	0.0
	5409-05 4-8	BRL	BRL	0.0

	5409-05 8-12	NT	NT	0.0
	5409-05 12-16	NT	NT	0.0
Citgo (5124 Mudd Tavern Road)	5124-01 0-4	BRL	BRL	0.0
	5124-01 4-8	NT	NT	0.0
	5124-01 8-12	NT	NT	0.0
	5124-01 12-13	NT	NT	0.0
	5124-02 0-4	BRL	BRL	0.0
	5124-02 4-8	NT	NT	0.0
	5124-02 8-12	NT	NT	0.0
	5124-03 0-4	BRL	BRL	0.0
	5124-03 4-8	NT	NT	0.0
	5124-03 8-12	NT	NT	0.0
Exxon (5123 Mudd Tavern Road)	5123-01 0-4	BRL	BRL	0.0
	5123-01 4-8	NT	NT	0.0
	5123-01 8-12	NT	NT	0.0
	5123-01 12-16	NT	NT	0.0
	5123-02 0-4	BRL	BRL	0.0
	5123-02 4-8	NT	NT	0.0
	5123-02 8-12	NT	NT	0.0
Shell (5117 Mudd Tavern Road)	5117-01 0-4	BRL	BRL	0.0
	5117-01 4-8	NT	NT	0.0
	5117-01 8-12	NT	NT	0.0
	5117-01 12-16	NT	NT	0.0
	5117-01 16-20	NT	NT	0.0
	5117-02 0-4	BRL	BRL	0.0
	5117-02 4-8	NT	NT	0.0
Valero (5116 Mudd Tavern Road)	5116-01 0-4	BRL	BRL	0.0
	5116-01 4-8	NT	NT	0.0
	5116-01 8-12	NT	NT	0.0
	5116-02 0-4	BRL	BRL	0.0
	5116-02 4-8	NT	NT	0.0
	5116-02 8-12	NT	NT	0.0
	5116-03 0-4	<b>0.89</b>	<b>13.0</b>	0.0
	5116-03 4-8	<b>0.31</b>	BRL	0.0
5116-03 8-12	NT	NT	0.0	

BRL = Below Laboratory Reporting Limits  
TPH = Total Petroleum Hydrocarbons  
DRO = Diesel Range Organics  
GRO = Gasoline Range Organics  
NT = Not Tested  
ppm = parts per million

mg/kg = milligram per kilogram  
PID = photo ionization detector  
**0.89** = Sample with a TPH Detection  
**72.8** = TPH above DEQ Clean-Fill Limits

The data from **Table 1** are described below.

- PID readings were 0.0 parts per million (ppm) for all soil samples collected from the five identified properties of interest.
- TPH-GRO or TPH-DRO were detected in four of the tested samples: 5409-04 0-4, 5409-04 4-8, 5116-03 0-4, and 5116-03 4-8. The highest concentrations identified were from 5409-04 0-4, from the southwest corner of the 7-11 property located at 5406 Mudd Tavern Road. The TPH-DRO concentration is above the Virginia Department of Environmental Quality clean-fill limit of 50 mg/kg and the reporting limit of 100 mg/kg.

- In addition to TPH analysis, 5409-02 from 0 to 4 feet was selected to be analyzed for VOCs using Method 8260B, due to its proximity to a former dry cleaners. Each analyte in this analytical suite was reported to be below laboratory reporting limits in this soil sample.

## 4.2 Groundwater Analytical Results

Groundwater was encountered in eight of the borings at approximate depths ranging from eight feet below ground surface (bgs) to 14 feet bgs. The wells were set and allowed to recover overnight after which they were sampled the following day. The Certificate of Analysis is provided in **Appendix E** and is summarized below in **Table 2**. Two of the wells (5409-05 and 5123-01) did not produce enough groundwater to collect a sample to be analyzed for TPH-DRO.

**Table 2 : Groundwater Analytical Results**

Location	Sample ID	Depth to Groundwater (feet)	TPH-GRO (mg/L)	TPH-DRO (mg/L)	Detected VOCs (mg/L)
7-11 (5409 Mudd Tavern Road)	5409-01	8	BRL	BRL	NT
	5409-02	12	BRL	<b>0.577</b>	Naphthalene = <b>0.0163</b> N-Butylbenzene = <b>0.00134</b> N-Propylbenzene = <b>0.00158</b> Sec-Butylbenzene = <b>0.0036</b>
	5409-04	12	BRL	BRL	NT
	5409-05	14	<b>0.12</b>	NT	NT
Citgo (5124 Mudd Tavern Road)	5124-01	10	BRL	BRL	NT
Exxon (5123 Mudd Tavern Road)	5123-01	12	BRL	NT	NT
Shell (5117 Mudd Tavern Road)	5117-01	16	BRL	BRL	NT
Valero (5116 Mudd Tavern Road)	5116-03	14	<b>6.40</b>	<b>3.07</b>	NT

BRL = Below Laboratory Reporting Limits  
TPH = Total Petroleum Hydrocarbons  
DRO = Diesel Range Organics  
GRO = Gasoline Range Organics

NT = Not Tested  
mg/l = milligram per liter

The data from **Table 2** are described below

- The depths to groundwater ranged from 8 to 16 feet.
- Laboratory results for groundwater samples collected from the parcels occupied by the Citgo, Exxon, and Shell fuel stations did not contain detectable concentrations of TPH.
- The groundwater sample collected from the parcel occupied by Valero at 5116 Mudd Tavern Road was reported to contain 6.40 milligrams per liter (mg/L) TPH-GRO and 3.07 mg/L TPH-DRO.
- The groundwater sample collected from boring 5409-05 (on the northwestern portion of the parcel occupied by 7-11 at 5409 Mudd Tavern Road) was reported to contain 0.12 mg/L of TPH-GRO. The groundwater sample collected from boring 5409-02 (on the southeastern portion of the same site) was reported to contain 0.577 mg/L of TPH-DRO.

- In addition to TPH analysis, 5409-02 was selected to be analyzed for VOCs using Method 8260B, due to its proximity to a dry cleaners. Of the compounds in this suite of analytes, four were detected: naphthalene, n-Butylbenzene, n-Propylbenzene, and sec-Butylbenzene. The highest concentration reported was of naphthalene at 0.0163 mg/L. These concentrations are relatively low and represent gasoline constituents and not dry cleaning solvents.

## 5 Route 1 / Dan Bell Lane Connector Road

In addition to the subsurface investigation, Cardno personnel also traversed the path of the proposed Route 1 / Dan Bell Lane connector road which is depicted on the **Vicinity Map**, in **Appendix A**. This was done on August 2, 2017 to evaluate potential environmental issues such as illegal dumping sites or debris piles. **Photographs 11-16** taken during the on-foot traverse are included in **Appendix C**. Debris observed in the proposed path of the connector road consisted mainly of metal debris. One location in the central portion was observed to contain approximately five discarded tires. No evidence of discarded tanks or drums were noted.

## 6 Conclusions

**Table 3** summarizes the petroleum detections at the sites assessed in this study.

**Table 3 – Summary of Petroleum Detections**

Site Name	Address	Figure	Petroleum Detections in Soil	Petroleum Detections in Groundwater
7-Eleven	5409 Mudd Tavern Road	1	<b>YES</b>	<b>YES</b>
Citgo	5124 Mudd Tavern Road	2	<b>NO</b>	<b>NO</b>
Exxon	5123 Mudd Tavern Road	2	<b>NO</b>	<b>NO</b>
Shell	5117 Mudd Tavern Road	2	<b>NO</b>	<b>NO</b>
Valero	5116 Mudd Tavern Road	2	<b>YES</b>	<b>YES</b>

**Table 3** shows that **NO** petroleum detections occurred at the Citgo, Exxon and Shells sites, thus VDOT should be able to use normal material handling procedures with respect to “haz mat” items in this area. Petroleum detections exist in shallow soils at the northeast corner of Route 1 and Mudd Tavern Road on the 7-Eleven site and within the frontage of the Valero site. The petroleum detections for both sites were detected at depths from 0 to 8 feet. The soil management conclusions are presented below.

### 6.1 Soil Management Conclusions

With respect to handling the petroleum-impacted soils during roadway construction in **Table 3**, the following options are available during construction.

1. VDOT can use DEQs guidance on *Management of Petroleum Contaminated Soil at VDOT Road Construction Sites* that allows excavated soils to be placed in the same excavation for utility projects if certain criteria are met (DEQ, 2011).

2. Another option is use of the DEQ clean fill restrictions, of which the soils near 5116-03 appear eligible if all requirements are met per VSWMR 9 VAC20-81-660.
3. Because the clean-fill limits were exceeded in 5409-04 from 0 to 4 feet, another option is off-site disposal at a treatment facility (such as thermal or bioremediation) or a landfill.

## 6.2 Groundwater Management Conclusions

Groundwater with TPH-GRO and TPH-DRO was encountered at both the 7-Eleven and Valero Sites. Stormwater drainage features (ditches and/or pipes) were not available at the time of this study, however when such plans are available, they should be compared with the data in this report and their corresponding depths. If proposed drainage depth or utilities are found to fall within the groundwater zone, the care will be needed to handle petroleum impacted groundwater pumped during roadway construction. The following options are available.

1. Evaluate discharging through the local sanitary sewer system. If feasible/approved, typical requirements include on-site temporary storage of pumped water, treatment/testing of sediment and dissolved concentrations and limitations on rate of introduction into the sanitary sewer. However, it is unknown if a sanitary sewer connection is nearby.
2. Evaluated on-site discharge through a VPDES Permit. This options involves submitting a permit application with approval prior to discharge. Typical requirements include on-site temporary storage of pumped water and treatment/testing of dissolved concentrations.
3. If Options 1 and 2 are not practical, a third option is off-site disposal at a treatment facility.

## 7 Recommendations

Based on the findings for this *Subsurface Investigation Report* for the proposed Route 606 (Mudd Tavern Road) improvement project in Thornburg (Spotsylvania County), Virginia, VDOT should consider the following.

- Compare the results of this study to future updated plans to determine if additional investigation/sampling is necessary, particularly for proposed excavations (such as stormwater piping) along the frontage of the sites of concern.
- Include a special provision for handling petroleum-impacted soils. The special provisions should outline the various management/disposal procedures should excavations occur near the areas of petroleum detection.
- Include a special provision for handling groundwater. Any groundwater encountered on the 7-Eleven or Valero properties, shall be handled as petroleum impacted.
- If the 7-Eleven property becomes a total take, then request that the property owner remove any and all fuel tanks from the property and conduct the necessary closures prior to VDOT's acquisition. Sample testing during the UST closures (directly beneath the tank and product lines) will also provide additional information for the project.
- Provide the results of this study to the road contractor so that proper health and safety measures can be implemented during construction.

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- Provide the results of this study to any utility entity that may need to potentially re-locate utilities as part of this project.

## 8 Limitations

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The investigation upon which this report is based represents an appropriate level of inquiry to satisfy the requirements as specified by VDOT and included in our work plan/opinion of probable cost dated April 24, 2017. No sampling investigation can completely eliminate uncertainty regarding the potential for recognized environmental conditions/areas of concern. Performance of this study is intended to reduce, but not eliminate, uncertainty regarding the potential for such conditions, and this practice recognizes reasonable limits of time and cost.

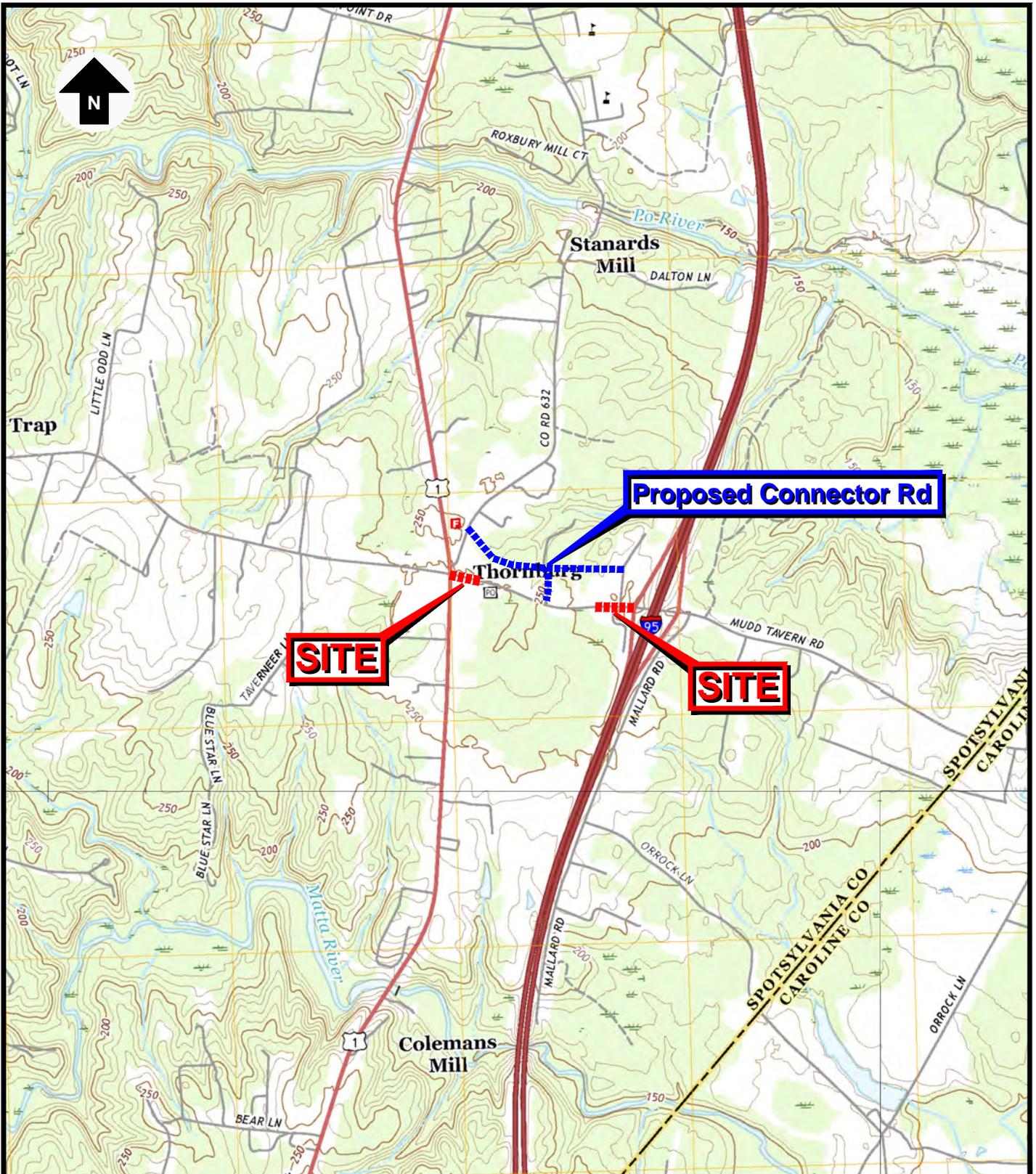
This report is intended only for use by VDOT and its agents for the sole purpose of verifying the environmental status of the subject property. It should be understood that the findings contained herein represent the current regulatory and operational status of the property as of the date of this report. Future activities either adjacent to or on the subject property could result in environmental conditions that do not exist today. The conclusions of this report are based on the available data and the plan sheets provided to Cardno. Should road plans change such as different proposed R/W limits or modified construction details, then the conclusions of this report should be re-evaluated.

Subsurface Investigation Report

APPENDIX

A

VICINITY MAP

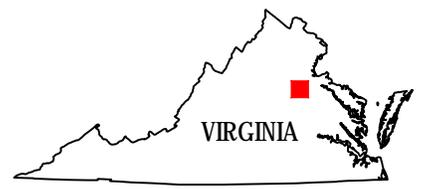
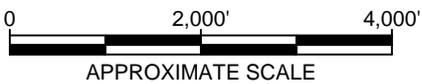


USGS 7.5' SPOTTSYLVANIA, VA QUADRANGLE - 2016  
 CONTOUR INTERVAL=10'

VFR048  
 08/11/2017

### Vicinity Map

**VDOT**  
 Route 606 - Mudd Tavern Road  
 Thornburg, Virginia

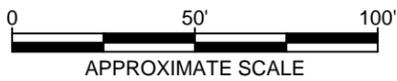
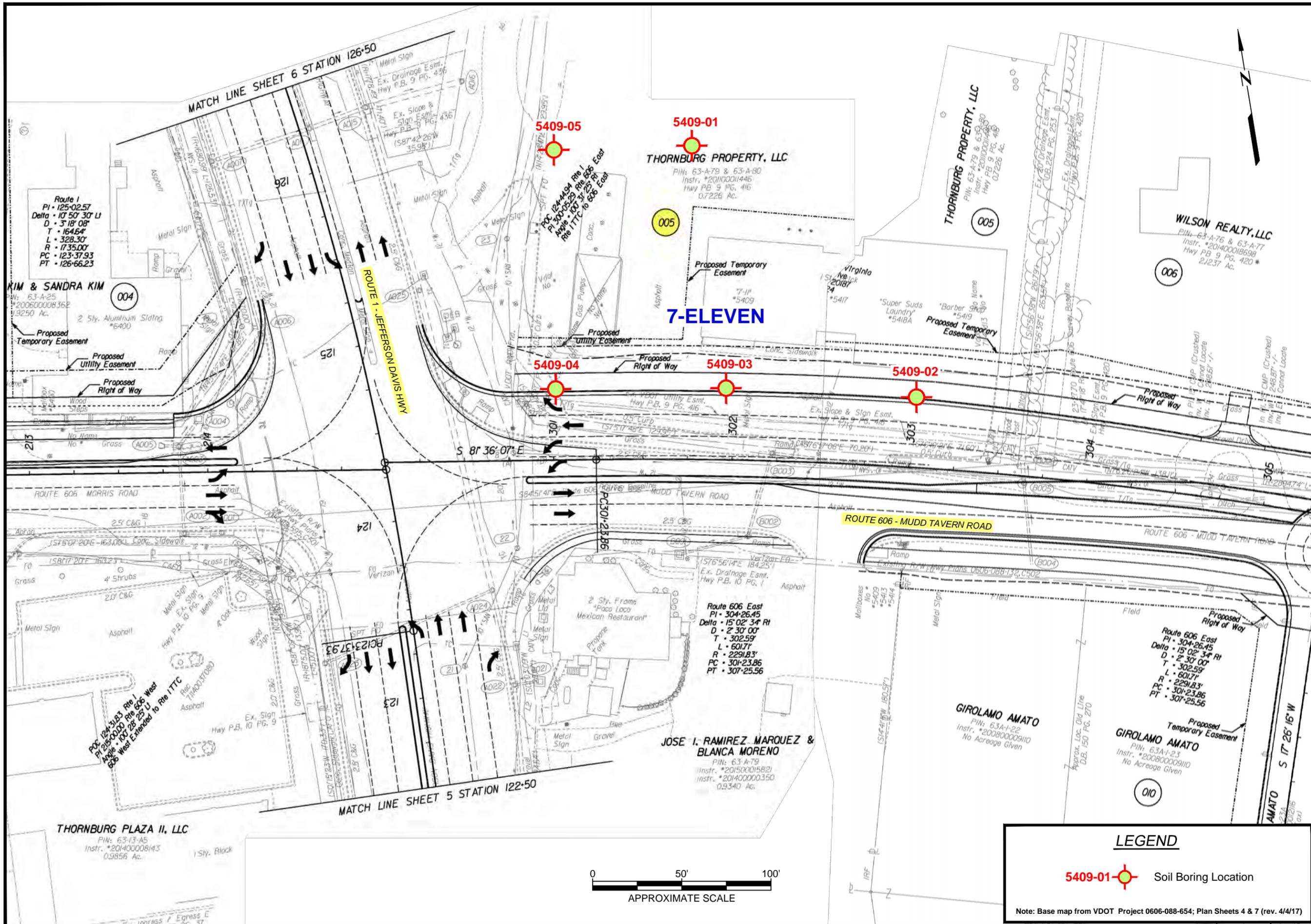


