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**Collins Aerospace**

A United Technologies Company

October 29, 2019

Mr. Anthony Leverock, Associate Engineer  
Permits and Plan Review Unit  
Waste Programs Division  
Arizona Department of Environmental Quality  
1110 West Washington Street  
Phoenix, Arizona 85007

Re: Groundwater Treatment Plant Startup Summary Letter  
Former Universal Propulsion Company, Inc.  
Facility 25401 North Central Avenue  
AZ HWMA Permit; ID No. AZD 980 814 479

Dear Mr. Leverock:

The Universal Propulsion Company, Inc. (UPCO) is submitting the attached Groundwater Treatment Plant Startup Summary Letter. The attached startup summary letter was prepared by Arcadis U.S., Inc. (Arcadis) at the direction of UPCO in accordance with the corrective measures being implemented under the Arizona Hazardous Management Waste Act (AZ HWMA) Permit for the UPCO Facility, ID No. AZD 980 814 479.

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



**Collins Aerospace**

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Please contact me at 704.423.7071, or Michael Nesky at 480.535.7427, if you have any questions or need additional information.

Sincerely,

Bruce C. Amig  
Manager, Remedial Programs

Enclosure: Groundwater Treatment Plant Startup Summary

CC:

Michael Nesky, UTC  
Karen Middleider, UTAS  
Tricia Gomes, City of Phoenix  
Julie Riemenschneider, City of Phoenix  
Jeff Page, City of Phoenix

Mr. Anthony Leverock  
Associate Engineer  
Permits and Plan Review Unit  
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Arizona Department of Environmental Quality  
1110 West Washington Street  
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Subject:  
Groundwater Treatment Plant Startup Summary  
Former Universal Propulsion Company, Inc., Facility  
25401 North Central Avenue, Phoenix, Arizona 85027  
Arizona HWMA Permit ID No. AZD 980 814 479; Place ID 2229

ENVIRONMENT

Date:  
October 31, 2019

Dear Mr. Leverock:

Contact:  
Michael Nesky

On behalf of Universal Propulsion Company, Inc. (UPCO), Arcadis U.S., Inc. (Arcadis) prepared this startup summary for the groundwater treatment plant (GWTP) located at the former UPCO facility at 25401 North Central Avenue in Phoenix, Arizona (the Site). The GWTP was installed as part of a corrective measure to address constituents of concern (COCs) present in groundwater at concentrations exceeding the Arizona Department of Environmental Quality (ADEQ)-approved site groundwater cleanup standards. Corrective measures are being implemented under the Arizona Hazardous Waste Management Act Permit (AZD 980 814 479) with ADEQ guidance.

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To address COC concentrations exceeding cleanup standards in the bedrock aquifer source area of the Site, the corrective measure includes groundwater extraction, ex-situ pretreatment of groundwater containing 1,4-dioxane and 1,1-dichloroethene with liquid granular activated carbon (GAC), treatment of groundwater containing perchlorate with an anoxic fluidized bed reactor (FBR), and reinjection of treated groundwater. Following is a summary of the startup activities performed as described in the AEDQ approved Startup Plan dated March 2019. The ADEQ approved Startup Plan is included as Attachment 1 for reference.

## 1 PRE-STARTUP/POST-CONSTRUCTION PUNCH LIST

Below is a list of items checked before starting the GWTP. Items were check off on field forms as appropriate. Checklist forms are provided as Attachment 2.

- a. Mechanical Components Installation Verification (Field Forms 1.a.i through 1.a.ix)
- b. Instruments (Field Form 1.b)
- c. Control Panels (Field Forms 1.c.i and 1.c.ii)

Corrective item summary:

- Labels need to be finished as applicable to system operation.
- Transducers under repair or have been repaired. Final measurement adjustment needs to be done.
- Several unglued joints identified and fixed.
- One check valve corrected.
- Manifold valves and unions tightened as necessary.
- Airline fittings were removed, cleaned, resealed, and connected due to air leaks.
- Airline hose replaced on FBR skid.
- Pressure gauges replaced with applicable range and system rescaled.
- Pressure transmitters replaced with appropriate range.
- Pressure snubbers replaced with higher quality ones.
- Flowmeter interface reconfigured to gallons per minute and verified scaling.
- Solenoid on valves were sticking in open position. Manual override solenoid to break it loose.
- Replace and verify original power supply inside master control panel (MCP).
- Replace fuse for receptacle in MCP with appropriately sized fuse per plans.

## 2 COMMUNICATION VERIFICATIONS

Below is a list of items completed to verify communications in the treatment system. Items were check off on field forms as appropriate. Checklist forms are provided as Attachment 2.

- a. Verification Over Copper Ethernet Verification (Field Form 2a)
- b. Communication Over Fiber Optic Verification (Field Form 2b)

Corrective item summary:

- No issues identified. All communication in working operation.

## 3 MECHANICAL DRY-RUN TEST

Below is a list of items completed to verify mechanical controls through a dry-run of the treatment system. Items were check off on field forms as appropriate. Checklist forms are provided as Attachment 2.

- a. Instrumentation Loop (Field Form 3a)
- b. Process Instrument Functionality (transducers, switches, valves, and other components; Field Form 3b)
- c. Alarm/Interlock Testing (Field Form 3c)
- d. Motor Bump Test (Field Form 3d)

Corrective item summary:



- Transducers were adjusted with several replaced. Need final water level adjustment.
- Need to add air compressor discharge pressure to SCADA and confirm.
- ORP probe replaced on FBR skid.
- Adjust and confirm switches and alarms in tanks as appropriate for system operation.
- Adjust all extraction well pump start modes in the VFD.

#### 4 CLEAN WATER TEST

Below is a list of items completed to verify the system, controls, and instrumentation operation and functionality through a clean water test in the treatment system. Items were check off on field forms as appropriate. Checklist forms are provided as Attachment 2.

a. Initial Tank/Vessel Fill

All tanks and vessels were filled with clean water from a fire hydrant. The ion exchange (IX) and GAC vessels were soaked to vendor-recommended durations prior to testing. FBR, tank T-300, general startup, carbon media, wash media, and fluidization loading were established in accordance with the Environgen Operation and Maintenance (O&M) Manual included as Appendix B of the Startup Plan (Attachment 1).

b. Process Instrument Functionality (transducers, switches, valves, and other components; Field Form 4b)

c. Motor Control Verification (Field Forms 4.c and 4.c.ii)

d. Process Control Verification (Field Form 4d)

e. FBR Integration and Optimization (Field Form 4e)

f. Clean Water Injection

Corrective item summary:

- Adjust pressure release valves on IX and GAC vessels.
- Inoperable transducers replaced; need final level adjustment in wells
- Flowmeters adjusted to gpm and correct pulse reading.
- Adjust air compressor operational range.
- Replace a faulty transducer cable in tank T-200.
- Adjust pressure regulators on manifold
- Adjust manual valves.
- Confirm injection flows and pressures in all injection wells. Adjust as necessary.
- Transfer pump VFDs adjusted as necessary for optimum system operation.
- Several FBR alarms need to be verified during treatment process.

#### 5 FLUIDIZED BED REACTOR STARTUP WHILE RECIRCULATING

This section summarizes FBR startup activities, sampling, and analytical results. During this portion of startup, system recirculation occurred using frac tanks, and no water was reinjected.

a. Baseline Assessment of Extracted Groundwater

Groundwater was purged and collected from the sample ports of extraction wells IW-1, EW-1, EW-2, and MW-20 on July 17, 2019. Field parameters for each well were recorded on a daily field log

(Attachment 3). Groundwater samples were submitted to Pace Analytical National Center for Testing & Innovation (Pace) for analyses of the following:

- Perchlorate by United States Environmental Protection Agency (EPA) Method 314.0
- 1,4-Dioxane by EPA Method 8260B-SIM
- 1,1-Dichloroethene by EPA Method 8260B
- Nitrate by EPA Method 300.0
- Total phosphorous by EPA Method 365.4

Analytical results are summarized in Table 1 and the laboratory analytical report is provided in Attachment 4.

b. Batching Groundwater

Extracted groundwater was initially batched (Batch 1) and placed in a frac tank. Batch 1 was sampled and submitted to Pace for analysis to determine the mass loading rate of the batch. Samples were analyzed for the following:

- Perchlorate by EPA Method 314.0
- 1,4-Dioxane by EPA Method 8260B-SIM
- 1,1-Dichloroethene by EPA Method 8260B
- Nitrate by EPA Method 300.0
- Total phosphorous by EPA Method 365.4

Due to a detection of 1,4-dioxane, Batch 1 was pumped through the GAC and placed back into the frac tank. Batch 1 was resampled and analyzed for 1,4-dioxane (Batch 1a) before pumping the first batch into the FBR. The 1,4-dioxane concentration for Batch 1a was non-detect. Analytical results are summarized in Table 2 and laboratory analytical reports are provided in Attachment 4.

c. Initial Feed of Extracted Water to Fluidized Bed Reactor

After the first batch was pumped into the reactor, the FBR was inoculated to expedite the biological startup. Field measurements were monitored daily to verify microbial acclimation and recorded on the daily field log (Attachment 3). FBR recirculation water was collected from sample port SP-301 and submitted to Pace for the analyses listed below. Results were used to verify that an adequate environment is maintained in the FBR for microbial growth and to confirm perchlorate removal greater than 70 percent.

- Perchlorate by EPA Method 314.0
- Nitrate by EPA Method 300.0
- Total phosphorous by EPA Method 365.4
- Total organic carbon by EPA Method 9060A

A total of four batches were prepared and run through the FBR before forward feed of extracted groundwater was initiated. During this portion of startup, system recirculation occurred using frac tanks, and no water was reinjected. Following Batch 2, batch mix perchlorate concentration samples were collected from sample port SP-201 for Batches 3 and 4. Batches 3 and 4 demonstrated a perchlorate removal rate of 98 percent prior to initiation of forward feed. Analytical results of the batched water are summarized in Table 2 and laboratory analytical reports are provided in Attachment 4.

## 6 TREATED WATER INJECTION, FORWARD FLOW, AND FLUIDIZED BED REACTOR FEED RAMP-UP

This section summarizes treated water injection, initial forward feed activities, and extracted groundwater feed ramp-up to the FBR.

### Treated Batch Water Injection

All treated batch water was pumped into a frac tank for final treatment and testing before reinjection. Treated batch water was pumped from the frac tank through the IX vessels and into injection equalization tank T-700. The IX vessels provided the final treatment/polishing of remaining perchlorate from the batched water until full microbial acclimation was achieved in the FBR. As the treated batch water was being pump through the IX vessels, a final treated water sample was collected from sample port SP-608 (the port on the final IX vessel) before the water was discharged into tank T-700. The sample was submitted to Pace and analyzed for the following:

- Perchlorate by EPA Method 314.0
- 1,4-Dioxane by EPA Method 8260B-SIM
- 1,1-Dichloroethene by EPA Method 8260B

Analytical results indicated that perchlorate, 1,4-dioxane, and 1,1-dichloroethene concentrations were non-detect, demonstrating that the IX vessels are effectively removing any remaining concentrations of COCs. All treated batch water from the frac tank was pumped through the IX vessels followed by reinjection into the designated injection wells. Analytical results are summarized in Table 3 and laboratory analytical reports are provided in Attachment 4.

### FBR Forward Flow and Feed Ramp-up Activities

On August 7, 2019, forward feed into the FBR was initiated. Groundwater was extracted from wells EW-1 and IW-1 at an initial flow rate of 15 gallons per minute (gpm). The treatment system was monitored daily with real-time field measurements, and the FBR environment was optimized and nutrient dosages adjusted as necessary. Field parameters were recorded on the daily field log (Attachment 3). Reactor influent (SP-201) and reactor effluent (SP-301) samples were collected daily to verify perchlorate removal efficiency in the FBR. Reactor samples were submitted to Pace on a 24-hour turnaround time for the analyses listed below:

- Perchlorate by EPA Method 314.0
- Nitrate by EPA Method 300.0
- Total phosphorous by EPA Method 365.4
- Total organic carbon by EPA Method 9060A
- Total suspended solids by EPA Method 2540 D-2011

Analytical results are summarized in Table 4 and laboratory analytical reports are provided in Attachment 4.

Forward flow was gradually increased until the target flow rate of 35 gpm was achieved on September 5, 2019. Additional extraction wells were placed online as necessary to achieve a designated flow rate and/or mass loading for the FBR. Extraction wells were periodically sampled and analyzed to monitor perchlorate concentration fluctuations during startup. Extraction well analytical results are summarized in Table 1 and laboratory analytical reports are provided in Attachment 4.

Mr. Anthony Leverock  
October 31, 2019

Treated water samples were collected from sample port SP-701 weekly to confirm that COC concentrations were less than the cleanup standards prior to reinjection. Treated water samples were analyzed as listed above for treated batch water injection. Analytical results are summarized in Table 3 and laboratory analytical reports are provided in Attachment 4.

Once the target flow was achieved, weekly monitoring and sampling of the treatment system continued for approximately six weeks before switching to monthly routine operation and monitoring. Weekly analytical results are summarized in Table 4 and laboratory analytical reports are provided in Attachment 4. Daily field logs are provided in Attachment 3.

If you have any questions, please contact me at 480.535.7427.

Sincerely,

Arcadis U.S., Inc.



Michael Nesky  
Principal Environmental Engineer



copies:

Bruce Amig, UTC

Tricia Gomes, City of Phoenix

Jeff Page, City of Phoenix

Karen Mittleider, UTAS

Julie Riemenschneider, City of Phoenix

Tables:

- 1 Extraction Well Analytical Results
- 2 Batch Sample Analytical Results
- 3 Ion Exchange Treated Water Analytical Results
- 4 FBR Analytical Results

Attachments:

- 1 March 2019 Startup Plan (on CD)
- 2 Startup Checklist (on CD)
- 3 Daily Field Logs (on CD)
- 4 Laboratory Analytical Reports (on CD)

# TABLES



**Table 1**  
**Extraction Well Analytical Results**  
**Groundwater Treatment Plant Startup Summary**  
**Former Universal Propulsion Company, Inc. Facility**  
**Phoenix, Arizona**

Lab ID	Sample ID	Well	Date	Perchlorate (mg/L)	1,1-DCE (mg/L)	1,4-Dioxane (mg/L)	Nitrate (mg/L)	Phosphorus, Total (mg/L)
				USEPA 314.0	USEPA 8260B	USEPA 8260B-SIM	USEPA 300	USEPA 365.4
L1120100-01	EW-1	EW-1	07/17/2019	0.115	<0.00100	<0.00300	1.73	<0.100
L1127530-03	EW1-080919	EW-1	08/09/2019	2.65				
L1127945-03	EW-1-081119	EW-1	08/11/2019	4.06				
L1128418-03	EW-1-081319	EW-1	08/13/2019	5.07				
L1129572-03	EW-1-081519	EW-1	08/15/2019	5.57				
L1130954-03	EW-1-082019	EW-1	08/20/2019	6.24				
L1131933-02	EW-1-082119	EW-1	08/21/2019	6.44				
L1131933-07	EW-1-082219	EW-1	08/22/2019	6.25				
L1132515-01	EW-1-082319	EW-1	08/23/2019	5.99				
L1132956-01	EW-1-082419	EW-1	08/24/2019	6.32				
L1132953-01	EW-1-082519	EW-1	08/25/2019	6.23				
L1133401-01	EW-1-082719	EW-1	08/27/2019	6.27				
L1134486-01	EW-1-082919	EW-1	08/29/2019	6.40				
L1138881-10	EW-1-091219	EW-1	09/12/2019	5.36				
L1141421-03	IW-1-091919 <sup>1</sup>	EW-1	09/19/2019	5.04				
L1120100-03	EW-2	EW-2	07/17/2019	0.0505	<0.00100	<0.00300	0.675	<0.100
L1127530-04	EW2-080919	EW-2	08/09/2019	0.0763				
L1130954-04	EW-2-082019	EW-2	08/20/2019	0.0713				
L1131933-01	EW-2-082119	EW-2	08/21/2019	0.0715				
L1131933-06	EW-2-082219	EW-2	08/22/2019	0.0712				
L1132515-02	EW-2-082319	EW-2	08/23/2019	0.0673				
L1132956-02	EW-2-082419	EW-2	08/24/2019	0.0664				
L1132953-02	EW-2-082519	EW-2	08/25/2019	0.0665				
L1133401-02	EW-2-082719	EW-2	08/27/2019	0.0682				
L1134486-02	EW-2-082919	EW-2	08/29/2019	0.0689				
L1136030-02	EW-2-090419	EW-2	09/04/2019	0.0605				
L1138881-11	EW-2-091219	EW-2	09/12/2019	0.065				
L1141421-04	EW-2-091919	EW-2	09/19/2019	0.0599				
L1131933-03	IW-082119	IW-1	08/21/2019	81.6				
L1120100-02	IW-1	IW-1	07/17/2019	80.7	<0.00100	<0.00300	9.36	<0.100
L1130954-05	IW-1-082019	IW-1	08/20/2019	81.2				
L1131933-08	IW-1-082219	IW-1	08/22/2019	77.4				
L1132515-03	IW-1-082319	IW-1	08/23/2019	74.1				
L1132956-03	IW-1-082419	IW-1	08/24/2019	73.3				
L1132953-03	IW-1-082519	IW-1	08/25/2019	73.9				

**Table 1**  
**Extraction Well Analytical Results**  
**Groundwater Treatment Plant Startup Summary**  
**Former Universal Propulsion Company, Inc. Facility**  
**Phoenix, Arizona**

Lab ID	Sample ID	Well	Date	Perchlorate (mg/L)	1,1-DCE (mg/L)	1,4-Dioxane (mg/L)	Nitrate (mg/L)	Phosphorus, Total (mg/L)
				USEPA 314.0	USEPA 8260B	USEPA 8260B-SIM	USEPA 300	USEPA 365.4
L1133401-03	IW-1-082719	IW-1	08/27/2019	70.7				
L1134486-03	IW-1-082919	IW-1	08/29/2019	69.8				
L1136030-01	EW-1-090419 <sup>2</sup>	IW-1	09/04/2019	60.7				
L1136030-03	IW-1-090419	IW-1	09/04/2019	55.5				
L1138881-12	IW-1-091219	IW-1	09/12/2019	53.9				
L1141421-05	EW-1-091919 <sup>1</sup>	IW-1	09/19/2019	52.1				
L1120100-04	MW-20	MW-20	07/17/2019	0.202	<0.00100	0.00918	<0.100	<0.100
L1136030-04	MW-20-090419	MW-20	09/04/2019	0.276		0.00855		
L1138881-06	MW-20-091219	MW-20	09/12/2019	0.338		0.0114		
L1141421-06	MW-20-091919	MW-20	09/19/2019	0.343		0.01		
L1143758-02	MW-20-092619	MW-20	09/26/2019	0.336		0.0107		

**Notes and Abbreviations:**

1 = Sample were collected from the wrong sample port.

2 = Sample was collected from the IW-1 sample port.

1,4-DCE = 1,4-dichloroethene

< = Analyte not detected above the listed laboratory reporting limit.

mg/L = milligrams per liter

USEPA = United States Environmental Protection Agency

**Table 2**  
**Batch Sample Analytical Results**  
**Groundwater Treatment Plant Startup Summary**  
**Former Universal Propulsion Company, Inc. Facility**  
**Phoenix, Arizona**

Lab ID	Sample ID	Batch	Date	Perchlorate (mg/L)	1,1-DCE (mg/L)	1,4-Dioxane (mg/L)	TOC (mg/L)	Nitrate (mg/L)	Phosphorus, Total (mg/L)
				USEPA 314.0	USEPA 8260B	USEPA 8260B-SIM	USEPA 9060A	USEPA 300	USEPA 365.4
L1120097-01	BATCH 1	1	07/17/2019	19.6	<0.00100	0.00429		3.04	<0.100
L1120097-02	TRIP BLANK	1	07/17/2019		<0.00100	<0.00300			
L1121166-01	BATCH 1A	1	07/22/2019			<0.00300			
L1122056-01	FBR-BATCH1-072319	1	07/23/2019	0.0267	<0.00100	<0.00300		<0.100	6.26
L1122056-02	FBR-BATCH1-0724/19	1	07/24/2019	0.0277	<0.00100	<0.00300		<0.100	4.94
L1122910-01	FBR-BATCH2-072519	2	07/25/2019	0.232				0.105	5.38
L1122910-02	FBR-BATCH2-072619	2	07/26/2019	0.255				<0.100	5.62
L1123351-01	FBR-BATCH2-072919	2	07/29/2019	0.217				<0.100	4.46
L1124619-01	FBR-BATCH3-073119	3	07/31/2019	0.189				0.185	3.98
L1124619-02	PT-201-073119	3	07/31/2019	8.88					
L1124619-03	FBR-BATCH3-080119	3	07/31/2019	0.181				<0.100	5.75
L1125452-01	FBR-BATCH 4-080319	4	08/05/2019	0.233					3.43
L1125452-02	PT-201-080319	4	08/05/2019	19.60					
L1125452-03	FBR-BATCH4-080419	4	08/04/2019	0.34				<0.100	4.48
L1125452-04	FBR-BATCH4-080519	4	08/05/2019	0.347				<0.100	3.26
L1125452-05	SP-401-080519	4	08/05/2019	0.36	<0.00100	<0.00300		0.196	3.04

**Notes and Abbreviations:**

1,4-DCE = 1,4-dichloroethene

< = Analyte not detected above the listed laboratory reporting limit.

mg/L = milligrams per liter

TOC = total organic carbon

USEPA = United States Environmental Protection Agency



**Table 3**  
**Ion Exchange Treated Water Analytical Results**  
**Groundwater Treatment Plant Startup Summary**  
**Former Universal Propulsion Company, Inc. Facility**  
**Phoenix, Arizona**

Lab ID	Sample ID	Date	Perchlorate (mg/L)	1,1-DCE (mg/L)	1,4-Dioxane (mg/L)
			USEPA 314.0	USEPA 8260B	USEPA 8260B-SIM
L1125450-01	SP-608-080519 <sup>1</sup>	08/05/2019	<0.00400	<0.00100	<0.00300
L1125450-02	TRIP-BLANK	08/05/2019		<0.00100	<0.00300
L1127530-01	SP-701-080919	08/09/2019	<0.00400	<0.00100	<0.00300
L1127530-02	TRIP BLANK	08/09/2019		<0.00100	<0.00300
L1129683-01	SP-701-081519	08/15/2019	<0.00400	<0.00100	<0.00300
L1129683-02	TRIP BLANK	08/15/2019		<0.00100	<0.00300
L1131970-01	SP-701-082219	08/22/2019	<0.00400	<0.00100	<0.00300
L1131970-02	TRIP BLANK	08/22/2019		<0.00100	<0.00300
L1134508-01	SP-701-082919	08/29/2019	<0.00400	<0.00100	<0.00300
L1134508-02	TRIP BLANK	08/29/2019		<0.00100	<0.00300
L1136546-01	SP-701-090519	09/05/2019	<0.00400	<0.00100	<0.00300
L1136546-02	TRIP BLANK	09/05/2019		<0.00100	<0.00300
L1138906-01	SP-701-091219	09/12/2019	<0.00400	<0.00100	<0.00300
L1138906-02	TRIP BLANK	09/12/2019		<0.00100	<0.00300
L1141424-01	SP-701-091919	09/19/2019	<0.00400	<0.00100	<0.00300
L1141424-02	TRIP BLANK	09/19/2019		<0.00100	<0.00300
L1143756-01	SP-701-092619	09/26/2019	<0.00400	<0.00100	<0.00300
L1143756-02	TRIP BLANK	09/26/2019		<0.00100	<0.00300
L1146243-01	SP-701-100319	10/3/2019	<0.00400	<0.00100	<0.00300
L1146243-02	TRIP BLANK	10/3/2019		<0.00100	<0.00300
L1149256-01	SP-701-101019	10/10/2019	<0.00400	<0.00100	<0.00300
L1149256-02	TRIP BLANK	10/10/2019		<0.00100	<0.00300

**Notes and Abbreviations:**

1 = Sample collected from Sample Port 608 on ion exchange) to confirm "clean" prior to injection.

1,4-DCE = 1,4-dichloroethene

< = Analyte not detected above the listed laboratory reporting limit.

mg/L = milligrams per liter

USEPA = United States Environmental Protection Agency

**Table 4**  
**FBR Analytical Results**  
**Groundwater Treatment Plant Startup Summary**  
**Former Universal Propulsion Company, Inc. Facility**  
**Phoenix, Arizona**

Lab ID	Sample ID	Date	Perchlorate (mg/L)	TSS (mg/L)	TOC (mg/L)	Nitrate (mg/L)	Phosphorus, Total (mg/L)
			USEPA 314.0	USEPA 2540 D-2011	USEPA 9060A	USEPA 300	USEPA 365.4
L1126435-01	SP-201-080719	08/07/2019	2.39	<2.50		1.89	<0.100
L1126435-02	SP-301-080719	08/07/2019	0.23	<2.50	<1.00	<0.100	2.07
L1127048-01	SP201-080819	08/08/2019	0.427	<2.50		1.83	<0.100
L1127048-02	SP301-080819	08/08/2019	0.24	<2.50	1.84	<0.100	1.23
L1127529-01	SP201-080919	08/09/2019	0.902			2.25	<0.100
L1127529-02	SP301-080919	08/09/2019	0.209	<2.50	8.85	<0.100	1.22
L1127945-01	SP-201-081119	08/11/2019	1.28			2.3	0.141
L1127945-02	SP-301-081119	08/11/2019	<0.00400	<2.50	7.56	<0.100	0.848
L1128418-01	SP-201-081319	08/13/2019	1.55			2.45	<0.100
L1128418-02	SP-301-081319	08/13/2019	<0.00400	2.5	1.42	<0.100	0.925
L1129572-01	SP-201-081519	08/15/2019	1.69			2.41	<0.100
L1129572-02	SP-301-081519	08/15/2019	<0.00400	<2.50	3.7	<0.100	0.604
L1130954-01	SP-201-082019	08/20/2019	1.830			2.58	<0.100
L1130954-02	SP-301-082019	08/20/2019	<0.00400	<3.33	13.9	<0.100	0.851
L1131933-04	SP-201-082119	08/21/2019	8.450				
L1131933-05	SP-301-082119	08/21/2019	0.0208				
L1131933-09	SP-201-082219	08/22/2019	8.76			3.18 <sup>1</sup>	<0.100
L1131933-10	SP-301-082219	08/22/2019	0.00674	<4.18	8.01	<0.100 <sup>1</sup>	0.972
L1132515-04	SP-201-082319	08/23/2019	6				
L1132515-05	SP-301-082319	08/23/2019	<0.00400				
L1132953-04	SP-201-082519	08/25/2019	11.1				
L1132953-05	SP-301-082519	08/25/2019	<0.00400				
L1132956-04	SP-201-082419	08/24/2019	9.17				<0.100
L1132956-05	SP-301-082419	08/24/2019	<0.00400	3.75	9.56		0.746
L1133401-04	SP-201-082719	08/27/2019	12.9				
L1133401-05	SP-301-082719	08/27/2019	0.00747				
L1134486-04	SP-201-082919	08/29/2019	14.70			3.79	<0.100
L1134486-05	SP-301-082919	08/29/2019	<0.00400	3.2	6.47	<0.100	0.753
L1134881-01	SP-201-083019	08/30/2019	14.30				
L1134881-02	SP-301-083019	08/30/2019	0.006				
L1136030-05	SP-201-090419	09/04/2019	4.97		<1.00		
L1136030-06	SP-301-090419	09/04/2019	<0.00400		8.54		
L1136458-01	SP-201-090519	09/05/2019	4.54			3.63	<0.100
L1136458-02	SP-301-090519	09/05/2019	<0.00400	3.2	9.12	<0.100	0.909
L1138881-01	SP-201-091219	09/12/2019	8.36	<2.50		4.06	<0.100

**Table 4**  
**FBR Analytical Results**  
**Groundwater Treatment Plant Startup Summary**  
**Former Universal Propulsion Company, Inc. Facility**  
**Phoenix, Arizona**

Lab ID	Sample ID	Date	Perchlorate (mg/L)	TSS (mg/L)	TOC (mg/L)	Nitrate (mg/L)	Phosphorus, Total (mg/L)
			USEPA 314.0	USEPA 2540 D-2011	USEPA 9060A	USEPA 300	USEPA 365.4
L1138881-02	SP-301-091219	09/12/2019	<0.00400	<2.50	6.23	<0.100	0.223
L1138881-04	SP-401-091219	09/12/2019		2.5			
L1138881-05	SP-211-091219	09/12/2019		<10.0			
L1141421-01	SP-201-091919	09/19/2019	8.21				
L1141421-02	SP-301-091919	09/19/2019	<0.00400				
L1143758-01	SP-301-092619	09/26/2019	<0.00400				
L1146242-01	SP-201-100319	10/3/2019	9.17				
L1146242-02	SP-301-100319	10/3/2019	<0.00400				
L1149254-01	SP-201-101019	10/10/2019	7.23				
L1149254-02	SP-301-101019	10/10/2019	<0.00400		1.08		

**Notes and Abbreviations:**

1 = Nitrate analysis by USPEA Method 9056A.

1,4-DCE = 1,4-dichloroethene

< = Analyte not detected above the listed laboratory reporting limit.

mg/L = milligrams per liter

TOC = total organic carbon

TSS = Total Suspended Solids

USEPA = United States Environmental Protection Agency

# ATTACHMENTS



**ATTACHMENT 1  
STARTUP PLAN (FINAL/SIGNED)**



Universal Propulsion Company, Inc.

# **STARTUP PLAN**

Former UPCO Facility

Phoenix, Arizona

March 2019



STARTUP PLAN

**STARTUP PLAN**

Former UPCO Facility  
Phoenix, Arizona

Prepared for:  
Universal Propulsion Company, Inc.

Prepared by:  
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Our Ref.:  
03994018.0031

Date:  
March 2019

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EXPIRES: 12-31-21

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## TABLES

Table 1. Startup Schedule

Table 2. Startup Sampling Plan

## APPENDICES

Appendix A Fields Forms

Appendix B Envirogen O&M Manual – Section 3

Appendix C Temporary Frac Tank System: Standard Operating Procedure and Site Plan



## ACRONYMS AND ABBREVIATIONS

ADEQ	Arizona Department of Environmental Quality
COC	constituent of concern
EPA	United States Environmental Protection Agency
FAH	Flow Alarm High
FAL	Flow Alarm Low
FBR	fluidized bed reactor
GAC	granular activated carbon
gpm	gallons per minute
GWTP	Groundwater Treatment Plant
HMI	Human Machine Interface
HIM	Human Interface Module
HOA	Hand-Off-Auto
IEX	ion exchange
IP	Internet Protocol
LAH	Level Alarm High
LAL	Level Alarm Low
MCC	Motor Control Center
MCP	Main Control Panel
mg/L	milligrams per liter
O&M	operations and maintenance
ORP	oxidation-reduction potential
P&ID	process and instrumentation diagram
PAH	Pressure Alarm High
PAL	Pressure Alarm Low
PLC	programmable logic controller

## STARTUP PLAN

RCP	Remote Control Panel
RJ-45	Registered Jack 45
SC	Subscriber Connector
SCADA	Supervisory Control and Data Acquisition
SOP	standard operating procedure
TOC	total organic carbon
UPCO	Universal Propulsion Company, Inc.
VFD	variable frequency drive

## INTRODUCTION

Arcadis U.S., Inc. (Arcadis) has prepared this Startup Plan for the Groundwater Treatment Plant (GWTP) located at the former Universal Propulsion Company, Inc. (UPCO) facility at 25401 North Central Avenue in Phoenix, Arizona (the Site). The GWTP was installed as part of a corrective measure for addressing constituents of concern (COCs) present in groundwater at concentrations above the Arizona Department of Environmental Quality (ADEQ)-approved site groundwater cleanup standards.

The purpose of this Startup Plan is to guide field personnel in the startup and shakedown of the full-scale groundwater treatment system at the Site. The system has been installed to treat perchlorate, 1,4-dioxane, and 1,1-dichloroethene in groundwater at the Site. The ADEQ-approved Site groundwater cleanup standards for the COCs, as established in the CMI Work Plan (Arcadis 2016), are 14 µg/L for perchlorate, 3.5µg/L for 1,4-dioxane, and 7 µg/L for 1,1-dichloroethene.

To address COC concentrations exceeding cleanup standards in the bedrock aquifer source area of the Site, the corrective measure includes groundwater extraction, ex-situ pretreatment of groundwater containing 1,4-dioxane and 1,1-dichloroethene with liquid granular activated carbon (GAC), treatment of groundwater containing perchlorate with an anoxic fluidized bed reactor (FBR), and reinjection of treated groundwater. Groundwater extraction, ex-situ treatment, and reinjection into the bedrock aquifer around the periphery of the perchlorate groundwater plume will remove constituent mass and provide hydraulic control of the plume. Additionally, groundwater extraction and reinjection within the bedrock aquifer source area will increase flushing through the source area, thereby increasing the constituent mass removal rate and decreasing the time to achieve the groundwater cleanup standards.

This Startup Plan will guide the overall facility startup process and aid in verifying system functionality, operability, and safety. The Startup Plan includes the steps described in sequentially numbered sections. Numbered headings correspond to relevant field forms, which are included as Appendix A. Plan drawings are attached to that appendix. Section 3 of the Envirogen Operation and Maintenance (O&M) Manual, which is the section relevant to this Plan, is included as Appendix B. Appendix C contains a Standard Operating Procedure (SOP) and site plan for the temporary frac tank.

# 1 PRE-STARTUP/POST-CONSTRUCTION PUNCH LIST

**Table 1** - Startup Schedule is to be used as a guide for the approximate duration of respective startup activities as they are described in the following sections of this document.

This section covers the list of items to check before starting the system. **Field Forms 1.a.i** through **1.a.ix**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 1.a.

- a. Mechanical Components Installation Verification - Using the appropriate Process and Instrumentation Diagram (P&ID), highlight sections as they are inspected, denoting areas needing attention – scan annotated P&ID to project team as a “status” update of system completeness - start at extraction wells and move through the plant in order of process flow.
  - i. Piping
    1. Inspect cracks, incomplete connections, unions, flanges.
    2. Verify piping supports/hangers, clamps, Unistrut.
    3. Install piping labels/flow direction arrows.
  - ii. Manual Valves
    1. Inspect for cracks, incomplete connections, unintentionally glued components.
    2. Manually operate valve (if applicable).
    3. Verify hand-tightness of unions (true-union valves).
    4. Position all manual valves in orientation as indicated on P&ID.
    5. Verify that sample ports are CLOSED.
  - iii. Check Valves
    1. Verify that check valves are installed in proper orientation.
  - iv. Pressure Control Valves
    1. Verify that pressure control valves are installed in proper orientation and location and adjusted such that they are fully OPEN (Do not adjust pressure control setpoint – this will be done during Step 4 – Clean Water test).
  - v. Pressure Indicators
    1. Verify that gauges are proper range for given process.
    2. Verify that gauges are fluid filled and calibrated (reading zero).

## STARTUP PLAN

- vi. Blind Flanges
  - 1. Verify that all are gasketed properly and torqued to manufacturer's specification.
- vii. Local Operation Verification
  - 1. Verify operation of all manual valves, sample ports, and other relevant system components.

**Field Form 1.b**, provided in Appendix A – Field Forms, is to be used to document the action items identified below in Section 1.b.

- b. Instruments
  - i. Installation Verification – Use P&ID to verify that all instruments as shown have been installed. Denote on P&ID any additional or missing instruments. Use manufacturer installation instructions and/or user manual to verify proper physical installation (including process connections, orientation, and other considerations) and proper wiring (including power source, signal wire type and quantity, grounding, and terminations).
  - ii. Local Programming Setup and Functionality Testing – Use manufacturer user manual along with process control description to configure local programming to provide the signals and local displays as per design. Where appropriate, verify that local screens turn on and all settings and monitoring are accessible. Verify that instruments are properly calibrated where possible (pressure and flows show “0” on local displays). Verify that instrument signal ranges in the programming match the signal ranges of the process instrument.

**Field Forms 1.c.i** and **1.c.ii**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 1.c.

- c. Control Panels
  - i. General Condition Assessment – Inspect control panel enclosure for any visible damage. Using the control panel layout and Bill of Materials drawings as a reference, verify that all devices indicated in the design have been installed and note any visible signs of damage or improper installation.
  - ii. Wiring Verification - Use the control panel wiring schematics to verify that physical wiring coincides with design. Use the Riser Diagram with control panel wiring schematics to verify that field wiring terminations to control panels coincide with design.

## STARTUP PLAN

- iii. Voltage Verification - Verify proper voltage throughout the entire panel from the line side of the main disconnect to the field device terminal blocks, verifying all devices from line to load side. Verify line side of each circuit protection device before closing each circuit.
- iv. Device Functionality Verification – Use device user manuals to verify expected functionality of each device after applying power.

## 2 COMMUNICATION VERIFICATIONS

This section identifies the action items that must be completed to verify communications in the treatment system. **Field Form 2.a**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 2.a.

- a. Verification Over Copper Ethernet Verification Checklist
  - i. Main Control Panel (MCP) Managed Switch Configuration – Configure managed ethernet switch to allow communication with Motor Control Center (MCC) Variable Frequency Drives (VFDs), FBR Programmable Logic Controller (PLC), and Remote Control Panel 1 (RCP-1) PLC by assigning managed switch Internet Protocol (IP) settings and network communications for each Registered Jack 45 (RJ-45) and Subscriber Connector (SC) port in use, as indicated on the Network Diagram.
  - ii. MCC Managed Switch Configuration – Configure managed ethernet switch to allow communication with MCP PLC and MCC VFD by assigning managed switch IP settings and network communications for each RJ-45 and SC port in use, as indicated on the Network Diagram.
  - iii. MCP to MCC – Verify communication from the MCP PLC to each VFD in the MCC by establishing connectivity through RSLogix (PLC programming software).
  - iv. MCP to FBR Skid – Verify communication between FBR PLC and MCP PLC by establishing messaging through RSLogix (Supervisory Control and Data Acquisition [SCADA] programming software).
  - v. SCADA to MCP – Verify communication between SCADA system and MCP PLC by establishing connectivity through RS View.
  - vi. SCADA to FBR – Verify communication between SCADA system and FBR PLC and Human Machine Interface (HMI) by establishing connectivity through RS View.

**Field Form 2.b**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 2.b.

- b. Communication Over Fiber Optic Verification Checklist
  - i. Verify communication between RCP-1 PLC and MCP PLC by establishing messaging through RSLogix.

## STARTUP PLAN

- ii. Verify communication between RCP-1 PLC and SCADA by establishing connectivity through RS View.



### 3 MECHANICAL DRY-RUN TEST PROCEDURE

**Field Form 3.a-b**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Sections 3.a and 3.b.

- a. Instrumentation Loop Checks - Verify signal continuity among all sensors; transmitters; valves; motors; and VFD control, junction boxes, and control panels.
- b. Process Instrument Functionality (transducers, switches, valves, and other components) - Verify instrumentation functionality with manual measurements where possible or by physically actuating devices.
  - i. Exercise pneumatic Bray valves, visually confirm valves open, and return to closed position.
  - ii. Verify that pressure transducers in Extraction and Injection wells are displaying a value – scale instruments according to manufacturer recommendations.
  - iii. Verify that float switches in tanks, sumps, and equipment pads show change in state when exercised.

**Field Form 3.c**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 3.c.

- c. Alarm/Interlock Testing Checklist
  - i. Modify existing alarm/interlock list table as checklist.
    1. Verify setpoints for scaled (analog) alarms (i.e., Flow Alarm Low [FAL]/Flow Alarm High [FAH], Pressure Alarm Low [PAL]/Pressure Alarm High [PAH], and others).
    2. Verify Normally Open or Normally Closed (Level Alarm Low [LAL]/Level Alarm High [LAH] float switches, and others).
    3. Verify that proper alarm groups are associated with respective interlocks.

**Field Forms 3.d.i and 3.d.ii**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 3.d.

- d. Motor Bump Test Checklist
  - i. Bump test all motors to verify functionality and rotation.
  - ii. Bump test all motors on VFDs to verify functionality and rotation.

## STARTUP PLAN

If items are detected that require repair or attention in the above steps, Arcadis personnel will attempt to make necessary repairs for minor corrections or require the construction contractor to correct items covered under warranty as appropriate. Depending on the severity of correction required, execution of the remainder of this Startup Plan may need to be postponed until the necessary repairs are completed.

## 4 CLEAN WATER TEST PROCEDURE

Refer to Appendix B – Envirogen O&M Manual Section 3 for startup procedures specifically related to the FBR.

- a. Frac Tank Recirculation System and Initial Tank Fill Procedures
  - i. Refer to Appendix C - Temporary Frac Tank System: Standard Operating Procedure and Site Plan.
  - ii. Use “manual fill” procedures using process pumps to fill tanks, vessels, and other components.
    1. Verify that all manual valves, Hand-Off-Auto (HOA) switches, and virtual switches are in proper orientation.
    2. Fill all tanks and vessels, ensuring that any air is “bled” off using manual sample ports and other components.
    3. Bypass Ion Exchange (IEX) and GAC skids once all vessels are full and air is bled off.
      - a. Allow IEX and GAC vessels to soak for vendor-recommended duration (minimum 12 hours).
    4. Fill T-300 (FBR) with clean water according to Appendix B – Envirogen O&M Manual - Sections 3.1.2 “General Startup,” 3.1.3 “Carbon Media Loading,” and 3.1.4 “Wash Media and Establish Fluidization Loading” for instruction on filling FBR with clean water, performing hydrostatic testing, and loading GAC media in preparation for Section 3.1.5 “Process Feed Startup Plan.” (1.5- to 2-day duration).
      - a. Arcadis’s subcontractor will perform carbon media loading activities under the oversight of Arcadis and Envirogen.

**Field Form 4.b**, provided in Appendix A – Field Forms, is to be used to document the action items identified below in Section 4.b.

- b. Process Instrument Functionality (transducers, switches, valves, and other equipment) - Verify instrumentation functionality with manual measurements where possible or by physically actuating devices. Verify that all transmitter current signals in milli-amperes at the control panel are within the expected range for the operating conditions.
  - i. Verify that pressure transducers are functional and providing anticipated scaled value (check by manually measuring water level).

## STARTUP PLAN

- ii. Verify that pressure transmitters are functional and providing anticipated scaled valve (check to associated pressure indicator where available).
- iii. Verify that all flow transmitters are functional and providing anticipated flow range value and flow pulse signals.

**Field Form 4.c** and **4.c.ii**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 4.c.

### c. Motor Control Verification Checklist

- i. Pump On/Off Control – Verify that pumps with motor starters turn on when in “Hand,” Off when in “Off,” and turn on with PLC command when in “Auto.” FAL.
- ii. VFD Control – Verify that pumps on VFDs allow control over the local Human Interface Module (HIM) device when in “Hand,” Off when in “Off,” and start at the defined speed point as per the PLC command when in “Auto.”

**Field Form 4.d**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 4.d.

### d. Process Control Verification

- i. Flow Control – Verify that VFD speed command setpoints from P&ID loop within the PLC properly control flow rates.
- ii. Level Control – Verify that VFD speed command setpoints from P&ID loop within the PLC properly control levels.

**Field Form 4.e**, provided in Appendix A – Field Forms, are to be used to document the action items identified below in Section 4.e.

### e. FBR Integration and Optimization -

- i. Ensure that process data exchange, alarms, interlocks, and permissives between MCP and FBR are functioning properly.

### f. Clean Water Injection

- i. After completing Clean Water Test, injection of some of the clean water volume stored in the frac tank and downstream process tankage will be necessary to provide storage volume for extracted water for feed flow to the FBR.
  - 1. Injection will occur via manual injection using Injection Pump P-701.

## STARTUP PLAN

- 
2. Injection wells will be identified, and injection volume will be determined by startup team and recorded at time of disposal.

## 5 STARTUP OF FLUIDIZED BED REACTOR WHILE RECIRCULATING THROUGH FRAC TANK

**During this portion of startup, system recirculation will occur through process tanks and the temporary Frac Tank System – NO WELLFIELD INJECTION WILL OCCUR during activities listed in Section 5.**

Two 21,000-gallon frac tanks will be used during this portion of startup activities. One frac tank will be used to batch extracted groundwater to the FBR. The second frac tank will be used to temporarily store treated water pending receipt of laboratory analyses confirming full treatment of COCs. Fully treated water generated during this portion of startup activities and temporarily stored in a frac tank will be pumped into the injection equalization tank as described in Section 6 and reinjected into the aquifer.

**Table 2** - Startup Sampling Plan is to be used as a guide for field and laboratory analysis during startup activities.

- a. Baseline Assessment of Extracted Groundwater. Before batching extracted groundwater in the temporary frac tank, laboratory analysis samples and field measurements of key parameters will be collected from each of the four extraction wells (IW-1, EW-1, EW-2, and MW-20) to provide initial data to the Arcadis engineer for determining which wells will be used for batching. All purge water generated during sample collection will be stored in the frac tank used for batching. Groundwater from extraction well MW-20 will be pumped through the liquid GAC system for pretreatment of 1,4-dioxane before placement into the frac tank.
  - i. Extracted Groundwater Laboratory Analysis Samples
    1. Manually turn on extraction pump and evacuate any air in the discharge piping via sample port.
    2. Purge sample port (SP-10X) in well vault for 15 to 20 seconds.
    3. Collect sample and pack on ice.
    4. Verify water quality and concentration of COCs via laboratory analysis as follows:
      - a. Laboratory Analysis of Individual Extraction Well Flow: Frequency – Once per Well; Turnaround Time – 48 hours.
        - i. Perchlorate by United States Environmental Protection Agency (EPA) Method 314.0

## STARTUP PLAN

- ii. 1,4-Dioxane by EPA Method 8260B
  - iii. 1,1-Dichloroethene by EPA Method 8260B
  - iv. Nitrate by EPA Method 300.0
  - v. Phosphorous, Total by EPA Method 6010B
- ii. Extracted Groundwater Field Measurements: Frequency – Once per Well; Turnaround Time – Real-Time Field Measurements.
- 1. Dissolved oxygen
  - 2. pH
  - 3. Nitrate-N
  - 4. Orthophosphate-P
  - 5. Total organic carbon (TOC)
  - 6. Oxidation-reduction potential (ORP)
- b. Batching Groundwater in Frac Tank. Analytical data from Section 5.a.i.4 will be used by the Arcadis engineer to determine an approximate mass loading rate supplied by an individual extraction well or blend of extraction wells to fill the frac tank with a batch of groundwater at the target concentration of approximately 10 milligrams per liter (mg/L) of perchlorate to be used for initial feed flow to the FBR, as specified in the Basis of Design Report.
- i. Fill the frac tank with groundwater from extraction well(s) per Arcadis engineer's baseline assessment and instruction.
  - ii. Sample batched groundwater in the frac tank to determine water quality and perchlorate concentrations before initial feed to the FBR.
    - 1. Laboratory analysis of initial batch of extraction well water in frac tank: Frequency – One-Time Sample; Turnaround Time – Rush (anticipate preliminary results in 48 hours, final analytical results in 72 hours).
      - a. Perchlorate by EPA Method 314.0
      - b. Nitrate by EPA Method 300.0
      - c. Phosphorous, Total by EPA Method 6010B
    - 2. Arcadis engineer will approve sample results before initial FBR feed.

## STARTUP PLAN

- c. Initial Feed of Extracted Water to FBR, Inoculation and Microbial Acclimation before Forward Feed [Total Estimated Duration: Up to 7 days]. Refer to Appendix B - Envirogen O&M Manual Section 3.1.6 for guidance on initial feed of extracted water, inoculation, and acclimation before forward feed through the FBR.
  - i. Initial Batch Sequence. Once analytical results of batched groundwater from Section 5.b.ii.1 are approved by the Arcadis engineer, replace clean water in the FBR with “batched” extracted groundwater from the Frac Tank System (approximately 3,000 gallons).
    - 1. Clean water from the FBR is to be pumped through IEX and into the second frac tank for temporary storage of treated water pending confirmation that IEX Effluent laboratory analysis results from Section 5.c.i.2 are less than cleanup standards for all COCs.
    - 2. Laboratory Analysis of FBR Effluent/IEX Influent and IEX Effluent. This sampling event occurs upon initial discharge of water from the FBR (during “Initial Batch Sequence” as clean water is replaced by batched groundwater) and during each sequential batching activity (three total batches assumed) to determine mass loading to IEX and verify that full treatment is achieved downstream of IEX: Frequency – Once During Each Batch. Sequence; Turnaround Time – 72 hours.
      - a. Perchlorate by EPA Method 314.0
      - b. 1,4-Dioxane by EPA Method 8260B
      - c. 1,1-Dichloroethene by EPA Method 8260B
      - d. Nitrate by EPA Method 300.0
      - e. Phosphorous, Total by EPA Method 6010B
      - f. TOC by EPA Method 415.3
  - ii. Inoculate FBR and Monitor Microbial Acclimation
    - 1. To expedite biological startup of FBR, inoculum (1-2% TSS) in the form of anaerobic digester sludge will be collected from a local municipal wastewater treatment facility.
    - 2. Inoculum will be added to the FBR once clean water in the FBR has been replaced by the initial batch of feed water.
      - a. Approximately 10 to 50 gallons of anaerobic digester sludge will be added to FBR per vendor recommendation (Refer to Appendix B - Envirogen O&M Manual Section 3.1.6).



## STARTUP PLAN

- b. Additional inoculum can be supplied by municipal wastewater treatment facility if biological acclimation is proceeding slowly and there is a need to boost biomass growth during FBR biological startup.
- iii. Field Measurements to Verify Microbial Acclimation: Frequency – Up to Daily; Turnaround – Real-Time Field Measurements.
  1. Dissolved oxygen
  2. pH (target = 6.5 – 7.5)
  3. Nitrate-N (target = less than 2.0 mg/L)
  4. Orthophosphate-P (target = 1.0 mg/L [minimum residual])
  5. TOC
  6. ORP
- iv. Laboratory Analysis of FBR Recirculation to verify adequate environment is maintained in the FBR for microbial growth: Frequency – Up to Daily; Turnaround Time - Rush (anticipate preliminary results in 48 hours, final analytical results in 72 hours).
  1. Perchlorate by EPA Method 314.0
  2. Nitrate by EPA Method 300.0
  3. Phosphorous, Total by EPA Method 6010B
  4. TOC by EPA Method 415.3
- v. Additional Batch Sequences. Per Appendix B: Envirogen O&M Manual - Section 3.1.6, feed flow will be provided to FBR as necessary using FBR Transfer Pump (P-201).
  1. Once nitrate-N concentration in the FBR drops below 1.0 mg/L after completing the above steps in Sections 5.c.i through 5.c.iv, approximately 3,000 gallons of feed flow will be introduced to the FBR at initial flow of 10 gallons per minute (gpm), while recirculating through the Frac Tank System.
    - a. Addition of sodium nitrate to FBR may be used (target = 20 to 25 parts per million of nitrate-N) to stimulate biomass growth in an effort to accelerate biological acclimation, as necessary.
    - b. The above step (Section 5.c.v) will be repeated to achieve desired results specified below in Section 5.c.v.2 before proceeding with Section 6.

## STARTUP PLAN

2. Administering Forward Flow
  - a. The below indicators will be used to determine the FBR's level of acclimation to transition to Section 6.
    - i. Nitrate concentration (less than 1.0 mg/L) is measured using field test kits.
    - ii. 70 percent perchlorate removal is observed, down to approximately 30 percent of original feed concentration, via laboratory analysis (Section 5.c.iv).
  - vi. Once analytical results from Section 5.c.i.2 are received and verified, and the indicators listed above in Section 5.c.v.2 are observed, forward flow will be administered per Section 6 below.

## 6 ADMINISTERING FORWARD FLOW: TREATED WATER INJECTION AND FBR FEED RAMP-UP

Results of laboratory analyses for treated water samples collected at the IEX Effluent, as specified in Section 5.c.i.2, will be used to confirm that COC cleanup standards have been achieved for treated water temporarily stored in the frac tank following each batch sequence. Upon receipt of verified laboratory analytical results that confirm cleanup standards have been achieved, treated water from the frac tank will be pumped into the injection equalization tank and reinjected into the aquifer before administering forward flow of the FBR.

After batch startup of the FBR, and after reinjection of treated water generated during batch startup of the FBR as specified in Section 5 above, groundwater extraction and reinjection of treated water will commence at an initial flow rate of approximately 10 gpm utilizing the extraction well(s) used during batching. Additional extraction wells will be placed on line, as appropriate, during each step up in flow rate as outlined below.

- a. Once analytical results are verified and approved as specified in Section 5.c above, system operation will transition stepwise to forward flow.
- b. [Duration: up to 5 weeks] – Assuming the following:
  - i. No unexpected FBR feed shutdowns.
  - ii. FBR feed water perchlorate concentrations do not vary significantly from the target concentration of 10 mg/L.
  - iii. No system or startup interruptions due to unexpected mechanical, electrical, or process control issues.
- c. IEX vessels will be relied on for treatment of perchlorate downstream of the FBR (i.e., “polishing”) until full microbial acclimation is achieved in the FBR. Analytical results from samples collected from the influent and effluent of the FBR, as specified in Section 6.f below, will be used to calculate the perchlorate destruction efficiency of the FBR and adjust dosing rates for the addition of nutrients and chemicals (e.g., TOC, nitrogen, phosphorous) based on effluent residual concentrations necessary to keep the FBR operating within acceptable ranges.
  - i. IEX will remain in operation following startup activities, through the life of the groundwater treatment system; the vendor recommends that IEX medium is continuously wetted.

## STARTUP PLAN

However, the FBR will be operated to maximize perchlorate destruction efficiency and minimize or eliminate perchlorate mass loading on IEX.

- d. Extracted flow and, therefore, FBR feed flow will be increased in a stepwise manner according to Appendix B - Envirogen O&M Manual Section 3, until system influent target of 35 gpm is achieved while operating all four extraction wells at the approximate individual flow rates specified in the Basis of Design Report.
  - i. Flow from extraction wells will be balanced to a blended target FBR feed concentration of approximately 10 mg/L perchlorate.
  - ii. Increase of feed rate at each step up in flow will be targeted at 5 gpm to regulate the mass loading of perchlorate into the FBR.
    - 1. Duration between 5 gpm stepwise increments is anticipated to be approximately 7 days but is dependent upon obtaining adequate perchlorate destruction efficiency and microbial acclimation before stepping up flow.
    - 2. Laboratory analytical data from Sections 6.e through 6.f and up to daily field measurements of ORP and other parameters (Section 5.c.iii) will be used to verify readiness to increase feed flow in a stepwise manner.
- e. Treated Water Laboratory Analysis – Frequency – Weekly; Turnaround Time – 5 Days.
  - i. Injection (SP-701)
    - 1. Perchlorate by EPA Method 314.0
    - 2. 1,4-Dioxane by EPA Method 8260B
    - 3. 1,1-Dichloroethene by EPA Method 8260B
- f. FBR Destruction Efficiency Laboratory Analysis - Samples from influent and effluent of FBR will be taken to capture FBR removal efficiency of perchlorate and mass loading of perchlorate to IEX skid – frequency of this sampling to be determined by the startup team at the time of system startup.
  - i. Reactor Influent (SP-201) and Reactor Effluent (SP-301)/IEX Influent – Frequency – Up to Daily; Turnaround Time – Rush (anticipate preliminary results in 48 hours, final analytical results in 72 hours).
    - 1. Perchlorate by EPA Method 3140
    - 2. Nitrate by EPA Method 300.0

## STARTUP PLAN

3. Total Suspended Solids by EPA Method 160.2
4. Phosphorus, Total by EPA Method 6010B
5. Ammonia (analyze FBR Effluent only if/when urea is used as a nutrient source)

After achieving the target design flow rate for the FBR, reinjection flow rates will be adjusted to their target design injection rates and system operation will switch from startup to routine operation and monitoring.

Valves at the injection header will be adjusted for each of the injection wells to regulate injection flow rates until the target rate into each well is achieved.

During the first year of routine operation, system performance sampling will be performed monthly. After the first year of routine operation, performance data will be evaluated to determine if a reduction in system performance sampling frequency is warranted, and if so, UPCO will submit a permit modification to ADEQ at that time. Routine monitoring of the system will include monthly collection of system performance samples from FBR Influent, FBR Effluent/IEX Influent, and IEX Effluent. Monthly system performance samples will be analyzed for perchlorate by EPA Method 314.0; 1,4-dioxane by EPA Method 8260B; and 1,1-Dichloroethene by EPA Method 8260B to document treatment performance of the FBR and IEX. The analytical results from samples collected from IEX Effluent will demonstrate that the treatment system achieves the COC cleanup standards before reinjecting treated water. Additionally, GAC system performance samples will be collected monthly from the GAC Influent and GAC Effluent. Monthly GAC system performance samples will be analyzed for 1,4-dioxane; and 1,1-dichloroethene by EPA Method 8260B to document pretreatment performance of the GAC system and to facilitate evaluation of liquid-phase carbon change-out schedules.

All routine monitoring analytical results will be tabulated and summarized in a letter report and delivered to ADEQ within 30 days of receipt of final laboratory analytical data. Additional operation, maintenance, monitoring, and reporting requirements will be outlined under separate cover for approval by ADEQ and incorporation into the UPCO Resource Conservation and Recovery Act permit.

Within 45 days of achievement of full system startup, a startup summary report will be submitted to ADEQ for incorporation into the UPCO Resource Conservation and Recovery Act permit. The startup summary report will include laboratory analytical reports, field logs, and a summation of startup activities performed during execution of this startup plan.