Subsurface Investigation Report

APPENDIX

B

SITE FIGURES



**LEGEND**

5409-01 Soil Boring Location

Note: Base map from VDOT Project 0606-088-654; Plan Sheets 4 & 7 (rev. 4/4/17)

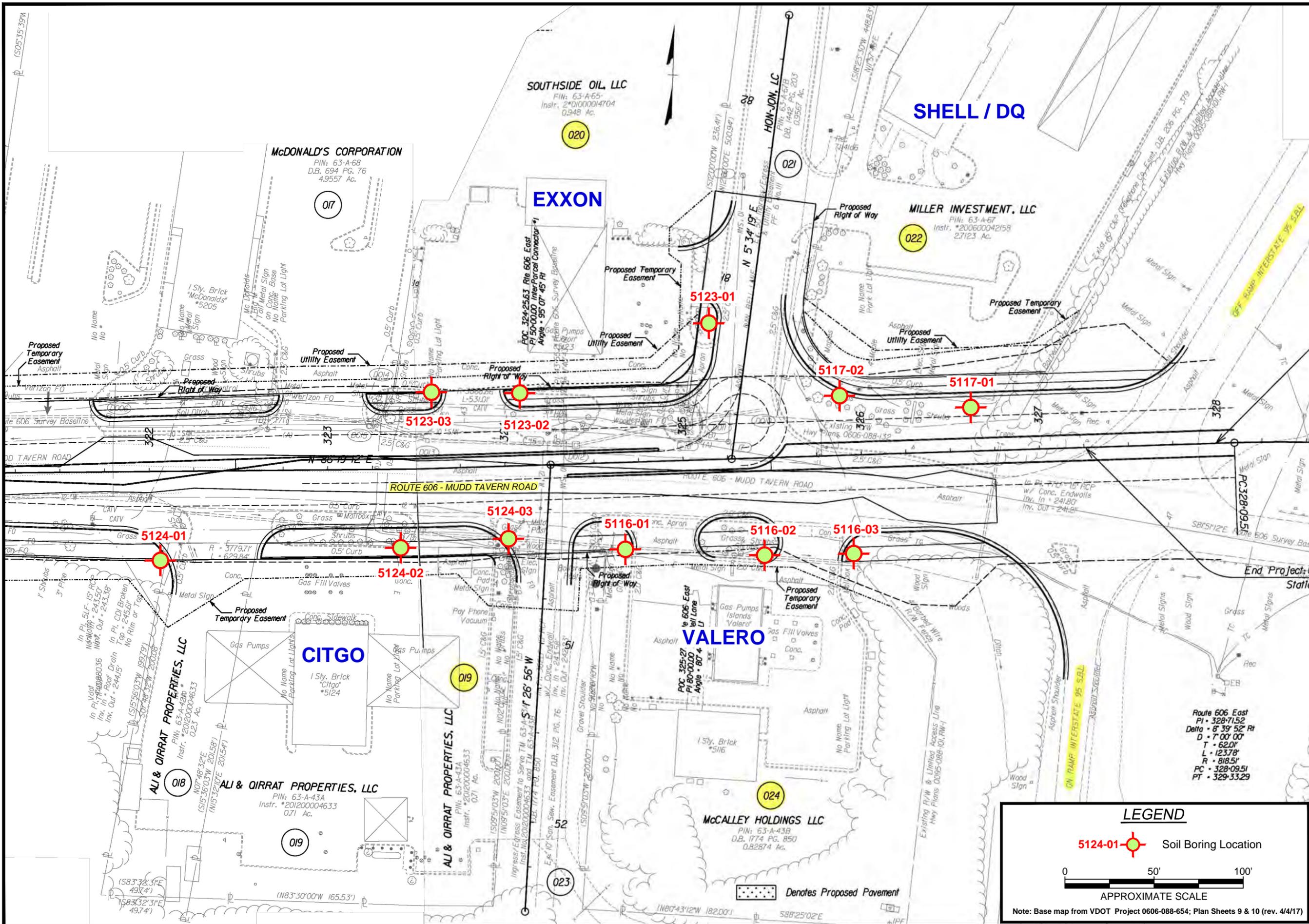


DESIGNED:	DA
DRAWN:	DES
CHECKED:	JPS
DATE:	08/04/2017
SCALE:	AS SHOWN
FILE NO.:	VFR048_Site Map.dwg
PROJECT NO.:	VFR048
OFFICE LOC.:	Ashland, VA, USA



**VDOT**  
Route 606 - Mudd Tavern Road  
Thornburg, Virginia  
Site Map

Figure  
1



DESIGNED:	DA
DRAWN:	DES
CHECKED:	JPS
DATE:	08/04/2017
SCALE:	AS SHOWN
FILE NO.:	VFR048_Site Map.dwg
PROJECT NO.:	VFR048
OFFICE LOC.:	Ashland, VA, USA

Subsurface Investigation Report

APPENDIX

C

PHOTOGRAPHS

<b>Client:</b>	<b>VDOT</b>	<b>Project Name:</b>	<b>RT 606 PHASE II</b>
<b>Site Name:</b>	<b>7-Eleven Site</b>	<b>Project Number:</b>	<b>VFR048</b>

Photo 1

**Date:**  
8/3/2017

**Description:**

View 7-Eleven site with car wash in background.



Photo 2

**Date:**  
8/3/2017

**Description:**

Alternate view of 7-Eleven parking lot.



<b>Client:</b>	VDOT	<b>Project Name:</b>	RT 606 PHASE II
<b>Site Name:</b>	Citgo Site	<b>Project Number:</b>	VFR048

Photo 3

**Date:**  
8/3/2017

**Description:**  
View of Citgo station.



Photo 4

**Date:**  
8/3/2017

**Description:**  
View of a UST basin in front of Citgo building.



<b>Client:</b>	<b>VDOT</b>	<b>Project Name:</b>	<b>RT 606 PHASE II</b>
<b>Site Name:</b>	<b>Exxon Site</b>	<b>Project Number:</b>	<b>VFR048</b>

Photo 5

**Date:**  
8/3/2017

**Description:**  
View of Exxon Station.



Photo 6

**Date:**  
8/3/2017

**Description:**  
View of Exxon Station  
looking towards Valero.



<b>Client:</b>	<b>VDOT</b>	<b>Project Name:</b>	<b>RT 606 PHASE II</b>
<b>Site Name:</b>	<b>Shell Site</b>	<b>Project Number:</b>	<b>VFR048</b>

Photo 7

**Date:**  
8/3/2017

**Description:**  
View of Shell Station.



Photo 8

**Date:**  
8/3/2017

**Description:**  
Alternate view of Shell Station.



<b>Client:</b>	<b>VDOT</b>	<b>Project Name:</b>	<b>RT 606 PHASE II</b>
<b>Site Name:</b>	<b>Valero Site</b>	<b>Project Number:</b>	<b>VFR048</b>

**Photo 9**

**Date:**  
8/3/2017

**Description:**  
View of Valero Station.



**Photo 10**

**Date:**  
8/3/2017

**Description:**  
Alternate view of Valero Station with UST basin in front.



Client:	VDOT	Project Name:	RT 606 PHASE II
Site Name:	Proposed Connector Road	Project Number:	VFR048
<p><b>Date:</b> 8/3/2017</p> <p><b>Description:</b> View of debris located along western portion of the proposed connector road</p>		<p>Photo 11</p> 	
		<p>Photo 12</p> 	
<p><b>Date:</b> 8/3/2017</p> <p><b>Description:</b> View of debris located along western portion of the proposed connector road.</p>			

<b>Client:</b>	<b>VDOT</b>	<b>Project Name:</b>	<b>RT 606 PHASE II</b>
<b>Site Name:</b>	<b>Proposed Connector Road</b>	<b>Project Number:</b>	<b>VFR048</b>

**Photo 13**

**Date:**  
8/3/2017

**Description:**  
View of debris located along western portion of the proposed connector road.



**Photo 14**

**Date:**  
8/3/2017

**Description:**  
View of debris located along central portion of the proposed connector road.



<b>Client:</b>	<b>VDOT</b>	<b>Project Name:</b>	<b>RT 606 PHASE II</b>
<b>Site Name:</b>	<b>Proposed Connector Road</b>	<b>Project Number:</b>	<b>VFR048</b>

**Photo 15**

**Date:**  
8/3/2017

**Description:**  
View of hotel located south of the eastern portion proposed connector road.



**Photo 3**

**Date:**  
8/3/2017

**Description:**  
View of debris located along eastern portion of the proposed connector road.



Subsurface Investigation Report

APPENDIX

D

SOIL BORING LOGS





LOG OF BORING 5116-02

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/2/2017  
 Date Completed : 8/2/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	Surf. Elev.	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3 4 5 6 7 8 9 10 11 12		Light brown, SANDY CLAYS, moist.		CL		0.0		
		Soft, wet, grey SANDY CLAYS.		CL		0.0		

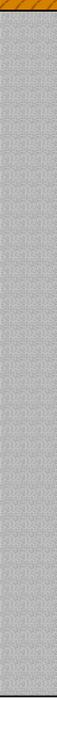


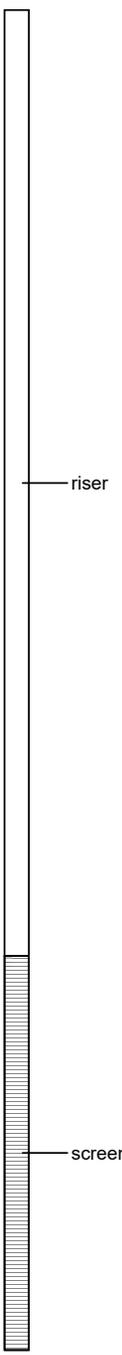
LOG OF BORING 5116-03

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/1/2017  
 Date Completed : 8/1/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3 4 5 6 7	Dry, orange, SANDY CLAYS		CL		0.0		
8 9 10 11 12 13 14 15 16 17	Light grey, CLAYEY SANDS, moist at 12 feet, wet at 14-17 feet.  Refusal at 17 feet.		SP		0.0		Groundwater sample collected at 1200 on 8/2/2017







LOG OF BORING 5117-02

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/3/2017  
 Date Completed : 8/3/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	Surf. Elev.	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3 4 5 6 7 8 9 10 11 12		Light brown, SANDY CLAYS with quartz gravels.		CL		0.0		
		Mottled, grey brown, SANDY CLAYS, soft, moist.		CL		0.0		
		Refusal at 12 feet.						



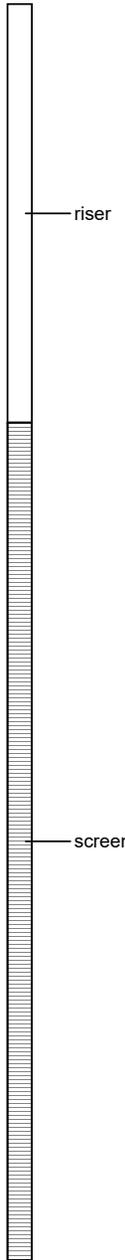
LOG OF BORING 5123-01

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/2/2017  
 Date Completed : 8/2/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3 4 5 6 7	Brown CLAYEY SANDS.		SP		0.0		
8 9 10 11 12 13 14 15 16	Mottled, grey orange SANDY CLAYS, stiff, moist.		CL		0.0		Groundwater sampled at 0950 on 8/3/2017. Insufficient water for AL.
16	Refusal at 16 feet.						





LOG OF BORING 5123-02

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/3/2017  
 Date Completed : 8/3/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	Surf. Elev.	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3 4 5 6 7 8 9 10 11 12		Light grey, SANDY CLAYS, moist, stiff.		CL		0.0		
		Light grey, SANDY CLAYS, moist, stiff.		CL		0.0		





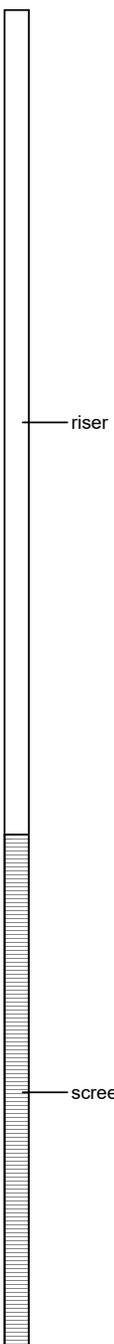
LOG OF BORING 5124-01

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/1/2017  
 Date Completed : 8/1/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3 4	Light brown, SANDY CLAYS.		CL		0.0		
4 5 6 7	Light grey, CLAYEY SANDS.		SP		0.0		
8 9 10 11 12	Light grey, CLAYEY SANDS, damp.		SP		0.0		Groundwater sample collected at 1000 on 8/2/2017
13	Refusal at 13 feet.						





LOG OF BORING 5124-02

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/1/2017  
 Date Completed : 8/1/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	Surf. Elev.	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS	
0		Light brown, SANDY CLAYS.		CL		0.0			
1									
2									
3									
4		Light grey, CLAYEY SANDS.		SP		0.0			
5									
6									
7									
8									
9									
10								0.0	Groundwater sample collected at 1000 on 8/2/2017
11									
12									



LOG OF BORING 5124-03

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/2/2017  
 Date Completed : 8/2/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	Surf. Elev.	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3 4 5 6 7 8 9 10 11 12		Light brown, SANDY CLAYS, moist.		CL		0.0		
		Soft, wet, grey SANDY CLAYS.		CL				

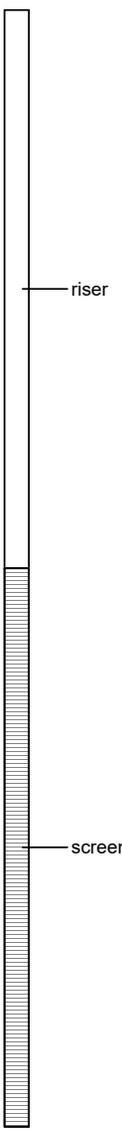


LOG OF BORING 5409-1

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/1/2017  
 Date Completed : 8/1/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet		DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3		Grey-brown, SANDY CLAYS, dense.		CL		0.0		
4 5 6 7		Grey-brown, SANDY CLAYS, dense, minimal recovery.		CL				
8 9 10 11 12		Grey-brown, SANDY CLAYS, dense; wet, minimal recovery.  Well set.		CL				Sample collected at 1000 on 8/1/2017





LOG OF BORING 5409-3

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/1/2017  
 Date Completed : 8/1/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	Surf. Elev.	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0		Light grey, CLAYEY SANDS, stiff.		SP		0.0		
1								
2								
3								
4		Light grey, CLAYEY SANDS, stiff.		SP		0.0		
5								
6								
7								
8		CLAYEY SANDS with quartz gravel/cobble fragments, stiff, dry.		SP				
9								
10		Refusal at ten feet.						

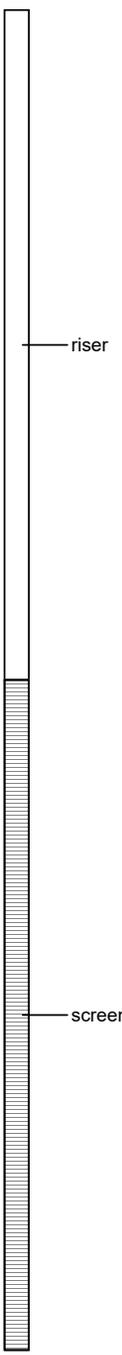


LOG OF BORING 5409-4

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/1/2017  
 Date Completed : 8/1/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet		DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0		Mottled, grey-light brown, SANDY CLAYS, soft, moist.		CL		0.0		
1								
2								
3								
4								
5	riser							
6						0.0		
7								
8		Red brown, CLAYEY SANDS, quartz gravel fragments, moist.		SP		0.0		Groundwater sample collected at 0900 on 8/2/2017
9								
10								
11								
12		Red brown, CLAYEY SANDS, quartz gravel fragments, wet.		SP		0.0		
13								
14								
15	screen							
16								
17								
18								
19								
20		Well set.						



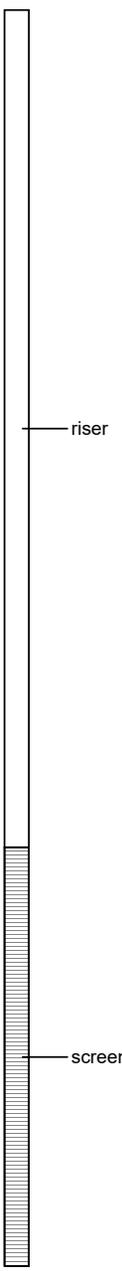
LOG OF BORING 5409-05

Virginia Department of Transportation  
 Route 606 Phase II  
 Thornburg, Virginia  
 Cardno Project # VFR048

Date Started : 8/2/2017  
 Date Completed : 8/2/2017  
 Hole Diameter : 1"  
 Drilling Method : Geoprobe  
 Sampling Method :

Company Rep. : R.P. Meredith  
 Logged By : Dane Anderson  
 Drilling Firm : Cardno, Inc.  
 Northing Coord. :  
 Easting Coord. :

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample Interval (feet)	PID Reading (ppm)	Rec. %	REMARKS
0 1 2 3 4	Asphalt; minimal recovery.						
4 5 6 7	Light brown, SANDY CLAYS with quartz; gravel fragments at 7-8 feet.		CL		0.0		
8 9 10 11	Mottled, red-brown grey, CLAYEY SANDS.		SP		0.0		
12 13 14 15 16	Mottled, red-brown grey, CLAYEY SANDS, moist.		SP				Groundwater sample collected at 0945 on 8/3/2017. Insufficient water for AL.



Subsurface Investigation Report

APPENDIX

E

CERTIFICATES OF ANALYSIS AND  
CHAIN-OF-CUSTODY FORMS



1941 Reymet Road • Richmond, Virginia 23237 • Tel: (804)-358-8295 Fax: (804)-358-8297

## Certificate of Analysis

*Final Report*

Laboratory Order ID 17H0192

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland, VA 23005

Date Received: August 4, 2017 11:40  
Date Issued: August 11, 2017 14:00  
Project Number: VFR048

Submitted To: Richard Page Meredith

Purchase Order:

Client Site I.D.: VFR048

Enclosed are the results of analyses for samples received by the laboratory on 08/04/2017 11:40. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

A handwritten signature in black ink that reads "Ted Soyars".

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.