# TABLES



TASK	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
1. Pre-Startup/Post-Construction Punch-List	Yellow								
2. Communication Verification		Yellow							
3. Mechanical Dry-Run Test Procedure		Yellow, Green							
4. Clean Water Test Procedure			Green	Green					
5. Startup of FBR while Recirculating through Frac-Tank				Green	Green				
6. Administering Forward Flow					Green	Yellow	Yellow	Yellow	Yellow

**Notes:**

Envirogen Onsite Support + Arcadis Startup Team

Arcadis Startup Team (only)

This schedule assumes the following:

1. No unexpected fixed bed reactor (FBR) feed shutdowns
2. Extracted water constituent of concern (COC) concentrations are as anticipated based on historical sampling data, and, therefore provide anticipated influent concentration
3. No system or startup interruptions occur due to unexpected mechanical, electrical or process control issues
4. Operator's presence is minimal on weekends

**Table 2**  
**Startup Sampling Plan**  
**Startup Plan, Former UPCO Facility**  
**Phoenix, Arizona**

Sample Frequency	Sample Location	Perchlorate by EPA 314.0	Nitrate by EPA 300.0	TOC by EPA 415.3	Iron, Dissolved 6010B	Iron, total by 6010B	Total Suspended Solids by EPA 160. 2	Ammonia	Phosphorous, Total by 6010B	1,4-Dioxane by EPA 8260B	1,1-Dichloroethene by EPA 8260B	Arsenic by 6010	Lead by 6010	ORP	pH	Temperature	Dissolved Oxygen	Ammonia-N	Phosphate	Nitrate	TOC	NOTES	
		Lab Analysis												Field Analysis									
Daily or Semi-Weekly	EW-1 (SP-111)													X	X	X	X						
	EW-2 (SP-112)													X	X	X	X						
	IW-1 (SP-113)													X	X	X	X						
	MW-20 (SP-114)													X	X	X	X						
	GAC EFFLUENT (SP-806)																						
	REACTOR INFLUENT (SP-201)	X^	X^						X^						X	X	X	X		X	X		
	REACTOR EFFLUENT (SP-301)	X^	X^	X^					X^						X	X	X	X	X	X	X		
INJECTION (SP-701)																							
Weekly	EW-1 (SP-111)	X	X					X						X	X	X	X		X	X			
	EW-2 (SP-112)	X	X					X						X	X	X	X		X	X			
	IW-1 (SP-113)	X	X					X						X	X	X	X		X	X			
	MW-20 (SP-114)	X	X					X	X					X	X	X	X		X	X			
	GAC EFFLUENT (SP-806)								X														
	REACTOR INFLUENT (SP-201)	X	X				X		X					X	X	X	X		X	X			
	REACTOR EFFLUENT (SP-301)	X	X	X			X	X	X					X	X	X	X	X	X	X	X		
INJECTION (SP-701)	X		Y	Y	Y				X	X	X	X											

**Notes:**  
 All samples are assumed to require standard turnaround time unless otherwise indicated in this table or in Startup Plan document.  
 ^ During Startup Plan - Section 5 & 6: Turnaround Time = Rush (anticipate preliminary results in 48 hours, final analytical results in 72 hours)  
 Y = To be sampled as necessary.  
 GAC = granular activated carbon



# APPENDIX A

Fields Forms





**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

Field Form 1.a.ii												
Unit Process (Drawing Reference Sheet)	Extraction/Injection Manifold (P-3)										Compressed Air	
	RW-02	RW-01	MW-05	IW-01	EW-01	MW-11	EW-02	RW-03	IW-03	MW-20 (Note 1)		
<b>Piping</b>												3/4
1. Inspect cracks, incomplete connections, unions, flanges												
2. Verify supports/hangers, clamps, unistrut												
3. Install piping labels/flow direction arrows												
4. Inspect dampener fitting												
5. Hose (compressed air only) - inspect compression fittings, etc.	FV-715	FV-714	FV-712	FV-113	FV-111	FV-713	FV-112	FV-716	FV-711	FV-114		
<b>Instrumentation</b>												
Verify the location and installation of the following:												
1. Level switch												
2. Pressure transducers												
3. Pressure transmitters												
4. Flow meters												
5. Pressure Relief Valve												
<b>Manual Valves</b>												
1. Inspect for cracks, incomplete connections, unintentionally glued components												
2. Manually operate valve (if applicable)												
a. Verify hand-tightness of unions (true-union valves)												
3. Position all manual valves in orientation as indicated on PID												
4. Verify sample ports are <u>CLOSED</u>												
<b>Check Valves</b>												
1. Verify check-valves are installed in proper orientation												
<b>Pressure Control Valves</b>												
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)												
2. Verify that the Pressure Control Valves are fully OPEN												
<b>Pressure Indicators</b>												
1. Verify that gauges are proper range for given process												
2. Verify gauges are fluid filled and calibrated (reading zero)												
<b>Flanges</b>												
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)												
2. Pump Suction and Discharge flange												
3. Torqued to manufacturer specification												
<b>Bulk Head Fittings</b>												
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall												

**Notes**

1. Not typical: There should be additional 2" valve going to Bag filters

Instructions: Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

Field Form 1.a.iii

Unit Process (Drawing Reference Sheet)	Influent Equalization Tank (T-200)								Backwashing Conditioning Tank (T-210)				Compressed Air
	IN	IN	IN	IN	IN	OUT	OUT	OUT	IN	OUT	OUT	OUT	
	Process water, P-3, from manifold 3" PVC	Process water, P-8, from GAC 2" PVC	Sump water, P-5 from FBR pad 3" PVC	From Sump Pump (P-003) 2" PVC	From P-211 2" PVC	To FBR Skid (P-5)	Tank Drain 2"	Atmosphere	Backwash P-8 from GAC Backwash 3" PVC	To P-211 (including P-11) 2"	Tank Drain 2"	Atmosphere	
<b>Piping</b>													
1. Inspect cracks, incomplete connections, unions, flanges													
2. Verify supports/hangers, clamps, unistrut													
3. Install piping labels/flow direction arrows													
4. Inspect dampener fitting													
5. Hose (compressed air only) - inspect compression fittings, etc.						FV-307				FV-212			
<b>Instrumentation</b>													
Verify the location and installation of the following:													
1. Level switch													
2. Pressure transducers													
3. Pressure transmitters													
4. Flow meters													
5. Pressure Relief Valve													
<b>Manual Valves</b>													
1. Inspect for cracks, incomplete connections, unintentionally glued components													
2. Manually operate valve (if applicable)													
a. Verify hand-tightness of unions (true-union valves)													
3. Position all manual valves in orientation as indicated on PID													
4. Verify sample ports are CLOSED													
<b>Check Valves</b>													
1. Verify check-valves are installed in proper orientation													
<b>Pressure Control Valves</b>													
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)													
2. Verify that the Pressure Control Valves are fully OPEN													
<b>Pressure Indicators</b>													
1. Verify that gauges are proper range for given process													
2. Verify gauges are fluid filled and calibrated (reading zero)													
<b>Flanges</b>													
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections,													
2. Pump Suction and Discharge flange													
3. Torqued to manufacturer specification													
<b>Bulk Head Fittings</b>													
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall													

**Notes**

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

Field Form 1.a.iv										
Unit Process (Drawing Reference Sheet)	FBR Equipment Skid (Vendor)			Fluidized Bed Reactor		Air Compressor		Tempered Water Tank & Emergency Eyewash and Shower	Sump Pump	FBR Containment Pad Level Switch
	IN	IN	OUT	OUT		OUT	Branch		OUT	
	Process Water P-4, from Influent EQ Tank	Fluidized Bed Reactor Tank	To Fluidized Bed Reactor Tank	Process Water P-6, to FBR Effluent Eq Tank		Compressed Air to P-4	Compressed Air to P-3		Sump Water P-4 to Influent	
	2" PVC			6" PVC		3/4"	3/4"		3"	
<b>Piping</b>										
1. Inspect cracks, incomplete connections, unions, flanges										
2. Verify supports/hangers, clamps, unistrut										
3. Install piping labels/flow direction arrows										
4. Inspect dampener fitting										
5. Hose (compressed air only) - inspect compression fittings, etc.			<b>FV-308</b>							
<b>Instrumentation</b>										
Verify the location and installation of the following:										
1. Level switch										
2. Pressure transducers										
3. Pressure transmitters										
4. Flow meters										
5. Pressure Relief Valve										
<b>Manual Valves</b>										
1. Inspect for cracks, incomplete connections, unintentionally glued components										
2. Manually operate valve (if applicable)										
a. Verify hand-tightness of unions (true-union valves)										
3. <u>Position all manual valves in orientation as indicated on PID</u>										
4. Verify sample ports are <b>CLOSED</b>										
<b>Check Valves</b>										
1. Verify check-valves are installed in proper orientation										
<b>Pressure Control Valves</b>										
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if applicable)										
2. Verify that the Pressure Control Valves are fully OPEN										
<b>Pressure Indicators</b>										
1. Verify that gauges are proper range for given process										
2. Verify gauges are fluid filled and calibrated (reading zero)										
<b>Flanges</b>										
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve)										
2. Pump Suction and Discharge flange										
3. Torqued to manufacturer specification										
<b>Bulk Head Fittings</b>										
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall										
<b>Notes:</b>										

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

Field Form 1.a.v											
Unit Process (Drawing Reference Sheet)	FBR Effluent Equalization Tank (T-400)				Filtration Transfer Pump (P-401)	Multi-Media Filter (T-501)					Compressed Air
	IN	OUT	OUT	OUT		IN	IN	OUT	OUT	OUT	
	Process Water	Drain	Process Water to P-401	Atmosphere		Process Water from P-401	Clean Backwash	Process Water to IX Vessels	Drain	Backwash	
<b>Pipe Size (inches)</b>	6	2	3		2	3	3	3	4	3	3/4
<b>Piping</b>											
1. Inspect cracks, incomplete connections, unions, flanges											
2. Verify supports/hangers, clamps, unistrut											
3. Install piping labels/flow direction arrows											
4. Inspect dampener fitting											
5. Hose (compressed air only) - inspect compression fittings, etc.			FV-501			FV-503	FV-502			FV-504	
<b>Instrumentation</b>											
Verify the location and installation of the following:											
1. Level switch											
2. Pressure transducers											
3. Pressure transmitters											
4. Flow meters											
5. Pressure Relief Valve											
<b>Manual Valves</b>											
1. Inspect for cracks, incomplete connections, unintentionally glued components											
2. Manually operate valve (if applicable)											
a. Verify hand-tightness of unions (true-union valves)											
3. <u>Position all manual valves in orientation as indicated on PID</u>											
4. Verify sample ports are <u>CLOSED</u>											
<b>Check Valves</b>											
1. Verify check-valves are installed in proper orientation											
<b>Pressure Control Valves</b>											
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)											
2. Verify that the Pressure Control Valves are fully OPEN											
<b>Pressure Indicators</b>											
1. Verify that gauges are proper range for given process											
2. Verify gauges are fluid filled and calibrated (reading zero)											
<b>Flanges</b>											
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)											
2. Pump Suction and Discharge flange											
3. Torqued to manufacturer specification											
<b>Bulk Head Fittings</b>											
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall											

**Notes**



**Instructions:** Verfiy that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on

Field Form 1.a.vii													
Unit Process (Drawing Reference Sheet)	Vendor Provided		GAC Manifold										
	IN	OUT	GAC Vessel (T-801)			GAC Vessel (T-802)			GAC Vessel (T-803)			Backwash (to P-4)	Clean Backwash (from P-9)
	Process Water	Process Water	IN	OUT	BYPASS	IN	OUT	BYPASS	IN	OUT	BYPASS		
<b>Pipe Size (inches)</b>	3	3	4	4	2	4	4	2	4	4	2	3	3
<b>Piping</b>													
1. Inspect cracks, incomplete connections, unions, flanges													
2. Verify supports/hangers, clamps, unistrut													
3. Install piping labels/flow direction arrows													
4. Inspect dampener fitting													
5. Hose (compressed air only) - inspect compression fittings, etc.													
<b>Instrumentation</b>													
Verify the location and installation of the following:													
1. Level switch													
2. Pressure transducers													
3. Pressure transmitters													
4. Flow meters													
5. Pressure Relief Valve													
<b>Manual Valves</b>													
1. Inspect for cracks, incomplete connections, unintentionally glued components													
2. Manually operate valve (if applicable)													
a. Verify hand-tightness of unions (true-union valves)													
3. <u>Position all manual valves in orientation as indicated on PID</u>													
4. Verify sample ports are CLOSED													
<b>Check Valves</b>													
1. Verify check-valves are installed in proper orientation													
<b>Pressure Control Valves</b>													
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)													
2. Verify that the Pressure Control Valves are fully OPEN													
<b>Pressure Indicators</b>													
1. Verify that gauges are proper range for given process													
2. Verify gauges are fluid filled and calibrated (reading zero)													
<b>Flanges</b>													
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)													
2. Pump Suction and Discharge flange													
3. Torqued to manufacturer specification													
<b>Bulk Head Fittings</b>													
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall													

**Notes**



**Project:** UTC UPCO **Date:**

**Description:** Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification **Inspector:**

**P-9**

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and

**Field Form 1.a.viii**

Unit Process (Drawing Reference Sheet)	Injection Equalization Tank (T-700)				Fire Protection Water
	IN	OUT	OUT	OUT	
	Process Water, P-7, From IX Vessels or IX bypass	Atmosphere	Process Water (P-3 to Manifold, includes P-701)	Clean Backwash (P-6 to Multi-media filter and to P-8 to GAC, includes P-501)	
<b>Pipe Size (inches)</b>	3" PVC		3" PVC	3" PVC	3" PVC
<b>Piping</b>					
1. Inspect cracks, incomplete connections, unions, flanges					
2. Verify supports/hangers, clamps, unistrut					
3. Install piping labels/flow direction arrows					
4. Inspect dampener fitting					
5. Hose (compressed air only) - inspect compression fittings, etc.					<b>FV-710</b>
<b>Instrumentation</b>					
Verify the location and installation of the following:					
1. Level switch					
2. Pressure transducers					
3. Pressure transmitters					
4. Flow meters					
5. Pressure Relief Valve					
<b>Manual Valves</b>					
1. Inspect for cracks, incomplete connections, unintentionally glued components					
2. Manually operate valve (if applicable)					
a. Verify hand-tightness of unions (true-union valves)					
3. Position all manual valves in orientation as indicated on PID					
4. Verify sample ports are <b>CLOSED</b>					
<b>Check Valves</b>					
1. Verify check-valves are installed in proper orientation					
<b>Pressure Control Valves</b>					
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)					
2. Verify that the Pressure Control Valves are fully OPEN					
<b>Pressure Indicators</b>					
1. Verify that gauges are proper range for given process					
2. Verify gauges are fluid filled and calibrated (reading zero)					
<b>Flanges</b>					
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)					
2. Pump Suction and Discharge flange					
3. Torqued to manufacturer specification					
<b>Bulk Head Fittings</b>					
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall					

**Notes**

**Project:** UTC UPCO **Date:**  
**Description:** Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification **Inspector:**

**P-10**

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies

Field Form 1.a.ix									
Unit Process (Drawing Reference Sheet)	P-10						P-11		
	IW-3	MW-5	MW-11	RW-1	RW-2	RW-3	Fire Protection Water	Drain	Fire Hydrant Connection
<b>Piping</b>									
1. Inspect cracks, incomplete connections, unions, flanges									
2. Verify supports/hangers, clamps, unistrut									
3. Install piping labels/flow direction arrows									
4. Inspect dampener fitting									
5. Hose (compressed air only) - inspect compression fittings, etc.									
<b>Instrumentation</b>									
Verify the location and installation of the following:									
1. Level switch									
2. Pressure transducers									
3. Pressure transmitters									
4. Flow meters									
5. Pressure Relief Valve									
<b>Manual Valves</b>									
1. Inspect for cracks, incomplete connections, unintentionally glued components									
2. Manually operate valve (if applicable)									
a. Verify hand-tightness of unions (true-union valves)									
3. <u>Position all manual valves in orientation as indicated on PID</u>									
4. Verify sample ports are <u>CLOSED</u>									
<b>Check Valves</b>									
1. Verify check-valves are installed in proper orientation									
<b>Pressure Control Valves</b>									
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)									
2. Verify that the Pressure Control Valves are fully OPEN									
<b>Pressure Indicators</b>									
1. Verify that gauges are proper range for given process									
2. Verify gauges are fluid filled and calibrated (reading zero)									
<b>Flanges</b>									
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)									
2. Pump Suction and Discharge flange									
3. Torqued to manufacturer specification									
<b>Bulk Head Fittings</b>									
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall									

**Notes**

**Project:** UTC UPCO

**Date:**

**Description:** Pre-Startup/Post-Construction Punch-List - 1.b Instrumentation Installation Verification

**Inspector:**

Instructions: Use P&IDs to walkthrough entire system and verify that all instruments listed are installed. Denote any inconsistencies on P&ID and reference on this sheet. Use Design Drawing Riser Diagram (E-8) to verify proper instrumentation cables have been terminated to the instruments from the designated control panel.

**Field Form 1.b**

Instrument	Description	Installation Verified (y/n)	Physical Install Correct (y/n)	Local Interface Configured (y/n/na)	Correct Power Source (y/n/na)	Correct Signal Cable (y/n/na)	Notes
FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW METER						
FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW METER						
FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW METER						
FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW METER						
FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW METER						
FIT-201	FBR TRANSFER PUMP P-201 EFFLUENT FLOW METER						
FIT-211	BACKWASH DECANT PUMP P-211 EFFLUENT FLOW METER						
FIT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT FLOW METER						
FIT-501	BACKWASH PUMP P-501 EFFLUENT FLOW METER						
FIT-701	INJECTION PUMP P-701 EFFLUENT FLOW METER						
FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW METER						
FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW METER						
FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW METER						
FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW METER						
FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW METER						
FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW METER						
FV-111	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE OPEN COMMAND						
FV-111	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE						
FV-112	EXTRACTION WELL EW-2 MANIFOLD FLOW VALVE						
FV-113	EXTRACTION WELL IW-1 MANIFOLD FLOW VALVE						
FV-114	EXTRACTION WELL MW-20 MANIFOLD FLOW VALVE						
FV-212	BACKWASH DECANT PUMP P-211 DISCHARGE VALVE						
FV-301	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE OPEN COMMAND						
FV-307	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE						
FV-501	MULTI-MEDIA FILTER T-501 INFLUENT VALVE						
FV-502	MMF T-501 EFFLUENT VALVE						
FV-503	MMF T-501 BACKWASH INFLUENT VALVE						
FV-504	MULTI-MEDIA FILTER T-501 BACKWASH EFFLUENT VALVE						
FV-711	EXTRACTION WELL IW-3 MANIFOLD FLOW VALVE						
FV-712	EXTRACTION WELL MW-5 MANIFOLD FLOW VALVE						
FV-713	EXTRACTION WELL MW-11 MANIFOLD FLOW VALVE						
FV-714	EXTRACTION WELL RW-1 MANIFOLD FLOW VALVE						
FV-715	EXTRACTION WELL RW-2 MANIFOLD FLOW VALVE						
FV-716	EXTRACTION WELL RW-3 MANIFOLD FLOW VALVE						
HS-001	BUILDING CONTAINMENT PAD ESTOP						
HS-002	FBR CONTAINMENT PAD ESTOP						
LS-001	BUILDING CONTAINMENT LEAK DETECTION						

**Field Form 1.b**

Instrument	Description	Installation Verified (y/n)	Physical Install Correct (y/n)	Local Interface Configured (y/n/na)	Correct Power Source (y/n/na)	Correct Signal Cable (y/n/na)	Notes
LS-002	FBR CONTAINMENT LEAK DETECTION						
LS-111	WELL VAULT LEAK DETECTION, EW-1						
LS-112	WELL VAULT LEAK DETECTION, EW-2						
LS-113	WELL VAULT LEAK DETECTION, IW-1						
LS-114	WELL VAULT LEAK DETECTION, MW-20						
LS-721	INJECTION WELL IW-3 VAULT LEAK DETECTION						
LS-722	INJECTION WELL MW-5 VAULT LEAK DETECTION						
LS-723	INJECTION WELL MW-11 VAULT LEAK DETECTION						
LS-724	INJECTION WELL RW-1 VAULT LEAK DETECTION						
LS-725	INJECTION WELL RW-2 VAULT LEAK DETECTION						
LS-726	INJECTION WELL RW-3 VAULT LEAK DETECTION						
LSH-003	SUMP HIGH LEVEL						
LSH-004	SUMP HIGH LEVEL						
LSHH-003	SUMP HIGH-HIGH LEVEL						
LSHH-004	SUMP HIGH-HIGH LEVEL						
LSHH-201	INFLUENT EQ TANK T-200 HIGH-HIGH WATER LEVEL						
LSHH-211	BACKWASH CONDITIONING TANK T-210 HIGH-HIGH LEVEL						
LSHH-401	FBR EFFLUENT EQ TANK T-400 HIGH-HIGH WATER LEVEL						
LSHH-701	INJECTION EQ TANK T-700 HIGH-HIGH WATER LEVEL						
LSL-003	SUMP LOW LEVEL						
LSL-004	SUMP LOW LEVEL						
LSLL-201	INFLUENT EQ TANK T-200 LOW-LOW WATER LEVEL						
LSLL-211	BACKWASH CONDITIONING TANK T-210 LOW-LOW LEVEL						
LSLL-401	FBR EFFLUENT EQ TANK T-400 LOW-LOW WATER LEVEL						
LSLL-701	INJECTION EQ TANK T-700 LOW-LOW WATER LEVEL						
PT-101	EXTRACTION WELL EW-1 CONTINUOUS WATER LEVEL						
PT-102	EXTRACTION WELL EW-2 CONTINUOUS WATER LEVEL						
PT-103	EXTRACTION WELL IW-1 CONTINUOUS WATER LEVEL						
PT-104	EXTRACTION WELL MW-20 CONTINUOUS WATER LEVEL						
PT-111	EXTRACTION WELL EW-1 MANIFOLD PIPING PRESSURE						
PT-112	EXTRACTION WELL EW-2 MANIFOLD PIPING PRESSURE						
PT-113	EXTRACTION WELL IW-1 MANIFOLD PIPING PRESSURE						
PT-114	EXTRACTION WELL MW-20 MANIFOLD PIPING PRESSURE						
PT-200	INFLUENT EQ TANK T-200 CONTINUOUS WATER LEVEL						
PT-201	FBR TRANSFER PUMP P-201 EFFLUENT PRESSURE						
PT-210	BACKWASH CONDITIONING TANK T-210 CONTINUOUS WATER LEVEL						
PT-211	BACKWASH DECANT PUMP P-211 EFFLUENT PRESSURE						
PT-400	FBR EFFLUENT EQ TANK T-400 CONTINUOUS WATER LEVEL						
PT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT PRESSURE						
PT-501	MULTI-MEDIA FILTER T-501 INFLUENT PRESSURE						
PT-502	MULTI-MEDIA FILTER T-501 EFFLUENT PRESSURE						
PT-601	IX T-601 INFUENT PRESSURE						
PT-602	IX T-601 EFFLUENT PRESSURE						

**Field Form 1.b**

Instrument	Description	Installation Verified (y/n)	Physical Install Correct (y/n)	Local Interface Configured (y/n/na)	Correct Power Source (y/n/na)	Correct Signal Cable (y/n/na)	Notes
PT-603	IX T-602 INFUENT PRESSURE						
PT-604	IX T-602 EFFLUENT PRESSURE						
PT-605	IX T-603 INFUENT PRESSURE						
PT-606	IX T-603 EFFLUENT PRESSURE						
PT-607	IX T-604 INFUENT PRESSURE						
PT-608	IX T-604 EFFLUENT PRESSURE						
PT-700	INJECTION EQ TANK T-700 CONTINOUS WATER LEVEL						
PT-701	INJECTION PUMP P-701 EFFLUENT PRESSURE						
PT-711	EXTRACTION WELL IW-3 MANIFOLD PIPING PRESSURE						
PT-712	EXTRACTION WELL MW-5 MANIFOLD PIPING PRESSURE						
PT-713	EXTRACTION WELL MW-11 MANIFOLD PIPING PRESSURE						
PT-714	EXTRACTION WELL RW-1 MANIFOLD PIPING PRESSURE						
PT-715	EXTRACTION WELL RW-2 MANIFOLD PIPING PRESSURE						
PT-716	EXTRACTION WELL RW-3 MANIFOLD PIPING PRESSURE						
PT-721	INJECTION WELL IW-3 CONTINOUS WATER LEVEL						
PT-722	INJECTION WELL MW-5 CONTINOUS WATER LEVEL						
PT-723	INJECTION WELL MW-11 CONTINOUS WATER LEVEL						
PT-724	INJECTION WELL RW-1 CONTINOUS WATER LEVEL						
PT-725	INJECTION WELL RW-2 CONTINOUS WATER LEVEL						
PT-726	INJECTION WELL RW-3 CONTINOUS WATER LEVEL						
PT-801	GAC T-801 INFLUENT PRESSURE						
PT-802	GAC T-801 EFFLUENT PRESSURE						
PT-803	GAC T-802 INFLUENT PRESSURE						
PT-804	GAC T-802 EFFLUENT PRESSURE						
PT-805	GAC T-803 INFLUENT PRESSURE						
PT-806	GAC T-803 EFFLUENT PRESSURE						
PT-807	FILTERS F-801&802 INFLUENT PRESSURE						
PT-808	FILTERS F-801&802 EFFLUENT PRESSURE						
PT-901	AIR COMPRESSOR A-900 DISCHARGE PRESSURE						

Project: UTC UPCO					Date:			
Description: Pre-Startup/Post-Construction Punch-List - 1.c MCP Build Verification					Inspector:			
Instructions: Use shop provided panel drawings to confirm all shown are installed and are in acceptable condition. Also use panel drawings to confirm wiring is as shown. Cross reference Riser Diagram E-8 to the pane drawings to verify all field wiring has been landed to proper PLC inputs/outputs and power terminals.								
Field Form 1.c								
TAG	QTY	DESCRIPTION	MANUFACTURER	PART #	INSTALLED (Y/N)	CONDITION ACCEPTABLE (Y/N)	LINE/LOAD VOLTAGE	NOTES
1	1	STEEL 2 DOOR ENCLOSURE 60X60X12	SCE	60EL6012LPPL				
2	1	BACK PANEL FOR ENCLOSURE	SCE	60P60				
3	1	UNMANAGED ETHERNET SWITCH, 2 FIBER	RED LION	106FX2-SC-MDR				
5	1	120 VAC PILOT LIGHT, LED, WHITE	AB	800FM-P3MN3W				
7	1	COMPACTLOGIX 5370 L3 CONTROLLER	AB	1769-L33ER				
8	5	16 POINT DISCRETE INPUT MODULE (120 VAC)	AB	1769-IA16				
9	2	120/240 VAC POWER SUPPLY 4A @ 5VDC	AB	1769-PA4				
10	1	32 POINT DISCRETE INPUT MODULE (24 VDC)	AB	1769-IQ32				
11	4	16 POINT ANALOG INPUT MODULE (COMPACT HIGH DENSITY)	AB	1769-IF16C				
12	3	8 POINT ANALOG INPUT MODULE	AB	1769-IF8				
13	2	16 POINT RELAY OUTPUT MODULE	AB	1769-OW16				
14	2	RIGHT END CAP/TERMINATOR	AB	1769-ECL				
15	1	LEFT END CAP/TERMINATOR	AB	1769-ECR				
16	1	1 FT. RIGHT-TO-LEFT BUS EXPANSION CABLE	AB	1769-CRL1				
17	1	UL UNINTERRUPTABLE POWER SUPPLY (850 VA)	SOLA	S1K850				
	1	UL UNINTERRUPTABLE POWER SUPPLY MOUNTING BRACKET	SOLA	S1K-PMBRK				
18	1	24 VDC POWER SUPPLY (120 W)	AB	1606-XLE120E				
19	1	SURGE AND FILTER PROTECTION DEVICE (20A)	AB	4983-DC120-20				
20	1	Stratix 5700 Switch, Managed, 8 Fast Ethernet Copper Ports, 2 Fast Ethernet Combo Ports, Full Software	AB	1783-BMS10CA				
21	1	DIN RAIL MOUNTED GFCI RECEPTACLE	AB	1492-REC15G				
22	1	MINIATURE CIRCUIT BREAKER, 1 P, 20 A	AB	1489-M1C200				
23	1	MINATURE CIRCUIT BREAKER 1 P, 8 A	AB	1492-SPM1C080				
24	2	MINATURE CIRCUIT BREAKER 1 P, 7 A	AB	1492-SPM1C070				
24B	2	MINATURE CIRCUIT BREAKER 1 P, 5 A	AB	1492-SPM1C050				
25	1	MINATURE CIRCUIT BREAKER 1 P, 2 A	AB	1492-SPM1C020				
26	15	5X20 MM 120 VAC FUSE HOLDER WITH INDICATOR	AB	1492-WFB4250				
	18	5X20 MM TIME DELAY CERAMIC FUSES (2 A)	BUSSMAN	S505-2-R				
27	15	5x20 MM 24 VDC FUSE HOLDER WITH INDICATOR	AB	1492-WFB424				
	3	5X20 MM TIME DELAY CERAMIC FUSES (8 A)	BUSSMAN	S505-8-R				
	3	5X20 MM TIME DELAY CERAMIC FUSES (3 A)	BUSSMAN	S505-3-R				
	7	5X20 MM TIME DELAY CERAMIC FUSES (2 A)	BUSSMAN	S505-2-R				
	3	5X20 MM TIME DELAY CERAMIC FUSES (1 A)	BUSSMAN	S505-1-R				
28	34	GENERAL PURPOSE SPDT RELAYS (120 VAC COIL), 16 A	AB	700-HK36A1				
29	34	5 PIN RELAY SOCKETS	AB	700-HN221				
30	1	4PDT GENERAL PURPOSE RELAYS (120 VAC COIL), 7 A	AB	700-HC24A1				
	1	14 PIN RELAY SOCKET	AB	700-HN104				
31	6	SURGE PROTECTION PLUG, 2 CH (120 VAC)	PHOENIX	2839185				
	6	SOCKET FOR ABOVE	PHOENIX	2839282				
32	6	ANALOG SURGE PROTECTION PLUG, 2 CH	PHOENIX	2838228				
	6	SOCKET FOR ABOVE	PHOENIX	2839208				
33	400	IEC TERMINAL BLOCK (30 A)	AB	1492-J3				
	10	CENTER JUMPER, 10 POLE	AB	1492-CJLJ5-10				
34	100	IEC GROUND TERMINAL BLOCK	AB	1492-J3G				
35	90	IEC PLUG IN DEVICE TERMINAL BLOCK	AB	1492-J3P				
	90	FUSE PLUG WITH BLOWN FUSE INDICATION (10-36 V)	AB	1492-FPK224				
	90	5X20 MM TIME DELAY CERAMIC FUSES (500 MA)	AB	S505-500-R				
36	50	END ANCHORS	AB	1492-ERL35				
37	10	DIN RAIL	AB	1492-DR5				
38	A-R	WIRING DUCT	TBD	TBD				
-	-	Verify Wiring as Per Panel Drawings	-	-				

**Project:** UTC UPCO

**Date:**

**Description:** Pre-Startup/Post-Construction Punch-List - 1.c MCP Build Verification

**Inspector:**

Instructions: Use shop provided panel drawings to confirm all shown are installed and are in acceptable condition. Also use panel drawings to confirm wiring is as shown. Cross reference Riser Diagram E-8 to the pane drawings to verify all field wiring has been landed to proper PLC inputs/outputs and power terminals.

**Field Form 1.c**

TAG	QTY	DESCRIPTION	MANUFACTURER	PART #	INSTALLED (Y/N)	CONDITION ACCEPTABLE (Y/N)	LINE/LOAD VOLTAGE	NOTES
1	1	STEEL 1 DOOR ENCLOSURE 48'X36"X16"	SCE	48EL3616LPPL				
	1	DRIP SHIELD	SCE	SCE-DS36N4				
2	1	DEAD FRONT FOR PANEL	SCE	DF48EL36LP				
3	1	BACK PANEL FOR ENCLOSURE	SCE	48P36				
4	1	DISCONNECT HANDLE OPERATOR WITH CABLE	EATON	-				
5	1	25A CIRCUIT BREAKER MAIN DISCONNECT	TBD	EGE3025FFG				
6	1	8" HMI PANEL	AUTOMATION DIRECT	EA9-T8CL				
7	1	VFD HIM	ALLEN BRADLEY	22-HIM-C2S				
8	1	3 POS. SELECTOR SWITCH	ALLEN BRADLEY	800FP-SM32PX20				
9	1	MIRCOLOGIX 1100 PLC PROCESSOR	ALLEN BRADLEY	1763-L16BWA				
10	1	ANALOG 2 INPUT / 2 OUTPUT CARD	ALLEN BRADLEY	1762-IF2OF2				
11	1	UNMANAGED ETHERNET SWITCH, 2 FIBER	RED LION	106FX2-SC-MDR				
12	1	24 VDC POWER SUPPLY (120 W)	ALLEN BRADLEY	1606-XLE120E				
13	1	500VA, 480-120V CONTROL TRANSFORMER	HAMMOND	PH500MLI				
14	6	GENERAL PURPOSE SPDT RELAYS (120 VAC COIL), 16 A	ALLEN BRADLEY	700-HK36A1				
14B	6	5 PIN RELAY SOCKETS	ALLEN BRADLEY	700-HN221				
15	1	3 POLE 3A CIRCUIT BREAKER	ALLEN BRADLEY	1489-M3C030				
16	1	7.5HP 480VAC VFD	ALLEN BRADLEY	25B-D013N104				
16B	2	7.5HP 3% LINE/LOAD RX	MTE	RL-01202				
17	1	480 VAC 1200BTUH PANEL AC UNIT	ICEQUBE	IQ1200VS				
18	50	IEC TERMINAL BLOCK (30 A)	AB	1492-J3				
19	5	5X20 MM 120 VAC FUSE HOLDER WITH INDICATOR	AB	1492-WFB4250				
20	3	5x20 MM 24 VDC FUSE HOLDER WITH INDICATOR	AB	1492-WFB424				
21	8	5X20 MM TIME DELAY CERAMIC FUSES (2 A)	BUSSMAN	S505-2-R				
22	2	MINATURE CIRCUIT BREAKER 1 P, 5 A	AB	1492-SPM1C050				
23	1	MINATURE CIRCUIT BREAKER 1 P, 2 A	AB	1492-SPM1C020				
24	10	CENTER JUMPER, 10 POLE	AB	1492-CJLJ5-10				
25	5	IEC GROUND TERMINAL BLOCK	AB	1492-J3G				
26	5	IEC PLUG IN DEVICE TERMINAL BLOCK	AB	1492-J3P				
28	5	FUSE PLUG WITH BLOWN FUSE INDICATION (10-36 V)	AB	1492-FPK224				
29	25	5X20 MM TIME DELAY CERAMIC FUSES (500 MA)	AB	S505-500-R				
30	5	END ANCHORS	AB	1492-ERL35				
30	5	DIN RAIL	AB	1492-DR5				
31	A-R	WIRING DUCT	TBD	TBD				

**Project:** UTC UPCO  
**Description:** Communication Verifications -  
 2.a Copper Ethernet

**Date:**  
**Inspector:**

Instructions: Use appropriate programming software to configure Ethernet Switches, PLC, SCADA, and VFDs for communication as indicated on the Network Diagram and Process Drawings. Verify communication between devices following the process shown in section 2.a of the startup plan. Use the checklist to verify completion.

**Field Form 2.a**

Item	Reference Section	Configuration Completed (y/n)	Coms Verified (y/n)	Notes
<b>Copper Ethernet Communication Verification</b>	<b>2.a</b>			
MCP Managed Switch Configuration	2.a.i			
MCC Managed Switch Configuration	2.a.ii			
MCP to MCC Com Check; configure VFDs	2.a.iii			
VFD-101				
VFD-102				
VFD-103				
VFD-104				
VFD-211				
VFD-201				
VFD-401				
VFD-501				
VFD-701				
MCP to FBR Com Check	2.a.iv			
SCADA to MCP Com Check	2.a.v			
SCADA to FBR Com Check	2.a.vi			



**Project:** UTC UPCO  
**Description:** Communication Verifications -  
 2.b Fiber Ethernet

**Date:**

**Inspector:**

Instructions: Use appropriate programming software to configure PLC, SCADA, and HMI for communication as indicated on the Network Diagram and Process Drawings. Verify communication between devices following the process shown in section 2.b of the startup plan. Use the checklist to verify completion.

**Field Form 2.b**

Item	Reference Section	Configuration Completed (y/n)	Coms Verified (y/n)	Notes
<b>Fiber Ethernet Communication Verification</b>	<b>2.b</b>			
MCP RCP-1 Com Check	2.b.i			
SCADA to RCP-1 Com Check	2.b.ii			

**Project:** UTC UPCO

**Date:**

**Description:** Mechanical Dry-Run Test Procedure - 3.a-b Instrumentation Loop Checks and Functionality Verification

**Inspector:**

Instructions: Use P&IDs and IO List to identify all intrumetation in entire system for loop check and functionality verification. Denote any inconsistencies on this sheet.

**Field Form 3.a-b**

Signal	Instrument	Descirption	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verfied (y/n)	Notes
0402CR	0402CR	POWER LOSS RELAY	MCP	I:01:00					
LAHH-111	LS-111	WELL VAULT LEAK DETECTION, EW-1	MCP	I:01:01					
LAHH-113	LS-113	WELL VAULT LEAK DETECTION, IW-1	MCP	I:01:02					
LAHH-114	LS-114	WELL VAULT LEAK DETECTION, MW-20	MCP	I:01:03					
ZIC-111	FV-111 (ZSC-111)	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:04					
ZIO-111	FV-111 (ZSO-111)	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE OPEN	MCP	I:01:05					
ZIC-112	FV-112 (ZSC-112)	EXTRACTION WELL EW-2 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:06					
ZIO-112	FV-112 (ZSO-112)	EXTRACTION WELL EW-2 MANIFOLD FLOW VALVE OPEN	MCP	I:01:07					
ZIC-113	FV-113 (ZSC-113)	EXTRACTION WELL IW-1 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:08					
ZIO-113	FV-113 (ZSO-113)	EXTRACTION WELL IW-1 MANIFOLD FLOW VALVE OPEN	MCP	I:01:09					
ZIC-114	FV-114 (ZSC-114)	EXTRACTION WELL MW-20 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:10					
ZIO-114	FV-114 (ZSO-114)	EXTRACTION WELL MW-20 MANIFOLD FLOW VALVE OPEN	MCP	I:01:11					
ZIC-711	FV-711 (ZSC-711)	EXTRACTION WELL IW-3 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:12					
ZIO-711	FV-711 (ZSO-711)	EXTRACTION WELL IW-3 MANIFOLD FLOW VALVE OPEN	MCP	I:01:13					
ZIC-712	FV-712 (ZSC-712)	EXTRACTION WELL MW-5 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:14					
ZIO-712	FV-712 (ZSO-712)	EXTRACTION WELL MW-5 MANIFOLD FLOW VALVE OPEN	MCP	I:01:15					
ZIC-713	FV-713 (ZSC-713)	EXTRACTION WELL MW-11 MANIFOLD FLOW VALVE CLOSED	MCP	I:02:00					
ZIO-713	FV-713 (ZSO-713)	EXTRACTION WELL MW-11 MANIFOLD FLOW VALVE OPEN	MCP	I:02:01					
ZIC-714	FV-714 (ZSC-714)	EXTRACTION WELL RW-1 MANIFOLD FLOW VALVE CLOSED	MCP	I:02:02					
ZIO-714	FV-714 (ZSO-714)	EXTRACTION WELL RW-1 MANIFOLD FLOW VALVE OPEN	MCP	I:02:03					
ZIC-715	FV-715 (ZSC-715)	EXTRACTION WELL RW-2 MANIFOLD FLOW VALVE CLOSED	MCP	I:02:04					
ZIO-715	FV-715 (ZSO-715)	EXTRACTION WELL RW-2 MANIFOLD FLOW VALVE OPEN	MCP	I:02:05					
ZIC-716	FV-716 (ZSC-716)	EXTRACTION WELL RW-3 MANIFOLD FLOW VALVE CLOSED	MCP	I:02:06					
ZIO-716	FV-716 (ZSO-716)	EXTRACTION WELL RW-3 MANIFOLD FLOW VALVE OPEN	MCP	I:02:07					
LALL-201	LSLL-201	INFLUENT EQ TANK T-200 LOW-LOW WATER LEVEL	MCP	I:02:08					
LAHH-201	LSHH-201	INFLUENT EQ TANK T-200 HIGH-HIGH WATER LEVEL	MCP	I:02:09					
ZIC-212	FV-212 (ZSC-212)	BACKWASH DECANT PUMP P-211 DISCHARGE VALVE CLOSED	MCP	I:02:10					
ZIO-212	FV-212 (ZSO-212)	BACKWASH DECANT PUMP P-211 DISCHARGE VALVE OPEN	MCP	I:02:11					
LALL-211	LSLL-211	BACKWASH CONDITIONING TANK T-210 LOW-LOW LEVEL	MCP	I:02:12					
LAHH-211	LSHH-211	BACKWASH CONDITIONING TANK T-210 HIGH-HIGH LEVEL	MCP	I:02:13					
LAHH-003	LSHH-003	SUMP HIGH-HIGH LEVEL	MCP	I:02:14					
LAH-003	LSH-003	SUMP HIGH LEVEL	MCP	I:02:15					
LAL-003	LSL-003	SUMP LOW LEVEL	MCP	I:03:00					
HSA-001	HS-001	BUILDING CONTAINMENT PAD ESTOP	MCP	I:03:01					
LAHH-001	LS-001	BUILDING CONTAINMENT LEAK DETECTION	MCP	I:03:02					
LAHH-004	LSHH-004	SUMP HIGH-HIGH LEVEL	MCP	I:03:03					

**Field Form 3.a-b**

Signal	Instrument	Description	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verified (y/n)	Notes
LAH-004	LSH-004	SUMP HIGH LEVEL	MCP	I:03:04					
LAL-004	LSL-004	SUMP LOW LEVEL	MCP	I:03:05					
ZIC-307	FV-307 (ZSC-307)	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE CLOSED	MCP	I:03:06					
ZIO-307	FV-307 (ZSO-307)	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE OPEN	MCP	I:03:07					
HSA-002	HS-002	FBR CONTAINMENT PAD ESTOP	MCP	I:03:08					
LAHH-002	LS-002	FBR CONTAINMENT LEAK DETECTION	MCP	I:03:09					
LAHH-401	LSHH-401	FBR EFFLUENT EQ TANK T-400 HIGH-HIGH WATER LEVEL	MCP	I:03:10					
LALL-401	LSLL-401	FBR EFFLUENT EQ TANK T-400 LOW-LOW WATER LEVEL	MCP	I:03:11					
ZIC-501	FV-501 (ZSC-501)	MULTI-MEDIA FILTER T-501 INFLUENT VALVE CLOSED	MCP	I:03:12					
ZIO-501	FV-501 (ZSO-501)	MULTI-MEDIA FILTER T-501 INFLUENT VALVE OPEN	MCP	I:03:13					
ZIC-502	FV-502 (ZSC-502)	MMF T-501 EFFLUENT VALVE CLOSED	MCP	I:03:14					
ZIO-502	FV-502 (ZSO-502)	MMF T-501 EFFLUENT VALVE OPEN	MCP	I:03:15					
ZIO-503	FV-503 (ZSO-503)	MMF T-501 BACKWASH INFLUENT VALVE OPEN	MCP	I:04:00					
ZIC-503	FV-503 (ZSC-503)	MMF T-501 BACKWASH INFLUENT VALVE CLOSED	MCP	I:04:01					
ZIC-504	FV-504 (ZSC-504)	MULTI-MEDIA FILTER T-501 BACKWASH EFFLUENT VALVE CLOSED	MCP	I:04:02					
ZIO-504	FV-504 (ZSO-504)	MULTI-MEDIA FILTER T-501 BACKWASH EFFLUENT VALVE OPEN	MCP	I:04:03					
LAHH-701	LSHH-701	INJECTION EQ TANK T-700 HIGH-HIGH WATER LEVEL	MCP	I:04:04					
LALL-701	LSLL-701	INJECTION EQ TANK T-700 LOW-LOW WATER LEVEL	MCP	I:04:05					
LAHH-721	LS-721	INJECTION WELL IW-3 VAULT LEAK DETECTION	MCP	I:04:06					
LAHH-722	LS-722	INJECTION WELL MW-5 VAULT LEAK DETECTION	MCP	I:04:07					
LAHH-723	LS-723	INJECTION WELL MW-11 VAULT LEAK DETECTION	MCP	I:04:08					
LAHH-724	LS-724	INJECTION WELL RW-1 VAULT LEAK DETECTION	MCP	I:04:09					
LAHH-725	LS-725	INJECTION WELL RW-2 VAULT LEAK DETECTION	MCP	I:04:10					
LAHH-726	LS-726	INJECTION WELL RW-3 VAULT LEAK DETECTION	MCP	I:04:11					
FQ-111	FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW PULSE	MCP	I:06:00					
FQ-112	FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW PULSE	MCP	I:06:01					
FQ-113	FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW PULSE	MCP	I:06:02					
FQ-114	FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW PULSE	MCP	I:06:03					
FQ-711	FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW PULSE	MCP	I:06:04					
FQ-712	FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW PULSE	MCP	I:06:05					
FQ-713	FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW PULSE	MCP	I:06:06					
FQ-714	FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW PULSE	MCP	I:06:07					
FQ-715	FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW PULSE	MCP	I:06:08					
FQ-716	FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW PULSE	MCP	I:06:09					
FQ-200	FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW PULSE	MCP	I:06:10					
FQ-201	FIT-201	FBR TRANSFER PUMP P-201 EFFLUENT FLOW PULSE	MCP	I:06:11					
FQ-211	FIT-211	BACKWASH DECANT PUMP P-211 EFFLUENT FLOW PULSE	MCP	I:06:12					
FQ-401	FIT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT FLOW PULSE	MCP	I:06:13					
FQ-701	FIT-701	INJECTION PUMP P-701 EFFLUENT FLOW PULSE	MCP	I:06:14					
FQ-501	FIT-501	BACKWASH PUMP P-501 EFFLUENT FLOW PULSE	MCP	I:06:15					
LI-101	PT-101	EXTRACTION WELL EW-1 CONTINOUS WATER LEVEL	MCP	I:07:00					

**Field Form 3.a-b**

Signal	Instrument	Description	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verified (y/n)	Notes
LI-103	PT-103	EXTRACTION WELL IW-1 CONTINOUS WATER LEVEL	MCP	I:07:01					
LI-104	PT-104	EXTRACTION WELL MW-20 CONTINOUS WATER LEVEL	MCP	I:07:02					
LI-721	PT-721	INJECTION WELL IW-3 CONTINOUS WATER LEVEL	MCP	I:07:03					
LI-722	PT-722	INJECTION WELL MW-5 CONTINOUS WATER LEVEL	MCP	I:07:04					
LI-723	PT-723	INJECTION WELL MW-11 CONTINOUS WATER LEVEL	MCP	I:07:05					
LI-724	PT-724	INJECTION WELL RW-1 CONTINOUS WATER LEVEL	MCP	I:07:06					
LI-725	PT-725	INJECTION WELL RW-2 CONTINOUS WATER LEVEL	MCP	I:07:07					
LI-726	PT-726	INJECTION WELL RW-3 CONTINOUS WATER LEVEL	MCP	I:07:08					
PI-111	PT-111	EXTRACTION WELL EW-1 MANIFOLD PIPING PRESSURE	MCP	I:07:12					
PI-112	PT-112	EXTRACTION WELL EW-2 MANIFOLD PIPING PRESSURE	MCP	I:07:13					
PI-113	PT-113	EXTRACTION WELL IW-1 MANIFOLD PIPING PRESSURE	MCP	I:07:14					
PI-114	PT-114	EXTRACTION WELL MW-20 MANIFOLD PIPING PRESSURE	MCP	I:07:15					
PI-711	PT-711	EXTRACTION WELL IW-3 MANIFOLD PIPING PRESSURE	MCP	I:08:00					
PI-712	PT-712	EXTRACTION WELL MW-5 MANIFOLD PIPING PRESSURE	MCP	I:08:01					
PI-713	PT-713	EXTRACTION WELL MW-11 MANIFOLD PIPING PRESSURE	MCP	I:08:02					
PI-714	PT-714	EXTRACTION WELL RW-1 MANIFOLD PIPING PRESSURE	MCP	I:08:03					
PI-715	PT-715	EXTRACTION WELL RW-2 MANIFOLD PIPING PRESSURE	MCP	I:08:04					
PI-716	PT-716	EXTRACTION WELL RW-3 MANIFOLD PIPING PRESSURE	MCP	I:08:05					
PI-901	PT-901	AIR COMPRESSOR A-900 DISCHARGE PRESSURE	MCP	I:08:06					
LI-200	PT-200	INFLUENT EQ TANK T-200 CONTINOUS WATER LEVEL	MCP	I:08:07					
PI-201	PT-201	FBR TRANSFER PUMP P-201 EFFLUENT PRESSURE	MCP	I:08:08					
PI-211	PT-211	BACKWASH DECANT PUMP P-211 EFFLUENT PRESSURE	MCP	I:08:09					
LI-210	PT-210	BACKWASH CONDITIONING TANK T-210 CONTINOUS WATER LEVEL	MCP	I:08:10					
LI-400	PT-400	FBR EFFLUENT EQ TANK T-400 CONTINOUS WATER LEVEL	MCP	I:08:11					
PI-401	PT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT PRESSURE	MCP	I:08:12					
PI-501	PT-501	MULTI-MEDIA FILTER T-501 INFLUENT PRESSURE	MCP	I:08:13					
PI-502	PT-502	MULTI-MEDIA FILTER T-501 EFFLUENT PRESSURE	MCP	I:08:14					
PI-601	PT-601	IX T-601 INFUENT PRESSURE	MCP	I:08:15					
PI-602	PT-602	IX T-601 EFFLUENT PRESSURE	MCP	I:09:00					
PI-603	PT-603	IX T-602 INFUENT PRESSURE	MCP	I:09:01					
PI-604	PT-604	IX T-602 EFFLUENT PRESSURE	MCP	I:09:02					
PI-605	PT-605	IX T-603 INFUENT PRESSURE	MCP	I:09:03					
PI-606	PT-606	IX T-603 EFFLUENT PRESSURE	MCP	I:09:04					
PI-607	PT-607	IX T-604 INFUENT PRESSURE	MCP	I:09:05					
PI-608	PT-608	IX T-604 EFFLUENT PRESSURE	MCP	I:09:06					
PI-801	PT-801	GAC T-801 INFLUENT PRESSURE	MCP	I:09:07					
PI-802	PT-802	GAC T-801 EFFLUENT PRESSURE	MCP	I:09:08					
PI-803	PT-803	GAC T-802 INFLUENT PRESSURE	MCP	I:09:09					
PI-804	PT-804	GAC T-802 EFFLUENT PRESSURE	MCP	I:09:10					
PI-805	PT-805	GAC T-803 INFLUENT PRESSURE	MCP	I:09:11					
PI-806	PT-806	GAC T-803 EFFLUENT PRESSURE	MCP	I:09:12					
PI-807	PT-807	FILTERS F-801&802 INFLUENT PRESSURE	MCP	I:09:13					

**Field Form 3.a-b**

Signal	Instrument	Description	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verified (y/n)	Notes
PI-808	PT-808	FILTERS F-801&802 EFFLUENT PRESSURE	MCP	I:09:14					
LI-700	PT-700	INJECTION EQ TANK T-700 CONTINOUS WATER LEVEL	MCP	I:09:15					
PI-701	PT-701	INJECTION PUMP P-701 EFFLUENT PRESSURE	MCP	I:10:00					
FI-111	FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW RATE	MCP	I:11:00					
FI-112	FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW RATE	MCP	I:11:01					
FI-113	FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW RATE	MCP	I:11:02					
FI-114	FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW RATE	MCP	I:11:03					
FI-711	FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW RATE	MCP	I:11:04					
FI-712	FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW RATE	MCP	I:11:05					
FI-713	FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW RATE	MCP	I:11:06					
FI-714	FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW RATE	MCP	I:11:07					
FI-715	FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW RATE	MCP	I:12:00					
FI-716	FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW RATE	MCP	I:12:01					
FI-200	FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW RATE	MCP	I:12:02					
FI-201	FIT-201	FBR TRANSFER PUMP P-201 DISCHARGE FLOW RATE	MCP	I:12:03					
FI-211	FIT-211	BACKWASH DECANT PUMP P-211 DISCHARGE FLOW RATE	MCP	I:12:04					
FI-401	FIT-401	FILTRATION TRANSFER PUMP P-401 DISCHARGE FLOW RATE	MCP	I:12:05					
FI-701	FIT-701	INJECTION PUMP P-701 DISCHARGE FLOW RATE	MCP	I:12:06					
FI-501	FIT-501	BACKWASH PUMP P-501 DISCHARGE FLOW RATE	MCP	I:12:07					
VFD-101_ENABLE	VFD-101	EXTRACTION WELL EW-1 PUMP P-101 VFD ENABLE	MCP	O:14:00					
VFD-103_ENABLE	VFD-103	EXTRACTION WELL IW-1 PUMP P-103 VFD ENABLE	MCP	O:14:01					
VFD-104_ENABLE	VFD-104	EXTRACTION WELL MW-20 PUMP P-104 VFD ENABLE	MCP	O:14:02					
ZCO-111	FV-111	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:03					
ZCO-112	FV-112	EXTRACTION WELL EW-2 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:04					
ZCO-113	FV-113	EXTRACTION WELL IW-1 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:05					
ZCO-114	FV-114	EXTRACTION WELL MW-20 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:06					
ZCO-711	FV-711	EXTRACTION WELL IW-3 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:07					
ZCO-712	FV-712	EXTRACTION WELL MW-5 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:08					
ZCO-713	FV-713	EXTRACTION WELL MW-11 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:09					
ZCO-714	FV-714	EXTRACTION WELL RW-1 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:10					
ZCO-715	FV-715	EXTRACTION WELL RW-2 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:11					
ZCO-716	FV-716	EXTRACTION WELL RW-3 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:12					
VFD-201_ENABLE	VFD-201	FBR TRANSFER PUMP P-201 VFD ENABLE	MCP	O:14:13					
VFD-211_ENABLE	VFD-211	BACKWASH DECANT PUMP P-211 VFD ENABLE	MCP	O:14:14					
ZCO-212	FV-212	BACKWASH DECANT PUMP P-211 INFLUENT VALVE OPEN COMMAND	MCP	O:14:15					
YC-003	P-003 STARTER	SUMP PUMP P-003 RUN COMMAND	MCP	O:15:00					
ZCO-301	FV-301	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE OPEN COMMAND	MCP	O:15:01					
YC-004	P-004 STARTER	SUMP PUMP P-004 RUN COMMAND	MCP	O:15:02					
YC-900	A-900	AIR COMPRESSOR A-900 RUN COMMAND	MCP	O:15:03					

**Field Form 3.a-b**

Signal	Instrument	Description	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verified (y/n)	Notes
VFD-401_ENABLE	VFD-401	FILTRATION TRANSFER PUMP P-401 VFD ENABLE	MCP	O:15:04					
ZCO-501	FV-501	MULTI-MEDIA FILTER T-501 INFLUENT VALVE OPEN COMMAND	MCP	O:15:05					
ZCO-503	FV-503	MMF T-503 BACKWASH INFLUENT VALVE OPEN COMMAND	MCP	O:15:06					
ZCO-502	FV-502	IX BACKWASH INFLUENT VALVE OPEN COMMAND	MCP	O:15:07					
ZCO-504	FV-504	MULTI-MEDIA FILTER T-504 EFFLUENT VALVE OPEN COMMAND	MCP	O:15:08					
VFD-701_ENABLE	VFD-701	INJECTION PUMP P-701 VFD ENABLE	MCP	O:15:09					
VFD-501_ENABLE	VFD-501	BACKWASH PUMP P-501 VFD ENABLE	MCP	O:15:10					
CR-0602	CR-0602	POWER LOSS	RCP-1	I:0:00					
YI-102	VFD-102	EXTRACTION WELL EW-2 RUNNING	RCP-1	I:0:01					
YA-102	VFD-102	EXTRACTION WELL EW-2 FAULT	RCP-1	I:0:02					
HS102_HAND	VFD-102	EXTRACTION WELL EW-2 PUMP P-102 IN HAND	RCP-1	I:0:03					
LAHH-112	LS-112	WELL VAULT LEAK DETECTION, EW-2	RCP-1	I:0:04					
VFD-102_ENABLE	VFD-102	EXTRACTION WELL EW-2 PUMP P-102 VFD ENABLE	RCP-1	O:0:00					
LI-102	PT-102	EXTRACTION WELL EW-2 CONTINOUS WATER LEVEL	RCP-1	I:1:00					
SC-102	VFD-102	EXTRACTION WELL EW-2 PUMP P-102 VFD SPEED CONTROL	RCP-1	O:1:00					

**Project:** UTC UPCO

**Date:**

**Description:** Mechanical Dry-Run Test Procedure - 3.c Alarm and Interlock Verification

**Inspector:**

Instructions: Use P&IDs and Alarms List to identify and test all alarms in entire system. Denote any inconsistencies in alarms and responses from design on this sheet.

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Interlock #	Correct Interlock Response Verified (y/n)	Notes
FA-001	HS-003/SD-1XX	Building Fire Alarm						
HSA-001	HS-001	Treatment Building E-Stop						
LAHH-001	LS-001	Treatment Building Containment Pad Leak Detection						
FA-002	HS-004/SD-2XX	FBR Containment Fire Alarm						
HSA-002	HS-002	FBR Containment Pad E-Stop						
LAHH-002	LS-002	FBR Containment Pad Leak Detection						
LAL-003	LSL-003	Treatment Building Sump Low Water Level						
LAH-003	LSH-003	Treatment Building Sump High Water Level						
LAHH-003	LSHH-003	Treatment Building Sump High High Water Level						
LAL-004	LSL-004	FBR Containment Sump Low Water Level						
LAH-004	LSH-004	FBR Containment Sump High Water Level						
LAHH-004	LSHH-004	FBR Containment Sump High High Water Level						
FAH-005	FS-005	Emergency Shower Activation						
LAHH-111	LS-111	EW-1 Vault Leak Detection						
LAHH-112	LS-112	EW-2 Vault Leak Detection						
LAHH-113	LS-113	IW-1 Vault Leak Detection						
LAHH-114	LS-114	MW-20 Vault Leak Detection						
LAL-101	PT-101	EW-1 Low Water Level						
LAL-102	PT-102	EW-2 Low Water Level						
LAL-103	PT-103	IW-1 Low Water Level						
LAL-104	PT-104	MW-20 Low Water Level						
LAH-101	PT-101	EW-1 High Water Level						
LAH-102	PT-102	EW-2 High Water Level						
LAH-103	PT-103	IW-1 High Water Level						
LAH-104	PT-104	MW-20 High Water Level						
LALL-101	PT-101	EW-1 Low Low Water Level						
LALL-102	PT-102	EW-2 Low Low Water Level						
LALL-103	PT-103	IW-1 Low Low Water Level						
LALL-104	PT-104	MW-20 Low Low Water Level						
YA-101	P-101	EW-1 Pump Fault						
YA-102	P-102	EW-2 Pump Fault						
YA-103	P-103	IW-1 Pump Fault						
YA-104	P-104	MW-20 Pump Fault						
PAL-111	PT-111	EW-1 Manifold Low Pressure						
PAL-112	PT-112	EW-2 Manifold Low Pressure						
PAL-113	PT-113	IW-1 Manifold Low Pressure						

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Interlock #	Correct Interlock Response Verified (y/n)	Notes
PAL-114	PT-114	MW-20 Manifold Low Pressure						
PAH-111	PT-111	EW-1 Manifold High Pressure						
PAH-112	PT-112	EW-2 Manifold High Pressure						
PAH-113	PT-113	IW-1 Manifold High Pressure						
PAH-114	PT-114	MW-20 Manifold High Pressure						
PALL-111	PT-111	EW-1 Manifold Low Low Pressure						
PALL-112	PT-112	EW-2 Manifold Low Low Pressure						
PALL-113	PT-113	IW-1 Manifold Low Low Pressure						
PALL-114	PT-114	MW-20 Manifold Low Low Pressure						
PAHH-111	PT-111	EW-1 Manifold High High Pressure						
PAHH-112	PT-112	EW-2 Manifold High High Pressure						
PAHH-113	PT-113	IW-1 Manifold High High Pressure						
PAHH-114	PT-114	MW-20 Manifold High High Pressure						
FAL-111	FIT-111	EW-1 Manifold Low Flow						
FAL-112	FIT-112	EW-2 Manifold Low Flow						
FAL-113	FIT-113	IW-1 Manifold Low Flow						
FAL-114	FIT-114	MW-20 Manifold Low Flow						
FAH-111	FIT-111	EW-1 Manifold High Flow						
FAH-112	FIT-112	EW-2 Manifold High Flow						
FAH-113	FIT-113	IW-1 Manifold High Flow						
FAH-114	FIT-114	MW-20 Manifold High Flow						
FALL-111	FIT-111	EW-1 Manifold Low Low Flow						
FALL-112	FIT-112	EW-2 Manifold Low Low Flow						
FALL-113	FIT-113	IW-1 Manifold Low Low Flow						
FALL-114	FIT-114	MW-20 Manifold Low Low Flow						
ZAC-111	FV-111	EW-1 Manifold Valve Close Fault						
ZAC-112	FV-112	EW-2 Manifold Valve Close Fault						
ZAC-113	FV-113	IW-1 Manifold Valve Close Fault						
ZAC-114	FV-114	MW-20 Manifold Valve Close Fault						
ZAO-111	FV-111	EW-1 Manifold Valve Open Fault						
ZAO-112	FV-112	EW-2 Manifold Valve Open Fault						
ZAO-113	FV-113	IW-1 Manifold Valve Open Fault						
ZAO-114	FV-114	MW-20 Manifold Valve Open Fault						
FAL-200	FIT-200	Influent Low Flow Alarm						
FAH-200	FIT-200	Influent High Flow Alarm						
FALL-200	FIT-200	Influent Low Low Flow Alarm						
LAL-200	PT-200	Influent Tank Low Level Warning						
LAH-200	PT-200	Influent Tank High Level Warning						
LALL-200	PT-200	Influent Tank Low Low Level						
LAHH-200	PT-200	Influent Tank High High Level						
LALL-201	LSLL-201	Influent Tank Low Low Level Switch						
LAHH-201	LSHH-201	Influent Tank High High Level Switch						