1941 Reymet Road • Richmond, Virginia 23230 • Tel: (804)-358-8295 Fax: (804)-358-8297

## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

#### ANALYTICAL REPORT FOR SAMPLES

Laboratory Order ID 17H0192

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
5409-01 0-4	17H0192-01	Soil	08/01/2017 09:00	08/04/2017 11:40
5409-02 0-4	17H0192-02	Soil	08/01/2017 10:00	08/04/2017 11:40
5409-03 0-4	17H0192-03	Soil	08/01/2017 11:00	08/04/2017 11:40
5409-04 0-4	17H0192-04	Soil	08/01/2017 12:00	08/04/2017 11:40
5409-05 4-8	17H0192-05	Soil	08/02/2017 09:00	08/04/2017 11:40
5124-01 0-4	17H0192-06	Soil	08/01/2017 13:00	08/04/2017 11:40
5124-02 0-4	17H0192-07	Soil	08/01/2017 14:00	08/04/2017 11:40
5124-03 0-4	17H0192-08	Soil	08/02/2017 09:00	08/04/2017 11:40
5116-01 0-4	17H0192-09	Soil	08/01/2017 15:00	08/04/2017 11:40
5116-02 0-4	17H0192-10	Soil	08/02/2017 14:00	08/04/2017 11:40
5117-01 0-4	17H0192-11	Soil	08/02/2017 15:00	08/04/2017 11:40
5117-02 0-4	17H0192-12	Soil	08/03/2017 15:30	08/04/2017 11:40
5123-01 0-4	17H0192-13	Soil	08/02/2017 15:15	08/04/2017 11:40
5123-02 0-4	17H0192-14	Soil	08/03/2017 09:00	08/04/2017 11:40
5123-03 0-4	17H0192-15	Soil	08/03/2017 10:00	08/04/2017 11:40
5116-03 0-4	17H0192-16	Soil	08/02/2017 14:30	08/04/2017 11:40



1941 Reymet Road • Richmond, Virginia 23230 • Tel: (804)-358-8295 Fax: (804)-358-8297

## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/11/2017 14:00
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5409-01 0-4 **Laboratory Sample ID:** 17H0192-01

**Grab Date/Time:** 08/01/2017 09:00

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	01	SW8015C	<0.10 mg/kg		0.10	1	08/07/17 13:45	08/07/17 13:45	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	<i>01</i>	<i>SW8015C</i>	<i>119 %</i>		<i>80-120</i>		<i>08/07/17 13:45</i>	<i>08/07/17 13:45</i>	<i>CL</i>
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	01	SW8015C	<10.0 mg/kg		10.0	1	08/08/17 13:36	08/10/17 10:51	CVH
<i>Surr: Pentacosane (Surr)</i>	<i>01</i>	<i>SW8015C</i>	<i>81.9 %</i>		<i>40-160</i>		<i>08/08/17 13:36</i>	<i>08/10/17 10:51</i>	<i>CVH</i>



1941 Reymet Road • Richmond, Virginia 23230 • Tel: (804)-358-8295 Fax: (804)-358-8297

## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

Laboratory Order ID: 17H0192

**Analytical Results**

Sample I.D. 5409-02 0-4

Laboratory Sample ID: 17H0192-02

Grab Date/Time: 08/01/2017 10:00

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	02	SW8015C	<0.10 mg/kg		0.10	1	08/07/17 14:07	08/07/17 14:07	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	02	SW8015C	117 %		80-120		08/07/17 14:07	08/07/17 14:07	CL
<b>Volatile Organic Compounds by GCMS</b>									
1,1,1,2-Tetrachloroethane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,1,1-Trichloroethane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,1,2,2-Tetrachloroethane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,1,2-Trichloroethane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,1-Dichloroethane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,1-Dichloroethylene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,1-Dichloropropene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2,3-Trichlorobenzene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2,3-Trichloropropane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2,4-Trichlorobenzene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2,4-Trimethylbenzene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2-Dibromo-3-chloropropane (DBCP)	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2-Dibromoethane (EDB)	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2-Dichlorobenzene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2-Dichloroethane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,2-Dichloropropane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,3,5-Trimethylbenzene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,3-Dichlorobenzene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,3-Dichloropropane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
1,4-Dichlorobenzene	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS
2,2-Dichloropropane	02	SW8260B	<5.00 ug/kg		5.00	1	08/04/17 15:31	08/04/17 15:31	KCS



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith

Project Number: VFR048

Client Site I.D.: VFR048

Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

Sample I.D. 5409-02 0-4

Laboratory Sample ID: 17H0192-02

Grab Date/Time: 08/01/2017 10:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Organic Compounds by GCMS</b>									
2-Butanone (MEK)	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
2-Chlorotoluene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
2-Hexanone (MBK)	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
4-Chlorotoluene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
4-Isopropyltoluene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
4-Methyl-2-pentanone (MIBK)	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Acetone	02	SW8260B	<10.0 ug/kg	10.0	1	08/04/17 15:31	08/04/17 15:31	KCS	
Benzene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Bromobenzene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Bromochloromethane	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Bromodichloromethane	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Bromoform	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Bromomethane	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Carbon disulfide	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Carbon tetrachloride	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Chlorobenzene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Chloroethane	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Chloroform	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Chloromethane	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
cis-1,2-Dichloroethylene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
cis-1,3-Dichloropropene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Dibromochloromethane	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Dibromomethane	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Dichlorodifluoromethane	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Di-isopropyl ether (DIPE)	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	
Ethylbenzene	02	SW8260B	<5.00 ug/kg	5.00	1	08/04/17 15:31	08/04/17 15:31	KCS	



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith

Project Number: VFR048

Client Site I.D.: VFR048

Purchase Order:

Laboratory Order ID: 17H0192

**Analytical Results**

Sample I.D. 5409-02 0-4

Laboratory Sample ID: 17H0192-02

Grab Date/Time: 08/01/2017 10:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Organic Compounds by GCMS</b>									
Hexachlorobutadiene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Iodomethane	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Isopropylbenzene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
m+p-Xylenes	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Methylene chloride	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Methyl-t-butyl ether (MTBE)	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Naphthalene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
n-Butylbenzene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
n-Propylbenzene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
o-Xylene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
sec-Butylbenzene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Styrene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
tert-Butylbenzene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Tetrachloroethylene (PCE)	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Toluene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
trans-1,2-Dichloroethylene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
trans-1,3-Dichloropropene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Trichloroethylene	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Trichlorofluoromethane	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Vinyl acetate	02	SW8260B	<10.0 ug/kg	10.0	1		08/04/17 15:31	08/04/17 15:31	KCS
Vinyl chloride	02	SW8260B	<5.00 ug/kg	5.00	1		08/04/17 15:31	08/04/17 15:31	KCS
Xylenes, Total	02	SW8260B	<15.0 ug/kg	15.0	1		08/04/17 15:31	08/04/17 15:31	KCS
Surr: 1,2-Dichloroethane-d4 (Surr)	02	SW8260B	99.0 %	80-120			08/04/17 15:31	08/04/17 15:31	KCS
Surr: 4-Bromofluorobenzene (Surr)	02	SW8260B	102 %	85-120			08/04/17 15:31	08/04/17 15:31	KCS



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

Laboratory Order ID: 17H0192

**Analytical Results**

Sample I.D. 5409-02 0-4

Laboratory Sample ID: 17H0192-02

Grab Date/Time: 08/01/2017 10:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Organic Compounds by GCMS</b>									
Surr: Dibromofluoromethane (Surr)	02	SW8260B	98.3 %		80-119		08/04/17 15:31	08/04/17 15:31	KCS
Surr: Toluene-d8 (Surr)	02	SW8260B	101 %		85-115		08/04/17 15:31	08/04/17 15:31	KCS
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	02	SW8015C	<10.0 mg/kg		10.0	1	08/08/17 13:36	08/10/17 11:18	CVH
Surr: Pentacosane (Surr)	02	SW8015C	86.2 %		40-160		08/08/17 13:36	08/10/17 11:18	CVH



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Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

Sample I.D. 5409-03 0-4

Laboratory Sample ID: 17H0192-03

Grab Date/Time: 08/01/2017 11:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	03	SW8015C	<0.10 mg/kg	0.10	1		08/07/17 14:30	08/07/17 14:30	CL
Surr: 2,5-Dibromotoluene (FID)	03	SW8015C	105 %	80-120			08/07/17 14:30	08/07/17 14:30	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	03	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 11:44	CVH
Surr: Pentacosane (Surr)	03	SW8015C	85.9 %	40-160			08/08/17 13:36	08/10/17 11:44	CVH



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/11/2017 14:00
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

Sample I.D. 5409-04 0-4 Laboratory Sample ID: 17H0192-04

Grab Date/Time: 08/01/2017 12:00

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	04	SW8015C	72.8 mg/kg		4.97	50	08/07/17 12:37	08/07/17 12:37	CL
Surr: 2,5-Dibromotoluene (FID)	04	SW8015C	472 %	S	80-120		08/07/17 12:37	08/07/17 12:37	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	04	SW8015C	3970 mg/kg		495	50	08/08/17 13:36	08/10/17 12:11	CVH
Surr: Pentacosane (Surr)	04	SW8015C	73.6 %		40-160		08/08/17 13:36	08/10/17 12:11	CVH



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

Laboratory Order ID: 17H0192

**Analytical Results**

Sample I.D. 5409-05 4-8

Laboratory Sample ID: 17H0192-05

Grab Date/Time: 08/02/2017 09:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	05	SW8015C	<0.10 mg/kg	0.10	1		08/07/17 14:52	08/07/17 14:52	CL
Surr: 2,5-Dibromotoluene (FID)	05	SW8015C	114 %	80-120			08/07/17 14:52	08/07/17 14:52	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	05	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 12:38	CVH
Surr: Pentacosane (Surr)	05	SW8015C	78.3 %	40-160			08/08/17 13:36	08/10/17 12:38	CVH



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/11/2017 14:00
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5124-01 0-4 **Laboratory Sample ID:** 17H0192-06

**Grab Date/Time:** 08/01/2017 13:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	06RE1	SW8015C	<0.47 mg/kg	0.47	1		08/07/17 17:29	08/07/17 17:29	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	<i>06RE1</i>	<i>SW8015C</i>	<i>91.2 %</i>	<i>80-120</i>			<i>08/07/17 17:29</i>	<i>08/07/17 17:29</i>	<i>CL</i>
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	06	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 13:04	CVH
<i>Surr: Pentacosane (Surr)</i>	<i>06</i>	<i>SW8015C</i>	<i>78.5 %</i>	<i>40-160</i>			<i>08/08/17 13:36</i>	<i>08/10/17 13:04</i>	<i>CVH</i>



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/11/2017 14:00
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

Sample I.D. 5124-02 0-4 Laboratory Sample ID: 17H0192-07

Grab Date/Time: 08/01/2017 14:00

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	07RE1	SW8015C	<0.45 mg/kg		0.45	1	08/07/17 17:52	08/07/17 17:52	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	<i>07RE1</i>	<i>SW8015C</i>	<i>116 %</i>		<i>80-120</i>		<i>08/07/17 17:52</i>	<i>08/07/17 17:52</i>	<i>CL</i>
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	07	SW8015C	<10.0 mg/kg		10.0	1	08/08/17 13:36	08/10/17 13:31	CVH
<i>Surr: Pentacosane (Surr)</i>	<i>07</i>	<i>SW8015C</i>	<i>70.8 %</i>		<i>40-160</i>		<i>08/08/17 13:36</i>	<i>08/10/17 13:31</i>	<i>CVH</i>



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/11/2017 14:00
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5124-03 0-4 **Laboratory Sample ID:** 17H0192-08

**Grab Date/Time:** 08/02/2017 09:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	08	SW8015C	<0.10 mg/kg	0.10	1		08/07/17 16:00	08/07/17 16:00	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	08	SW8015C	98.4 %	80-120			08/07/17 16:00	08/07/17 16:00	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	08	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 13:58	CVH
<i>Surr: Pentacosane (Surr)</i>	08	SW8015C	89.7 %	40-160			08/08/17 13:36	08/10/17 13:58	CVH



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/11/2017 14:00
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5116-01 0-4 **Laboratory Sample ID:** 17H0192-09

**Grab Date/Time:** 08/01/2017 15:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	09	SW8015C	<0.10 mg/kg	0.10	1		08/07/17 16:22	08/07/17 16:22	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	09	SW8015C	98.8 %	80-120			08/07/17 16:22	08/07/17 16:22	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	09	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 14:24	CVH
<i>Surr: Pentacosane (Surr)</i>	09	SW8015C	90.0 %	40-160			08/08/17 13:36	08/10/17 14:24	CVH



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/11/2017 14:00
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5116-02 0-4 **Laboratory Sample ID:** 17H0192-10

**Grab Date/Time:** 08/02/2017 14:00

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	10	SW8015C	<0.10 mg/kg		0.10	1	08/07/17 16:45	08/07/17 16:45	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	10	SW8015C	103 %		80-120		08/07/17 16:45	08/07/17 16:45	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	10	SW8015C	<10.0 mg/kg		10.0	1	08/08/17 13:36	08/10/17 14:51	CVH
<i>Surr: Pentacosane (Surr)</i>	10	SW8015C	69.1 %		40-160		08/08/17 13:36	08/10/17 14:51	CVH



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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5117-01 0-4 **Laboratory Sample ID:** 17H0192-11

**Grab Date/Time:** 08/02/2017 15:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	11RE1	SW8015C	<0.41 mg/kg	0.41	1		08/08/17 12:59	08/08/17 12:59	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	<i>11RE1</i>	<i>SW8015C</i>	<i>88.5 %</i>	<i>80-120</i>			<i>08/08/17 12:59</i>	<i>08/08/17 12:59</i>	<i>CL</i>
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	11	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 15:17	CVH
<i>Surr: Pentacosane (Surr)</i>	<i>11</i>	<i>SW8015C</i>	<i>91.1 %</i>	<i>40-160</i>			<i>08/08/17 13:36</i>	<i>08/10/17 15:17</i>	<i>CVH</i>



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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5117-02 0-4 **Laboratory Sample ID:** 17H0192-12

**Grab Date/Time:** 08/03/2017 15:30

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	12	SW8015C	<0.10 mg/kg	0.10	1		08/07/17 12:42	08/07/17 12:42	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	12	SW8015C	92.6 %	80-120			08/07/17 12:42	08/07/17 12:42	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	12	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 15:44	CVH
<i>Surr: Pentacosane (Surr)</i>	12	SW8015C	88.6 %	40-160			08/08/17 13:36	08/10/17 15:44	CVH



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Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

Sample I.D. 5123-01 0-4

Laboratory Sample ID: 17H0192-13

Grab Date/Time: 08/02/2017 15:15

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	13	SW8015C	<0.10 mg/kg	0.10	1		08/07/17 13:05	08/07/17 13:05	CL
Surr: 2,5-Dibromotoluene (FID)	13	SW8015C	91.2 %	80-120			08/07/17 13:05	08/07/17 13:05	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	13	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 16:11	CVH
Surr: Pentacosane (Surr)	13	SW8015C	88.4 %	40-160			08/08/17 13:36	08/10/17 16:11	CVH



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Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/11/2017 14:00
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5123-02 0-4 **Laboratory Sample ID:** 17H0192-14

**Grab Date/Time:** 08/03/2017 09:00

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	14	SW8015C	<0.10 mg/kg		0.10	1	08/07/17 13:28	08/07/17 13:28	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	14	SW8015C	90.0 %		80-120		08/07/17 13:28	08/07/17 13:28	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	14	SW8015C	<10.0 mg/kg		10.0	1	08/08/17 13:36	08/10/17 16:37	CVH
<i>Surr: Pentacosane (Surr)</i>	14	SW8015C	99.1 %		40-160		08/08/17 13:36	08/10/17 16:37	CVH



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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5123-03 0-4 **Laboratory Sample ID:** 17H0192-15

**Grab Date/Time:** 08/03/2017 10:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	15	SW8015C	<0.10 mg/kg	0.10	1		08/07/17 13:51	08/07/17 13:51	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	15	SW8015C	93.5 %	80-120			08/07/17 13:51	08/07/17 13:51	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	15	SW8015C	<10.0 mg/kg	10.0	1		08/08/17 13:36	08/10/17 17:04	CVH
<i>Surr: Pentacosane (Surr)</i>	15	SW8015C	91.7 %	40-160			08/08/17 13:36	08/10/17 17:04	CVH



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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0192**

**Analytical Results**

**Sample I.D.** 5116-03 0-4 **Laboratory Sample ID:** 17H0192-16

**Grab Date/Time:** 08/02/2017 14:30

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
<b>TPH-Volatiles (GRO)</b>	16	SW8015C	<b>0.89 mg/kg</b>	0.41	1		08/07/17 14:14	08/07/17 14:14	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	16	SW8015C	90.6 %	80-120			08/07/17 14:14	08/07/17 14:14	CL
<b>Semivolatile Hydrocarbons by GC</b>									
<b>TPH-Semi-Volatiles (DRO)</b>	16	SW8015C	<b>13.0 mg/kg</b>	10.0	1		08/08/17 13:36	08/10/17 17:30	CVH
<i>Surr: Pentacosane (Surr)</i>	16	SW8015C	102 %	40-160			08/08/17 13:36	08/10/17 17:30	CVH



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### Final Report

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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

### Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
<b>Volatile Hydrocarbons by GC</b>		<b>Preparation Method: SW5030B</b>			
17H0192-01	5.01 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-02	5.09 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-03	5.05 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-04	10.1 g / 10.0 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-05	5.17 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-06	5.00 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-06RE1	1.06 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-07	5.15 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-07RE1	1.12 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-08	5.16 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-09	5.15 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-10	5.12 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
17H0192-11	5.13 g / 5.00 mL	SW8015C	BAH0184	SAH0204	AH70039
<b>Volatile Organic Compounds by GCMS</b>		<b>Preparation Method: SW5030B</b>			
17H0192-02	5.01 g / 5.00 mL	SW8260B	BAH0188	SAH0192	AG70053
<b>Volatile Hydrocarbons by GC</b>		<b>Preparation Method: SW5030B</b>			
17H0192-12	5.24 g / 5.00 mL	SW8015C	BAH0196	SAH0232	AF70032
17H0192-13	5.09 g / 5.00 mL	SW8015C	BAH0196	SAH0232	AF70032
17H0192-14	5.01 g / 5.00 mL	SW8015C	BAH0196	SAH0232	AF70032
17H0192-15	5.13 g / 5.00 mL	SW8015C	BAH0196	SAH0232	AF70032
17H0192-16	1.23 g / 5.00 mL	SW8015C	BAH0196	SAH0232	AF70032
<b>Volatile Hydrocarbons by GC</b>		<b>Preparation Method: SW5030B</b>			
17H0192-11RE1	1.23 g / 5.00 mL	SW8015C	BAH0239	SAH0250	AH70039
Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
<b>Semivolatile Hydrocarbons by GC</b>		<b>Preparation Method: SW8100</b>			
17H0192-01	50.7 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-02	53.1 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-03	51.6 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-04	50.5 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-05	51.1 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107



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## Certificate of Analysis

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Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048  
Purchase Order:

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
17H0192-06	52.8 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-07	51.2 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-08	51.8 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-09	50.5 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-10	51.9 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-11	50.6 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-12	53.8 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-13	51.0 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-14	51.3 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-15	50.9 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107
17H0192-16	51.4 g / 1.00 mL	SW8015C	BAH0241	SAH0348	AF70107



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Client Site I.D.: VFR048	Purchase Order:

### Volatile Hydrocarbons by GC - Quality Control

#### Air Water and Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
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#### Batch BAH0184 - SW5030B

<b>Blank (BAH0184-BLK1)</b>				Prepared & Analyzed: 08/07/2017						
TPH-Volatiles (GRO)	<0.10 mg/kg	0.10	mg/kg							
Surr: 2,5-Dibromotoluene (FID)	99.0		ug/L	100		99.0	80-120			
<b>LCS (BAH0184-BS1)</b>				Prepared & Analyzed: 08/07/2017						
TPH-Volatiles (GRO)	1.00 mg/kg	0.10	mg/kg	1.00	mg/kg	99.8	70-130			
Surr: 2,5-Dibromotoluene (FID)	103		ug/L	100	ug/L	103	80-120			
<b>Matrix Spike (BAH0184-MS1)</b>				Source: 17H0192-01		Prepared & Analyzed: 08/07/2017				
TPH-Volatiles (GRO)	0.82 mg/kg	0.10	mg/kg	0.990	<0.10 mg/kg	82.8	70-130			
Surr: 2,5-Dibromotoluene (FID)	102		ug/L	100	ug/L	102	80-120			
<b>Matrix Spike Dup (BAH0184-MSD1)</b>				Source: 17H0192-01		Prepared & Analyzed: 08/07/2017				
TPH-Volatiles (GRO)	0.45 mg/kg	0.10	mg/kg	0.992	<0.10 mg/kg	45.2	70-130	58.6	20	M, P
Surr: 2,5-Dibromotoluene (FID)	69.7		ug/L	100	ug/L	69.7	80-120			S