**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Interlock #	Correct Interlock Response Verified (y/n)	Notes
FAL-201	FIT-201	FBR Transfer Pump Low Flow						
FAH-201	FIT-201	FBR Transfer Pump High Flow						
FAHH-201	FIT-201	FBR Transfer Pump High High Flow						
PAL-201	PT-201	FBR Transfer Pump Low Discharge Pressure Alarm						
PAH-201	PT-201	FBR Transfer Pump High Discharge Pressure Alarm						
PAHH-201	PT-201	FBR Transfer Pump High High Discharge Pressure Alarm						
YA-201	P-201	FBR Transfer Pump Fault						
LAL-210	PT-210	Backwash Conditioning Tank Low Level						
LAH-210	PT-210	Backwash Conditioning Tank High Level						
LALL-210	PT-210	Backwash Conditioning Tank Low Low Level						
LAHH-210	PT-210	Backwash Conditioning Tank High High Level						
LALL-211	LSLL-211	Backwash Conditioning Tank Low Low Switch						
LAHH-211	LSHH-211	Backwash Conditioning Tank High High Switch						
PAL-211	PT-211	Backwash Decant Low Pressure						
PAH-211	PT-211	Backwash Decant High Pressure						
PAHH-211	PT-211	Backwash Decant High High Pressure						
FAL-211	FIT-211	Backwash Decant Pump Low Flow						
FAH-211	FIT-211	Backwash Decant Pump High Flow						
YA-211	P-211	Backwash Decant Pump Fault						
ZAC-212	FV-212	Backwash Conditioning Tank Effluent Valve Close Fault						
ZAO-212	FV-212	Backwash Conditioning Tank Effluent Valve Open Fault						
AAL-300	AE-300	FBR Low pH						
AAH-300	AE-300	FBR High pH						
TAL-300	AE-301	FBR Low Temperature						
TAH-300	AE-301	FBR High Temperature						
AAL-301	AE-301	FBR Low ORP						
AAH-301	AE-301	FBR High ORP						
FAL-301	FIT-301	FBR Fluidization Flow Low						
FAH-301	FIT-301	FBR Fluidization Flow High						
FAHH-301	FIT-301	FBR Fluidization Flow High High						
PAL-301	PIT-301	FBR Fluidization Low Pressure						
PAH-301	PIT-301	FBR Fluidization High Pressure						
PAHH-301	PIT-301	FBR Fluidization High High Pressure						
FAL-303	FS-303	Electron Donor Low Flow						
FAL-305	FS-305	Nutrient Low Flow						
PAL-305	PSL-305	FBR Instrument Air Pressure Low						
ZAC-307	FV-307	FBR Transfer Valve Close Fault						
ZAO-307	FV-307	FBR Transfer Valve Open Fault						
ZAC-308	FV-308	FBR Fluidization Valve Close Fault						
ZAO-308	FV-308	FBR Fluidization Valve Open Fault						
LAL-400	PT-400	FBR Effluent Equilization Tank Low Level						
LAH-400	PT-400	FBR Effluent Equilization Tank High Level						

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Interlock #	Correct Interlock Response Verified (y/n)	Notes
LALL-400	PT-400	FBR Effluent Equilization Tank Low Low Level						
LAHH-400	PT-400	FBR Effluent Equilization Tank High High Level						
LALL-401	LSLL-401	FBR Effluent Equilization Tank Low Low Switch						
LAHH-401	LSHH-401	FBR Effluent Equilization Tank High High Switch						
YA-401	P-401	Filtration Transfer Pump Fault						
FAL-401	FIT-401	Filtration Pump Low Flow						
FAH-401	FIT-401	Filtration Pump High Flow						
FAHH-401	FIT-401	Filtration Pump High High Flow						
PAL-401	PT-401	Filtration Transfer Pump Low Pressure						
PAH-401	PT-402	Filtration Transfer Pump High Pressure						
PAHH-401	PT-403	Filtration Transfer Pump High High Pressure						
FAL-501	FIT-501	Clean Backwash Pump Low Flow						
FAH-501	FIT-501	Clean Backwash Pump High Flow						
FAHH-501	FIT-501	Clean Backwash Pump High High Flow						
PAL-511	PT-501	Clean Backwash Pump Low Pressure						
PAH-511	PT-502	Clean Backwash Pump High Pressure						
PAHH-511	PT-503	Clean Backwash Pump High High Pressure						
YA-501	P-501	Backwash Pump Fault						
ZAC-501	FV-501	Multimedia Filter Influent Valve Close Fault						
ZAO-501	FV-501	Multimedia Filter Influent Valve Open Fault						
ZAC-502	FV-502	Multimedia Filter Effluent Valve Close Fault						
ZAO-502	FV-502	Multimedia Filter Effluent Valve Open Fault						
PAH-501	PT-501	Multimedia Filter High Influent Pressure						
PAHH-501	PT-501	Multimedia Filter High High Influent Pressure						
PAH-502	PT-502	Multimedia Filter High Backwash Pressure						
PAHH-502	PT-502	Multimedia Filter High High Backwash Pressure						
DPAH-501	PT-501/502	Multimedia Filter High High Differential Pressure						
ZAC-503	FV-503	Multimedia Filter Backwash Influent Valve Close Fault						
ZAO-503	FV-503	Multimedia Filter Backwash Influent Valve Open Fault						
ZAC-504	FV-504	Multimedia Filter Backwash Effluent Valve Close Fault						
ZAO-504	FV-504	Multimedia Filter Backwash Effluent Valve Open Fault						
PAH-601	PT-601	T-601 IX Vessel High Influent Pressure						
PAHH-601	PT-601	T-601 IX Vessel High High Influent Pressure						
PAH-602	PT-602	T-601 IX Vessel High Effluent Pressure						
PAHH-602	PT-602	T-601 IX Vessel High High Effluent Pressure						
DPAH-601	PT-601/602	T-601 IX Vessel High Differential Pressure						
PAH-603	PT-603	T-602 IX Vessel High Influent Pressure						
PAHH-603	PT-603	T-602 IX Vessel High High Influent Pressure						
PAH-604	PT-604	T-602 IX Vessel High Effluent Pressure						
PAHH-604	PT-604	T-602 IX Vessel High High Effluent Pressure						
DPAH-602	PT-603/604	T-602 IX Vessel High Differential Pressure						
PAH-605	PT-605	T-603 IX Vessel High Influent Pressure						

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Interlock #	Correct Interlock Response Verified (y/n)	Notes
PAHH-605	PT-605	T-603 IX Vessel High High Influent Pressure						
PAH-606	PT-606	T-603 IX Vessel High Effluent Pressure						
PAHH-606	PT-606	T-603 IX Vessel High High Effluent Pressure						
DPAH-603	PT-605/606	T-603 IX Vessel High Differential Pressure						
PAH-607	PT-607	T-604 IX Vessel High Influent Pressure						
PAHH-607	PT-607	T-604 IX Vessel High High Influent Pressure						
PAH-608	PT-608	T-604 IX Vessel High Effluent Pressure						
PAHH-608	PT-608	T-604 IX Vessel High High Effluent Pressure						
DPAH-604	PT-607/608	T-604 IX Vessel High Differential Pressure						
LAL-700	PT-700	Injection Equilization Tank Low Level						
LAH-700	PT-700	Injection Equilization Tank High Level						
LALL-700	PT-700	Injection Equilization Tank Low Low Level						
LAHH-700	PT-700	Injection Equilization Tank High High Level						
LALL-701	LSLL-701	Injection Equilization Tank Low Low Switch						
LAHH-701	LSHH-701	Injection Equilization Tank High High Switch						
FAL-701	FIT-701	Injection Pump Low Flow						
FAH-701	FIT-701	Injection Pump High Flow						
FAHH-701	FIT-701	Injection Pump High High Flow						
PAL-701	PIT-701	Inection Pump Low Pressure						
PAH-701	PIT-701	Injection Pump High Pressure						
PAHH-701	PIT-701	Injection Pump High High Pressure						
YA-701	P-701	Injection Pump Fault						
LAL-710	LSL-710	Fire Water Tank Low Level						
LAH-710	LSH-710	Fire Water Tank High Level						
LALL-710	LSLL-710	Fire Water Tank Low Low Level						
LAHH-710	LSHH-710	Fire Water Tank High High Level						
ZAO-710	FV-710	Fire Water Tank Valve Open Fault						
ZAO-711	FV-711	IW-3 Manifold Valve Open Fault						
ZAO-712	FV-712	MW-5 Manifold Valve Open Fault						
ZAO-713	FV-713	MW-11 Manifold Valve Open Fault						
ZAO-714	FV-714	RW-1 Manifold Valve Open Fault						
ZAO-715	FV-715	RW-2 Manifold Valve Open Fault						
ZAO-716	FV-716	RW-3 Manifold Valve Open Fault						
ZAC-710	FV-710	Fire Water Valve Close Fault						
ZAC-711	FV-711	IW-3 Manifold Valve Close Fault						
ZAC-712	FV-712	MW-5 Manifold Valve Close Fault						
ZAC-713	FV-713	MW-11 Manifold Valve Close Fault						
ZAC-714	FV-714	RW-1 Manifold Valve Close Fault						
ZAC-715	FV-715	RW-2 Manifold Valve Close Fault						
ZAC-716	FV-716	RW-3 Manifold Valve Close Fault						
PAL-711	PT-711	IW-3 Manifold Low Pressure						
PAL-712	PT-712	MW-5 Manifold Low Pressure						

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Interlock #	Correct Interlock Response Verified (y/n)	Notes
PAL-713	PT-713	MW-11 Manifold Low Pressure						
PAL-714	PT-714	RW-1 Manifold Low Pressure						
PAL-715	PT-715	RW-2 Manifold Low Pressure						
PAL-716	PT-716	RW-3 Manifold Low Pressure						
PAH-711	PT-711	IW-3 Manifold High Pressure						
PAH-712	PT-712	MW-5 Manifold High Pressure						
PAH-713	PT-713	MW-11 Manifold High Pressure						
PAH-714	PT-714	RW-1 Manifold High Pressure						
PAH-715	PT-715	RW-2 Manifold High Pressure						
PAH-716	PT-716	RW-3 Manifold High Pressure						
PALL-711	PT-711	IW-3 Manifold Low Low Pressure						
PALL-712	PT-712	MW-5 Manifold Low Low Pressure						
PALL-713	PT-713	MW-11 Manifold Low Low Pressure						
PALL-714	PT-714	RW-1 Manifold Low Low Pressure						
PALL-715	PT-715	RW-2 Manifold Low Low Pressure						
PALL-716	PT-716	RW-3 Manifold Low Low Pressure						
PAHH-711	PT-711	IW-3 Manifold High High Pressure						
PAHH-712	PT-712	MW-5 Manifold High High Pressure						
PAHH-713	PT-713	MW-11 Manifold High High Pressure						
PAHH-714	PT-714	RW-1 Manifold High High Pressure						
PAHH-715	PT-715	RW-2 Manifold High High Pressure						
PAHH-716	PT-716	RW-3 Manifold High High Pressure						
FAL-711	FIT-711	IW-3 Manifold Low Flow						
FAL-712	FIT-712	MW-5 Manifold Low Flow						
FAL-713	FIT-713	MW-11 Manifold Low Flow						
FAL-714	FIT-714	RW-1 Manifold Low Flow						
FAL-715	FIT-715	RW-2 Manifold Low Flow						
FAL-716	FIT-716	RW-3 Manifold Low Flow						
FAH-711	FIT-711	IW-3 Manifold High Flow						
FAH-712	FIT-712	MW-5 Manifold High Flow						
FAH-713	FIT-713	MW-11 Manifold High Flow						
FAH-714	FIT-714	RW-1 Manifold HighFlow						
FAH-715	FIT-715	RW-2 Manifold High Flow						
FAH-716	FIT-716	RW-3 Manifold High Flow						
FALL-711	FIT-711	IW-3 Manifold Low Low Flow						
FALL-712	FIT-712	MW-5 Manifold Low Low Flow						
FALL-713	FIT-713	MW-11 Manifold Low Low Flow						
FALL-714	FIT-714	RW-1 Manifold Low Low Flow						
FALL-715	FIT-715	RW-2 Manifold Low Low Flow						
FALL-716	FIT-716	RW-3 Manifold Low Low Flow						
LAL-721	PT-721	Injection Well Low Water Level						
LAL-722	PT-722	Injection Well Low Water Level						

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Interlock #	Correct Interlock Response Verified (y/n)	Notes
LAL-723	PT-723	Injection Well Low Water Level						
LAL-724	PT-724	Injection Well Low Water Level						
LAL-725	PT-725	Injection Well Low Water Level						
LAL-726	PT-726	Injection Well Low Water Level						
LAH-721	PT-721	Injection Well High Water Level						
LAH-722	PT-722	Injection Well High Water Level						
LAH-723	PT-723	Injection Well High Water Level						
LAH-724	PT-724	Injection Well High Water Level						
LAH-725	PT-725	Injection Well High Water Level						
LAH-726	PT-726	Injection Well High Water Level						
LAHH-721	PT-721	High High Injection Well Water Level						
LAHH-722	PT-722	High High Injection Well Water Level						
LAHH-723	PT-723	High High Injection Well Water Level						
LAHH-724	PT-724	High High Injection Well Water Level						
LAHH-725	PT-725	High High Injection Well Water Level						
LAHH-726	PT-726	High High Injection Well Water Level						
LAHH-731	LS-731	Injection Vault Leak Detection						
LAHH-732	LS-732	Injection Vault Leak Detection						
LAHH-733	LS-733	Injection Vault Leak Detection						
LAHH-734	LS-734	Injection Vault Leak Detection						
LAHH-735	LS-735	Injection Vault Leak Detection						
LAHH-736	LS-736	Injection Vault Leak Detection						
PAH-807	PT-807	Bag Filter High Influent Pressure						
PAHH-807	PT-807	Bag Filter High High Influent Pressure						
PAH-808	PT-808	Bag Filter High Effluent Pressure						
DPAH-808	PT-807/808	Bag Filter High Differential Pressure						
PAH-801	PT-801	T-801 GAC Vessel High Influent Pressure						
PAHH-801	PT-801	T-801 GAC Vessel HighHigh Influent Pressure						
PAH-802	PT-802	T-801 GAC Vessel High Effluent Pressure						
DPAH-801	PT-801/802	T-801 GAC Vessel High Differential Pressure						
PAH-805	PT-805	T-803 GAC Vessel High Influent Pressure						
PAHH-805	PT-805	T-803 GAC Vessel High High Influent Pressure						
PAH-806	PT-806	T-803 GAC Vessel High Effluent Pressure						
DPAH-803	PT-805/806	T-803 GAC Vessel High Differential Pressure						
PAL-901	PT-901	Air Compressor Low Pressure						
PALL-901	PT-901	Air Compressor Low Low Pressure						

<b>Project:</b> UTC UPCO	<b>Date:</b>
<b>Description:</b> Mechanical Dry-Run Test Procedure - 3.d.i Motor Bump-Test Verification	<b>Inspector:</b>

Instructions: Bump-test motors by placing motor in Hand briefly. Verify rotation.

**Field Form 3.d.i**

Motor	Description	Verify Motor Operation (Bump Test) (y/n)	Proper Rotation Verified (y/n)	Notes
P-003	SUMP PUMP			
P-004	SUMP PUMP			

<b>Project:</b> UTC UPCO	<b>Date:</b>
<b>Description:</b> Mechanical Dry-Run Test Procedure - 3.d.ii VFD Bump-Test Verification	
<b>Inspector:</b>	

Instructions: Bump-test motors by jogging VFD. Verify rotation.

<b>Field Form 3.d.ii</b>				
VFD	Description	Verify Motor Operation (Bump Test) (y/n)	Proper Rotation Verified (y/n)	Notes
VFD-101	EW-1 PUMP VFD			
VFD-102	EW-2 PUMP VFD			
VFD-103	IW-1 PUMP VFD			
VFD-104	MW-20 PUMP VFD			
VFD-201	FBR TRANSFER PUMP VFD			
VFD-211	BACKWASH DECANT PUMP VFD			
VFD-401	FILTRATION TRANSFER PUMP VFD			
VFD-501	CLEAN BACKWASH PUMP VFD			
VFD-701	INJECTION PUMP VFD			

**Project:** UTC UPCO  
**Description:** Clean Water Test Procedure -4.b Process Instrumentation Functionality

**Date:**

**Inspector:**

Instructions: Verify instruments with manual measurement or visual inspection where possible.

**Field Form 4.b**

Signal	Instrument	Description	Value Verified (y/n)	Notes
FQ-111	FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW PULSE		
FQ-112	FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW PULSE		
FQ-113	FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW PULSE		
FQ-114	FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW PULSE		
FQ-711	FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW PULSE		
FQ-712	FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW PULSE		
FQ-713	FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW PULSE		
FQ-714	FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW PULSE		
FQ-715	FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW PULSE		
FQ-716	FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW PULSE		
FQ-200	FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW PULSE		
FQ-201	FIT-201	FBR TRANSFER PUMP P-201 EFFLUENT FLOW PULSE		
FQ-211	FIT-211	BACKWASH DECANT PUMP P-211 EFFLUENT FLOW PULSE		
FQ-401	FIT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT FLOW PULSE		
FQ-701	FIT-701	INJECTION PUMP P-701 EFFLUENT FLOW PULSE		
FQ-501	FIT-501	BACKWASH PUMP P-501 EFFLUENT FLOW PULSE		
LI-101	PT-101	EXTRACTION WELL EW-1 CONTINOUS WATER LEVEL		
LI-103	PT-103	EXTRACTION WELL IW-1 CONTINOUS WATER LEVEL		
LI-104	PT-104	EXTRACTION WELL MW-20 CONTINOUS WATER LEVEL		
LI-721	PT-721	INJECTION WELL IW-3 CONTINOUS WATER LEVEL		
LI-722	PT-722	INJECTION WELL MW-5 CONTINOUS WATER LEVEL		
LI-723	PT-723	INJECTION WELL MW-11 CONTINOUS WATER LEVEL		
LI-724	PT-724	INJECTION WELL RW-1 CONTINOUS WATER LEVEL		
LI-725	PT-725	INJECTION WELL RW-2 CONTINOUS WATER LEVEL		
LI-726	PT-726	INJECTION WELL RW-3 CONTINOUS WATER LEVEL		
PI-111	PT-111	EXTRACTION WELL EW-1 MANIFOLD PIPING PRESSURE		
PI-112	PT-112	EXTRACTION WELL EW-2 MANIFOLD PIPING PRESSURE		
PI-113	PT-113	EXTRACTION WELL IW-1 MANIFOLD PIPING PRESSURE		
PI-114	PT-114	EXTRACTION WELL MW-20 MANIFOLD PIPING PRESSURE		
PI-711	PT-711	EXTRACTION WELL IW-3 MANIFOLD PIPING PRESSURE		
PI-712	PT-712	EXTRACTION WELL MW-5 MANIFOLD PIPING PRESSURE		
PI-713	PT-713	EXTRACTION WELL MW-11 MANIFOLD PIPING PRESSURE		
PI-714	PT-714	EXTRACTION WELL RW-1 MANIFOLD PIPING PRESSURE		
PI-715	PT-715	EXTRACTION WELL RW-2 MANIFOLD PIPING PRESSURE		
PI-716	PT-716	EXTRACTION WELL RW-3 MANIFOLD PIPING PRESSURE		
PI-901	PT-901	AIR COMPRESSOR A-900 DISCHARGE PRESSURE		
LI-200	PT-200	INFLUENT EQ TANK T-200 CONTINOUS WATER LEVEL		
PI-201	PT-201	FBR TRANSFER PUMP P-201 EFFLUENT PRESSURE		
PI-211	PT-211	BACKWASH DECANT PUMP P-211 EFFLUENT PRESSURE		
LI-210	PT-210	BACKWASH CONDITIONING TANK T-210 CONTINOUS WATER LEVEL		
LI-400	PT-400	FBR EFFLUENT EQ TANK T-400 CONTINOUS WATER LEVEL		
PI-401	PT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT PRESSURE		
PI-501	PT-501	MULTI-MEDIA FILTER T-501 INFLUENT PRESSURE		
PI-502	PT-502	MULTI-MEDIA FILTER T-501 EFFLUENT PRESSURE		
PI-601	PT-601	IX T-601 INFUENT PRESSURE		
PI-602	PT-602	IX T-601 EFFLUENT PRESSURE		
PI-603	PT-603	IX T-602 INFUENT PRESSURE		
PI-604	PT-604	IX T-602 EFFLUENT PRESSURE		
PI-605	PT-605	IX T-603 INFUENT PRESSURE		
PI-606	PT-606	IX T-603 EFFLUENT PRESSURE		
PI-607	PT-607	IX T-604 INFUENT PRESSURE		
PI-608	PT-608	IX T-604 EFFLUENT PRESSURE		
PI-801	PT-801	GAC T-801 INFLUENT PRESSURE		
PI-802	PT-802	GAC T-801 EFFLUENT PRESSURE		
PI-803	PT-803	GAC T-802 INFLUENT PRESSURE		
PI-804	PT-804	GAC T-802 EFFLUENT PRESSURE		
PI-805	PT-805	GAC T-803 INFLUENT PRESSURE		
PI-806	PT-806	GAC T-803 EFFLUENT PRESSURE		
PI-807	PT-807	FILTERS F-801&802 INFLUENT PRESSURE		
PI-808	PT-808	FILTERS F-801&802 EFFLUENT PRESSURE		
LI-700	PT-700	INJECTION EQ TANK T-700 CONTINOUS WATER LEVEL		
PI-701	FIT-701	INJECTION PUMP P-701 EFFLUENT PRESSURE		
FI-111	FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW RATE		
FI-112	FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW RATE		
FI-113	FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW RATE		
FI-114	FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW RATE		
FI-711	FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW RATE		
FI-712	FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW RATE		
FI-713	FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW RATE		
FI-714	FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW RATE		
FI-715	FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW RATE		
FI-716	FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW RATE		
FI-200	FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW RATE		
FI-201	FIT-201	FBR TRANSFER PUMP P-201 DISCHARGE FLOW RATE		
FI-211	FIT-211	BACKWASH DECANT PUMP P-211 DISCHARGE FLOW RATE		
FI-401	FIT-401	FILTRATION TRANSFER PUMP P-401 DISCHARGE FLOW RATE		
FI-701	FIT-701	INJECTION PUMP P-701 DISCHARGE FLOW RATE		
FI-501	FIT-501	BACKWASH PUMP P-501 DISCHARGE FLOW RATE		
LI-102	PT-102	EXTRACTION WELL EW-2 CONTINOUS WATER LEVEL		



<b>Project:</b> UTC UPCO	<b>Date:</b>
<b>Description:</b> Clean Water Test Procedure - 4.c.i Motor Control Verification	<b>Inspector:</b>

Instructions: Bump-test motors by placing motor in Hand briefly. If motor runs normally, proceed to test operation as per 4.c.i. Denote any inconsistencies on this sheet.

**Field Form 4.c**

Motor	Description	Verify Motor Operation (Bump Test) (y/n)	Motor runs when HOA is in Hand (y/n)	Does not run when in HOA is in Off (y/n)	Runs according to PLC when in Auto (y/n)	Notes
P-003	SUMP PUMP					
P-004	SUMP PUMP					

**Project:** UTC UPCO **Date:**  
**Description:** Clean Water Test Procedure - 4.c.ii VFD Control Verification **Inspector:**

Instructions: Bump-test motors by placing jogging VFD. If motor runs normally, proceed to test operation as per 4.c.ii. Denote any inconsistencies on this sheet.

**Field Form 4.c.ii**

VFD	Description	Verify Motor Operation (Bump Test) (y/n)	VFD control using HIM when HOA is in Hand (y/n)	Run when in HOA is in Off? (y/n)	Starts/Stops and runs at speed according to PLC when in Auto (y/n)	Notes
VFD-101	EW-1 PUMP VFD					
VFD-102	EW-2 PUMP VFD					
VFD-103	IW-1 PUMP VFD					
VFD-104	MW-20 PUMP VFD					
VFD-201	FBR TRANSFER PUMP VFD					
VFD-211	BACKWASH DECANT PUMP VFD					
VFD-401	FILTRATION TRANSFER PUMP VFD					
VFD-501	CLEAN BACKWASH PUMP VFD					
VFD-701	INJECTION PUMP VFD					

**Project:** UTC UPCO

**Date:**

**Description:** Clean Water Test Procedure - 4.d Process Control Verification

**Inspector:**

Instructions: Verify setpoint parameter functionality. Verify control loop controls according to design in the process control description.

**Field Form 4.d**

Control Loop	Control Loop Description	Setpoint Parameter	SCADA Input	Setpoint Parameter Calculated	SP Parameter Description	PV Measurement	Automatic Decrease/Increase SP	Control Loop Parameters, Functionality, and Tuning Verified (y/n)	Notes
SC-101	EW-1 VFD Speed Control	EW-1 Pump Flow Rate Setpoint (FC-111)	EW-1 Extraction Flow Rate Setpoint (FIT_111_SP)	FC-111 = FIT_111_SP	EW-1 Flow Rate	FIT-111	LAL/LAH-101		
SC-102	EW-2 VFD Speed Control	FC-112	FIT_112_SP	FC-112 = FIT_112_SP	EW-1 Flow Rate	FIT-112	LAL/LAH-102		
SC-103	IW-1 VFD Speed Control	FC-113	FIT_113_SP	FC-113 = FIT_113_SP	EW-1 Flow Rate	FIT-113	LAL/LAH-103		
SC-104	MW-20 VFD Speed Control	FC-114	FIT_114_SP	FC-114 = FIT_114_SP	EW-1 Flow Rate	FIT-114	LAL/LAH-104		
SC-201	P-201 VFD Speed Control	FC-201	LI_200_SP	FC-201 = (FI-200) * (LI-200) / LI200_SP	P-201 Discharge Flow Rate	FIT-201	LAL/LAH-201		
SC-211	P-211 VFD Speed Control	FC-211	LI_210_SP	FC-211 = (FI-211) * (LI-210) / LI210_SP	P-211 Discharge Flow Rate	FIT-211	LAL/LAH-210		
SC-401	P-401 VFD Speed Control	FC-401	LI_400_SP	FC-401 = (FI-400) * (LI-400) / LI400_SP	P-401 Discharge Flow Rate	FIT-401	LAL/LAH-400		
SC-701	P-701 VFD Speed Control	FC-701	LI_700_SP	FC-701 = (FI-700) * (LI-700) / LI700_SP	P-701 Discharge Flow Rate	FIT-701	LAL/LAH-701		
SC-501	P-501 VFD Speed Control	FC-501	FIT_501_SP	FC-501 = FIT_501_SP	P-501 Discharge Flow Rate	FIT-501	LAL/LAH-501		

**Project:** UTC UPCO **Date:**

**Description:**  
Clean Water Test Procedure - 4.e FBR Integration and Optimization **Inspector:**

Instructions: Coordinate with FBR instruction and/or FBR vendor representative to test the SCADA/FBR integration items listed in this checklist.

**Field Form 4.e**

Item	Verified (y/n)	Notes
Process data from FBR displays properly on SCADA		
FBR alarms display properly on SCADA		
Permissive signal from FBP is received at MCP when FBR is in "FBR ON" mode		
Permissive signal from FBR is removed when FBR is in "FBR OFF" or "FBR Recycle" mode		
Verify appropriate SCADA alarms transfer to FBP as per Process Control Description section 2.3.D		
Partial Forward Flow recovery process verified, as per Process Control Description section 2.3.F		

# APPENDIX B

Envirogen O&M Manual – Section 3



### **3 FBR SYSTEM OPERATION**

The following section will provide information on the system startup, operations, and maintenance.

#### **3.1 FBR SYSTEM PROCESS STARTUP**

##### **3.1.1 Startup Precautions**

The precautions listed below are to be carefully followed to ensure maximum system efficiency and equipment life.

##### CONTINUOUS OPERATION

The health and efficiency of the biological activity that performs the waste contaminant conversion in a biological process such as the anoxic FBR system described previously can only be maintained if the biomass receives a proper supply of electron acceptors (See Table 2-1), nutrients and electron donor on a continuous basis. Accordingly, it is very important to minimize downtime and to specifically limit downtime to no more than 24 hours if possible.

##### BIOREACTOR MEDIA BED HEIGHT

Excess bioreactor media and biological growth must be kept out of the bioreactor distribution and flow guide system to minimize the possibility of plugging. In a properly operating system the bed height will increase as biological growth takes place. The FBR is equipped with a biomass separation device and an in-bed media cleaning system. These are installed to help remove biological solids from the media and therefore limit bed expansion. If it is necessary to add or remove media from the bioreactor, the addition and removal procedures described in Sections 3.1.3 and 3.1.4 below must be followed explicitly.

##### BIOREACTOR TEMPERATURE

The biological conversion process is temperature sensitive. A reactor temperature below 50°F (10°C) may negatively affect the microbes and reactor performance temporarily. This affect is not permanent; returning to more moderate temperatures will restore performance. If the reactor temperature increases beyond 100°F (38°C) for any reason (e.g., due to a severe pump malfunction or operation for an extended period of time in recycle mode in extremely hot weather) steps should be taken to immediately lower the temperature. A long re-acclimation period may result if the temperature remains above 100°F (38°C) for more than two hours.

### 3.1.2 General Startup

Prior to attempting start-up the operator should review individual component manufacturer's documentation in Appendix B to familiarize themselves with components and any additional information needed for their operation. Some general guidelines are listed below and should be performed prior to media addition.

1. Stroke all valves prior to flooding system to verify operation;
2. Lubricate and oil all rotating components per manufacturer's recommendations. Verify rotation;
3. Energize system. Close main disconnect switches;
4. Confirm correct operation of the control system;
5. Verify instrument calibrations;
6. Refer to startup procedure in Section 3.1.7 below for the order in which all equipment should be started;
7. Fill reactor vessel and piping with clean water. Bleed all air pockets from system;
8. Hydrotest the vessel and piping by recirculation of the clean water. Check for leaks in tank, pipes, and fittings. Tighten loose connections and repair all leaks before media loading.

### 3.1.3 Carbon Media Loading

The FBR uses granular activated carbon (GAC) as media. After completing the general startup preparation guidelines, the FBR vessel should be ready for loading the GAC that will serve as the support matrix for the microbes. The GAC will be shipped in 1,100 lb (500 kg) super sacks. Care must be taken by the installing contractor to minimize or avoid spilling the GAC into the collection and effluent piping systems. The steps for adding the GAC to the FBR are listed below:

1. Drain the water from the FBR – assumed to be clean water from hydro testing – to an approved drain until the vessel is approximately half full.
2. Temporarily cover or protect the top of the effluent weir trough and recycle pipe openings as necessary; this is intended to ensure that GAC is placed only at the bottom of the FBR and none of it is spilled into the recycle or effluent collection piping systems.
3. Isolate all tank valves to the FBR and remove (or retract) the in-bed cleaning devices.
4. Add media to the reactor one sack at a time. Each super sack can be elevated into position over the top of the FBR using a crane or other approved lifting device; a worker stationed on or near the top of the FBR can assist in transferring the carbon media from the super sack to the reaction vessel; use dust control measures or dust PPE as necessary.

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5. Open the super sack and unload the GAC into the bottom of the FBR taking care to not spill any media into recycle or effluent collection piping systems; the fluid level in the FBR will increase as GAC is added; add additional water as necessary during the loading to keep the media fully submerged.
6. Repeat steps 4 & 5 and periodically check the approximate bed height. Continue loading until a settled bed height of approximately 6'-9" is achieved (approximately 8.5 super sacks). *Note: GAC density varies, so it is necessary to periodically calculate the number of additional super sacks to be loaded. On average each super sack is about 35 ft<sup>3</sup> (1,100 lbs), and will increase the settled bed height approximately 9.6 inches.*
7. Remove temporary covers and plugs from the effluent piping and recycle systems.
8. Add clean water to the reactor to raise the water level to 14 ft. The water level needs to cover the recycle header and remain about 4" below the elevation of the Effluent collector.
9. Fluidize the FBR (per section 3.1.4) for approximately 20 – 30 minutes to even the media bed, and then de-energize (stop) the fluidization pump. Wait 30 minutes for the bed to settle and measure the elevation of the media bed. The settled bed height in the FBR can be measured by dropping a weighted probe down through the liquid at the top of the FBR until the probe reaches the top of the settled media.
10. Continue to add media, per steps 4 and 5 above (note: As needed reinstall temporary covers over the effluent collector and recycle header) until measured bed height is between 6'-11" and 7'-1" (about 2 to 4" higher than the desired settled bed depth of 6'-9"). It is estimated it will take a total of about 308 cubic feet (or approximately 9 super sacks) of media to bring the media to the required settled bed height of 6'-9" from the bottom (or approximately 9'-3" from the top of the sidewall).
11. Remove any temporary covers and plugs from the effluent piping and recycle systems. If needed add clean water until the level is about 2" below the effluent collector.
12. Allow media to soak overnight to saturate, settle, release air bubbles attached to media and sink floating GAC particles.

### 3.1.4 Wash Media and Establish Fluidization Loading

It is important to wash out the media fines prior to placing the FBR into operation. Fill the FBR with clean water up to just below the effluent trough weir. Remove any floating GAC fines from the FBR using a skimmer net.

Establish media fluidization to the FBR in recycle operating mode

**FBR-300:** Verify that manual feed valve V-320 is closed. Open the manual valves between FBR-300 and FBR fluidization pump P-301 (V-301A, V-301B, V-301F and V308). Verify or open



instrument isolation valves V-301G (pressure gauge), V-301J (pressure switch), V-322 (ORP probe), V-323 (pH probe), ensure sample valves V-301H and V-321 are closed as well as the strainer drain (V-301D) and vent (V-301C) valves. Make sure that the FBR is filled with water up over the effluent collector piping, otherwise loss of FBR fluidization pump prime and pump damage may occur. Start fluidization pump P-301 at the control panel. Set the initial fluidization flow at 400 gpm for the FBR using flow indicator FIT-301 for flow measurement and adjusting the flow with valve V-308.

Increase the fluidization flow in incremental steps to approximately 480 gpm. As additional water is added to the FBR, the fluidization recycle flow will cause the fines to separate and rise to the top of the media bed. Shut the pumping system down after running in recycle for 24 hours. Let the reactor stand for 1 hour to allow the fines to settle on top of the media bed. A siphon hose system may be utilized to “vacuum” the top of the media bed that contains these fines. These excess fines should be disposed as required by site regulations.

After the fines are removed, run the FBR system in recycle for 10 minutes to re-level the reactor bed then shut down the FBR again, allow the bed to settle for at least 30 minutes, and record the settled bed height using a weighted probe or hand held sludge gun. The settled bed height should be  $\pm 2$ ” from the desired settled bed height of 6’-11” as measured from the bottom of the reactor. Adjust bed height by adding or removing GAC as necessary. It is preferred that pre-wetted media be used if additional media is required.

Establish the fluidization loading of each FBR bed. Start fluidization pump P-301 or P-302 at a recycle flow rate of 480 gpm. Monitor and record the bed height, FBR fluidization flow, and temperature for the FBR. Establish the “**Normal System Fluidization Flow**” (NSFF) for the FBR. This is a fluidization flow that results in a clean expanded bed height of approximately 8’-10” for the FBR as measured from the bottom of the reactor; 1.28 times the settled bed height; when operating at normal treatment temperature. Increased water temperature requires a higher flow to achieve a given level of media fluidization. The FBR fluidization flow rate should always be maintained at the established NSFF. It is recommended that a mark be placed to indicate the fluidization flow control valve position necessary to achieve this rate for each FBR.

Once the bed is fluidized the pH of the reactor will likely require adjustment due to the basic nature of virgin GAC. Obtain a water sample from the FBR and determine the pH using a colorimetric test. Calculate the required amount of acid needed to adjust the pH of the FBR to approximately 7.0. Operate the FBR in recycle mode to thoroughly mix the acid.

### 3.1.5 Process Feed Startup Plan

The following items are assumed to be in place prior to initial startup:

1. The FBR equipment skids with all associated piping is fully assembled and filled with clean water;
2. The FBRs are full of media and clean water, and operating in recycle mode (i.e., the fluidization pump has been fully tested mechanically and is functional);
3. The complete system has been fully tested mechanically and has been accepted by the client for startup including all pumps, vessels, instruments, and controls;

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4. Feed water system including the controls (provided by others) are ready for startup; Ensure that the manual feed isolation valve is open (V-320)
5. Effluent is connected to next process or discharge.

### 3.1.5.1 Inoculation

To expedite start-up, the FBRs can be inoculated by the installing contractor with a specific nitrate and perchlorate degrading culture. Prior to introducing the microbial seed to the FBRs, the potable water in the FBRs should be replaced with feed water by operating the reactor in flow-through mode. The FBRs should be operated in forward feed mode long enough to fill the with process water. Add nutrient solution to the water recycle to provide an initial residual concentration of phosphate-P.

Perform the following steps to properly seed the FBR vessels:

1. Shut off the system feed and allow the FBRs to run in recycle mode (close V-320);
2. Add the seed (concentrated microorganisms) to the FBR vessel;
3. Allow the system to operate in recycle mode for 18-24 hours to promote microbial attachment to the granular activated carbon and GAC particles.

Monitor the system for nitrate - nitrogen ( $\text{NO}_3\text{-N}$ ), total organic carbon (TOC), and document the FBR system parameters on the appropriate FBR Process Monitoring Log Sheet in the Appendix. Adjust nutrient dosages as needed to maintain residual phosphate-P levels at 1.0 mg/l. Maintain a pH of 6.5 to 7.5 within the FBR. Add carbon substrate if needed to reduce initial nitrate - nitrogen ( $\text{NO}_3\text{-N}$ ) concentration to below 2.0 mg/l.

During this time the microbial growth should be monitored via feed and effluent groundwater quality testing, substrate utilization, and field analytical testing. Adjustments should be made to the initial setting of the biomass separation devices as needed. Monitor the FBR per the monitoring Log Sheet included in Appendix E and add nutrients to maintain phosphate-P levels in the discharge water within the range of 0.5-1.0 mg/L. **SAMPLES FOR PHOSPHATE-P MUST BE FILTERED BEFORE ANALYSIS.**

### 3.1.6 Initial Feed

With the feed flow stopped and the FBR fluidization pumps operating in recycle mode as described in Sections 3.1.5 and 3.1.6, the water will circulate through the FBRs. The procedure below is for starting initial feed flow to the FBR.

When the nitrate concentration in the water drops below 1.0 mg/L, open V-320 and start forward feed flow to the system at 10 gpm. Monitor the system using the Monitoring Log Sheet in Appendix E and adjust nutrient dosage as needed to maintain residual phosphate (P) levels at about 1.0 mg/L (See Section 3.1.7.1). Monitor AIT-300 and manually add acid or base to maintain a pH of 6.5 to 7.5 within the FBR. Flow may be increased daily to the system by no more than 10 percent provided effluent nitrate is being maintained at the discharge from the FBR system. If all

parameters remain in range continue feeding water until the system is processing the flow available or up to full design flow.

Note: If an acid or base dosing is needed to maintain the FBR operating pH at this stage of process start-up, use locally available chemicals (pool chemical supplier). pH adjustment may not be needed during normal operations; however, if necessary a pH adjustment pump and controls have been included.

Open the instrument air isolation valves leading to the biomass separator control panel, and set the following preliminary settings for the biomass separator:

AIR FLOW RATE: 15 SCFH;

ELEVATION OF Center Pipe: Set the center pipe slot at the normal water level.

During this time, microbial growth should be monitored via feed and effluent groundwater quality testing, substrate utilization, and field analytical tests. Make adjustments to the initial settings of the biomass separators as needed.

Monitor the FBR as per monitoring log sheet and add nutrients as needed to maintain residual ammonia-N, phosphate-P.

### **3.1.7 Startup Equipment, Test Kits, and Chemicals**

A number of on-site analyses will be required using simple field test kits. If there is historical data on the feed composition, feed sampling and analyses can be reduced. Less frequent analyses can be performed by a certified laboratory. A recommended list of parameters for monitoring the FBRs is detailed in the Monitoring Log Sheet included in Appendix E. Total Organic Carbon (TOC), Nitrate as N, Ammonia as N, and Ortho-phosphate-P field analyses can be done using simple field test kits. These field analyses should be supplemented with periodic certified laboratory analyses as a quality assurance/quality control (QA/QC) measure of the accuracy of the field analyses. The use of methods requiring a spectrophotometer is recommended for the on-site analyses rather than the use of simple visual field test kits. The spectrophotometer methods produce much more reliable and quantitative measurements than simple visual “color wheel” test kits, although sample test kits can be used if measured values are confirmed frequently by certified laboratory analyses.

#### **Suggested Analytical Equipment and Reagents**

Below is a list of recommended equipment and reagents which can be purchased directly from HACH (Loveland, CO) in order to perform the recommended analyses. Additional reagents can be purchased from HACH as needed. In addition to the equipment listed below, a few 250-ml beakers, 5-ml and 10-ml transfer pipettes, 100-ml graduated cylinders, and disposable 0.45 µm filters and syringes etc. will also be required.

#### **Preferred Equipment**

HACH DR/850 Colorimeter, Cat. No. 4845000 (online)

HACH DR200 Digital Reactor, Cat. No. LTV082.53.40001 (online)

#### **Preferred Reagents**

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Parameter	Analytical Method	Cat. No.	Range
Ortho-phosphate – P	8048 PhosVer® 3	2106069, 2508025	0.06 – 5.00 mg/l
Nitrate – N	8039 NitraVer®5	2106169, 2511025	0.3 – 30.0 mg/l
Ammonia – N	10031 Salicylate	2606945	0 – 50 mg/l
Total Organic Carbon, MR	10173 Direct	2815945	15 – 150 mg/l

### **Chemicals**

Below are the recommended chemicals and quantities required for FBR startup:

75 wt% Phosphoric acid nutrients;

190 proof, de-natured ethanol;

### **3.2 FBR OPERATION**

The following sections detail the different operation modes of the anoxic FBR system.

#### **3.2.1 FBR Operating Modes**

The FBR has three operating conditions.

- FBR OFF-LINE
- FBR RECYCLE
- FBR ON-LINE

Alarm conditions that will trigger FBR SYSTEM SHUTDOWN or FBR FEED SHUTDOWN as well as their set points are detailed in the Process Controls Specification, which is included in the Appendix.

The active operating status for the system is displayed at the operator interface terminal (OIT) display screen.

##### **3.2.1.1 FBR SYSTEM SHUTDOWN**

A complete FBR system shutdown is when the FBR is shutdown, fluidization pumps P-301 and P-302 are OFF and FBR isolation valve V-320 is CLOSED. There is no recycle flow to the reactor.

To perform a complete system shutdown, the operator should stop the feed flow to the FBR then place both fluidization pumps in the OFF position. The FBR feed pump will stop and the entire FBR system will be in SHUTDOWN. There is no automated valve that will close to stop feed flow. Manual valve V-320 should be closed to ensure no feed reaches the FBR.

External triggers, such as a power failure or loss of instrument air pressure will trigger a complete FBR system shutdown. An internal trigger for a FBR system shutdown is created when the process operator presses the E-Stop button.

# APPENDIX C

## Temporary Frac Tank System: Standard Operating Procedure and Site Plan



# FRAC TANK SYSTEM STANDARD OPERATING PROCEDURE

Rev. #: 00

Rev Date: December 2018



## APPROVAL SIGNATURES

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

(Technical Expert)

## I. SETUP

1. Frac tank to be 21,000 gal, placed parallel to the north wall of the treatment system building
  - a. Request “clean” tank from vendor
  - b. Spill guard required
  - c. Verify cleanliness of tank via laboratory analysis
2. Temporary recirculation pump to be placed to the West of the frac tank with pump discharge facing building
  - a. Operating range 10 – 75 gpm
  - b. Max Operating Point: 75 gpm @ 30 ft
  - c. VFD Controlled
3. Approx. 200’ of 3-inch hosing to be supplied for “influent” and “effluent” connections to system
  - a. Influent connection - 70’ hose from frac tank to 6-inch blind flange at top header (extraction) on left side of manifold
  - b. Effluent connection - 130’ hose from 6-inch blind flange at bottom header (injection) on right side of manifold to frac tank
  - c. Utilize hose ramps where necessary
4. Fill Frac Tank with clean water
  - a. A total of approximately 55,000 gal will be required to fill all system tankage, vessels and piping
  - b. Frac Tank refill will be required via water truck
  - c. Open isolation valves and check hosing and couplings for leaks



## **II. OPERATION**

### **Initial Fill Procedure**

1. Open isolation valve associated with influent hosing (between frac tank and extraction header on manifold)
2. Open manual ball valves and pneumatic Bray valves necessary to move water between tankage (not required between all process components – refer to PID)
3. Turn on temporary recirculation pump and adjust flow so that reasonable fill rate of T-200 is achieved – approximately 50 gpm.
4. Fill T-200 to level alarm high high setpoint as indicated in Alarm/Interlock Summary Table
5. Pump down T-200 to typical operational level as described in Process Control description and maintain this level while filling downstream tankage and vessels
6. Using manual system operation, repeat above steps until all downstream tanks and vessels are full
  - a. Add clean water to frac tank as necessary to fill all downstream tankage and vessels

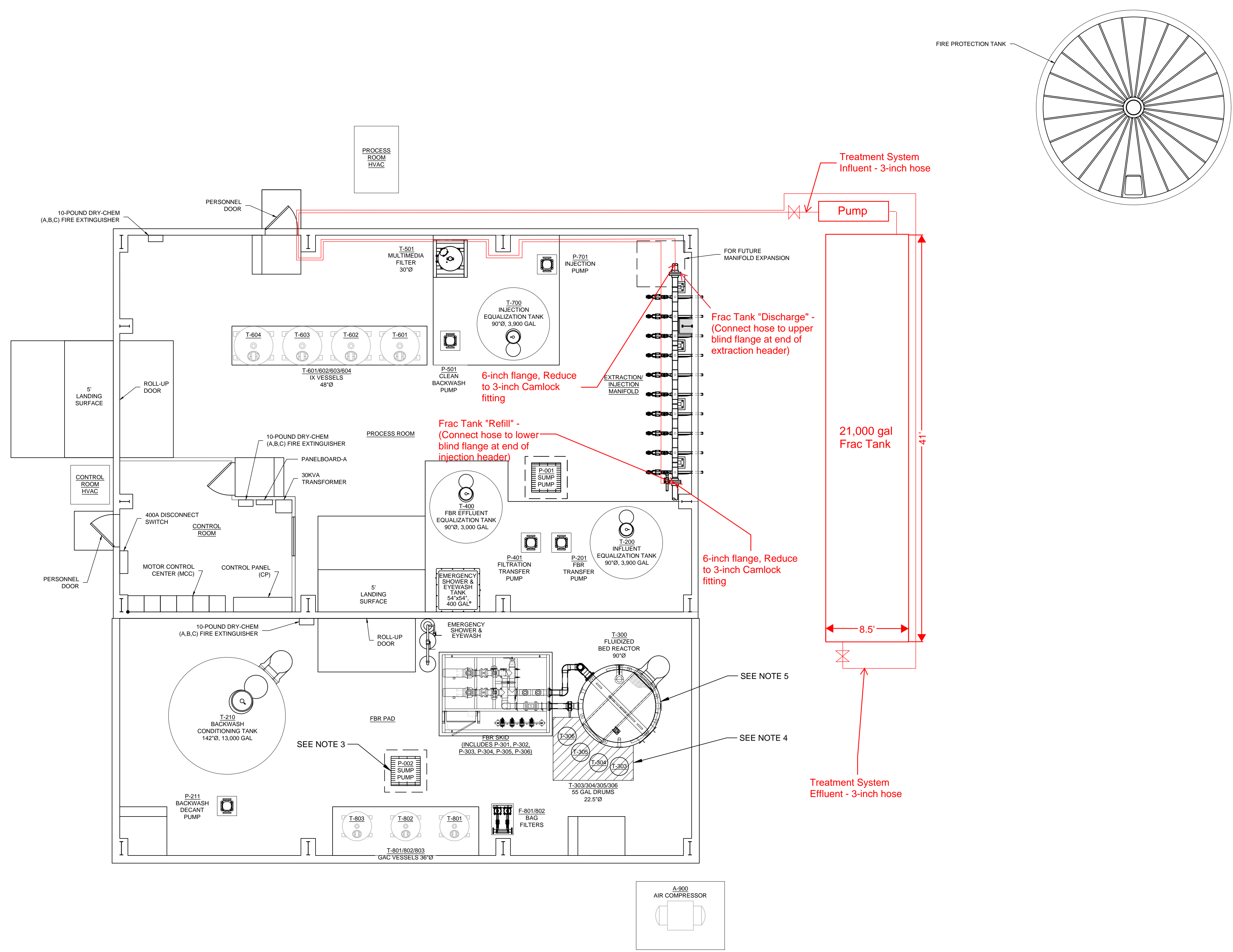
## **III. TEMPORARY FRAC TANK SYSTEM DECOMMISSIONING AND REMOVAL**

1. Pump frac tank down to a low level that can be achieved by temporary pump
2. Isolate valves associated with frac tank
3. Verify Treatment System is “off”, and Injection Extraction manifold valving is in proper position
4. Disconnect 3-inch hoses at ends connected to Treatment System Injection/Extraction manifold and move near Treatment System sump
  - a. Replace blind flanges at either end of Injection/Extraction Manifold
5. Allow all water in hoses to drain to Treatment System sump by disconnecting hoses at frac tank and “walking” hoses back to Treatment System, allowing water to drain out of hoses

SOP: Frac Tank System Standard Operating Procedure

Rev. #: 00 | Rev Date: December 2018

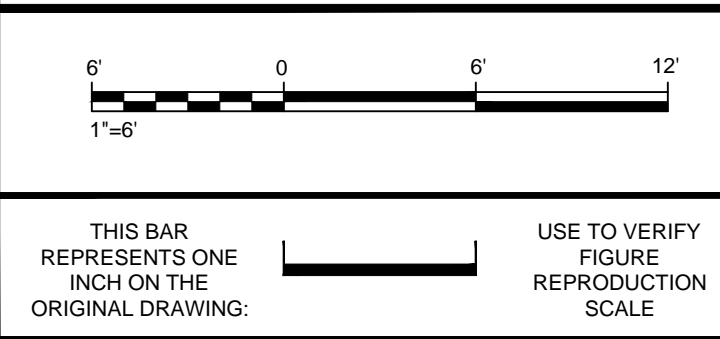
- a. Secondary containment outside of treatment system shall be used to prevent any untreated water from spilling onto ground as hose segments are being disconnected
6. Using temporary sump pump, pump down any standing water in secondary containment around frac tank or hoses outside the Treatment System containment area
  - a. This water can be pumped to Treatment System sump or Frac Tank
7. Using temporary sump pump, pump down remaining water in frac tank
  - a. This water can be pumped to Treatment System sump



- TEMPORARY FRAC TANK SYSTEM NOTES:**
- TANK LOCATION SHOWN IS APPROXIMATE - TO BE VERIFIED BY FIELD ENGINEER PRIOR TO PLACEMENT.
  - HOSE RAMPS AND DELINEATORS TO BE UTILIZED AS NECESSARY.

- NOTES:**
- SEE SHEET S-3 FOR ELEVATION VIEWS.
  - MASONRY WALL TO BE INSTALLED ALONG PERIMETER OF FBR PAD (WITH ACCESS GATES(S) WHERE APPLICABLE). SEE SHEET S-5.
  - PROTECTIVE CONCRETE COATING SHALL BE APPLIED TO SUMP FLOOR AND WALLS.
  - PROTECTIVE CONCRETE COATING SHALL BE APPLIED TO PAD FLOOR.
  - T-200/210/400/700 FITTINGS AND APPURTENANCES INSTALLATION PER SNYDER'S "GUIDELINES FOR USE AND INSTALLATION".
  - PUMP DISCHARGE AND SUCTION PIPING ELEVATIONS TO BE DETERMINED BY CONTRACTOR AND CONNECTIONS TO BE FIELD FITTED.
  - PIPING NOT CONTAINED WITHIN THE TREATMENT BUILDING SHALL BE INSULATED. ANY PIPING NOT INSULATED SHALL BE PAINTED.

**NOT FOR CONSTRUCTION**



No.	Date	Revisions	By	Ckd
0	2/1/18	100% DESIGN	MRB	MRB

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Professional Engineer's Name <b>MICHAEL R. BERRY</b>		
Professional Engineer's No. 34035 EXP. 9/30/2020		
State AZ	Date Signed 2/1/18	Project Mgr.
Designed by	Drawn by	Checked by



ARCADIS U.S., INC.

FORMER UNIVERSAL PROPULSION COMPANY, INC. FACILITY PHOENIX, ARIZONA  
100% DESIGN

## TREATMENT SYSTEM GENERAL ARRANGEMENT

MECHANICAL

ARCADIS Project No. 03994018.0025.00002
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**ATTACHMENT 2  
STARTUP FIELD CHECKLISTS**



<b>Project:</b> UTC UPCO		<b>Date:</b> 2019		<b>P-2</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification		<b>Inspector:</b> Toller/Hammer/Vespalec		
<b>Instructions:</b> Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.				
<b>Field Form 1.a.i</b>				
Unit Process (Drawing Reference Sheet)	Extraction Wells (P-2)			
	IW-01	EW-01	MW-20	EW-02
<b>Piping</b>				
1. Inspect for cracks, incomplete connections, unions, flanges	X	X	X	X
2. Verify supports/hangers, clamps, unistrut	X	X	X	X
3. Install piping labels/flow direction arrows	NI	NI	NI	NI
4. Inspect dampener fitting	X	X	X	X
5. Hose (compressed air only) - inspect compression fittings, etc.				
<b>Instrumentation</b>				
Verify the location and installation of the following:				
1. Level switch	X	X	NTA	X
2. Pressure transducers	X	X	UR	UR
3. Pressure transmitters	X	X	X	X
4. Flow meters	X	X	X	X
5. Pressure Relief Valve	X	X	X	X
<b>Manual Valves</b>				
1. Inspect for cracks, incomplete connections, unintentionally glued components	X	X	X-glued one joint	X
2. Manually operate valve (if applicable)	X	X	X	X
a. Verify hand-tightness of unions (true-union valves)	X	X	X	X
3. <u>Position all manual valves in orientation as indicated on PID</u>	X	X	X	X
4. Verify sample ports are <u>CLOSED</u>	X	X	X	X
<b>Check Valves</b>				
1. Verify check-valves are installed in proper orientation	X	X	X-corrected	X
<b>Pressure Control Valves</b>				
1. Verify proper installation (orientation, complete/tight connection between upstream and downstream piping)	X	X	X	X
2. Verify that the Pressure Control Valves are fully OPEN (will be manually adjusted during Clean Water Test)	X	X	X	X
<b>Pressure Indicators</b>				
1. Verify that gauges are proper range for given process	X	X	X	X
2. Verify gauges are fluid filled and calibrated (reading zero)	X	X	X	X
<b>Flanges</b>				
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)	X	X	X	X
2. Pump Suction and Discharge flange	X	X	X	X
3. Torqued to manufacturer specification	X	X	X	X
<b>Bulk Head Fittings</b>				
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall				
<b>Notes</b>				
NI = not installed NTA = installed, but needs to be adjusted RP = Gauges to be replaced with range from 0-100 psi or 0-160 psi. UR = Under repair or replacement by manufacturer				

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this

Field Form 1.a.ii											
Unit Process (Drawing Reference Sheet)	Extraction/Injection Manifold (P-3)										Compressed Air
	RW-02	RW-01	MW-05	IW-01	EW-01	MW-11	EW-02	RW-03	IW-03	MW-20 (Note 1)	
<b>Piping</b>											3/4
1. Inspect cracks, incomplete connections, unions, flanges	X	X	X	X	X	X	X	X	X	X	
2. Verify supports/hangers, clamps, unistrut	X	X	X	X	X	X	X	X	X	X	X
3. Install piping labels/flow direction arrows	X	X	X	X	X	X	X	X	X	X	X
4. Inspect dampener fitting											X
5. Hose (compressed air only) - inspect compression fittings, etc.	FV-715 X <sup>2</sup>	FV-714 X <sup>2</sup>	FV-712 X	FV-113 X <sup>2</sup>	FV-111 X <sup>2</sup>	FV-713 X	FV-112 X	FV-716 X	FV-711 X	FV-114 X <sup>2</sup>	X-T
<b>Instrumentation</b>											
Verify the location and installation of the following:											
1. Level switch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2. Pressure transducers	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
3. Pressure transmitters											
4. Flow meters	X	X	X	X	X	X	X	X	X	X	
5. Pressure Relief Valve	X	X	X	X	X	X	X	X	X	X	
<b>Manual Valves</b>											
1. Inspect for cracks, incomplete connections, unintentionally glued components	X	X	X	X	X	X	X	X	X	X	
2. Manually operate valve (if applicable)	X	X	X	X	X	X	X	X	X	X	X
a. Verify hand-tightness of unions (true-union valves)	X-T	X-T	X-T	X-T	X-T	X-T	X-T	X-T	X-T	X-T	X-T
3. <u>Position all manual valves in orientation as indicated on PID</u>	X	X	X	X	X	X	X	X	X	X	X-T
4. Verify sample ports are <u>CLOSED</u>	X	X	X	X	X	X	X	X	X	X	N/A
<b>Check Valves</b>											
1. Verify check-valves are installed in proper orientation	X	X	X	X	X	X	X	X	X	X	
<b>Pressure Control Valves</b>											
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)	X	X	X	X	X	X	X	X	X	X	
2. Verify that the Pressure Control Valves are fully OPEN	X	X	X	X	X	X	X	X	X	X	
<b>Pressure Indicators</b>											
1. Verify that gauges are proper range for given process				X	X		X	X	X		X
2. Verify gauges are fluid filled and calibrated (reading zero)				X	X		X	X	X		X
<b>Flanges</b>											
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)	X	X	X	X	X	X	X	X	X	X	
2. Pump Suction and Discharge flange											
3. Torqued to manufacturer specification	X	X	X	X	X	X	X	X	X	X	
<b>Bulk Head Fittings</b>											
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall											

**Notes**  
1. Not typical: There should be additional 2" valve going to Bag filters  
2 = Retighten air fitting due to air leakage.  
N/A = not applicable  
T = connection was tightened as appropriate

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-4</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

**Field Form 1.a.iii**

Unit Process (Drawing Reference Sheet)	Influent Equalization Tank (T-200)								Backwashing Conditioning Tank (T-210)				Compressed Air
	IN	IN	IN	IN	IN	OUT	OUT	OUT	IN	OUT	OUT	OUT	
	Process water, P-3, from manifold	Process water, P-8, from GAC	Sump water, P-5 from FBR pad sump pump	From Sump Pump (P-003)	From P-211	To FBR Skid (P-5)	Tank Drain	Atmosphere	Backwash P-8 from GAC Backwash Header	To P-211 (including P-11)	Tank Drain	Atmosphere	
	3" PVC	2" PVC	3" PVC	2" PVC	2" PVC		2"		3" PVC	2"	2"		
<b>Piping</b>													
1. Inspect cracks, incomplete connections, unions, flanges	X	X	X	X	X	X	X	X	X	X	X	X	X
2. Verify supports/hangers, clamps, unistrut	X	X	X	X	X	X	X	X	X	X	X	X	X
3. Install piping labels/flow direction arrows	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	X
4. Inspect dampener fitting	X	X	X	X	X	X	X	X	X	X	X	X	
5. Hose (compressed air only) - inspect compression fittings, etc.						FV-307				FV-212			X
						X				X			
<b>Instrumentation</b>													
Verify the location and installation of the following:	X	X	X	X	X	X	X	X	X	X	X	X	
1. Level switch	X	X	X	X	X	X	X	X	X	X	X	X	
2. Pressure transducers	X	X	X	X	X	X	X	X	X	X	X	X	
3. Pressure transmitters	X	X	X	X	X	X	X	X	X	X	X	X	
4. Flow meters	X	X	X	X	X	X	X	X	X	X	X	X	
5. Pressure Relief Valve	X	X	X	X	X	X	X	X	X	X	X	X	
<b>Manual Valves</b>													
1. Inspect for cracks, incomplete connections, unintentionally glued components	X			X		X	X	X	X	X	X	X	X
2. Manually operate valve (if applicable)	X			X		X	X	X	X	X	X	X	
a. Verify hand-tightness of unions (true-union valves)	X			X		X	X	X	X	X	X	X	



<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-4</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