#### Batch BAH0196 - SW5030B

<b>Blank (BAH0196-BLK1)</b>				Prepared & Analyzed: 08/07/2017						
TPH-Volatiles (GRO)	<0.10 mg/kg	0.10	mg/kg							
Surr: 2,5-Dibromotoluene (FID)	92.6		ug/L	100		92.6	80-120			
<b>LCS (BAH0196-BS1)</b>				Prepared & Analyzed: 08/07/2017						
TPH-Volatiles (GRO)	0.93 mg/kg	0.10	mg/kg	1.00	mg/kg	93.1	70-130			
Surr: 2,5-Dibromotoluene (FID)	94.8		ug/L	100	ug/L	94.8	80-120			
<b>Matrix Spike (BAH0196-MS1)</b>				Source: 17H0192-12		Prepared & Analyzed: 08/07/2017				
TPH-Volatiles (GRO)	0.47 mg/kg	0.10	mg/kg	0.984	<0.10 mg/kg	47.3	70-130			M
Surr: 2,5-Dibromotoluene (FID)	65.1		ug/L	100	ug/L	65.1	80-120			S



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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

### Volatile Hydrocarbons by GC - Quality Control

#### Air Water and Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
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#### Batch BAH0196 - SW5030B

<b>Matrix Spike Dup (BAH0196-MSD1)</b>		<b>Source: 17H0192-12</b>		<b>Prepared &amp; Analyzed: 08/07/2017</b>						
TPH-Volatiles (GRO)	0.16 mg/kg	0.10	mg/kg	1.00	<0.10 mg/kg	15.8	70-130	98.5	20	M, P
<i>Surr: 2,5-Dibromotoluene (FID)</i>	23.7		ug/L	100	ug/L	23.7	80-120			S

#### Batch BAH0239 - SW5030B

<b>Blank (BAH0239-BLK1)</b>		<b>Prepared &amp; Analyzed: 08/08/2017</b>								
TPH-Volatiles (GRO)	<0.10 mg/kg	0.10	mg/kg							
<i>Surr: 2,5-Dibromotoluene (FID)</i>	95.3		ug/L	100		95.3	80-120			

<b>LCS (BAH0239-BS1)</b>		<b>Prepared &amp; Analyzed: 08/08/2017</b>								
TPH-Volatiles (GRO)	1.03 mg/kg	0.10	mg/kg	0.984	mg/kg	105	70-130			
<i>Surr: 2,5-Dibromotoluene (FID)</i>	104		ug/L	100	ug/L	104	80-120			

<b>Matrix Spike (BAH0239-MS1)</b>		<b>Source: 17H0201-01</b>		<b>Prepared &amp; Analyzed: 08/08/2017</b>						
TPH-Volatiles (GRO)	0.84 mg/kg	0.10	mg/kg	0.984	<0.10 mg/kg	84.9	70-130			
<i>Surr: 2,5-Dibromotoluene (FID)</i>	95.6		ug/L	100	ug/L	95.6	80-120			

<b>Matrix Spike Dup (BAH0239-MSD1)</b>		<b>Source: 17H0201-01</b>		<b>Prepared &amp; Analyzed: 08/08/2017</b>						
TPH-Volatiles (GRO)	0.73 mg/kg	0.10	mg/kg	0.982	<0.10 mg/kg	73.9	70-130	14.0	20	
<i>Surr: 2,5-Dibromotoluene (FID)</i>	94.0		ug/L	100	ug/L	94.0	80-120			



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## Certificate of Analysis

### Final Report

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Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith

Project Number: VFR048

Client Site I.D.: VFR048

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
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#### Batch BAH0188 - SW5030B

#### Blank (BAH0188-BLK1)

Prepared & Analyzed: 08/04/2017

1,1,1,2-Tetrachloroethane	<5.00 ug/kg	5.00	ug/kg							
1,1,1-Trichloroethane	<5.00 ug/kg	5.00	ug/kg							
1,1,1,2,2-Tetrachloroethane	<5.00 ug/kg	5.00	ug/kg							
1,1,2-Trichloroethane	<5.00 ug/kg	5.00	ug/kg							
1,1-Dichloroethane	<5.00 ug/kg	5.00	ug/kg							
1,1-Dichloroethylene	<5.00 ug/kg	5.00	ug/kg							
1,1-Dichloropropene	<5.00 ug/kg	5.00	ug/kg							
1,2,3-Trichlorobenzene	<5.00 ug/kg	5.00	ug/kg							
1,2,3-Trichloropropane	<5.00 ug/kg	5.00	ug/kg							
1,2,4-Trichlorobenzene	<5.00 ug/kg	5.00	ug/kg							
1,2,4-Trimethylbenzene	<5.00 ug/kg	5.00	ug/kg							
1,2-Dibromo-3-chloropropane (DBCP)	<5.00 ug/kg	5.00	ug/kg							
1,2-Dibromoethane (EDB)	<5.00 ug/kg	5.00	ug/kg							
1,2-Dichlorobenzene	<5.00 ug/kg	5.00	ug/kg							
1,2-Dichloroethane	<5.00 ug/kg	5.00	ug/kg							
1,2-Dichloropropane	<5.00 ug/kg	5.00	ug/kg							
1,3,5-Trimethylbenzene	<5.00 ug/kg	5.00	ug/kg							
1,3-Dichlorobenzene	<5.00 ug/kg	5.00	ug/kg							
1,3-Dichloropropane	<5.00 ug/kg	5.00	ug/kg							
1,4-Dichlorobenzene	<5.00 ug/kg	5.00	ug/kg							
2,2-Dichloropropane	<5.00 ug/kg	5.00	ug/kg							
2-Butanone (MEK)	<5.00 ug/kg	5.00	ug/kg							
2-Chlorotoluene	<5.00 ug/kg	5.00	ug/kg							
2-Hexanone (MBK)	<5.00 ug/kg	5.00	ug/kg							
4-Chlorotoluene	<5.00 ug/kg	5.00	ug/kg							
4-Isopropyltoluene	<5.00 ug/kg	5.00	ug/kg							
4-Methyl-2-pentanone (MIBK)	<5.00 ug/kg	5.00	ug/kg							
Acetone	<10.0 ug/kg	10.0	ug/kg							
Benzene	<5.00 ug/kg	5.00	ug/kg							
Bromobenzene	<5.00 ug/kg	5.00	ug/kg							
Bromochloromethane	<5.00 ug/kg	5.00	ug/kg							



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith

Project Number: VFR048

Client Site I.D.: VFR048

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
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#### Batch BAH0188 - SW5030B

#### Blank (BAH0188-BLK1)

Prepared & Analyzed: 08/04/2017

Bromodichloromethane	<5.00 ug/kg	5.00	ug/kg							
Bromoform	<5.00 ug/kg	5.00	ug/kg							
Bromomethane	<5.00 ug/kg	5.00	ug/kg							
Carbon disulfide	<5.00 ug/kg	5.00	ug/kg							
Carbon tetrachloride	<5.00 ug/kg	5.00	ug/kg							
Chlorobenzene	<5.00 ug/kg	5.00	ug/kg							
Chloroethane	<5.00 ug/kg	5.00	ug/kg							
Chloroform	<5.00 ug/kg	5.00	ug/kg							
Chloromethane	<5.00 ug/kg	5.00	ug/kg							
cis-1,2-Dichloroethylene	<5.00 ug/kg	5.00	ug/kg							
cis-1,3-Dichloropropene	<5.00 ug/kg	5.00	ug/kg							
Dibromochloromethane	<5.00 ug/kg	5.00	ug/kg							
Dibromomethane	<5.00 ug/kg	5.00	ug/kg							
Dichlorodifluoromethane	<5.00 ug/kg	5.00	ug/kg							
Di-isopropyl ether (DIPE)	<5.00 ug/kg	5.00	ug/kg							
Ethylbenzene	<5.00 ug/kg	5.00	ug/kg							
Hexachlorobutadiene	<5.00 ug/kg	5.00	ug/kg							
Iodomethane	<5.00 ug/kg	5.00	ug/kg							
Isopropylbenzene	<5.00 ug/kg	5.00	ug/kg							
m+p-Xylenes	<5.00 ug/kg	5.00	ug/kg							
Methylene chloride	<5.00 ug/kg	5.00	ug/kg							
Methyl-t-butyl ether (MTBE)	<5.00 ug/kg	5.00	ug/kg							
Naphthalene	<5.00 ug/kg	5.00	ug/kg							
n-Butylbenzene	<5.00 ug/kg	5.00	ug/kg							
n-Propylbenzene	<5.00 ug/kg	5.00	ug/kg							
o-Xylene	<5.00 ug/kg	5.00	ug/kg							
sec-Butylbenzene	<5.00 ug/kg	5.00	ug/kg							
Styrene	<5.00 ug/kg	5.00	ug/kg							
tert-Butylbenzene	<5.00 ug/kg	5.00	ug/kg							
Tetrachloroethylene (PCE)	<5.00 ug/kg	5.00	ug/kg							
Toluene	<5.00 ug/kg	5.00	ug/kg							



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/11/2017 14:00
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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 Limits	RPD	RPD Limit	Qual
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#### Batch BAH0188 - SW5030B

##### Blank (BAH0188-BLK1)

Prepared & Analyzed: 08/04/2017

trans-1,2-Dichloroethylene	<5.00 ug/kg	5.00	ug/kg						
trans-1,3-Dichloropropene	<5.00 ug/kg	5.00	ug/kg						
Trichloroethylene	<5.00 ug/kg	5.00	ug/kg						
Trichlorofluoromethane	<5.00 ug/kg	5.00	ug/kg						
Vinyl acetate	<10.0 ug/kg	10.0	ug/kg						
Vinyl chloride	<5.00 ug/kg	5.00	ug/kg						
Xylenes, Total	<15.0 ug/kg	15.0	ug/kg						
<hr style="border-top: 1px dashed black;"/>									
<i>Surr: 1,2-Dichloroethane-d4 (Surr)</i>	53.5		ug/kg	50.0		107	70-120		
<i>Surr: 4-Bromofluorobenzene (Surr)</i>	46.7		ug/kg	50.0		93.4	75-120		
<i>Surr: Dibromofluoromethane (Surr)</i>	53.8		ug/kg	50.0		108	80-119		
<i>Surr: Toluene-d8 (Surr)</i>	51.1		ug/kg	50.0		102	85-120		

##### LCS (BAH0188-BS1)

Prepared & Analyzed: 08/04/2017

1,1,1,2-Tetrachloroethane	54.8 ug/L	5	ug/L	50.0	ug/L	110	75-125		
1,1,1-Trichloroethane	48.6 ug/L	5	ug/L	50.0	ug/L	97.1	70-135		
1,1,2,2-Tetrachloroethane	52.5 ug/L	5	ug/L	50.0	ug/L	105	55-130		
1,1,2-Trichloroethane	51.2 ug/L	5	ug/L	50.0	ug/L	102	60-125		
1,1-Dichloroethane	53.0 ug/L	5	ug/L	50.0	ug/L	106	75-125		
1,1-Dichloroethylene	48.8 ug/L	5	ug/L	50.0	ug/L	97.7	65-135		
1,1-Dichloropropene	48.6 ug/L	5	ug/L	50.0	ug/L	97.3	70-135		
1,2,3-Trichlorobenzene	53.3 ug/L	5	ug/L	50.0	ug/L	107	60-135		
1,2,3-Trichloropropane	50.8 ug/L	5	ug/L	50.0	ug/L	102	65-130		
1,2,4-Trichlorobenzene	51.7 ug/L	5	ug/L	50.0	ug/L	103	65-130		
1,2,4-Trimethylbenzene	51.3 ug/L	5	ug/L	50.0	ug/L	103	65-135		
1,2-Dibromo-3-chloropropane (DBCP)	42.4 ug/L	5	ug/L	50.0	ug/L	84.7	40-135		
1,2-Dibromoethane (EDB)	49.7 ug/L	5	ug/L	50.0	ug/L	99.4	70-125		
1,2-Dichlorobenzene	51.0 ug/L	5	ug/L	50.0	ug/L	102	75-120		
1,2-Dichloroethane	49.1 ug/L	5	ug/L	50.0	ug/L	98.3	70-135		
1,2-Dichloropropane	49.3 ug/L	5	ug/L	50.0	ug/L	98.6	70-120		
1,3,5-Trimethylbenzene	53.5 ug/L	5	ug/L	50.0	ug/L	107	65-135		
1,3-Dichlorobenzene	53.6 ug/L	5	ug/L	50.0	ug/L	107	70-125		



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/11/2017 14:00
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0188 - SW5030B

#### LCS (BAH0188-BS1)

Prepared & Analyzed: 08/04/2017

1,3-Dichloropropane	48.6 ug/L	5	ug/L	50.0	ug/L	97.2	75-125			
1,4-Dichlorobenzene	51.6 ug/L	5	ug/L	50.0	ug/L	103	70-125			
2,2-Dichloropropane	49.0 ug/L	5	ug/L	50.0	ug/L	98.0	65-135			
2-Butanone (MEK)	43.8 ug/L	5	ug/L	50.0	ug/L	87.7	30-160			
2-Chlorotoluene	54.2 ug/L	5	ug/L	50.0	ug/L	108	70-130			
2-Hexanone (MBK)	50.5 ug/L	5	ug/L	50.0	ug/L	101	55-130			
4-Chlorotoluene	53.0 ug/L	5	ug/L	50.0	ug/L	106	75-125			
4-Isopropyltoluene	53.2 ug/L	5	ug/L	50.0	ug/L	106	75-135			
4-Methyl-2-pentanone (MIBK)	45.2 ug/L	5	ug/L	50.0	ug/L	90.5	60-135			
Acetone	49.6 ug/L	10	ug/L	50.0	ug/L	99.1	20-160			
Benzene	49.1 ug/L	5	ug/L	50.0	ug/L	98.2	75-125			
Bromobenzene	49.5 ug/L	5	ug/L	50.0	ug/L	98.9	65-120			
Bromochloromethane	50.4 ug/L	5	ug/L	50.0	ug/L	101	70-125			
Bromodichloromethane	50.3 ug/L	5	ug/L	50.0	ug/L	101	70-130			
Bromoform	48.8 ug/L	5	ug/L	50.0	ug/L	97.5	55-135			
Bromomethane	48.7 ug/L	5	ug/L	50.0	ug/L	97.5	30-160			
Carbon disulfide	47.8 ug/L	5	ug/L	50.0	ug/L	95.7	45-160			
Carbon tetrachloride	46.8 ug/L	5	ug/L	50.0	ug/L	93.7	65-135			
Chlorobenzene	49.7 ug/L	5	ug/L	50.0	ug/L	99.3	75-125			
Chloroethane	50.2 ug/L	5	ug/L	50.0	ug/L	100	40-155			
Chloroform	47.5 ug/L	5	ug/L	50.0	ug/L	94.9	70-125			
Chloromethane	47.9 ug/L	5	ug/L	50.0	ug/L	95.8	50-130			
cis-1,2-Dichloroethylene	50.4 ug/L	5	ug/L	50.0	ug/L	101	65-125			
cis-1,3-Dichloropropene	42.1 ug/L	5	ug/L	50.0	ug/L	84.1	70-125			
Dibromochloromethane	43.0 ug/L	5	ug/L	50.0	ug/L	85.9	65-130			
Dibromomethane	49.1 ug/L	5	ug/L	50.0	ug/L	98.1	75-130			
Dichlorodifluoromethane	46.6 ug/L	5	ug/L	50.0	ug/L	93.2	35-135			
Ethylbenzene	49.4 ug/L	5	ug/L	50.0	ug/L	98.8	75-125			
Hexachlorobutadiene	51.5 ug/L	5	ug/L	50.0	ug/L	103	55-140			
Isopropylbenzene	53.4 ug/L	5	ug/L	50.0	ug/L	107	75-130			
m+p-Xylenes	103 ug/L	5	ug/L	100	ug/L	103	80-125			



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/11/2017 14:00
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0188 - SW5030B

##### LCS (BAH0188-BS1)

Prepared & Analyzed: 08/04/2017

Methylene chloride	47.6 ug/L	5	ug/L	50.0	ug/L	95.1	55-140			
Methyl-t-butyl ether (MTBE)	49.1 ug/L	5	ug/L	50.0	ug/L	98.3	65-125			
Naphthalene	52.2 ug/L	5	ug/L	50.0	ug/L	104	40-125			
n-Butylbenzene	56.2 ug/L	5	ug/L	50.0	ug/L	112	65-140			
n-Propylbenzene	52.8 ug/L	5	ug/L	50.0	ug/L	106	65-135			
o-Xylene	51.8 ug/L	5	ug/L	50.0	ug/L	104	75-125			
sec-Butylbenzene	54.2 ug/L	5	ug/L	50.0	ug/L	108	65-130			
Styrene	45.1 ug/L	5	ug/L	50.0	ug/L	90.3	75-125			
tert-Butylbenzene	53.7 ug/L	5	ug/L	50.0	ug/L	107	65-130			
Tetrachloroethylene (PCE)	66.6 ug/L	5	ug/L	50.0	ug/L	133	65-140			
Toluene	45.4 ug/L	5	ug/L	50.0	ug/L	90.7	70-125			
trans-1,2-Dichloroethylene	48.8 ug/L	5	ug/L	50.0	ug/L	97.5	65-135			
trans-1,3-Dichloropropene	42.6 ug/L	5	ug/L	50.0	ug/L	85.2	65-125			
Trichloroethylene	47.8 ug/L	5	ug/L	50.0	ug/L	95.7	75-125			
Trichlorofluoromethane	45.5 ug/L	5	ug/L	50.0	ug/L	91.1	25-185			
Vinyl chloride	41.8 ug/L	5	ug/L	50.0	ug/L	83.6	60-130			
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Surr: 1,2-Dichloroethane-d4 (Surr)	52.5		ug/kg	50.0	ug/kg	105	70-120			
Surr: 4-Bromofluorobenzene (Surr)	50.7		ug/kg	50.0	ug/kg	101	75-120			
Surr: Dibromofluoromethane (Surr)	52.5		ug/kg	50.0	ug/kg	105	80-119			
Surr: Toluene-d8 (Surr)	50.0		ug/kg	50.0	ug/kg	100	85-120			

##### Matrix Spike (BAH0188-MS1)

Source: 17H0139-03

Prepared & Analyzed: 08/04/2017

1,1,1,2-Tetrachloroethane	53.0 ug/L	5	ug/L	50.0	<5 ug/L	106	75-125			
1,1,1-Trichloroethane	47.6 ug/L	5	ug/L	50.0	<5 ug/L	95.2	70-135			
1,1,2,2-Tetrachloroethane	45.7 ug/L	5	ug/L	50.0	<5 ug/L	91.3	55-130			
1,1,2-Trichloroethane	46.4 ug/L	5	ug/L	50.0	<5 ug/L	92.8	60-125			
1,1-Dichloroethane	48.8 ug/L	5	ug/L	50.0	<5 ug/L	97.6	75-125			
1,1-Dichloroethylene	46.7 ug/L	5	ug/L	50.0	<5 ug/L	93.3	65-135			
1,1-Dichloropropene	50.5 ug/L	5	ug/L	50.0	<5 ug/L	101	70-135			
1,2,3-Trichlorobenzene	51.2 ug/L	5	ug/L	50.0	<5 ug/L	102	60-135			
1,2,3-Trichloropropane	45.0 ug/L	5	ug/L	50.0	<5 ug/L	90.0	65-130			



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/11/2017 14:00
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0188 - SW5030B