**Field Form 1.a.iii**

Unit Process (Drawing Reference Sheet)	Influent Equalization Tank (T-200)								Backwashing Conditioning Tank (T-210)				Compressed Air
	IN	IN	IN	IN	IN	OUT	OUT	OUT	IN	OUT	OUT	OUT	
	Process water, P-3, from manifold	Process water, P-8, from GAC	Sump water, P-5 from FBR pad sump pump	From Sump Pump (P-003)	From P-211	To FBR Skid (P-5)	Tank Drain	Atmosphere	Backwash P-8 from GAC Backwash Header	To P-211 (including P-11)	Tank Drain	Atmosphere	
	3" PVC	2" PVC	3" PVC	2" PVC	2" PVC		2"		3" PVC	2"	2"		
3. Position all manual valves in orientation as indicated on PID	X			X		X	X	X	X	X	X	X	X
4. Verify sample ports are CLOSED	X			X		X	X	X	X	X	X	X	
<b>Check Valves</b>													
1. Verify check-valves are installed in proper orientation	X			X		X	X	X		X	X	X	
<b>Pressure Control Valves</b>													
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)	X			X		X	X	X		X	X	X	
2. Verify that the Pressure Control Valves are fully OPEN	X			X		X	X	X		X	X	X	
<b>Pressure Indicators</b>													
1. Verify that gauges are proper range for given process	X					X	X	X	X	X	X	X	X
2. Verify gauges are fluid filled and calibrated (reading zero)	X					X	X	X	X	X	X	X	
<b>Flanges</b>													
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections.	X	X	X	X	X	X	X	X	X	X	X	X	
2. Pump Suction and Discharge flange	X	X	X	X	X	X	X	X	X	X	X	X	
3. Torqued to manufacturer specification	X	X	X	X	X	X	X	X	X	X	X	X	
<b>Bulk Head Fittings</b>													

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-4</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

**Field Form 1.a.iii**

Unit Process (Drawing Reference Sheet)	Influent Equalization Tank (T-200)								Backwashing Conditioning Tank (T-210)				Compressed Air
	IN	IN	IN	IN	IN	OUT	OUT	OUT	IN	OUT	OUT	OUT	
	Process water, P-3, from manifold	Process water, P-8, from GAC	Sump water, P-5 from FBR pad sump pump	From Sump Pump (P-003)	From P-211	To FBR Skid (P-5)	Tank Drain	Atmosphere	Backwash P-8 from GAC Backwash Header	To P-211 (including P-11)	Tank Drain	Atmosphere	
3" PVC	2" PVC	3" PVC	2" PVC	2" PVC		2"		3" PVC	2"	2"		3/4"	
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall	X	X	X	X		X	X	X	X	X	X		

**Notes**

NI = not installed

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-5</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

**Field Form 1.a.iv**

Unit Process (Drawing Reference Sheet)	FBR Equipment Skid (Vendor)			Fluidized Bed Reactor	Air Compressor		Tempered Water Tank & Emergency Eyewash and Shower	Sump Pump	FBR Containment Pad Level Switch
	IN	IN	OUT	OUT	OUT	Branch		OUT	
	Process Water P-4, from Influent EQ Tank	Fluidized Bed Reactor Tank	To Fluidized Bed Reactor Tank	Process Water P-6, to FBR Effluent Eq Tank	Compressed Air to P-4	Compressed Air to P-3		Sump Water P-4 to Influent	
	2" PVC			6" PVC	3/4"	3/4"		3"	
<b>Piping</b>									
1. Inspect cracks, incomplete connections, unions, flanges	X	X	X	X	X	X	X	X	
2. Verify supports/hangers, clamps, unistrut	X	X	X	X	X	X	X	X	
3. Install piping labels/flow direction arrows	X	X	X	NI	X	X	X	X	
4. Inspect dampener fitting	X	X	X	X			X	X	
5. Hose (compressed air only) - inspect compression fittings, etc.			FV-308 X-replaced		X	X			
<b>Instrumentation</b>									
Verify the location and installation of the following:	X	X	X	X				X	
1. Level switch	X	X	X	X			X	X	X
2. Pressure transducers	X	X	X	X				X	
3. Pressure transmitters	X	X	X	X				X	
4. Flow meters	X	X	X	X				X	
5. Pressure Relief Valve	X	X	X	X				X	
<b>Manual Valves</b>									
1. Inspect for cracks, incomplete connections, unintentionally glued components	X			X	X	X		X	
2. Manually operate valve (if applicable)	X			X	X	X		X	
a. Verify hand-tightness of unions (true-union valves)	X			X	X	X		X	

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-5</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

**Field Form 1.a.iv**

Unit Process (Drawing Reference Sheet)	FBR Equipment Skid (Vendor)			Fluidized Bed Reactor		Air Compressor		Tempered Water Tank & Emergency Eyewash and Shower	Sump Pump	FBR Containment Pad Level Switch
	IN	IN	OUT	OUT		OUT	Branch		OUT	
	Process Water P-4, from Influent EQ Tank	Fluidized Bed Reactor Tank	To Fluidized Bed Reactor Tank	Process Water P-6, to FBR Effluent Eq Tank		Compressed Air to P-4	Compressed Air to P-3		Sump Water P-4 to Influent	
	2" PVC			6" PVC		3/4"	3/4"		3"	
3. <u>Position all manual valves in orientation as indicated on PID</u>	X			X		X	X		X	
4. Verify sample ports are CLOSED	X			X						
<b>Check Valves</b>										
1. Verify check-valves are installed in proper orientation	X			X					X	
<b>Pressure Control Valves</b>										
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if	X			X					X	
2. Verify that the Pressure Control Valves are fully OPEN	X			X					X	
<b>Pressure Indicators</b>										
1. Verify that gauges are proper range for given process	X					X	X		X	
2. Verify gauges are fluid filled and calibrated (reading zero)	X					X	X		X	
<b>Flanges</b>										
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve	X	X	X	X					X	
2. Pump Suction and Discharge flange	X			X					X	
3. Torqued to manufacturer specification	X	X	X	X	X				X	

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-5</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

**Field Form 1.a.iv**

Unit Process (Drawing Reference Sheet)	FBR Equipment Skid (Vendor)			Fluidized Bed Reactor	Air Compressor		Tempered Water Tank & Emergency Eyewash and Shower	Sump Pump	FBR Containment Pad Level Switch
	IN	IN	OUT	OUT	OUT	Branch		OUT	
	Process Water P-4, from Influent EQ Tank	Fluidized Bed Reactor Tank	To Fluidized Bed Reactor Tank	Process Water P-6, to FBR Effluent Eq Tank	Compressed Air to P-4	Compressed Air to P-3		Sump Water P-4 to Influent	
	2" PVC			6" PVC	3/4"	3/4"		3"	
<b>Bulk Head Fittings</b>									
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall	X	X	X	X	X				

**Notes:**

NI = not installed

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-6</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

Field Form 1.a.v											
Unit Process (Drawing Reference Sheet)	FBR Effluent Equalization Tank (T-400)				Filtration Transfer Pump (P-401)	Multi-Media Filter (T-501)					Compressed Air
	IN	OUT	OUT	OUT		IN	IN	OUT	OUT	OUT	
	Process Water	Drain	Process Water to P-401	Atmosphere		Process Water from P-401	Clean Backwash	Process Water to IX Vessels	Drain	Backwash	
Pipe Size (inches)	6	2	3		2	3	3	3	4	3	3/4
<b>Piping</b>											
1. Inspect cracks, incomplete connections, unions, flanges	X	X	X	X	X	X	X	X	X	X	X
2. Verify supports/hangers, clamps, unistrut	X	X	X	X	X	X	X	X	X	X	X
3. Install piping labels/flow direction arrows	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	X
4. Inspect dampener fitting	X		X								
5. Hose (compressed air only) - inspect compression fittings, etc.			FV-501 X				FV-503 X <sup>1</sup>	FV-502 X <sup>1</sup>		FV-504 X	X
<b>Instrumentation</b>											
Verify the location and installation of the following:											
1. Level switch	X	X	X	X							
2. Pressure transducers	X	X	X	X							
3. Pressure transmitters						X	X	X	X	X	
4. Flow meters						X					
5. Pressure Relief Valve						X	X	X	X	X	
<b>Manual Valves</b>											
1. Inspect for cracks, incomplete connections, unintentionally glued components		X	X			X	X	X	X	X	X
2. Manually operate valve (if applicable)		X	X			X	X	X	X	X	X
a. Verify hand-tightness of unions (true-union valves)		X	X			X	X	X	X	X	X
3. Position all manual valves in orientation as indicated on PID		X	X			X	X	X	X	X	X
4. Verify sample ports are CLOSED						X	X	X	X	X	
<b>Check Valves</b>											
1. Verify check-valves are installed in proper orientation						X					
<b>Pressure Control Valves</b>											
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)											
2. Verify that the Pressure Control Valves are fully OPEN											
<b>Pressure Indicators</b>											
1. Verify that gauges are proper range for given process						X	X	X	X	X	X
2. Verify gauges are fluid filled and calibrated (reading zero)						X	X	X	X	X	X

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-6</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

Field Form 1.a.v											
Unit Process (Drawing Reference Sheet)	FBR Effluent Equalization Tank (T-400)				Filtration Transfer Pump (P-401)	Multi-Media Filter (T-501)					Compressed Air
	IN	OUT	OUT	OUT		IN	IN	OUT	OUT	OUT	
	Process Water	Drain	Process Water to P-401	Atmosphere		Process Water from P-401	Clean Backwash	Process Water to IX Vessels	Drain	Backwash	
<b>Flanges</b>											
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)	X	X	X	X	X	X	X	X	X	X	
2. Pump Suction and Discharge flange	X	X	X	X	X						
3. Torqued to manufacturer specification	X	X	X	X	X	X	X	X	X	X	
<b>Bulk Head Fittings</b>											
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall	X	X	X	X							

**Notes**

1 = Retighten air fitting due to air leakage.

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-7</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification		
<b>Inspector:</b> Toller/Hammer/Vespalec		

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and

**Field Form 1.a.vi**

Unit Process (Drawing Reference Sheet)	IEX Manifold												IX Bypass
	P-601			P-602			P-603			P-604			
	IN	OUT	BYPASS	IN	OUT	BYPASS	IN	OUT	BYPASS	IN	OUT	BYPASS	
<b>Pipe Size (inches)</b>	4	4	3	4	4	3	4	4	3	4	4	3	3
<b>Piping</b>													
1. Inspect cracks, incomplete connections, unions, flanges	X	X	X	X	X	X	X	X	X	X	X	X	X
2. Verify supports/hangers, clamps, unistrut	X	X	X	X	X	X	X	X	X	X	X	X	X
3. Install piping labels/flow direction arrows	X	X	X	X	X	X	X	X	X	X	X	X	X
4. Inspect dampener fitting													
5. Hose (compressed air only) - inspect compression fittings, etc.													
<b>Instrumentation</b>													
Verify the location and installation of the following:													
1. Level switch													
2. Pressure transducers													
3. Pressure transmitters	X	X		X	X		X	X		X	X		X
4. Flow meters													
5. Pressure Relief Valve	X	X	X	X	X	X	X	X	X	X	X	X	
<b>Manual Valves</b>													
1. Inspect for cracks, incomplete connections, unintentionally glued components	X	X	X	X	X	X	X	X	X	X	X	X	X
2. Manually operate valve (if applicable)	X	X	X	X	X	X	X	X	X	X	X	X	X
a. Verify hand-tightness of unions (true-union valves)	X	X	X	X	X	X	X	X	X	X	X	X	X
3. Position all manual valves in orientation as indicated on PID	X	X	X	X	X	X	X	X	X	X	X	X	X
4. Verify sample ports are CLOSED	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Check Valves</b>													
1. Verify check-valves are installed in proper orientation	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Pressure Control Valves</b>													
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)													
2. Verify that the Pressure Control Valves are fully OPEN													
<b>Pressure Indicators</b>													
1. Verify that gauges are proper range for given process													
2. Verify gauges are fluid filled and calibrated (reading zero)													
<b>Flanges</b>													
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)	X	X	X	X	X	X	X	X	X	X	X	X	X
2. Pump Suction and Discharge flange													
3. Torqued to manufacturer specification	X	X	X	X	X	X	X	X	X	X	X	X	X



Project: UTC UPCO Date: 2019  
 Description: Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification  
 Inspector: Toller/Hammer/Vespalec

**P-7**

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and

**Field Form 1.a.vi**

Unit Process (Drawing Reference Sheet)	IEX Manifold												IX Bypass
	P-601			P-602			P-603			P-604			
	IN	OUT	BYPASS	IN	OUT	BYPASS	IN	OUT	BYPASS	IN	OUT	BYPASS	
<b>Bulk Head Fittings</b>													
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall	X	X	X	X	X	X	X	X	X	X	X	X	X

**Notes**

Project: UTC UPCO												Date: 2019		P-8
Description: Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification												Inspector: Toller/Hammer/Vespalec		
Instructions: Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.														
Field Form 1.a.vii														
Unit Process (Drawing Reference Sheet)	Vendor Provided		GAC Manifold									Backwash (to P-4)	Clean Backwash (from P-9)	
	IN	OUT	GAC Vessel (T-801)			GAC Vessel (T-802)			GAC Vessel (T-803)					
	Process Water	Process Water	IN	OUT	BYPASS	IN	OUT	BYPASS	IN	OUT	BYPASS			
Pipe Size (inches)	3	3	4	4	2	4	4	2	4	4	2	3	3	
<b>Piping</b>														
1. Inspect cracks, incomplete connections, unions, flanges	X	X	X	X	X	X	X	X	X	X	X	X	X	
2. Verify supports/hangers, clamps, unistrut	X	X	X	X	X	X	X	X	X	X	X	X	X	
3. Install piping labels/flow direction arrows	X	X	X	X	X	X	X	X	X	X	X	X	X	
4. Inspect dampener fitting														
5. Hose (compressed air only) - inspect compression fittings, etc.	X	X	X	X	X	X	X	X	X	X	X	X	X	
<b>Instrumentation</b>														
Verify the location and installation of the following:														
1. Level switch														
2. Pressure transducers														
3. Pressure transmitters	X	X	X	X	X	X	X	X	X	X	X	X	X	
4. Flow meters														
5. Pressure Relief Valve			X	X	X	X	X	X	X	X	X			
<b>Manual Valves</b>														
1. Inspect for cracks, incomplete connections, unintentionally glued components	X	X <sup>1</sup>	X	X	X	X	X	X	X	X	X	X	X	
2. Manually operate valve (if applicable)	X	X	X	X	X	X	X	X	X	X	X	X	X	
a. Verify hand-tightness of unions (true-union valves)	X	X	X	X	X	X	X	X	X	X	X	X	X	
3. Position all manual valves in orientation as indicated on PID	X	X	X	X	X	X	X	X	X	X	X	X	X	
4. Verify sample ports are CLOSED	X	X	X	X	X	X	X	X	X	X	X	X	X	
<b>Check Valves</b>														
1. Verify check-valves are installed in proper orientation		X												
<b>Pressure Control Valves</b>														
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)														
2. Verify that the Pressure Control Valves are fully OPEN														
<b>Pressure Indicators</b>														
1. Verify that gauges are proper range for given process	X	X												
2. Verify gauges are fluid filled and calibrated (reading zero)	X	X												
<b>Flanges</b>														
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)	X	X	X	X	X	X	X	X	X	X	X	X	X	
2. Pump Suction and Discharge flange	X	X	X	X	X	X	X	X	X	X	X	X	X	
3. Torqued to manufacturer specification	X	X	X	X	X	X	X	X	X	X	X	X	X	

**Project:** UTC UPCO **Date:** 2019  
**Description:** Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification **Inspector:** Toller/Hammer/Vespalec

**P-8**

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

**Field Form 1.a.vii**

Unit Process (Drawing Reference Sheet)	Vendor Provided		GAC Manifold											
	IN	OUT	GAC Vessel (T-801)			GAC Vessel (T-802)			GAC Vessel (T-803)			Backwash (to P-4)	Clean Backwash (from P-9)	
	Process Water	Process Water	IN	OUT	BYPASS	IN	OUT	BYPASS	IN	OUT	BYPASS			
<b>Bulk Head Fittings</b>														
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall														

**Notes**

1= One joint was found unglued and corrected.

<b>Project:</b> UTC UPCO			<b>Date:</b> 2019		<b>P-9</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification			<b>Toller/Hammer/ Inspector:</b> Vespaiec		
<b>Instructions:</b> Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on					
<b>Field Form 1.a.viii</b>					
Unit Process (Drawing Reference Sheet)	Injection Equalization Tank (T-700)				Fire Protection Water
	IN	OUT	OUT	OUT	
	Process Water, P-7, From IX Vessels or IX bypass	Atmosphere	Process Water (P-3 to Manifold, includes P-701)	Clean Backwash (P-6 to Multi-media filter and to P-8 to GAC, includes P-501)	
<b>Pipe Size (inches)</b>	<b>3" PVC</b>		<b>3" PVC</b>	<b>3" PVC</b>	<b>3" PVC</b>
<b>Piping</b>					
1. Inspect cracks, incomplete connections, unions, flanges	X	X	X	X	X
2. Verify supports/hangers, clamps, unistrut	X	X	X	X	X
3. Install piping labels/flow direction arrows	NI	NI	NI	NI	NI
4. Inspect dampener fitting	X	X	X	X	X
5. Hose (compressed air only) - inspect compression fittings, etc.					<b>FV-710</b> X
<b>Instrumentation</b>					
Verify the location and installation of the following:					
1. Level switch	X	X	X	X	X
2. Pressure transducers	X	X	X	X	X
3. Pressure transmitters	X	X	X	X	X
4. Flow meters	X	X	X	X	X
5. Pressure Relief Valve	X	X	X	X	X
<b>Manual Valves</b>					
1. Inspect for cracks, incomplete connections, unintentionally glued components	X	X	X	X	X
2. Manually operate valve (if applicable)	X	X	X	X	X
a. Verify hand-tightness of unions (true-union valves)	X	X	X	X	X
3. <u>Position all manual valves in orientation as indicated on PID</u>	X	X	X	X	X
4. Verify sample ports are <u>CLOSED</u>	X	X	X	X	X
<b>Check Valves</b>					
1. Verify check-valves are installed in proper orientation	X	X	X	X	X
<b>Pressure Control Valves</b>					
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)	X	X	X	X	X
2. Verify that the Pressure Control Valves are fully OPEN	X	X	X	X	X
<b>Pressure Indicators</b>					
1. Verify that gauges are proper range for given process	X	X	X	X	X
2. Verify gauges are fluid filled and calibrated (reading zero)	X	X	X	X	X
<b>Flanges</b>					
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)	X	X	X	X	X
2. Pump Suction and Discharge flange	X	X	X	X	X
3. Torqued to manufacturer specification	X	X	X	X	X

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>Toller/Hammer/ Inspector:</b> Vespalec	<b>P-9</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification			

**Instructions:** Verfiy that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on

Bulk Head Fittings					
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall	X	X	X	X	

**Notes**

NI = not installed

<b>Project:</b> UTC UPCO	<b>Date:</b> 2019	<b>P-10</b>
<b>Description:</b> Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification	<b>Inspector:</b> Toller/Hammer/Vespalec	

**Instructions:** Verify that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

Field Form 1.a.ix									
Unit Process (Drawing Reference Sheet)	P-10						P-11		
	IW-3	MW-5	MW-11	RW-1	RW-2	RW-3	Fire Protection Water	Drain	Fire Hydrant Connection
<b>Piping</b>									
1. Inspect cracks, incomplete connections, unions, flanges	X	X	X	X	X	X	X	X	
2. Verify supports/hangers, clamps, unistrut	X	X	X	X	X	X	X	X	
3. Install piping labels/flow direction arrows	NI	NI	NI	NI	NI	NI	NI	X	
4. Inspect dampener fitting	X	X	X	X	X	X	X	X	
5. Hose (compressed air only) - inspect compression fittings, etc.									
<b>Instrumentation</b>									
Verify the location and installation of the following:									
1. Level switch	X	X	X	NTA	NTA	X			
2. Pressure transducers	UR	X	X	X	X	X			
3. Pressure transmitters									
4. Flow meters									
5. Pressure Relief Valve	X	X	X	X	X	X			
<b>Manual Valves</b>									
1. Inspect for cracks, incomplete connections, unintentionally glued components	X	X	X	X	X	X	X	X	
2. Manually operate valve (if applicable)	X	X	X	X	X	X	X	X	
a. Verify hand-tightness of unions (true-union valves)	X	X	X	X	X	X	X	X	
3. <u>Position all manual valves in orientation as indicated on PID</u>	X	X	X	X	X	X	X	X	
4. Verify sample ports are <u>CLOSED</u>	X	X	X	X	X	X			
<b>Check Valves</b>									
1. Verify check-valves are installed in proper orientation	X	X	X	X	X	X	X	X	
<b>Pressure Control Valves</b>									
1. Adjust pressure setpoint to approximate target for process flow in given piping segment (if possible will not in operation)	X	X	X	X	X	X	X		
2. Verify that the Pressure Control Valves are fully OPEN	X	X	X	X	X	X	X		
<b>Pressure Indicators</b>									
1. Verify that gauges are proper range for given process	RP	RP	RP	RP	RP	RP	RP		
2. Verify gauges are fluid filled and calibrated (reading zero)	X	X	X	X	X	X	X		
<b>Flanges</b>									
1. Verify all are gasketed properly and tightened (i.e. pump suction and discharge, flow meter, valve connections, blind flanges, expansion joints)	X	X	X	X	X	X	X		
2. Pump Suction and Discharge flange									
3. Torqued to manufacturer specification	X	X	X	X	X	X	X	X	X

**Project:** UTC UPCO **Date:** 2019  
**Description:** Pre-Startup/Post-Construction Punch-List - 1.a Mechanical Verification **Inspector:** Toller/Hammer/Vespalec

P-10

**Instructions:** Verfiy that all items listed in 1.a Mechanical Components section of Startup Plan are installed as intended. Using Design Drawings P&ID, start at extraction wells and verify proper installation and steadfastness of piping and fittings. Denote any inconsistencies on P&ID and reference on this sheet.

Field Form 1.a.ix									
Unit Process (Drawing Reference Sheet)	P-10						P-11		
	IW-3	MW-5	MW-11	RW-1	RW-2	RW-3	Fire Protection Water	Drain	Fire Hydrant Connection

<b>Bulk Head Fittings</b>									
1. Verify fitting is properly located on tank, exterior "lock-nut" is tight and fitting is flush with tank wall							X	X	X

**Notes**

NI = not installed  
 NTA = installed, but needs to be adjusted  
 RP = Gauges to be replaced with range from 0-100 psi or 0-160 psi.  
 UR = Under repair or replacement by manufacturer

**Project:** UTC UPCO **Date:** 2/26-3/1 and 3/11-3/15  
**Description:** Pre-Startup/Post-Construction Punch-List - 1.b Instrumentation Installation Verification **Inspector:** Nick Thomas

Instructions: Use P&IDs to walkthrough entire system and verify that all instruments listed are installed. Denote any inconsistencies on P&ID and reference on this sheet. Use Design Drawing Riser Diagram (E-8) to verify proper instrumentation cables have been terminated to the instruments from the designated control panel.

**Field Form 1.b**

Instrument	Description	Installation Verified (y/n)	Physical Install Correct (y/n)	Local Interface Configured (y/n/na)	Correct Power Source (y/n/na)	Correct Signal Cable (y/n/na)	Notes
FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-201	FBR TRANSFER PUMP P-201 EFFLUENT FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-211	BACKWASH DECANT PUMP P-211 EFFLUENT FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-501	BACKWASH PUMP P-501 EFFLUENT FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-701	INJECTION PUMP P-701 EFFLUENT FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW METER	Y	Y	N	Y	Y	Local interface configured for GPM display and verified scaling
							Solenoid valve controlling instrument air had temporary issue of sticking open. Exercising the manual mechanics override appeared to break loose whatever was causing this, but should be noted in case issue comes back up
FV-111	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	
FV-112	EXTRACTION WELL EW-2 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	
FV-113	EXTRACTION WELL IW-1 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	Same as FV-111
FV-114	EXTRACTION WELL MW-20 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	Same as FV-111
FV-212	BACKWASH DECANT PUMP P-211 DISCHARGE VALVE	Y	Y	N/A	Y	Y	
FV-301	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE	Y	Y	N/A	Y	Y	
FV-307	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE	Y	Y	N/A	Y	Y	
FV-501	MULTI-MEDIA FILTER T-501 INFLUENT VALVE	Y	Y	N/A	Y	Y	
FV-502	MMF T-501 EFFLUENT VALVE	Y	Y	N/A	Y	Y	
FV-503	MMF T-501 BACKWASH INFLUENT VALVE	Y	Y	N/A	Y	Y	
FV-504	MULTI-MEDIA FILTER T-501 BACKWASH EFFLUENT VALVE	Y	Y	N/A	Y	Y	
FV-711	EXTRACTION WELL IW-3 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	Same as FV-111
FV-712	EXTRACTION WELL MW-5 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	Same as FV-111
FV-713	EXTRACTION WELL MW-11 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	Same as FV-111
FV-714	EXTRACTION WELL RW-1 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	Same as FV-111
FV-715	EXTRACTION WELL RW-2 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	Same as FV-111
FV-716	EXTRACTION WELL RW-3 MANIFOLD FLOW VALVE	Y	Y	N/A	Y	Y	Same as FV-111
HS-001	BUILDING CONTAINMENT PAD ESTOP	Y	Y	N/A	Y	Y	
HS-002	FBR CONTAINMENT PAD ESTOP	Y	Y	N/A	Y	Y	
LS-001	BUILDING CONTAINMENT LEAK DETECTION	Y	Y	N/A	Y	Y	
LS-002	FBR CONTAINMENT LEAK DETECTION	Y	Y	N/A	Y	Y	
LS-111	WELL VAULT LEAK DETECTION, EW-1	Y	Y	N/A	N/A	Y	
LS-112	WELL VAULT LEAK DETECTION, EW-2	Y	Y	N/A	N/A	Y	
LS-113	WELL VAULT LEAK DETECTION, IW-1	Y	Y	N/A	N/A	Y	
LS-114	WELL VAULT LEAK DETECTION, MW-20	Y	Y	N/A	N/A	Y	
LS-721	INJECTION WELL IW-3 VAULT LEAK DETECTION	Y	Y	N/A	N/A	Y	
LS-722	INJECTION WELL MW-5 VAULT LEAK DETECTION	Y	Y	N/A	N/A	Y	
LS-723	INJECTION WELL MW-11 VAULT LEAK DETECTION	Y	Y	N/A	N/A	Y	
LS-724	INJECTION WELL RW-1 VAULT LEAK DETECTION	Y	Y	N/A	N/A	Y	



**Field Form 1.b**

Instrument	Description	Installation Verified (y/n)	Physical Install Correct (y/n)	Local Interface Configured (y/n/na)	Correct Power Source (y/n/na)	Correct Signal Cable (y/n/na)	Notes
LS-725	INJECTION WELL RW-2 VAULT LEAK DETECTION	Y	Y	N/A	N/A	Y	
LS-726	INJECTION WELL RW-3 VAULT LEAK DETECTION	Y	Y	N/A	N/A	Y	
LSH-003	SUMP HIGH LEVEL	Y	Y	N/A	N/A	Y	
LSH-004	SUMP HIGH LEVEL	Y	Y	N/A	N/A	Y	
LSHH-003	SUMP HIGH-HIGH LEVEL	Y	Y	N/A	N/A	Y	
LSHH-004	SUMP HIGH-HIGH LEVEL	Y	Y	N/A	N/A	Y	
LSHH-201	INFLUENT EQ TANK T-200 HIGH-HIGH WATER LEVEL	Y	Y	N/A	N/A	Y	
LSHH-211	BACKWASH CONDITIONING TANK T-210 HIGH-HIGH WATER LEVEL	Y	Y	N/A	N/A	Y	
LSHH-401	FBR EFFLUENT EQ TANK T-400 HIGH-HIGH WATER LEVEL	Y	Y	N/A	N/A	Y	
LSHH-701	INJECTION EQ TANK T-700 HIGH-HIGH WATER LEVEL	Y	Y	N/A	N/A	Y	
LSL-003	SUMP LOW LEVEL	Y	Y	N/A	N/A	Y	
LSL-004	SUMP LOW LEVEL	Y	Y	N/A	N/A	Y	
LSLL-201	INFLUENT EQ TANK T-200 LOW-LOW WATER LEVEL	Y	Y	N/A	N/A	Y	
LSLL-211	BACKWASH CONDITIONING TANK T-210 LOW-LOW LEVEL	Y	Y	N/A	N/A	Y	
LSLL-401	FBR EFFLUENT EQ TANK T-400 LOW-LOW WATER LEVEL	Y	Y	N/A	N/A	Y	
LSLL-701	INJECTION EQ TANK T-700 LOW-LOW WATER LEVEL	Y	Y	N/A	N/A	Y	
PT-101	EXTRACTION WELL EW-1 CONTINUOUS WATER LEVEL	Y	Y	N	N/A	Y	Final adjustment/level to be confirmed with scaling.
PT-102	EXTRACTION WELL EW-2 CONTINUOUS WATER LEVEL	Y	Y	N	N/A	Y	Final adjustment/level to be confirmed with scaling.
PT-103	EXTRACTION WELL IW-1 CONTINUOUS WATER LEVEL	Y	Y	N	N/A	Y	Final adjustment/level to be confirmed with scaling.
PT-104	EXTRACTION WELL MW-20 CONTINUOUS WATER LEVEL	Y	Y	N	N/A	Y	Final adjustment/level to be confirmed with scaling.
PT-111	EXTRACTION WELL EW-1 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-112	EXTRACTION WELL EW-2 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-113	EXTRACTION WELL IW-1 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-114	EXTRACTION WELL MW-20 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-200	INFLUENT EQ TANK T-200 CONTINUOUS WATER LEVEL	Y	Y	N/A	N/A	Y	
PT-201	FBR TRANSFER PUMP P-201 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-210	BACKWASH CONDITIONING TANK T-210 CONTINUOUS WATER LEVEL	Y	Y	Y	N/A	Y	
PT-211	BACKWASH DECANT PUMP P-211 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-400	FBR EFFLUENT EQ TANK T-400 CONTINUOUS WATER LEVEL	Y	Y	Y	N/A	Y	
PT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-501	MULTI-MEDIA FILTER T-501 INFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-502	MULTI-MEDIA FILTER T-501 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-601	IX T-601 INFUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-602	IX T-601 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-603	IX T-602 INFUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-604	IX T-602 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-605	IX T-603 INFUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-606	IX T-603 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-607	IX T-604 INFUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-608	IX T-604 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-700	INJECTION EQ TANK T-700 CONTINUOUS WATER LEVEL	Y	Y	Y	N/A	Y	
PT-701	INJECTION PUMP P-701 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-711	EXTRACTION WELL IW-3 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-712	EXTRACTION WELL MW-5 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-713	EXTRACTION WELL MW-11 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-714	EXTRACTION WELL RW-1 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-715	EXTRACTION WELL RW-2 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-716	EXTRACTION WELL RW-3 MANIFOLD PIPING PRESSURE	Y	Y	N/A	N/A	Y	
PT-721	INJECTION WELL IW-3 CONTINUOUS WATER LEVEL	Y	Y	N/A	N	Y	Final adjustment/level to be confirmed with scaling.
PT-722	INJECTION WELL MW-5 CONTINUOUS WATER LEVEL	Y	Y	N/A	N	Y	Final adjustment/level to be confirmed with scaling.
PT-723	INJECTION WELL MW-11 CONTINUOUS WATER LEVEL	Y	Y	N/A	N	Y	Final adjustment/level to be confirmed with scaling.
PT-724	INJECTION WELL RW-1 CONTINUOUS WATER LEVEL	Y	Y	N/A	N	Y	Final adjustment/level to be confirmed with scaling.
PT-725	INJECTION WELL RW-2 CONTINUOUS WATER LEVEL	Y	Y	N/A	N	Y	Final adjustment/level to be confirmed with scaling.