#### Matrix Spike (BAH0188-MS1)

Source: 17H0139-03

Prepared & Analyzed: 08/04/2017

1,2,4-Trichlorobenzene	52.0 ug/L	5	ug/L	50.0	<5 ug/L	104	65-130			
1,2,4-Trimethylbenzene	53.6 ug/L	5	ug/L	50.0	<5 ug/L	107	65-135			
1,2-Dibromo-3-chloropropane (DBCP)	40.8 ug/L	5	ug/L	50.0	<5 ug/L	81.6	40-135			
1,2-Dibromoethane (EDB)	45.9 ug/L	5	ug/L	50.0	<5 ug/L	91.8	70-125			
1,2-Dichlorobenzene	50.4 ug/L	5	ug/L	50.0	<5 ug/L	101	75-120			
1,2-Dichloroethane	45.6 ug/L	5	ug/L	50.0	<5 ug/L	91.1	70-135			
1,2-Dichloropropane	48.8 ug/L	5	ug/L	50.0	<5 ug/L	97.7	70-120			
1,3,5-Trimethylbenzene	56.5 ug/L	5	ug/L	50.0	<5 ug/L	113	65-135			
1,3-Dichlorobenzene	52.5 ug/L	5	ug/L	50.0	<5 ug/L	105	70-125			
1,3-Dichloropropane	44.8 ug/L	5	ug/L	50.0	<5 ug/L	89.5	75-125			
1,4-Dichlorobenzene	50.2 ug/L	5	ug/L	50.0	<5 ug/L	100	70-125			
2,2-Dichloropropane	48.2 ug/L	5	ug/L	50.0	<5 ug/L	96.5	65-135			
2-Butanone (MEK)	36.8 ug/L	5	ug/L	50.0	<5 ug/L	73.7	30-160			
2-Chlorotoluene	54.5 ug/L	5	ug/L	50.0	<5 ug/L	109	70-130			
2-Hexanone (MBK)	42.6 ug/L	5	ug/L	50.0	<5 ug/L	85.3	55-130			
4-Chlorotoluene	53.3 ug/L	5	ug/L	50.0	<5 ug/L	107	75-125			
4-Isopropyltoluene	55.2 ug/L	5	ug/L	50.0	<5 ug/L	110	75-135			
4-Methyl-2-pentanone (MIBK)	39.7 ug/L	5	ug/L	50.0	<5 ug/L	79.4	60-135			
Acetone	41.9 ug/L	10	ug/L	50.0	<10 ug/L	82.4	20-160			
Benzene	48.3 ug/L	5	ug/L	50.0	<5 ug/L	96.6	75-125			
Bromobenzene	47.9 ug/L	5	ug/L	50.0	<5 ug/L	95.9	65-120			
Bromochloromethane	45.7 ug/L	5	ug/L	50.0	<5 ug/L	91.4	70-125			
Bromodichloromethane	46.9 ug/L	5	ug/L	50.0	<5 ug/L	93.9	70-130			
Bromoform	43.8 ug/L	5	ug/L	50.0	<5 ug/L	87.6	55-135			
Bromomethane	42.3 ug/L	5	ug/L	50.0	<5 ug/L	84.6	30-160			
Carbon disulfide	44.6 ug/L	5	ug/L	50.0	<5 ug/L	89.1	45-160			
Carbon tetrachloride	46.1 ug/L	5	ug/L	50.0	<5 ug/L	92.3	65-135			
Chlorobenzene	48.5 ug/L	5	ug/L	50.0	<5 ug/L	96.9	75-125			
Chloroethane	46.6 ug/L	5	ug/L	50.0	<5 ug/L	93.3	40-155			
Chloroform	43.7 ug/L	5	ug/L	50.0	<5 ug/L	87.3	70-125			
Chloromethane	46.2 ug/L	5	ug/L	50.0	<5 ug/L	92.5	50-130			



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## Certificate of Analysis

### Final Report

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Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0188 - SW5030B

#### Matrix Spike (BAH0188-MS1)

Source: 17H0139-03

Prepared & Analyzed: 08/04/2017

cis-1,2-Dichloroethylene	45.7 ug/L	5	ug/L	50.0	<5 ug/L	91.5	65-125			
cis-1,3-Dichloropropene	40.9 ug/L	5	ug/L	50.0	<5 ug/L	81.8	70-125			
Dibromochloromethane	39.2 ug/L	5	ug/L	50.0	<5 ug/L	78.5	65-130			
Dibromomethane	43.2 ug/L	5	ug/L	50.0	<5 ug/L	86.3	75-130			
Dichlorodifluoromethane	44.4 ug/L	5	ug/L	50.0	<5 ug/L	88.8	35-135			
Ethylbenzene	50.6 ug/L	5	ug/L	50.0	<5 ug/L	101	75-125			
Hexachlorobutadiene	52.6 ug/L	5	ug/L	50.0	<5 ug/L	105	55-140			
Isopropylbenzene	54.0 ug/L	5	ug/L	50.0	<5 ug/L	108	75-130			
m+p-Xylenes	102 ug/L	5	ug/L	100	<5 ug/L	102	80-125			
Methylene chloride	44.5 ug/L	5	ug/L	50.0	<5 ug/L	89.1	55-140			
Methyl-t-butyl ether (MTBE)	46.8 ug/L	5	ug/L	50.0	<5 ug/L	93.7	65-125			
Naphthalene	52.2 ug/L	5	ug/L	50.0	<5 ug/L	104	40-125			
n-Butylbenzene	57.9 ug/L	5	ug/L	50.0	<5 ug/L	116	65-140			
n-Propylbenzene	55.3 ug/L	5	ug/L	50.0	<5 ug/L	111	65-135			
o-Xylene	51.2 ug/L	5	ug/L	50.0	<5 ug/L	102	75-125			
sec-Butylbenzene	55.9 ug/L	5	ug/L	50.0	<5 ug/L	112	65-130			
Styrene	45.4 ug/L	5	ug/L	50.0	<5 ug/L	90.8	75-125			
tert-Butylbenzene	57.6 ug/L	5	ug/L	50.0	<5 ug/L	115	65-130			
Tetrachloroethylene (PCE)	66.8 ug/L	5	ug/L	50.0	<5 ug/L	134	65-140			
Toluene	44.5 ug/L	5	ug/L	50.0	<5 ug/L	88.6	70-125			
trans-1,2-Dichloroethylene	45.8 ug/L	5	ug/L	50.0	<5 ug/L	91.6	65-135			
trans-1,3-Dichloropropene	41.4 ug/L	5	ug/L	50.0	<5 ug/L	82.8	65-125			
Trichloroethylene	48.2 ug/L	5	ug/L	50.0	<5 ug/L	96.5	75-125			
Trichlorofluoromethane	42.1 ug/L	5	ug/L	50.0	<5 ug/L	84.3	25-185			
Vinyl chloride	17.5 ug/L	5	ug/L	50.0	<5 ug/L	35.1	60-130			M
<hr style="border-top: 1px dashed black;"/>										
Surr: 1,2-Dichloroethane-d4 (Surr)	2300		ug/kg	2500	ug/kg	91.8	70-120			
Surr: 4-Bromofluorobenzene (Surr)	2560		ug/kg	2500	ug/kg	102	75-120			
Surr: Dibromofluoromethane (Surr)	2400		ug/kg	2500	ug/kg	96.0	80-119			
Surr: Toluene-d8 (Surr)	2500		ug/kg	2500	ug/kg	100	85-120			



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/11/2017 14:00
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0188 - SW5030B

#### Matrix Spike Dup (BAH0188-MSD1)

Source: 17H0139-03

Prepared & Analyzed: 08/04/2017

1,1,1,2-Tetrachloroethane	58.5 ug/L	5	ug/L	50.0	<5 ug/L	117	75-125		30	
1,1,1-Trichloroethane	52.7 ug/L	5	ug/L	50.0	<5 ug/L	105	70-135		30	
1,1,1,2,2-Tetrachloroethane	50.7 ug/L	5	ug/L	50.0	<5 ug/L	101	55-130		30	
1,1,2-Trichloroethane	51.6 ug/L	5	ug/L	50.0	<5 ug/L	103	60-125		30	
1,1-Dichloroethane	55.4 ug/L	5	ug/L	50.0	<5 ug/L	111	75-125		30	
1,1-Dichloroethylene	51.7 ug/L	5	ug/L	50.0	<5 ug/L	103	65-135		30	
1,1-Dichloropropene	55.4 ug/L	5	ug/L	50.0	<5 ug/L	111	70-135		30	
1,2,3-Trichlorobenzene	56.5 ug/L	5	ug/L	50.0	<5 ug/L	113	60-135		30	
1,2,3-Trichloropropane	49.6 ug/L	5	ug/L	50.0	<5 ug/L	99.3	65-130		30	
1,2,4-Trichlorobenzene	56.8 ug/L	5	ug/L	50.0	<5 ug/L	114	65-130		30	
1,2,4-Trimethylbenzene	59.0 ug/L	5	ug/L	50.0	<5 ug/L	118	65-135		30	
1,2-Dibromo-3-chloropropane (DBCP)	47.3 ug/L	5	ug/L	50.0	<5 ug/L	94.5	40-135		30	
1,2-Dibromoethane (EDB)	50.8 ug/L	5	ug/L	50.0	<5 ug/L	102	70-125		30	
1,2-Dichlorobenzene	55.3 ug/L	5	ug/L	50.0	<5 ug/L	111	75-120		30	
1,2-Dichloroethane	50.0 ug/L	5	ug/L	50.0	<5 ug/L	100	70-135		30	
1,2-Dichloropropane	53.7 ug/L	5	ug/L	50.0	<5 ug/L	107	70-120		30	
1,3,5-Trimethylbenzene	62.1 ug/L	5	ug/L	50.0	<5 ug/L	124	65-135		30	
1,3-Dichlorobenzene	57.1 ug/L	5	ug/L	50.0	<5 ug/L	114	70-125		30	
1,3-Dichloropropane	49.9 ug/L	5	ug/L	50.0	<5 ug/L	99.8	75-125		30	
1,4-Dichlorobenzene	55.1 ug/L	5	ug/L	50.0	<5 ug/L	110	70-125		30	
2,2-Dichloropropane	52.9 ug/L	5	ug/L	50.0	<5 ug/L	106	65-135		30	
2-Butanone (MEK)	45.3 ug/L	5	ug/L	50.0	<5 ug/L	90.5	30-160		30	
2-Chlorotoluene	60.4 ug/L	5	ug/L	50.0	<5 ug/L	121	70-130		30	
2-Hexanone (MBK)	49.8 ug/L	5	ug/L	50.0	<5 ug/L	99.6	55-130		30	
4-Chlorotoluene	58.1 ug/L	5	ug/L	50.0	<5 ug/L	116	75-125		30	
4-Isopropyltoluene	60.0 ug/L	5	ug/L	50.0	<5 ug/L	120	75-135		30	
4-Methyl-2-pentanone (MIBK)	48.4 ug/L	5	ug/L	50.0	<5 ug/L	96.9	60-135		30	
Acetone	51.6 ug/L	10	ug/L	50.0	<10 ug/L	102	20-160		30	
Benzene	53.8 ug/L	5	ug/L	50.0	<5 ug/L	108	75-125		30	
Bromobenzene	52.2 ug/L	5	ug/L	50.0	<5 ug/L	104	65-120		30	
Bromochloromethane	48.9 ug/L	5	ug/L	50.0	<5 ug/L	97.8	70-125		30	



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith

Project Number: VFR048

Client Site I.D.: VFR048

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
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#### Batch BAH0188 - SW5030B

#### Matrix Spike Dup (BAH0188-MSD1)

Source: 17H0139-03

Prepared & Analyzed: 08/04/2017

Bromodichloromethane	52.1 ug/L	5	ug/L	50.0	<5 ug/L	104	70-130		30	
Bromoform	48.3 ug/L	5	ug/L	50.0	<5 ug/L	96.7	55-135		30	
Bromomethane	45.4 ug/L	5	ug/L	50.0	<5 ug/L	90.8	30-160		30	
Carbon disulfide	49.5 ug/L	5	ug/L	50.0	<5 ug/L	99.0	45-160		30	
Carbon tetrachloride	52.4 ug/L	5	ug/L	50.0	<5 ug/L	105	65-135		30	
Chlorobenzene	53.3 ug/L	5	ug/L	50.0	<5 ug/L	107	75-125		30	
Chloroethane	50.2 ug/L	5	ug/L	50.0	<5 ug/L	100	40-155		30	
Chloroform	48.3 ug/L	5	ug/L	50.0	<5 ug/L	96.6	70-125		30	
Chloromethane	50.3 ug/L	5	ug/L	50.0	<5 ug/L	101	50-130		30	
cis-1,2-Dichloroethylene	51.0 ug/L	5	ug/L	50.0	<5 ug/L	102	65-125		30	
cis-1,3-Dichloropropene	46.0 ug/L	5	ug/L	50.0	<5 ug/L	91.9	70-125		30	
Dibromochloromethane	43.5 ug/L	5	ug/L	50.0	<5 ug/L	87.1	65-130		30	
Dibromomethane	49.0 ug/L	5	ug/L	50.0	<5 ug/L	98.1	75-130		30	
Dichlorodifluoromethane	48.1 ug/L	5	ug/L	50.0	<5 ug/L	96.2	35-135		30	
Ethylbenzene	55.6 ug/L	5	ug/L	50.0	<5 ug/L	111	75-125		30	
Hexachlorobutadiene	58.2 ug/L	5	ug/L	50.0	<5 ug/L	116	55-140		30	
Isopropylbenzene	59.2 ug/L	5	ug/L	50.0	<5 ug/L	118	75-130		30	
m+p-Xylenes	112 ug/L	5	ug/L	100	<5 ug/L	112	80-125		30	
Methylene chloride	48.3 ug/L	5	ug/L	50.0	<5 ug/L	96.6	55-140		30	
Methyl-t-butyl ether (MTBE)	51.3 ug/L	5	ug/L	50.0	<5 ug/L	103	65-125		30	
Naphthalene	57.8 ug/L	5	ug/L	50.0	<5 ug/L	115	40-125		30	
n-Butylbenzene	62.6 ug/L	5	ug/L	50.0	<5 ug/L	125	65-140		30	
n-Propylbenzene	60.6 ug/L	5	ug/L	50.0	<5 ug/L	121	65-135		30	
o-Xylene	55.6 ug/L	5	ug/L	50.0	<5 ug/L	111	75-125		30	
sec-Butylbenzene	61.7 ug/L	5	ug/L	50.0	<5 ug/L	123	65-130		30	
Styrene	49.4 ug/L	5	ug/L	50.0	<5 ug/L	98.8	75-125		30	
tert-Butylbenzene	63.2 ug/L	5	ug/L	50.0	<5 ug/L	126	65-130		30	
Tetrachloroethylene (PCE)	75.1 ug/L	5	ug/L	50.0	<5 ug/L	150	65-140		30	M
Toluene	50.2 ug/L	5	ug/L	50.0	<5 ug/L	99.9	70-125		30	
trans-1,2-Dichloroethylene	51.0 ug/L	5	ug/L	50.0	<5 ug/L	102	65-135		30	
trans-1,3-Dichloropropene	46.1 ug/L	5	ug/L	50.0	<5 ug/L	92.2	65-125		30	



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/11/2017 14:00
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0188 - SW5030B

#### Matrix Spike Dup (BAH0188-MSD1)

Source: 17H0139-03

Prepared & Analyzed: 08/04/2017

Trichloroethylene	53.3 ug/L	5	ug/L	50.0	<5 ug/L	107	75-125	30		
Trichlorofluoromethane	46.4 ug/L	5	ug/L	50.0	<5 ug/L	92.8	25-185	30		
Vinyl chloride	18.9 ug/L	5	ug/L	50.0	<5 ug/L	37.7	60-130	30	M	
<hr style="border-top: 1px dashed black;"/>										
Surr: 1,2-Dichloroethane-d4 (Surr)	2390		ug/kg	2500	ug/kg	95.8	70-120			
Surr: 4-Bromofluorobenzene (Surr)	2540		ug/kg	2500	ug/kg	101	75-120			
Surr: Dibromofluoromethane (Surr)	2390		ug/kg	2500	ug/kg	95.7	80-119			
Surr: Toluene-d8 (Surr)	2520		ug/kg	2500	ug/kg	101	85-120			



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## Certificate of Analysis

### Final Report

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Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	Purchase Order:	

### Semivolatile Hydrocarbons by GC - Quality Control

#### Air Water and Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
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#### Batch BAH0241 - SW8100

##### Blank (BAH0241-BLK1)

Prepared: 08/08/2017 Analyzed: 08/09/2017

TPH-Semi-Volatiles (DRO)	<10.0 mg/kg	10.0	mg/kg							
<i>Surr: Pentacosane (Surr)</i>	3.72		mg/kg	4.92		75.6	40-160			

##### LCS (BAH0241-BS1)

Prepared: 08/08/2017 Analyzed: 08/09/2017

TPH-Semi-Volatiles (DRO)	69.5 mg/kg	10.0	mg/kg	98.0	mg/kg	70.9	40-160			
<i>Surr: Pentacosane (Surr)</i>	3.36		mg/kg	4.90	mg/kg	68.5	40-160			

##### Matrix Spike (BAH0241-MS1)

Source: 17H0166-05

Prepared: 08/08/2017 Analyzed: 08/09/2017

TPH-Semi-Volatiles (DRO)	75.0 mg/kg	10.0	mg/kg	99.0	<10.0 mg/kg	75.8	40-160			
<i>Surr: Pentacosane (Surr)</i>	3.59		mg/kg	4.95	mg/kg	72.5	40-160			

##### Matrix Spike Dup (BAH0241-MSD1)

Source: 17H0166-05

Prepared: 08/08/2017 Analyzed: 08/09/2017

TPH-Semi-Volatiles (DRO)	75.7 mg/kg	10.0	mg/kg	98.0	<10.0 mg/kg	77.2	40-160	0.864	20	
<i>Surr: Pentacosane (Surr)</i>	3.63		mg/kg	4.90	mg/kg	74.0	40-160			



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## Certificate of Analysis

### Final Report

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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

### Certified Analyses included in this Report

Analyte	Certifications
<b>SW8015C in Solids</b>	
TPH-Semi-Volatiles (DRO)	VELAP,NC,WVDEP
TPH-Volatiles (GRO)	VELAP,NC,WVDEP
<b>SW8260B in Solids</b>	
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,VELAP,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



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## Certificate of Analysis

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### Certified Analyses included in this Report

Analyte	Certifications
Bromomethane	NC,VELAP,WVDEP
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
Iodomethane	NC,VELAP,WVDEP
Isopropylbenzene	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
Dibromofluoromethane (Surr)	VELAP



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005  
Date Issued: 8/11/2017 14:00

Submitted To: Richard Page Meredith  
Project Number: VFR048  
Client Site I.D.: VFR048  
Purchase Order:

Code	Description	Lab Number	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2017
NC	North Carolina DENR	495	12/31/2017
PADEP	NELAC-Pennsylvania	001	10/31/2017
VELAP	NELAC-Virginia Certificate #9316	460021	06/14/2018
WVDEP	West Virginia DEP	350	11/30/2017



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/11/2017 14:00
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	Purchase Order:	

### Summary of Data Qualifiers

M Matrix spike recovery is outside established acceptance limits

P Duplicate analysis does not meet the acceptance criteria for precision

S Surrogate recovery was outside acceptance criteria

RPD Relative Percent Difference

Qual Qualifiers

-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 OF CUSTODY



10988 Richardson Road, Ashland, VA 23005 / TEL: (804) 798-6525 • FAX: (804) 798-5907

## Sample Collection Information

Client: VDOT	Project: VFR048	Project No. VFR048
Sampler: Dane Anderson / RP Meredith		
Date of Collection: 8/1-3/17	Date of Ship.: 8/4/17	Ship. Method:

### Turnaround Requirements

Regular  
 Rush

Analysis Requested

### Sample Log and Analysis Request

Sample Number	Sample ID	Date	Time	Matrix	Grab/Comp.	Number of Containers / Type	TPH-DRO	TPH-GRO	VOCs (8260)	Remarks
1	5409-01 0-4	8/1/17	0900	S	G	1-4 02	X	X		
2	5409-02 0-4	8/1/17	1000			1-4, 1-2	X	X	X	
3	5409-03 0-4	8/1/17	1100			1-4 02				
4	5409-04 0-4	8/1/17	1200							
5	5409-05 4-8	8/2/17	0900							
6	5124-01 0-4	8/1/17	1300							
7	5124-02 0-4	8/1/17	1400							
8	5124-03 0-4	8/2/17	0900							
9	5116-01 0-4	8/2/17	1300							
10	5116-02 0-4	8/2/17	1400							
11	5117-01 0-4	8/2/17	1500							
12	5117-02 0-4	8/3/17	1530							
13	5123-01 0-4	8/2/17	1515							
14	5123-02 0-4	8/3/17	0900							
15	5123-03 0-4	8/3/17	1050							
16	5116-07 0-4	8/2/17	1430							

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Condition:
			8/4/17 1030	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Condition:
	8/4/17 1140		08/04/17 1140	6.5°C No Seal On Ice

Comments:

Requested By: MMA 17H0192  
 VFR048  
 Recd: 08/04/2017 Due: 08/11/2017



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/11/2017 14:00
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	Purchase Order:	

## Sample Conditions Checklist

Samples Received at:	6.50°C
How were samples received?	AWS Courier
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?	No
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?	No
Are all volatile organic and TOX containers free of headspace?	NA
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.	NA
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes

Dane Anderson notified of sample temp via email. BAR 08/04/17 1515



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## Certificate of Analysis

*Final Report*

Laboratory Order ID 17H0515

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland, VA 23005	Date Received:	August 15, 2017 11:21
		Date Issued:	August 22, 2017 12:13
		Project Number:	VFR048
Submitted To:	Joshua Shrader	Purchase Order:	
Client Site I.D.:	Thornburg		

Enclosed are the results of analyses for samples received by the laboratory on 08/15/2017 11:21. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

A handwritten signature in black ink that reads "Ted Soyars".

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.

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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/22/2017 12:13

Submitted To: Joshua Shrader

Project Number: VFR048

Client Site I.D.: Thornburg

Purchase Order:

#### ANALYTICAL REPORT FOR SAMPLES

Laboratory Order ID 17H0515

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
5409-04 4-8	17H0515-01	Soil	08/02/2017 14:00	08/15/2017 11:21
5116-03 4-8	17H0515-02	Soil	08/02/2017 15:00	08/15/2017 11:21



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/22/2017 12:13

Submitted To: Joshua Shrader  
Client Site I.D.: Thornburg

Project Number: VFR048  
Purchase Order:

**Laboratory Order ID: 17H0515**

**Analytical Results**

Sample I.D. 5409-04 4-8

Laboratory Sample ID: 17H0515-01

Grab Date/Time: 08/02/2017 14:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	01	SW8015C	<0.10 mg/kg	0.10	1		08/16/17 02:28	08/16/17 02:28	CL
Surr: 2,5-Dibromotoluene (FID)	01	SW8015C	82.0 %	80-120			08/16/17 02:28	08/16/17 02:28	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	01	SW8015C	37.9 mg/kg	10.0	1		08/16/17 15:30	08/17/17 22:58	CVH
Surr: Pentacosane (Surr)	01	SW8015C	77.7 %	40-160			08/16/17 15:30	08/17/17 22:58	CVH



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/22/2017 12:13
Submitted To: Joshua Shrader	Project Number: VFR048
Client Site I.D.: Thornburg	Purchase Order:

**Laboratory Order ID: 17H0515**

**Analytical Results**

Sample I.D. 5116-03 4-8 Laboratory Sample ID: 17H0515-02

Grab Date/Time: 08/02/2017 15:00

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	02	SW8015C	0.31 mg/kg		0.10	1	08/16/17 02:51	08/16/17 02:51	CL
Surr: 2,5-Dibromotoluene (FID)	02	SW8015C	117 %		80-120		08/16/17 02:51	08/16/17 02:51	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	02	SW8015C	<10.0 mg/kg		10.0	1	08/16/17 15:30	08/17/17 23:23	CVH
Surr: Pentacosane (Surr)	02	SW8015C	84.3 %		40-160		08/16/17 15:30	08/17/17 23:23	CVH

### Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
<b>Volatile Hydrocarbons by GC</b>					
		<b>Preparation Method: SW5030B</b>			
17H0515-01	5.05 g / 5.00 mL	SW8015C	BAH0463	SAH0458	AF70032
17H0515-02	5.12 g / 5.00 mL	SW8015C	BAH0463	SAH0458	AF70032
<b>Semivolatile Hydrocarbons by GC</b>					
		<b>Preparation Method: SW8100</b>			
17H0515-01	52.9 g / 1.00 mL	SW8015C	BAH0502	SAH0542	AH70099
17H0515-02	52.0 g / 1.00 mL	SW8015C	BAH0502	SAH0542	AH70099



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/22/2017 12:13

Submitted To: Joshua Shrader  
Client Site I.D.: Thornburg

Project Number: VFR048  
Purchase Order:

### Volatile Hydrocarbons by GC - Quality Control

#### Air Water and Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Qual
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**Batch BAH0463 - SW5030B**

**Blank (BAH0463-BLK1)**

Prepared & Analyzed: 08/16/2017

TPH-Volatiles (GRO)	<0.10 mg/kg	0.10	mg/kg						
Surr: 2,5-Dibromotoluene (FID)	118		ug/L	100		118	80-120		

**LCS (BAH0463-BS1)**

Prepared & Analyzed: 08/16/2017

TPH-Volatiles (GRO)	0.85 mg/kg	0.10	mg/kg	0.990	mg/kg	85.7	70-130		
Surr: 2,5-Dibromotoluene (FID)	118		ug/L	100	ug/L	118	80-120		

**Matrix Spike (BAH0463-MS1)**

**Source: 17H0515-02**

Prepared & Analyzed: 08/16/2017

TPH-Volatiles (GRO)	0.59 mg/kg	0.10	mg/kg	0.977	0.31 mg/kg	28.3	70-130		M
Surr: 2,5-Dibromotoluene (FID)	115		ug/L	100	ug/L	115	80-120		

**Matrix Spike Dup (BAH0463-MSD1)**

**Source: 17H0515-02**

Prepared & Analyzed: 08/16/2017

TPH-Volatiles (GRO)	0.72 mg/kg	0.10	mg/kg	0.945	0.31 mg/kg	43.5	70-130	20.6	20	M, P
Surr: 2,5-Dibromotoluene (FID)	105		ug/L	100	ug/L	105	80-120			



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/22/2017 12:13
Submitted To:	Joshua Shrader	Project Number:	VFR048
Client Site I.D.:	Thornburg	Purchase Order:	

### Semivolatile Hydrocarbons by GC - Quality Control

#### Air Water and Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
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#### Batch BAH0502 - SW8100

##### Blank (BAH0502-BLK1)

Prepared: 08/16/2017 Analyzed: 08/17/2017

TPH-Semi-Volatiles (DRO)	<10.0 mg/kg	10.0	mg/kg							
Surr: Pentacosane (Surr)	2.98		mg/kg	4.85		61.5	40-160			

##### LCS (BAH0502-BS1)

Prepared: 08/16/2017 Analyzed: 08/17/2017

TPH-Semi-Volatiles (DRO)	49.4 mg/kg	10.0	mg/kg	91.9	mg/kg	53.8	40-160			
Surr: Pentacosane (Surr)	2.74		mg/kg	4.60	mg/kg	59.6	40-160			

##### Duplicate (BAH0502-DUP1)

Source: 17H0451-06

Prepared: 08/16/2017 Analyzed: 08/17/2017

TPH-Semi-Volatiles (DRO)	<10.0 mg/kg	10.0	mg/kg					NA	20	
Surr: Pentacosane (Surr)	6.58		mg/kg	4.89	mg/kg	135	40-160			

##### Matrix Spike (BAH0502-MS1)

Source: 17H0451-06

Prepared: 08/16/2017 Analyzed: 08/17/2017

TPH-Semi-Volatiles (DRO)	47.8 mg/kg	10.0	mg/kg	98.0	<10.0 mg/kg	48.7	40-160			
Surr: Pentacosane (Surr)	2.56		mg/kg	4.90	mg/kg	52.2	40-160			



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/22/2017 12:13
Submitted To:	Joshua Shrader	Project Number:	VFR048
Client Site I.D.:	Thornburg	Purchase Order:	

### Certified Analyses included in this Report

Analyte	Certifications
<b>SW8015C in Solids</b>	
TPH-Semi-Volatiles (DRO)	VELAP,NC,WVDEP
TPH-Volatiles (GRO)	VELAP,NC,WVDEP

Code	Description	Lab Number	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2017
NC	North Carolina DENR	495	12/31/2017
PADEP	NELAC-Pennsylvania	001	10/31/2017
VELAP	NELAC-Virginia Certificate #9316	460021	06/14/2018
WVDEP	West Virginia DEP	350	11/30/2017



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/22/2017 12:13
Submitted To:	Joshua Shrader	Project Number:	VFR048
Client Site I.D.:	Thornburg	Purchase Order:	

### Summary of Data Qualifiers

M Matrix spike recovery is outside established acceptance limits

P Duplicate analysis does not meet the acceptance criteria for precision

RPD Relative Percent Difference

Qual Qualifiers

-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.





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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/22/2017 12:13
Submitted To:	Joshua Shrader	Project Number:	VFR048
Client Site I.D.:	Thornburg	Purchase Order:	

## Sample Conditions Checklist

Samples Received at:	0.20°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?	No
Are all volatile organic and TOX containers free of headspace?	NA
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.	NA
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes



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## Certificate of Analysis

*Final Report*

Laboratory Order ID 17H0196

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland, VA 23005

Date Received: August 4, 2017 11:40

Date Issued: August 9, 2017 15:18

Project Number: VFR048

Submitted To: Richard Page Meredith

Purchase Order:

Client Site I.D.: VFR048

Enclosed are the results of analyses for samples received by the laboratory on 08/04/2017 11:40. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

A handwritten signature in black ink that reads "Ted Soyars".

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.

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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/9/2017 15:18

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

### ANALYTICAL REPORT FOR SAMPLES

Laboratory Order ID 17H0196

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
5409-01	17H0196-01	Ground Water	08/01/2017 10:00	08/04/2017 11:40
5409-02	17H0196-02	Ground Water	08/02/2017 08:30	08/04/2017 11:40
5409-04	17H0196-03	Ground Water	08/02/2017 09:00	08/04/2017 11:40
5409-05	17H0196-04	Ground Water	08/03/2017 09:45	08/04/2017 11:40
5124-01	17H0196-05	Ground Water	08/02/2017 10:00	08/04/2017 11:40
5116-03	17H0196-06	Ground Water	08/02/2017 12:00	08/04/2017 11:40
5117-01	17H0196-07	Ground Water	08/03/2017 09:00	08/04/2017 11:40
5123-01	17H0196-08	Ground Water	08/03/2017 09:50	08/04/2017 11:40



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/9/2017 15:18
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0196**

**Analytical Results**

**Sample I.D.** 5409-01 **Laboratory Sample ID:** 17H0196-01

**Grab Date/Time:** 08/01/2017 10:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	01	SW8015C	<0.10 mg/L	0.10	1		08/07/17 17:17	08/07/17 17:17	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	<i>01</i>	<i>SW8015C</i>	<i>94.2 %</i>	<i>80-120</i>			<i>08/07/17 17:17</i>	<i>08/07/17 17:17</i>	<i>CL</i>
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	01	SW8015C	<0.515 mg/L	0.515	1		08/08/17 13:28	08/08/17 19:07	CVH
<i>Surr: Pentacosane (Surr)</i>	<i>01</i>	<i>SW8015C</i>	<i>64.6 %</i>	<i>40-160</i>			<i>08/08/17 13:28</i>	<i>08/08/17 19:07</i>	<i>CVH</i>



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/9/2017 15:18

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

**Laboratory Order ID: 17H0196**

**Analytical Results**

Sample I.D. 5409-02

Laboratory Sample ID: 17H0196-02

Grab Date/Time: 08/02/2017 08:30

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	02	SW8015C	<0.10 mg/L		0.10	1	08/07/17 17:40	08/07/17 17:40	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	02	SW8015C	107 %		80-120		08/07/17 17:40	08/07/17 17:40	CL
<b>Volatile Organic Compounds by GCMS</b>									
1,1,1,2-Tetrachloroethane	02	SW8260B	<0.40 ug/L		0.40	1	08/07/17 12:48	08/07/17 12:48	KCS
1,1,1-Trichloroethane	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,1,2,2-Tetrachloroethane	02	SW8260B	<0.40 ug/L		0.40	1	08/07/17 12:48	08/07/17 12:48	KCS
1,1,2-Trichloroethane	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,1-Dichloroethane	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,1-Dichloroethylene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,1-Dichloropropene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2,3-Trichlorobenzene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2,3-Trichloropropane	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2,4-Trichlorobenzene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2,4-Trimethylbenzene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2-Dibromo-3-chloropropane (DBCP)	02	SW8260B	<4.00 ug/L		4.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2-Dibromoethane (EDB)	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2-Dichlorobenzene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2-Dichloroethane	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,2-Dichloropropane	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,3,5-Trimethylbenzene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,3-Dichlorobenzene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,3-Dichloropropane	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
1,4-Dichlorobenzene	02	SW8260B	<1.00 ug/L		1.00	1	08/07/17 12:48	08/07/17 12:48	KCS
2,2-Dichloropropane	02	SW8260B	<2.00 ug/L		2.00	1	08/07/17 12:48	08/07/17 12:48	KCS



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/9/2017 15:18

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

Laboratory Order ID: 17H0196

#### Analytical Results

Sample I.D. 5409-02

Laboratory Sample ID: 17H0196-02

Grab Date/Time: 08/02/2017 08:30

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Organic Compounds by GCMS</b>									
2-Butanone (MEK)	02	SW8260B	<10.0 ug/L	10.0	1	1	08/07/17 12:48	08/07/17 12:48	KCS
2-Chlorotoluene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
2-Hexanone (MBK)	02	SW8260B	<5.00 ug/L	5.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
4-Chlorotoluene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
4-Isopropyltoluene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
4-Methyl-2-pentanone (MIBK)	02	SW8260B	<5.00 ug/L	5.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Acetone	02	SW8260B	<10.0 ug/L	10.0	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Benzene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Bromobenzene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Bromochloromethane	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Bromodichloromethane	02	SW8260B	<0.50 ug/L	0.50	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Bromoform	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Bromomethane	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Carbon disulfide	02	SW8260B	<10.0 ug/L	10.0	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Carbon tetrachloride	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Chlorobenzene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Chloroethane	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Chloroform	02	SW8260B	<0.50 ug/L	0.50	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Chloromethane	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
cis-1,2-Dichloroethylene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
cis-1,3-Dichloropropene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Dibromochloromethane	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Dibromomethane	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Dichlorodifluoromethane	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Di-isopropyl ether (DIPE)	02	SW8260B	<5.00 ug/L	5.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS
Ethylbenzene	02	SW8260B	<1.00 ug/L	1.00	1	1	08/07/17 12:48	08/07/17 12:48	KCS



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## Certificate of Analysis

### Final Report

Client Name: Cardno MM&A-Ashland  
10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/9/2017 15:18

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

Laboratory Order ID: 17H0196

#### Analytical Results

Sample I.D. 5409-02

Laboratory Sample ID: 17H0196-02

Grab Date/Time: 08/02/2017 08:30

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Organic Compounds by GCMS</b>									
Hexachlorobutadiene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Iodomethane	02	SW8260B	<10.0 ug/L	10.0	1	08/07/17 12:48	08/07/17 12:48	KCS	
Isopropylbenzene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
m+p-Xylenes	02	SW8260B	<2.00 ug/L	2.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Methylene chloride	02	SW8260B	<4.00 ug/L	4.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Methyl-t-butyl ether (MTBE)	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
<b>Naphthalene</b>	02	SW8260B	<b>16.3 ug/L</b>	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
<b>n-Butylbenzene</b>	02	SW8260B	<b>1.34 ug/L</b>	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
<b>n-Propylbenzene</b>	02	SW8260B	<b>1.58 ug/L</b>	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
o-Xylene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
<b>sec-Butylbenzene</b>	02	SW8260B	<b>3.60 ug/L</b>	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Styrene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
tert-Butylbenzene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Tetrachloroethylene (PCE)	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Toluene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
trans-1,2-Dichloroethylene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
trans-1,3-Dichloropropene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Trichloroethylene	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Trichlorofluoromethane	02	SW8260B	<1.00 ug/L	1.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Vinyl acetate	02	SW8260B	<10.0 ug/L	10.0	1	08/07/17 12:48	08/07/17 12:48	KCS	
Vinyl chloride	02	SW8260B	<0.50 ug/L	0.50	1	08/07/17 12:48	08/07/17 12:48	KCS	
Xylenes, Total	02	SW8260B	<3.00 ug/L	3.00	1	08/07/17 12:48	08/07/17 12:48	KCS	
Surr: 1,2-Dichloroethane-d4 (Surr)	02	SW8260B	114 %	70-120		08/07/17 12:48	08/07/17 12:48	KCS	
Surr: 4-Bromofluorobenzene (Surr)	02	SW8260B	104 %	75-120		08/07/17 12:48	08/07/17 12:48	KCS	



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### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/9/2017 15:18
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0196**

**Analytical Results**

<b>Sample I.D.</b> 5409-02	<b>Laboratory Sample ID:</b> 17H0196-02
<b>Grab Date/Time:</b> 08/02/2017 08:30	

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Organic Compounds by GCMS</b>									
<i>Surr: Dibromofluoromethane (Surr)</i>	02	SW8260B	104 %		80-119		08/07/17 12:48	08/07/17 12:48	KCS
<i>Surr: Toluene-d8 (Surr)</i>	02	SW8260B	102 %		85-120		08/07/17 12:48	08/07/17 12:48	KCS
<b>Semivolatile Hydrocarbons by GC</b>									
<b>TPH-Semi-Volatiles (DRO)</b>	02	SW8015C	<b>0.577 mg/L</b>		0.521	1	08/08/17 13:28	08/08/17 19:33	CVH
<i>Surr: Pentacosane (Surr)</i>	02	SW8015C	91.5 %		40-160		08/08/17 13:28	08/08/17 19:33	CVH



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### Final Report

Client Name: Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued: 8/9/2017 15:18
Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0196**

**Analytical Results**

<b>Sample I.D.</b> 5409-04	<b>Laboratory Sample ID:</b> 17H0196-03
<b>Grab Date/Time:</b> 08/02/2017 09:00	

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	03	SW8015C	<0.10 mg/L	0.10	1		08/07/17 18:03	08/07/17 18:03	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	03	SW8015C	99.7 %	80-120			08/07/17 18:03	08/07/17 18:03	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	03	SW8015C	<0.526 mg/L	0.526	1		08/08/17 13:28	08/08/17 19:58	CVH
<i>Surr: Pentacosane (Surr)</i>	03	SW8015C	67.7 %	40-160			08/08/17 13:28	08/08/17 19:58	CVH



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### Final Report

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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0196**

**Analytical Results**

Sample I.D. 5409-05	Laboratory Sample ID: 17H0196-04
Grab Date/Time: 08/03/2017 09:45	

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	04	SW8015C	0.12 mg/L		0.10	1	08/07/17 18:26	08/07/17 18:26	CL
Surr: 2,5-Dibromotoluene (FID)	04	SW8015C	102 %		80-120		08/07/17 18:26	08/07/17 18:26	CL



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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0196**

**Analytical Results**

Sample I.D. 5124-01	Laboratory Sample ID: 17H0196-05
Grab Date/Time: 08/02/2017 10:00	

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	05	SW8015C	<0.10 mg/L	0.10	1		08/07/17 18:48	08/07/17 18:48	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	05	SW8015C	99.8 %	80-120			08/07/17 18:48	08/07/17 18:48	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	05	SW8015C	<0.521 mg/L	0.521	1		08/08/17 13:28	08/08/17 20:24	CVH
<i>Surr: Pentacosane (Surr)</i>	05	SW8015C	75.0 %	40-160			08/08/17 13:28	08/08/17 20:24	CVH



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Ashland VA, 23005

Date Issued: 8/9/2017 15:18

Submitted To: Richard Page Meredith  
Client Site I.D.: VFR048

Project Number: VFR048

Purchase Order:

**Laboratory Order ID: 17H0196**

**Analytical Results**

Sample I.D. 5116-03

Laboratory Sample ID: 17H0196-06

Grab Date/Time: 08/02/2017 12:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	06	SW8015C	6.40 mg/L	0.20		2	08/07/17 19:57	08/07/17 19:57	CL
Surr: 2,5-Dibromotoluene (FID)	06	SW8015C	115 %	80-120			08/07/17 19:57	08/07/17 19:57	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	06	SW8015C	3.07 mg/L	0.515		1	08/08/17 13:28	08/08/17 20:50	CVH
Surr: Pentacosane (Surr)	06	SW8015C	75.8 %	40-160			08/08/17 13:28	08/08/17 20:50	CVH



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### Final Report

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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

**Laboratory Order ID: 17H0196**

**Analytical Results**

**Sample I.D.** 5117-01 **Laboratory Sample ID:** 17H0196-07

**Grab Date/Time:** 08/03/2017 09:00

Parameter	Samp ID	Method	Result	Reporting Qual	Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	07	SW8015C	<0.10 mg/L	0.10	1		08/07/17 19:11	08/07/17 19:11	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	07	SW8015C	94.2 %	80-120			08/07/17 19:11	08/07/17 19:11	CL
<b>Semivolatile Hydrocarbons by GC</b>									
TPH-Semi-Volatiles (DRO)	07	SW8015C	<0.543 mg/L	0.543	1		08/08/17 13:28	08/08/17 21:16	CVH
<i>Surr: Pentacosane (Surr)</i>	07	SW8015C	77.2 %	40-160			08/08/17 13:28	08/08/17 21:16	CVH



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/9/2017 15:18
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	Purchase Order:	

**Laboratory Order ID: 17H0196**

**Analytical Results**

<b>Sample I.D.</b> 5123-01	<b>Laboratory Sample ID:</b> 17H0196-08
<b>Grab Date/Time:</b> 08/03/2017 09:50	

Parameter	Samp ID	Method	Result	Qual	Reporting Limit	D.F.	Sample Prep Date/Time	Analysis Date/Time	Analyst
<b>Volatile Hydrocarbons by GC</b>									
TPH-Volatiles (GRO)	08	SW8015C	<0.10 mg/L		0.10	1	08/07/17 19:34	08/07/17 19:34	CL
<i>Surr: 2,5-Dibromotoluene (FID)</i>	08	SW8015C	102 %		80-120		08/07/17 19:34	08/07/17 19:34	CL



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## Certificate of Analysis

### Final Report

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Ashland VA, 23005

Date Issued: 8/9/2017 15:18

Submitted To: Richard Page Meredith

Project Number: VFR048

Client Site I.D.: VFR048

Purchase Order:

### Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
<b>Semivolatile Hydrocarbons by GC</b>		<b>Preparation Method: SW3510C</b>			
17H0196-01	970 mL / 1.00 mL	SW8015C	BAH0242	SAH0260	AG70070
17H0196-02	960 mL / 1.00 mL	SW8015C	BAH0242	SAH0260	AG70070
17H0196-03	950 mL / 1.00 mL	SW8015C	BAH0242	SAH0260	AG70070
17H0196-05	960 mL / 1.00 mL	SW8015C	BAH0242	SAH0260	AG70070
17H0196-06	970 mL / 1.00 mL	SW8015C	BAH0242	SAH0260	AG70070
17H0196-07	920 mL / 1.00 mL	SW8015C	BAH0242	SAH0260	AG70070
<b>Volatile Hydrocarbons by GC</b>		<b>Preparation Method: SW5030B</b>			
17H0196-01	5.00 mL / 5.00 mL	SW8015C	BAH0197	SAH0203	AF70032
17H0196-02	5.00 mL / 5.00 mL	SW8015C	BAH0197	SAH0203	AF70032
17H0196-03	5.00 mL / 5.00 mL	SW8015C	BAH0197	SAH0203	AF70032
17H0196-04	5.00 mL / 5.00 mL	SW8015C	BAH0197	SAH0203	AF70032
17H0196-05	5.00 mL / 5.00 mL	SW8015C	BAH0197	SAH0203	AF70032
17H0196-06	5.00 mL / 5.00 mL	SW8015C	BAH0197	SAH0203	AF70032
17H0196-07	5.00 mL / 5.00 mL	SW8015C	BAH0197	SAH0203	AF70032
17H0196-08	5.00 mL / 5.00 mL	SW8015C	BAH0197	SAH0203	AF70032
<b>Volatile Organic Compounds by GCMS</b>		<b>Preparation Method: SW5030B</b>			
17H0196-02	5.00 mL / 5.00 mL	SW8260B	BAH0229	SAH0237	AG70053



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## Certificate of Analysis

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Submitted To: Richard Page Meredith	Project Number: VFR048
Client Site I.D.: VFR048	Purchase Order:

### Volatile Hydrocarbons by GC - Quality Control

#### Air Water and Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
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#### Batch BAH0197 - SW5030B

##### Blank (BAH0197-BLK1)

Prepared & Analyzed: 08/07/2017

TPH-Volatiles (GRO)	<0.10 mg/L	0.10	mg/L	1.00	mg/L	92.7	70-130
Surr: 2,5-Dibromotoluene (FID)	97.2		ug/L	100	ug/L	97.2	80-120

##### LCS (BAH0197-BS1)

Prepared & Analyzed: 08/07/2017

TPH-Volatiles (GRO)	0.93 mg/L	0.10	mg/L	1.00	mg/L	92.7	70-130
Surr: 2,5-Dibromotoluene (FID)	95.0		ug/L	100	ug/L	95.0	80-120

##### Matrix Spike (BAH0197-MS1)

Source: 17H0196-01

Prepared & Analyzed: 08/07/2017

TPH-Volatiles (GRO)	0.93 mg/L	0.10	mg/L	1.00	<0.10 mg/L	92.7	70-130
Surr: 2,5-Dibromotoluene (FID)	97.5		ug/L	100	ug/L	97.5	80-120

##### Matrix Spike Dup (BAH0197-MSD1)

Source: 17H0196-01

Prepared & Analyzed: 08/07/2017

TPH-Volatiles (GRO)	0.95 mg/L	0.10	mg/L	1.00	<0.10 mg/L	95.0	70-130	2.41	20
Surr: 2,5-Dibromotoluene (FID)	100		ug/L	100	ug/L	100	80-120		



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## Certificate of Analysis

### Final Report

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Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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 Limit	Qual
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#### Batch BAH0229 - SW5030B

#### Blank (BAH0229-BLK1)

Prepared & Analyzed: 08/07/2017

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						
1,1,1,2,2-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						



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/9/2017 15:18
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0229 - SW5030B

#### Blank (BAH0229-BLK1)

Prepared & Analyzed: 08/07/2017

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	<1.00 ug/L	1.00	ug/L							
Iodomethane	<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							



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### 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
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#### Batch BAH0229 - SW5030B

##### Blank (BAH0229-BLK1)

Prepared & Analyzed: 08/07/2017

trans-1,2-Dichloroethylene	<1.00 ug/L	1.00	ug/L							
trans-1,3-Dichloropropene	<1.00 ug/L	1.00	ug/L							
Trichloroethylene	<1.00 ug/L	1.00	ug/L							
Trichlorofluoromethane	<1.00 ug/L	1.00	ug/L							
Vinyl acetate	<10.0 ug/L	10.0	ug/L							
Vinyl chloride	<0.50 ug/L	0.50	ug/L							
Xylenes, Total	<3.00 ug/L	3.00	ug/L							
<hr style="border-top: 1px dashed black;"/>										
Surr: 1,2-Dichloroethane-d4 (Surr)	51.0		ug/L	50.0		102	70-120			
Surr: 4-Bromofluorobenzene (Surr)	50.3		ug/L	50.0		101	75-120			
Surr: Dibromofluoromethane (Surr)	51.0		ug/L	50.0		102	80-119			
Surr: Toluene-d8 (Surr)	51.0		ug/L	50.0		102	85-120			

##### LCS (BAH0229-BS1)

Prepared & Analyzed: 08/07/2017

1,1,1,2-Tetrachloroethane	49.3 ug/L	0.4	ug/L	50.0	ug/L	98.5	80-130			
1,1,1-Trichloroethane	46.0 ug/L	1	ug/L	50.0	ug/L	92.0	65-130			
1,1,2,2-Tetrachloroethane	43.2 ug/L	0.4	ug/L	50.0	ug/L	86.5	65-130			
1,1,2-Trichloroethane	44.6 ug/L	1	ug/L	50.0	ug/L	89.3	75-125			
1,1-Dichloroethane	49.2 ug/L	1	ug/L	50.0	ug/L	98.4	70-135			
1,1-Dichloroethylene	45.5 ug/L	1	ug/L	50.0	ug/L	91.0	70-130			
1,1-Dichloropropene	46.5 ug/L	1	ug/L	50.0	ug/L	92.9	75-135			
1,2,3-Trichlorobenzene	45.4 ug/L	1	ug/L	50.0	ug/L	90.8	55-140			
1,2,3-Trichloropropane	42.2 ug/L	1	ug/L	50.0	ug/L	84.4	75-125			
1,2,4-Trichlorobenzene	47.3 ug/L	1	ug/L	50.0	ug/L	94.6	65-135			
1,2,4-Trimethylbenzene	47.0 ug/L	1	ug/L	50.0	ug/L	94.1	75-130			
1,2-Dibromo-3-chloropropane (DBCP)	37.2 ug/L	4	ug/L	50.0	ug/L	74.4	50-130			
1,2-Dibromoethane (EDB)	43.2 ug/L	1	ug/L	50.0	ug/L	86.4	80-120			
1,2-Dichlorobenzene	45.6 ug/L	1	ug/L	50.0	ug/L	91.2	70-120			
1,2-Dichloroethane	45.6 ug/L	1	ug/L	50.0	ug/L	91.1	70-130			
1,2-Dichloropropane	44.9 ug/L	1	ug/L	50.0	ug/L	89.9	75-125			
1,3,5-Trimethylbenzene	49.2 ug/L	1	ug/L	50.0	ug/L	98.5	75-125			
1,3-Dichlorobenzene	47.4 ug/L	1	ug/L	50.0	ug/L	94.8	75-125			



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Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0229 - SW5030B

#### LCS (BAH0229-BS1)

Prepared & Analyzed: 08/07/2017

1,3-Dichloropropane	43.4 ug/L	1	ug/L	50.0	ug/L	86.9	75-125			
1,4-Dichlorobenzene	46.0 ug/L	1	ug/L	50.0	ug/L	92.1	75-125			
2,2-Dichloropropane	50.7 ug/L	2	ug/L	50.0	ug/L	101	70-135			
2-Butanone (MEK)	42.0 ug/L	10	ug/L	50.0	ug/L	84.1	30-150			
2-Chlorotoluene	48.3 ug/L	1	ug/L	50.0	ug/L	96.5	75-125			
2-Hexanone (MBK)	46.0 ug/L	5	ug/L	50.0	ug/L	92.0	55-130			
4-Chlorotoluene	47.6 ug/L	1	ug/L	50.0	ug/L	95.2	75-130			
4-Isopropyltoluene	48.3 ug/L	1	ug/L	50.0	ug/L	96.6	75-130			
4-Methyl-2-pentanone (MIBK)	44.3 ug/L	5	ug/L	50.0	ug/L	88.5	60-135			
Acetone	42.0 ug/L	10	ug/L	50.0	ug/L	84.0	40-140			
Benzene	44.3 ug/L	1	ug/L	50.0	ug/L	88.5	80-120			
Bromobenzene	43.7 ug/L	1	ug/L	50.0	ug/L	87.3	75-125			
Bromochloromethane	44.5 ug/L	1	ug/L	50.0	ug/L	89.0	65-130			
Bromodichloromethane	45.2 ug/L	0.5	ug/L	50.0	ug/L	90.3	75-120			
Bromoform	42.5 ug/L	1	ug/L	50.0	ug/L	84.9	70-130			
Bromomethane	43.2 ug/L	1	ug/L	50.0	ug/L	86.4	30-145			
Carbon disulfide	43.7 ug/L	10	ug/L	50.0	ug/L	87.3	35-160			
Carbon tetrachloride	43.7 ug/L	1	ug/L	50.0	ug/L	87.5	65-140			
Chlorobenzene	44.5 ug/L	1	ug/L	50.0	ug/L	88.9	80-120			
Chloroethane	44.1 ug/L	1	ug/L	50.0	ug/L	88.2	60-135			
Chloroform	43.4 ug/L	0.5	ug/L	50.0	ug/L	86.8	65-135			
Chloromethane	42.7 ug/L	1	ug/L	50.0	ug/L	85.3	40-125			
cis-1,2-Dichloroethylene	46.2 ug/L	1	ug/L	50.0	ug/L	92.3	70-125			
cis-1,3-Dichloropropene	40.1 ug/L	1	ug/L	50.0	ug/L	80.3	70-130			
Dibromochloromethane	38.8 ug/L	1	ug/L	50.0	ug/L	77.7	60-135			
Dibromomethane	43.4 ug/L	1	ug/L	50.0	ug/L	86.8	75-125			
Dichlorodifluoromethane	41.5 ug/L	1	ug/L	50.0	ug/L	83.1	30-155			
Ethylbenzene	45.2 ug/L	1	ug/L	50.0	ug/L	90.4	75-125			
Hexachlorobutadiene	46.0 ug/L	1	ug/L	50.0	ug/L	92.0	50-140			
Isopropylbenzene	48.1 ug/L	1	ug/L	50.0	ug/L	96.2	75-125			
m+p-Xylenes	92.7 ug/L	2	ug/L	100	ug/L	92.7	75-130			



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### 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
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#### Batch BAH0229 - SW5030B

##### LCS (BAH0229-BS1)

Prepared & Analyzed: 08/07/2017

Methylene chloride	41.9 ug/L	4	ug/L	50.0	ug/L	83.8	55-140			
Methyl-t-butyl ether (MTBE)	49.8 ug/L	1	ug/L	50.0	ug/L	99.7	65-125			
Naphthalene	44.4 ug/L	1	ug/L	50.0	ug/L	88.9	55-140			
n-Butylbenzene	50.2 ug/L	1	ug/L	50.0	ug/L	100	70-135			
n-Propylbenzene	48.0 ug/L	1	ug/L	50.0	ug/L	95.9	70-130			
o-Xylene	45.7 ug/L	1	ug/L	50.0	ug/L	91.5	80-120			
sec-Butylbenzene	48.9 ug/L	1	ug/L	50.0	ug/L	97.8	70-125			
Styrene	40.9 ug/L	1	ug/L	50.0	ug/L	81.9	65-135			
tert-Butylbenzene	49.8 ug/L	1	ug/L	50.0	ug/L	99.5	70-130			
Tetrachloroethylene (PCE)	59.9 ug/L	1	ug/L	50.0	ug/L	120	45-150			
Toluene	41.5 ug/L	1	ug/L	50.0	ug/L	83.1	75-120			
trans-1,2-Dichloroethylene	46.2 ug/L	1	ug/L	50.0	ug/L	92.4	60-140			
trans-1,3-Dichloropropene	41.5 ug/L	1	ug/L	50.0	ug/L	83.0	55-140			
Trichloroethylene	44.6 ug/L	1	ug/L	50.0	ug/L	89.2	70-125			
Trichlorofluoromethane	40.8 ug/L	1	ug/L	50.0	ug/L	81.6	60-145			
Vinyl chloride	37.0 ug/L	0.5	ug/L	50.0	ug/L	74.0	50-145			
<hr style="border-top: 1px dashed black;"/>										
Surr: 1,2-Dichloroethane-d4 (Surr)	53.0		ug/L	50.0	ug/L	106	70-120			
Surr: 4-Bromofluorobenzene (Surr)	51.6		ug/L	50.0	ug/L	103	75-120			
Surr: Dibromofluoromethane (Surr)	52.2		ug/L	50.0	ug/L	104	80-119			
Surr: Toluene-d8 (Surr)	51.0		ug/L	50.0	ug/L	102	85-120			

##### Matrix Spike (BAH0229-MS1)

Source: 17H0196-02

Prepared & Analyzed: 08/07/2017

1,1,1,2-Tetrachloroethane	55.6 ug/L	0.4	ug/L	50.0	<0.4 ug/L	111	80-130			
1,1,1-Trichloroethane	53.2 ug/L	1	ug/L	50.0	<1 ug/L	106	65-130			
1,1,2,2-Tetrachloroethane	52.3 ug/L	0.4	ug/L	50.0	<0.4 ug/L	105	65-130			
1,1,2-Trichloroethane	53.4 ug/L	1	ug/L	50.0	<1 ug/L	107	75-125			
1,1-Dichloroethane	57.2 ug/L	1	ug/L	50.0	<1 ug/L	114	70-135			
1,1-Dichloroethylene	52.0 ug/L	1	ug/L	50.0	<1 ug/L	104	70-130			
1,1-Dichloropropene	54.0 ug/L	1	ug/L	50.0	<1 ug/L	108	75-135			
1,2,3-Trichlorobenzene	51.2 ug/L	1	ug/L	50.0	<1 ug/L	102	55-140			
1,2,3-Trichloropropane	50.3 ug/L	1	ug/L	50.0	<1 ug/L	101	75-125			



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### 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
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#### Batch BAH0229 - SW5030B

#### Matrix Spike (BAH0229-MS1)

Source: 17H0196-02

Prepared & Analyzed: 08/07/2017

1,2,4-Trichlorobenzene	51.3 ug/L	1	ug/L	50.0	<1 ug/L	103	65-135			
1,2,4-Trimethylbenzene	51.3 ug/L	1	ug/L	50.0	<1 ug/L	102	75-130			
1,2-Dibromo-3-chloropropane (DBCP)	42.6 ug/L	4	ug/L	50.0	<4 ug/L	85.2	50-130			
1,2-Dibromoethane (EDB)	49.4 ug/L	1	ug/L	50.0	<1 ug/L	98.8	80-120			
1,2-Dichlorobenzene	49.9 ug/L	1	ug/L	50.0	<1 ug/L	99.8	70-120			
1,2-Dichloroethane	53.3 ug/L	1	ug/L	50.0	<1 ug/L	107	70-130			
1,2-Dichloropropane	51.9 ug/L	1	ug/L	50.0	<1 ug/L	104	75-125			
1,3,5-Trimethylbenzene	54.2 ug/L	1	ug/L	50.0	<1 ug/L	108	75-125			
1,3-Dichlorobenzene	51.4 ug/L	1	ug/L	50.0	<1 ug/L	103	75-125			
1,3-Dichloropropane	50.6 ug/L	1	ug/L	50.0	<1 ug/L	101	75-125			
1,4-Dichlorobenzene	49.3 ug/L	1	ug/L	50.0	<1 ug/L	98.6	75-125			
2,2-Dichloropropane	53.7 ug/L	2	ug/L	50.0	<2 ug/L	107	70-135			
2-Butanone (MEK)	46.7 ug/L	10	ug/L	50.0	<10 ug/L	93.4	30-150			
2-Chlorotoluene	53.6 ug/L	1	ug/L	50.0	<1 ug/L	107	75-125			
2-Hexanone (MBK)	49.9 ug/L	5	ug/L	50.0	<5 ug/L	99.8	55-130			
4-Chlorotoluene	52.1 ug/L	1	ug/L	50.0	<1 ug/L	104	75-130			
4-Isopropyltoluene	52.2 ug/L	1	ug/L	50.0	<1 ug/L	104	75-130			
4-Methyl-2-pentanone (MIBK)	47.6 ug/L	5	ug/L	50.0	<5 ug/L	95.2	60-135			
Acetone	58.5 ug/L	10	ug/L	50.0	<10 ug/L	110	40-140			
Benzene	51.0 ug/L	1	ug/L	50.0	<1 ug/L	102	80-120			
Bromobenzene	48.8 ug/L	1	ug/L	50.0	<1 ug/L	97.6	75-125			
Bromochloromethane	52.1 ug/L	1	ug/L	50.0	<1 ug/L	104	65-130			
Bromodichloromethane	51.7 ug/L	0.5	ug/L	50.0	<0.5 ug/L	103	75-120			
Bromoform	48.1 ug/L	1	ug/L	50.0	<1 ug/L	96.3	70-130			
Bromomethane	48.9 ug/L	1	ug/L	50.0	<1 ug/L	97.9	30-145			
Carbon disulfide	48.0 ug/L	10	ug/L	50.0	<10 ug/L	96.0	35-160			
Carbon tetrachloride	49.3 ug/L	1	ug/L	50.0	<1 ug/L	98.5	65-140			
Chlorobenzene	49.6 ug/L	1	ug/L	50.0	<1 ug/L	99.2	80-120			
Chloroethane	52.3 ug/L	1	ug/L	50.0	<1 ug/L	105	60-135			
Chloroform	51.5 ug/L	0.5	ug/L	50.0	<0.5 ug/L	102	65-135			
Chloromethane	50.2 ug/L	1	ug/L	50.0	<1 ug/L	100	40-125			



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### 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
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#### Batch BAH0229 - SW5030B

#### Matrix Spike (BAH0229-MS1)

Source: 17H0196-02

Prepared & Analyzed: 08/07/2017

cis-1,2-Dichloroethylene	53.6 ug/L	1	ug/L	50.0	<1 ug/L	107	70-125			
cis-1,3-Dichloropropene	44.2 ug/L	1	ug/L	50.0	<1 ug/L	88.4	70-130			
Dibromochloromethane	45.0 ug/L	1	ug/L	50.0	<1 ug/L	90.0	60-135			
Dibromomethane	50.2 ug/L	1	ug/L	50.0	<1 ug/L	100	75-125			
Dichlorodifluoromethane	48.4 ug/L	1	ug/L	50.0	<1 ug/L	96.7	30-155			
Ethylbenzene	49.9 ug/L	1	ug/L	50.0	<1 ug/L	99.5	75-125			
Hexachlorobutadiene	50.4 ug/L	1	ug/L	50.0	<1 ug/L	101	50-140			
Isopropylbenzene	54.9 ug/L	1	ug/L	50.0	<1 ug/L	108	75-125			
m+p-Xylenes	103 ug/L	2	ug/L	100	<2 ug/L	103	75-130			
Methylene chloride	51.7 ug/L	4	ug/L	50.0	<4 ug/L	103	55-140			
Methyl-t-butyl ether (MTBE)	56.1 ug/L	1	ug/L	50.0	<1 ug/L	112	65-125			
Naphthalene	66.3 ug/L	1	ug/L	50.0	16.3 ug/L	99.9	55-140			
n-Butylbenzene	56.3 ug/L	1	ug/L	50.0	1.34 ug/L	110	70-135			
n-Propylbenzene	54.4 ug/L	1	ug/L	50.0	1.58 ug/L	106	70-130			
o-Xylene	51.9 ug/L	1	ug/L	50.0	<1 ug/L	103	80-120			
sec-Butylbenzene	58.1 ug/L	1	ug/L	50.0	3.60 ug/L	109	70-125			
Styrene	45.8 ug/L	1	ug/L	50.0	<1 ug/L	91.6	65-135			
tert-Butylbenzene	55.7 ug/L	1	ug/L	50.0	<1 ug/L	110	70-130			
Tetrachloroethylene (PCE)	65.7 ug/L	1	ug/L	50.0	<1 ug/L	131	45-150			
Toluene	47.2 ug/L	1	ug/L	50.0	<1 ug/L	93.9	75-120			
trans-1,2-Dichloroethylene	51.2 ug/L	1	ug/L	50.0	<1 ug/L	102	60-140			
trans-1,3-Dichloropropene	45.4 ug/L	1	ug/L	50.0	<1 ug/L	90.8	55-140			
Trichloroethylene	50.1 ug/L	1	ug/L	50.0	<1 ug/L	100	70-125			
Trichlorofluoromethane	47.5 ug/L	1	ug/L	50.0	<1 ug/L	95.0	60-145			
Vinyl chloride	42.3 ug/L	0.5	ug/L	50.0	<0.5 ug/L	84.7	50-145			
<hr style="border-top: 1px dashed black;"/>										
Surr: 1,2-Dichloroethane-d4 (Surr)	51.4		ug/L	50.0	ug/L	103	70-120			
Surr: 4-Bromofluorobenzene (Surr)	52.6		ug/L	50.0	ug/L	105	75-120			
Surr: Dibromofluoromethane (Surr)	53.2		ug/L	50.0	ug/L	106	80-119			
Surr: Toluene-d8 (Surr)	50.9		ug/L	50.0	ug/L	102	85-120			



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## Certificate of Analysis

### Final Report

Client Name:	Cardno MM&A-Ashland 10988 Richardson Road Ashland VA, 23005	Date Issued:	8/9/2017 15:18
Submitted To:	Richard Page Meredith	Project Number:	VFR048
Client Site I.D.:	VFR048	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
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#### Batch BAH0229 - SW5030B

#### Matrix Spike Dup (BAH0229-MSD1)

Source: 17H0196-02

Prepared & Analyzed: 08/07/2017

1,1,1,2-Tetrachloroethane	53.2 ug/L	0.4	ug/L	50.0	<0.4 ug/L	106	80-130	4.54	30	
1,1,1-Trichloroethane	51.3 ug/L	1	ug/L	50.0	<1 ug/L	103	65-130	3.46	30	
1,1,1,2,2-Tetrachloroethane	48.9 ug/L	0.4	ug/L	50.0	<0.4 ug/L	97.7	65-130	6.84	30	
1,1,2-Trichloroethane	50.9 ug/L	1	ug/L	50.0	<1 ug/L	102	75-125	4.85	30	
1,1-Dichloroethane	54.8 ug/L	1	ug/L	50.0	<1 ug/L	110	70-135	4.23	30	
1,1-Dichloroethylene	50.2 ug/L	1	ug/L	50.0	<1 ug/L	100	70-130	3.52	30	
1,1-Dichloropropene	52.0 ug/L	1	ug/L	50.0	<1 ug/L	104	75-135	3.75	30	
1,2,3-Trichlorobenzene	50.0 ug/L	1	ug/L	50.0	<1 ug/L	99.9	55-140	2.51	30	
1,2,3-Trichloropropane	47.9 ug/L	1	ug/L	50.0	<1 ug/L	95.8	75-125	4.97	30	
1,2,4-Trichlorobenzene	50.8 ug/L	1	ug/L	50.0	<1 ug/L	102	65-135	1.12	30	
1,2,4-Trimethylbenzene	49.4 ug/L	1	ug/L	50.0	<1 ug/L	98.4	75-130	3.74	30	
1,2-Dibromo-3-chloropropane (DBCP)	42.1 ug/L	4	ug/L	50.0	<4 ug/L	84.2	50-130	1.20	30	
1,2-Dibromoethane (EDB)	47.5 ug/L	1	ug/L	50.0	<1 ug/L	95.1	80-120	3.90	30	
1,2-Dichlorobenzene	48.5 ug/L	1	ug/L	50.0	<1 ug/L	96.9	70-120	2.91	30	
1,2-Dichloroethane	51.3 ug/L	1	ug/L	50.0	<1 ug/L	103	70-130	3.88	30	
1,2-Dichloropropane	50.6 ug/L	1	ug/L	50.0	<1 ug/L	101	75-125	2.50	30	
1,3,5-Trimethylbenzene	52.5 ug/L	1	ug/L	50.0	<1 ug/L	105	75-125	3.26	30	
1,3-Dichlorobenzene	49.6 ug/L	1	ug/L	50.0	<1 ug/L	99.1	75-125	3.53	30	
1,3-Dichloropropane	49.0 ug/L	1	ug/L	50.0	<1 ug/L	98.0	75-125	3.27	30	
1,4-Dichlorobenzene	47.2 ug/L	1	ug/L	50.0	<1 ug/L	94.3	75-125	4.50	30	
2,2-Dichloropropane	52.0 ug/L	2	ug/L	50.0	<2 ug/L	104	70-135	3.20	30	
2-Butanone (MEK)	52.2 ug/L	10	ug/L	50.0	<10 ug/L	104	30-150	11.0	30	
2-Chlorotoluene	51.8 ug/L	1	ug/L	50.0	<1 ug/L	104	75-125	3.49	30	
2-Hexanone (MBK)	49.3 ug/L	5	ug/L	50.0	<5 ug/L	98.7	55-130	1.13	30	
4-Chlorotoluene	50.3 ug/L	1	ug/L	50.0	<1 ug/L	101	75-130	3.40	30	
4-Isopropyltoluene	50.7 ug/L	1	ug/L	50.0	<1 ug/L	101	75-130	2.95	30	
4-Methyl-2-pentanone (MIBK)	48.2 ug/L	5	ug/L	50.0	<5 ug/L	96.4	60-135	1.34	30	
Acetone	54.5 ug/L	10	ug/L	50.0	<10 ug/L	102	40-140	7.11	30	
Benzene	49.6 ug/L	1	ug/L	50.0	<1 ug/L	99.0	80-120	2.74	30	
Bromobenzene	47.8 ug/L	1	ug/L	50.0	<1 ug/L	95.6	75-125	2.11	30	
Bromochloromethane	50.0 ug/L	1	ug/L	50.0	<1 ug/L	99.9	65-130	4.17	30	



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Client Site I.D.:	VFR048	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
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#### Batch BAH0229 - SW5030B

#### Matrix Spike Dup (BAH0229-MSD1)

Source: 17H0196-02

Prepared & Analyzed: 08/07/2017

Bromodichloromethane	50.4 ug/L	0.5	ug/L	50.0	<0.5 ug/L	101	75-120	2.58	30	
Bromoform	45.8 ug/L	1	ug/L	50.0	<1 ug/L	91.7	70-130	4.92	30	
Bromomethane	48.4 ug/L	1	ug/L	50.0	<1 ug/L	96.7	30-145	1.17	30	
Carbon disulfide	49.4 ug/L	10	ug/L	50.0	<10 ug/L	98.8	35-160	2.89	30	
Carbon tetrachloride	47.8 ug/L	1	ug/L	50.0	<1 ug/L	95.6	65-140	2.99	30	
Chlorobenzene	48.3 ug/L	1	ug/L	50.0	<1 ug/L	96.5	80-120	2.76	30	
Chloroethane	50.5 ug/L	1	ug/L	50.0	<1 ug/L	101	60-135	3.35	30	
Chloroform	48.9 ug/L	0.5	ug/L	50.0	<0.5 ug/L	97.1	65-135	5.22	30	
Chloromethane	49.6 ug/L	1	ug/L	50.0	<1 ug/L	99.1	40-125	1.40	30	
cis-1,2-Dichloroethylene	51.8 ug/L	1	ug/L	50.0	<1 ug/L	104	70-125	3.43	30	
cis-1,3-Dichloropropene	42.9 ug/L	1	ug/L	50.0	<1 ug/L	85.8	70-130	2.96	30	
Dibromochloromethane	44.1 ug/L	1	ug/L	50.0	<1 ug/L	88.1	60-135	2.07	30	
Dibromomethane	48.1 ug/L	1	ug/L	50.0	<1 ug/L	96.2	75-125	4.35	30	
Dichlorodifluoromethane	46.6 ug/L	1	ug/L	50.0	<1 ug/L	93.1	30-155	3.77	30	
Ethylbenzene	48.3 ug/L	1	ug/L	50.0	<1 ug/L	96.4	75-125	3.22	30	
Hexachlorobutadiene	50.0 ug/L	1	ug/L	50.0	<1 ug/L	100	50-140	0.638	30	
Isopropylbenzene	53.6 ug/L	1	ug/L	50.0	<1 ug/L	105	75-125	2.47	30	
m+p-Xylenes	99.7 ug/L	2	ug/L	100	<2 ug/L	99.3	75-130	3.50	30	
Methylene chloride	49.8 ug/L	4	ug/L	50.0	<4 ug/L	99.6	55-140	3.78	30	
Methyl-t-butyl ether (MTBE)	53.9 ug/L	1	ug/L	50.0	<1 ug/L	107	65-125	3.95	30	
Naphthalene	65.8 ug/L	1	ug/L	50.0	16.3 ug/L	99.0	55-140	0.742	30	
n-Butylbenzene	54.5 ug/L	1	ug/L	50.0	1.34 ug/L	106	70-135	3.25	30	
n-Propylbenzene	53.6 ug/L	1	ug/L	50.0	1.58 ug/L	104	70-130	1.48	30	
o-Xylene	49.9 ug/L	1	ug/L	50.0	<1 ug/L	99.5	80-120	3.85	30	
sec-Butylbenzene	56.0 ug/L	1	ug/L	50.0	3.60 ug/L	105	70-125	3.61	30	
Styrene	44.5 ug/L	1	ug/L	50.0	<1 ug/L	89.0	65-135	2.86	30	
tert-Butylbenzene	54.3 ug/L	1	ug/L	50.0	<1 ug/L	107	70-130	2.58	30	
Tetrachloroethylene (PCE)	63.3 ug/L	1	ug/L	50.0	<1 ug/L	127	45-150	3.67	30	
Toluene	46.8 ug/L	1	ug/L	50.0	<1 ug/L	93.2	75-120	0.766	30	
trans-1,2-Dichloroethylene	49.3 ug/L	1	ug/L	50.0	<1 ug/L	98.6	60-140	3.78	30	
trans-1,3-Dichloropropene	44.2 ug/L	1	ug/L	50.0	<1 ug/L	88.3	55-140	2.77	30	



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Client Site I.D.:	VFR048	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
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#### Batch BAH0229 - SW5030B

#### Matrix Spike Dup (BAH0229-MSD1)

Source: 17H0196-02

Prepared & Analyzed: 08/07/2017

Trichloroethylene	48.5 ug/L	1	ug/L	50.0	<1 ug/L	97.1	70-125	3.20	30	
Trichlorofluoromethane	45.8 ug/L	1	ug/L	50.0	<1 ug/L	91.7	60-145	3.58	30	
Vinyl chloride	42.8 ug/L	0.5	ug/L	50.0	<0.5 ug/L	85.6	50-145	1.06	30	
<hr style="border-top: 1px dashed black;"/>										
Surr: 1,2-Dichloroethane-d4 (Surr)	52.0		ug/L	50.0	ug/L	104	70-120			
Surr: 4-Bromofluorobenzene (Surr)	51.2		ug/L	50.0	ug/L	102	75-120			
Surr: Dibromofluoromethane (Surr)	52.7		ug/L	50.0	ug/L	105	80-119			
Surr: Toluene-d8 (Surr)	50.8		ug/L	50.0	ug/L	102	85-120			



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Client Site I.D.:	VFR048	Purchase Order:	

### Semivolatile Hydrocarbons by GC - Quality Control

#### Air Water and Soil Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
<b>Batch BAH0242 - SW3510C</b>										
<b>Blank (BAH0242-BLK1)</b> <span style="float: right;">Prepared &amp; Analyzed: 08/08/2017</span>										
TPH-Semi-Volatiles (DRO)	<0.500 mg/L	0.500	mg/L							
<i>Surr: Pentacosane (Surr)</i>	0.227		mg/L	0.250		90.9	40-160			
<b>LCS (BAH0242-BS1)</b> <span style="float: right;">Prepared &amp; Analyzed: 08/08/2017</span>										
TPH-Semi-Volatiles (DRO)	4.4 mg/L	0.500	mg/L	5.00	mg/L	87.6	40-160			
<i>Surr: Pentacosane (Surr)</i>	0.207		mg/L	0.250	mg/L	83.0	40-160			
<b>Matrix Spike (BAH0242-MS1)</b> <span style="float: right;">Source: 17H0205-01 Prepared &amp; Analyzed: 08/08/2017</span>										
TPH-Semi-Volatiles (DRO)	3.3 mg/L	0.526	mg/L	5.26	2.1 mg/L	23.1	40-160			M
<i>Surr: Pentacosane (Surr)</i>	0.169		mg/L	0.263	mg/L	64.4	40-160			
<b>Matrix Spike Dup (BAH0242-MSD1)</b> <span style="float: right;">Source: 17H0205-01 Prepared &amp; Analyzed: 08/08/2017</span>										
TPH-Semi-Volatiles (DRO)	3.5 mg/L	0.505	mg/L	5.05	2.1 mg/L	27.3	40-160	4.90	20	M
<i>Surr: Pentacosane (Surr)</i>	0.177		mg/L	0.253	mg/L	70.1	40-160			



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### Certified Analyses included in this Report

Analyte	Certifications
<b>SW8015C in Non-Potable Water</b>	
TPH-Semi-Volatiles (DRO)	VELAP,NC,WVDEP
TPH-Volatiles (GRO)	VELAP,NC,WVDEP
<b>SW8260B in Non-Potable Water</b>	
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



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### Certified Analyses included in this Report

Analyte	Certifications
Bromomethane	NC,VELAP,WVDEP
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
Iodomethane	NC,VELAP,WVDEP
Isopropylbenzene	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



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## Certificate of Analysis

### *Final Report*

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10988 Richardson Road  
Ashland VA, 23005

Date Issued: 8/9/2017 15:18

Submitted To: Richard Page Meredith

Project Number: VFR048

Client Site I.D.: VFR048

Purchase Order:

Code	Description	Lab Number	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2017
NC	North Carolina DENR	495	12/31/2017
PADEP	NELAC-Pennsylvania	001	10/31/2017
VELAP	NELAC-Virginia Certificate #9316	460021	06/14/2018
WVDEP	West Virginia DEP	350	11/30/2017



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### Summary of Data Qualifiers

M Matrix spike recovery is outside established acceptance limits  
RPD Relative Percent Difference  
Qual Qualifiers  
-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 OF CUSTODY



10988 Richardson Road, Ashland, VA 23005 / TEL: (804) 798-6525 • FAX: (804) 798-5907

## Sample Collection Information

Client: VDOT	Project:	Project No. VFR 048
Sampler: Dane Anderson / RP Meredith		
Date of Collection: 8/13/17	Date of Ship.: 8/14/17	Ship. Method:

Turnaround Requirements

Regular  
 Rush

Analysis Requested

### Sample Log and Analysis Request

Sample Number	Sample ID	Date	Time	Matrix	Grab/Comp.	Number of Containers / Type	TPH-DRO	TPH-GRO	VOCs (8260)	Remarks
1	5409-01	8/11/17	1000	GW	G	3	X	X		
2	5409-02	8/2/17	0830			2	X	X	X	
3	5409-03	8/2/17	0900			3	X	X		
4	5409-05	8/3/17	0945			2	X	X		
5	5124-01	8/2/17	1000			3	X	X		
6	5116-03	8/2/17	1200			7	X	X		
7	5112-01	8/3/17	0900			3	X	X		
8	5123-01	8/3/17	0952			2	X	X		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Condition:
Samon 8/14/17 1140			8/14/17 1140	6.50C No Seal On Ice

Requested By:

**MMA** 17H0196  
**VFR048**  
 Recd: 08/04/2017 Date: 08/11/2017  
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## Sample Conditions Checklist

Samples Received at:	6.50°C
How were samples received?	AWS Courier
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?	No
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.	No
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes

Dane Anderson was notified via email regarding sample temp and trip blank for GRO/VOC. BAR 08/04/17 1520