**Field Form 1.b**

Instrument	Description	Installation Verified (y/n)	Physical Install Correct (y/n)	Local Interface Configured (y/n/na)	Correct Power Source (y/n/na)	Correct Signal Cable (y/n/na)	Notes
PT-726	INJECTION WELL RW-3 CONTINUOUS WATER LEVEL	Y	Y	N/A	N	Y	Final adjustment/level to be confirmed with scaling.
PT-801	GAC T-801 INFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-802	GAC T-801 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-803	GAC T-802 INFLUENT PRESSURE	N/A	N/A	N/A	N/A	N/A	does not exist, not on P&IDs, shown as gauge only
PT-804	GAC T-802 EFFLUENT PRESSURE	N/A	N/A	N/A	N/A	N/A	does not exist, not on P&IDs, shown as gauge only
PT-805	GAC T-803 INFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-806	GAC T-803 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-807	FILTERS F-801&802 INFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-808	FILTERS F-801&802 EFFLUENT PRESSURE	Y	Y	N/A	N/A	Y	
PT-901	AIR COMPRESSOR A-900 DISCHARGE PRESSURE	Y	Y	N/A	N/A	Y	

Project: UTC UPCO				Date: 2/26-3/1 and 3/11-3/15				
Description: Pre-Startup/Post-Construction Punch-List - 1.c MCP Build Verification				Inspector: Nick Thomas				
Instructions: Use shop provided panel drawings to confirm all shown are installed and are in acceptable condition. Also use panel drawings to confirm wiring is as shown. Cross reference Riser Diagram E-8 to the pane drawings to verify all field wiring has been landed to proper PLC inputs/outputs and power terminals.								
Field Form 1.c								
TAG	QTY	DESCRIPTION	MANUFACTURER	PART #	INSTALLED (Y/N)	CONDITION ACCEPTABLE (Y/N)	LINE/LOAD VOLTAGE	NOTES
1	1	STEEL 2 DOOR ENCLOSURE 60X60X12	SCE	60EL6012LPPL	Y	Y	n/a	
2	1	BACK PANEL FOR ENCLOSURE	SCE	60P60	Y	Y	n/a	
3	1	UNMANAGED ETHERNET SWITCH, 2 FIBER	RED LION	106FX2-SC-MDR	Y	Y	Verified	
5	1	120 VAC PILOT LIGHT, LED, WHITE	AB	800FM-P3MN3W	Y	Y	Verified	
7	1	COMPACTLOGIX 5370 L3 CONTROLLER	AB	1769-L33ER	Y	Y	Verified	
8	5	16 POINT DISCRETE INPUT MODULE (120 VAC)	AB	1769-IA16	Y	Y	Verified	
9	2	120/240 VAC POWER SUPPLY 4A @ 5VDC	AB	1769-PA4	Y	Y	Verified	Original power suply was faulty. Replaced and verified
10	1	32 POINT DISCRETE INPUT MODULE (24 VDC)	AB	1769-IQ32	Y	Y	Verified	
11	4	16 POINT ANALOG INPUT MODULE (COMPACT HIGH DENSITY)	AB	1769-IF16C	Y	Y	Verified	
12	3	8 POINT ANALOG INPUT MODULE	AB	1769-IF8	Y	Y	Verified	
13	2	16 POINT RELAY OUTPUT MODULE	AB	1769-OW16	Y	Y	Verified	
14	2	RIGHT END CAP/TERMINATOR	AB	1769-ECL	Y	Y	Verified	
15	1	LEFT END CAP/TERMINATOR	AB	1769-ECR	Y	Y	Verified	
16	1	1 FT. RIGHT-TO-LEFT BUS EXPANSION CABLE	AB	1769-CRL1	Y	Y	Verified	
17	1	UL UNINTERRUPTABLE POWER SUPPLY (850 VA)	SOLA	S1K850	Y	Y	Verified	
	1	UL UNINTERRUPTABLE POWER SUPPLY MOUNTING BRACKET	SOLA	S1K-PMBRK	Y	Y	Verified	
18	1	24 VDC POWER SUPPLY (120 W)	AB	1606-XLE120E	Y	Y	Verified	
19	1	SURGE AND FILTER PROTECTION DEVICE (20A)	AB	4983-DC120-20	Y	Y	Verified	
20	1	Stratix 5700 Switch, Managed, 8 Fast Ethernet Copper Ports, 2 Fast Ethernet Combo Ports, Full Software	AB	1783-BMS10CA	Y	Y	Verified	
21	1	DIN RAIL MOUNTED GFCI RECEPTACLE	AB	1492-REC15G	Y	Y	Verified	
22	1	MINIATURE CIRCUIT BREAKER, 1 P, 20 A	AB	1489-M1C200	Y	Y	Verified	
23	1	MINATURE CIRCUIT BREAKER 1 P, 8 A	AB	1492-SPM1C080	Y	Y	Verified	
24	2	MINATURE CIRCUIT BREAKER 1 P, 7 A	AB	1492-SPM1C070	Y	Y	Verified	
24B	2	MINATURE CIRCUIT BREAKER 1 P, 5 A	AB	1492-SPM1C050	Y	Y	Verified	
25	1	MINATURE CIRCUIT BREAKER 1 P, 2 A	AB	1492-SPM1C020	Y	Y	Verified	
26	15	5X20 MM 120 VAC FUSE HOLDER WITH INDICATOR	AB	1492-WFB4250	Y	Y	Verified	
	18	5X20 MM TIME DELAY CERAMIC FUSES (2 A)	BUSSMAN	S505-2-R	Y	Y	Verified	Did not verify each individual fuse. Did verify that each circuit could power up devices. Fuse for receptacle was indadequately sized and replaed with 5A as shown on drawings.
27	15	5x20 MM 24 VDC FUSE HOLDER WITH INDICATOR	AB	1492-WFB424	Y	Y	Verified	
	3	5X20 MM TIME DELAY CERAMIC FUSES (8 A)	BUSSMAN	S505-8-R	n/a	n/a	n/a	
	3	5X20 MM TIME DELAY CERAMIC FUSES (3 A)	BUSSMAN	S505-3-R	n/a	n/a	n/a	Did not verify each individual fuse. Did verify that each circuit could power up devices.
	7	5X20 MM TIME DELAY CERAMIC FUSES (2 A)	BUSSMAN	S505-2-R	n/a	n/a	n/a	
	3	5X20 MM TIME DELAY CERAMIC FUSES (1 A)	BUSSMAN	S505-1-R	n/a	n/a	n/a	
28	34	GENERAL PURPOSE SPDT RELAYS (120 VAC COIL), 16 A	AB	700-HK36A1	Y	Y	Verified	
29	34	5 PIN RELAY SOCKETS	AB	700-HN221	Y	Y	Verified	
30	1	4PDT GENERAL PURPOSE RELAYS (120 VAC COIL), 7 A	AB	700-HC24A1	Y	Y	Verified	
	1	14 PIN RELAY SOCKET	AB	700-HN104	Y	Y	Verified	
31	6	SURGE PROTECTION PLUG, 2 CH (120 VAC)	PHOENIX	2839185	Y	Y	Verified	
	6	SOCKET FOR ABOVE	PHOENIX	2839282	Y	Y	Verified	

**Project:** UTC UPCO **Date:** 2/26-3/1 and 3/11-3/15  
**Description:** Pre-Startup/Post-Construction Punch-List - 1.c MCP Build Verification **Inspector:** Nick Thomas

Instructions: Use shop provided panel drawings to confirm all shown are installed and are in acceptable condition. Also use panel drawings to confirm wiring is as shown. Cross reference Riser Diagram E-8 to the panel drawings to verify all field wiring has been landed to proper PLC inputs/outputs and power terminals.

Field Form 1.c								
TAG	QTY	DESCRIPTION	MANUFACTURER	PART #	INSTALLED (Y/N)	CONDITION ACCEPTABLE (Y/N)	LINE/LOAD VOLTAGE	NOTES
32	6	ANALOG SURGE PROTECTION PLUG, 2 CH	PHOENIX	2838228	Y	Y	Verified	
	6	SOCKET FOR ABOVE	PHOENIX	2839208	Y	Y	Verified	
33	400	IEC TERMINAL BLOCK (30 A)	AB	1492-J3	Y	Y	Verified	
	10	CENTER JUMPER, 10 POLE	AB	1492-CJLJ5-10	Y	Y	Verified	
34	100	IEC GROUND TERMINAL BLOCK	AB	1492-J3G	Y	Y	Verified	
35	90	IEC PLUG IN DEVICE TERMINAL BLOCK	AB	1492-J3P	Y	Y	Verified	
	90	FUSE PLUG WITH BLOWN FUSE INDICATION (10-36 V)	AB	1492-FPK224	Y	Y	n/a	
	90	5X20 MM TIME DELAY CERAMIC FUSES (500 MA)	AB	S505-500-R	Y	Y	n/a	
36	50	END ANCHORS	AB	1492-ERL35	Y	Y	n/a	
37	10	DIN RAIL	AB	1492-DR5	Y	Y	n/a	
38	A-R	WIRING DUCT	TBD	TBD	Y	Y	n/a	
-	-	Verify Wiring as Per Panel Drawings	Issues corrected and verified					

**Project:** UTC UPCO

**Date:** 2/26-3/1 and 3/11-3/15

**Description:** Pre-Startup/Post-Construction Punch-List - 1.c MCP Build Verification

**Inspector:** Nick Thomas

Instructions: Use shop provided panel drawings to confirm all shown are installed and are in acceptable condition. Also use panel drawings to confirm wiring is as shown. Cross reference Riser Diagram E-8 to the pane drawings to verify all field wiring has been landed to proper PLC inputs/outputs and power terminals.

**Field Form 1.c**

TAG	QTY	DESCRIPTION	MANUFACTURER	PART #	INSTALLED (Y/N)	CONDITION ACCEPTABLE (Y/N)	LINE/LOAD VOLTAGE	NOTES
1	1	STEEL 1 DOOR ENCLOSURE 48'X36"X16"	SCE	48EL3616LPPL	y	y	NA	
	1	DRIP SHIELD	SCE	SCE-DS36N4	y	y	NA	
2	1	DEAD FRONT FOR PANEL	SCE	DF48EL36LP	y	y	NA	
3	1	BACK PANEL FOR ENCLOSURE	SCE	48P36	y	y	NA	
4	1	DISCONNECT HANDLE OPERATOR WITH CABLE	EATON	-	y	y	NA	
5	1	25A CIRCUIT BREAKER MAIN DISCONNECT	TBD	EGE3025FFG	y	y	y	
6	1	8" HMI PANEL	AUTOMATION DIRECT	EA9-T8CL	y	y	NA	
7	1	VFD HIM	ALLEN BRADLEY	22-HIM-C2S	y	y	y	
8	1	3 POS. SELECTOR SWITCH	ALLEN BRADLEY	800FP-SM32PX20	y	y	y	
9	1	MIRCOLOGIX 1100 PLC PROCESSOR	ALLEN BRADLEY	1763-L16BWA	y	y	NA	
10	1	ANALOG 2 INPUT / 2 OUTPUT CARD	ALLEN BRADLEY	1762-IF2OF2	y	y	NA	
11	1	UNMANAGED ETHERNET SWITCH, 2 FIBER	RED LION	106FX2-SC-MDR	y	y	NA	
12	1	24 VDC POWER SUPPLY (120 W)	ALLEN BRADLEY	1606-XLE120E	y	y	y	
13	1	500VA, 480-120V CONTROL TRANSFORMER	HAMMOND	PH500MLI	y	y	y	
14	6	GENERAL PURPOSE SPDT RELAYS (120 VAC COIL), 16 A	ALLEN BRADLEY	700-HK36A1	y	y	y	
14B	6	5 PIN RELAY SOCKETS	ALLEN BRADLEY	700-HN221	y	y	y	
15	1	3 POLE 3A CIRCUIT BREAKER	ALLEN BRADLEY	1489-M3C030	y	y	y	
16	1	7.5HP 480VAC VFD	ALLEN BRADLEY	25B-D013N104	y	y	y	
16B	2	7.5HP 3% LINE/LOAD RX	MTE	RL-01202	y	y	y	
17	1	480 VAC 1200BTUH PANEL AC UNIT	ICEQUBE	IQ1200VS	y	y	y	
18	50	IEC TERMINAL BLOCK (30 A)	AB	1492-J3	y	y	y	
19	5	5X20 MM 120 VAC FUSE HOLDER WITH INDICATOR	AB	1492-WFB4250	y	y	y	
20	3	5x20 MM 24 VDC FUSE HOLDER WITH INDICATOR	AB	1492-WFB424	y	y	y	
21	8	5X20 MM TIME DELAY CERAMIC FUSES (2 A)	BUSSMAN	S505-2-R	y	y	y	
22	2	MINATURE CIRCUIT BREAKER 1 P, 5 A	AB	1492-SPM1C050	y	y	y	
23	1	MINATURE CIRCUIT BREAKER 1 P, 2 A	AB	1492-SPM1C020	y	y	y	
24	10	CENTER JUMPER, 10 POLE	AB	1492-CJLJ5-10	y	y	NA	
25	5	IEC GROUND TERMINAL BLOCK	AB	1492-J3G	y	y	NA	
26	5	IEC PLUG IN DEVICE TERMINAL BLOCK	AB	1492-J3P	y	y	y	
28	5	FUSE PLUG WITH BLOWN FUSE INDICATION (10-36 V)	AB	1492-FPK224	y	y	NA	
29	25	5X20 MM TIME DELAY CERAMIC FUSES (500 MA)	AB	S505-500-R	y	y	NA	
30	5	END ANCHORS	AB	1492-ERL35	y	y	NA	
30	5	DIN RAIL	AB	1492-DR5	y	y	NA	
31	A-R	WIRING DUCT	TBD	TBD	y	y	NA	

**Project:** UTC UPCO  
**Description:** Communication Verifications -  
 2.a Copper Ethernet

**Date:** 2/26-3/1, 3/11-3/15, and 6/24-6/28  
**Inspector:** Nick Thomas

Instructions: Use appropriate programming software to configure Ethernet Switches, PLC, SCADA, and VFDs for communication as indicated on the Network Diagram and Process Drawings. Verify communication between devices following the process shown in section 2.a of the startup plan. Use the checklist to verify completion.

**Field Form 2.a**

Item	Reference Section	Configuration Completed (y/n)	Coms Verified (y/n)	Notes
<b>Copper Ethernet Communication Verification</b>	<b>2.a</b>			
MCP Managed Switch Configuration	2.a.i	Y	Y	
MCC Managed Switch Configuration	2.a.ii	Y	Y	
MCP to MCC Com Check; configure VFDs	2.a.iii	Y	Y	
VFD-101		Y	Y	
VFD-102		Y	Y	
VFD-103		Y	Y	
VFD-104		Y	Y	
VFD-211		Y	Y	
VFD-201		Y	Y	
VFD-401		Y	Y	
VFD-501		Y	Y	
VFD-701		Y	Y	
MCP to FBR Com Check	2.a.iv	Y	Y	
SCADA to MCP Com Check	2.a.v	Y	Y	
SCADA to FBR Com Check	2.a.vi	Y	Y	

**Project:** UTC UPCO  
**Description:** Communication Verifications -  
 2.b Fiber Ethernet

**Date:** 2/26-3/1, 3/11-3/15, and 6/24-6/28

**Inspector:** Nick Thomas

Instructions: Use appropriate programming software to configure PLC, SCADA, and HMI for communication as indicated on the Network Diagram and Process Drawings. Verify communication between devices following the process shown in section 2.b of the startup plan. Use the checklist to verify completion.

**Field Form 2.b**

Item	Reference Section	Configuration Completed (y/n)	Coms Verified (y/n)	Notes
<b>Fiber Ethernet Communication Verification</b>	<b>2.b</b>			
MCP RCP-1 Com Check	2.b.i	Y	Y	
SCADA to RCP-1 Com Check	2.b.ii	Y	Y	

Project: UTC UPCO

Description: Mechanical Dry-Run Test Procedure - 3.a-b Instrumentation Loop Checks and Functionality Verification

Date: 2/26-3/1, 3/11-3/15, and 6/24-6/28

Inspector: Nick Thomas

Instructions: Use P&IDs and IO List to identify all intrumetation in entire system for loop check and functionality verification. Denote any inconsistencies on this sheet.

Field Form 3.a-b

Signal	Instrument	Description	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verified (y/n)	Notes
0402CR	0402CR	POWER LOSS RELAY	MCP	I:01:00	NA	PASS	PASS	NA	
LAHH-111	LS-111	WELL VAULT LEAK DETECTION, EW-1	MCP	I:01:01	NA	PASS	PASS	NA	
LAHH-113	LS-113	WELL VAULT LEAK DETECTION, IW-1	MCP	I:01:02	NA	PASS	PASS	NA	
LAHH-114	LS-114	WELL VAULT LEAK DETECTION, MW-20	MCP	I:01:03	NA	PASS	PASS	NA	
ZIC-111	FV-111 (ZSC-111)	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:04	NA	PASS	PASS	NA	
ZIO-111	FV-111 (ZSO-111)	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE OPEN	MCP	I:01:05	NA	PASS	PASS	NA	
ZIC-112	FV-112 (ZSC-112)	EXTRACTION WELL EW-2 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:06	NA	PASS	PASS	NA	
ZIO-112	FV-112 (ZSO-112)	EXTRACTION WELL EW-2 MANIFOLD FLOW VALVE OPEN	MCP	I:01:07	NA	PASS	PASS	NA	
ZIC-113	FV-113 (ZSC-113)	EXTRACTION WELL IW-1 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:08	NA	PASS	PASS	NA	
ZIO-113	FV-113 (ZSO-113)	EXTRACTION WELL IW-1 MANIFOLD FLOW VALVE OPEN	MCP	I:01:09	NA	PASS	PASS	NA	
ZIC-114	FV-114 (ZSC-114)	EXTRACTION WELL MW-20 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:10	NA	PASS	PASS	NA	
ZIO-114	FV-114 (ZSO-114)	EXTRACTION WELL MW-20 MANIFOLD FLOW VALVE OPEN	MCP	I:01:11	NA	PASS	PASS	NA	
ZIC-711	FV-711 (ZSC-711)	EXTRACTION WELL IW-3 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:12	NA	PASS	PASS	NA	
ZIO-711	FV-711 (ZSO-711)	EXTRACTION WELL IW-3 MANIFOLD FLOW VALVE OPEN	MCP	I:01:13	NA	PASS	PASS	NA	
ZIC-712	FV-712 (ZSC-712)	EXTRACTION WELL MW-5 MANIFOLD FLOW VALVE CLOSED	MCP	I:01:14	NA	PASS	PASS	NA	
ZIO-712	FV-712 (ZSO-712)	EXTRACTION WELL MW-5 MANIFOLD FLOW VALVE OPEN	MCP	I:01:15	NA	PASS	PASS	NA	
ZIC-713	FV-713 (ZSC-713)	EXTRACTION WELL MW-11 MANIFOLD FLOW VALVE CLOSED	MCP	I:02:00	NA	PASS	PASS	NA	
ZIO-713	FV-713 (ZSO-713)	EXTRACTION WELL MW-11 MANIFOLD FLOW VALVE OPEN	MCP	I:02:01	NA	PASS	PASS	NA	
ZIC-714	FV-714 (ZSC-714)	EXTRACTION WELL RW-1 MANIFOLD FLOW VALVE CLOSED	MCP	I:02:02	NA	PASS	PASS	NA	
ZIO-714	FV-714 (ZSO-714)	EXTRACTION WELL RW-1 MANIFOLD FLOW VALVE OPEN	MCP	I:02:03	NA	PASS	PASS	NA	
ZIC-715	FV-715 (ZSC-715)	EXTRACTION WELL RW-2 MANIFOLD FLOW VALVE CLOSED	MCP	I:02:04	NA	PASS	PASS	NA	
ZIO-715	FV-715 (ZSO-715)	EXTRACTION WELL RW-2 MANIFOLD FLOW VALVE OPEN	MCP	I:02:05	NA	PASS	PASS	NA	
ZIC-716	FV-716 (ZSC-716)	EXTRACTION WELL RW-3 MANIFOLD FLOW VALVE CLOSED	MCP	I:02:06	NA	PASS	PASS	NA	
ZIO-716	FV-716 (ZSO-716)	EXTRACTION WELL RW-3 MANIFOLD FLOW VALVE OPEN	MCP	I:02:07	NA	PASS	PASS	NA	
LALL-201	LSLL-201	INFLUENT EQ TANK T-200 LOW-LOW WATER LEVEL	MCP	I:02:08	NA	PASS	PASS	NA	
LAHH-201	LSHH-201	INFLUENT EQ TANK T-200 HIGH-HIGH WATER LEVEL	MCP	I:02:09	NA	PASS	PASS	NA	
ZIC-212	FV-212 (ZSC-212)	BACKWASH DECANT PUMP P-211 DISCHARGE VALVE CLOSED	MCP	I:02:10	NA	PASS	PASS	NA	
ZIO-212	FV-212 (ZSO-212)	BACKWASH DECANT PUMP P-211 DISCHARGE VALVE OPEN	MCP	I:02:11	NA	PASS	PASS	NA	
LALL-211	LSLL-211	BACKWASH CONDITIONING TANK T-210 LOW-LOW LEVEL	MCP	I:02:12	NA	PASS	PASS	NA	
LAHH-211	LSHH-211	BACKWASH CONDITIONING TANK T-210 HIGH-HIGH LEVEL	MCP	I:02:13	NA	PASS	PASS	NA	
LAHH-003	LSHH-003	SUMP HIGH-HIGH LEVEL	MCP	I:02:14	NA	PASS	PASS	NA	
LAH-003	LSH-003	SUMP HIGH LEVEL	MCP	I:02:15	NA	PASS	PASS	NA	
LAL-003	LSL-003	SUMP LOW LEVEL	MCP	I:03:00	NA	PASS	PASS	NA	
HSA-001	HS-001	BUILDING CONTAINMENT PAD ESTOP	MCP	I:03:01	NA	PASS	PASS	NA	
LAHH-001	LS-001	BUILDING CONTAINMENT LEAK DETECTION	MCP	I:03:02	NA	PASS	PASS	NA	
LAHH-004	LSHH-004	SUMP HIGH-HIGH LEVEL	MCP	I:03:03	NA	PASS	PASS	NA	
LAH-004	LSH-004	SUMP HIGH LEVEL	MCP	I:03:04	NA	PASS	PASS	NA	
LAL-004	LSL-004	SUMP LOW LEVEL	MCP	I:03:05	NA	PASS	PASS	NA	
ZIC-307	FV-307 (ZSC-307)	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE CLOSED	MCP	I:03:06	NA	PASS	PASS	NA	
ZIO-307	FV-307 (ZSO-307)	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE OPEN	MCP	I:03:07	NA	PASS	PASS	NA	
HSA-002	HS-002	FBR CONTAINMENT PAD ESTOP	MCP	I:03:08	NA	PASS	PASS	NA	
LAHH-002	LS-002	FBR CONTAINMENT LEAK DETECTION	MCP	I:03:09	NA	PASS	PASS	NA	
LAHH-401	LSHH-401	FBR EFFLUENT EQ TANK T-400 HIGH-HIGH WATER LEVEL	MCP	I:03:10	NA	PASS	PASS	NA	
LALL-401	LSLL-401	FBR EFFLUENT EQ TANK T-400 LOW-LOW WATER LEVEL	MCP	I:03:11	NA	PASS	PASS	NA	



Field Form 3.a-b

Signal	Instrument	Description	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verified (y/n)	Notes
ZIC-501	FV-501 (ZSC-501)	MULTI-MEDIA FILTER T-501 INFLUENT VALVE CLOSED	MCP	I:03:12	NA	PASS	PASS	NA	
ZIO-501	FV-501 (ZSO-501)	MULTI-MEDIA FILTER T-501 INFLUENT VALVE OPEN	MCP	I:03:13	NA	PASS	PASS	NA	
ZIC-502	FV-502 (ZSC-502)	MMF T-501 EFFLUENT VALVE CLOSED	MCP	I:03:14	NA	PASS	PASS	NA	
ZIO-502	FV-502 (ZSO-502)	MMF T-501 EFFLUENT VALVE OPEN	MCP	I:03:15	NA	PASS	PASS	NA	
ZIO-503	FV-503 (ZSO-503)	MMF T-501 BACKWASH INFLUENT VALVE OPEN	MCP	I:04:00	NA	PASS	PASS	NA	
ZIC-503	FV-503 (ZSC-503)	MMF T-501 BACKWASH INFLUENT VALVE CLOSED	MCP	I:04:01	NA	PASS	PASS	NA	
ZIC-504	FV-504 (ZSC-504)	MULTI-MEDIA FILTER T-501 BACKWASH EFFLUENT VALVE CLOSED	MCP	I:04:02	NA	PASS	PASS	NA	
ZIO-504	FV-504 (ZSO-504)	MULTI-MEDIA FILTER T-501 BACKWASH EFFLUENT VALVE OPEN	MCP	I:04:03	NA	PASS	PASS	NA	
LAHH-701	LSHH-701	INJECTION EQ TANK T-700 HIGH-HIGH WATER LEVEL	MCP	I:04:04	NA	PASS	PASS	NA	
LALL-701	LSLL-701	INJECTION EQ TANK T-700 LOW-LOW WATER LEVEL	MCP	I:04:05	NA	PASS	PASS	NA	
LAHH-721	LS-721	INJECTION WELL IW-3 VAULT LEAK DETECTION	MCP	I:04:06	NA	PASS	PASS	NA	
LAHH-722	LS-722	INJECTION WELL MW-5 VAULT LEAK DETECTION	MCP	I:04:07	NA	PASS	PASS	NA	
LAHH-723	LS-723	INJECTION WELL MW-11 VAULT LEAK DETECTION	MCP	I:04:08	NA	PASS	PASS	NA	
LAHH-724	LS-724	INJECTION WELL RW-1 VAULT LEAK DETECTION	MCP	I:04:09	NA	PASS	PASS	NA	
LAHH-725	LS-725	INJECTION WELL RW-2 VAULT LEAK DETECTION	MCP	I:04:10	NA	PASS	PASS	NA	
LAHH-726	LS-726	INJECTION WELL RW-3 VAULT LEAK DETECTION	MCP	I:04:11	NA	PASS	PASS	NA	
FQ-111	FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW PULSE	MCP	I:06:00	NA	PASS	PASS	NA	
FQ-112	FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW PULSE	MCP	I:06:01	NA	PASS	PASS	NA	
FQ-113	FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW PULSE	MCP	I:06:02	NA	PASS	PASS	NA	
FQ-114	FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW PULSE	MCP	I:06:03	NA	PASS	PASS	NA	
FQ-711	FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW PULSE	MCP	I:06:04	NA	PASS	PASS	NA	
FQ-712	FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW PULSE	MCP	I:06:05	NA	PASS	PASS	NA	
FQ-713	FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW PULSE	MCP	I:06:06	NA	PASS	PASS	NA	
FQ-714	FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW PULSE	MCP	I:06:07	NA	PASS	PASS	NA	
FQ-715	FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW PULSE	MCP	I:06:08	NA	PASS	PASS	NA	
FQ-716	FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW PULSE	MCP	I:06:09	NA	PASS	PASS	NA	
FQ-200	FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW PULSE	MCP	I:06:10	NA	PASS	PASS	NA	
FQ-201	FIT-201	FBR TRANSFER PUMP P-201 EFFLUENT FLOW PULSE	MCP	I:06:11	NA	PASS	PASS	NA	
FQ-211	FIT-211	BACKWASH DECANT PUMP P-211 EFFLUENT FLOW PULSE	MCP	I:06:12	NA	PASS	PASS	NA	
FQ-401	FIT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT FLOW PULSE	MCP	I:06:13	NA	PASS	PASS	NA	
FQ-701	FIT-701	INJECTION PUMP P-701 EFFLUENT FLOW PULSE	MCP	I:06:14	NA	PASS	PASS	NA	
FQ-501	FIT-501	BACKWASH PUMP P-501 EFFLUENT FLOW PULSE	MCP	I:06:15	NA	PASS	PASS	NA	
LI-101	PT-101	EXTRACTION WELL EW-1 CONTINUOUS WATER LEVEL	MCP	I:07:00	0-150 FT-ABS	PASS	PASS	N	Need final level adjustment.
LI-103	PT-103	EXTRACTION WELL IW-1 CONTINUOUS WATER LEVEL	MCP	I:07:01	0-150 FT-ABS	PASS	PASS	N	Need final level adjustment.
LI-104	PT-104	EXTRACTION WELL MW-20 CONTINUOUS WATER LEVEL	MCP	I:07:02	0-150 FT-ABS	PASS	PASS	N	Need final level adjustment.
LI-721	PT-721	EXTRACTION WELL IW-3 CONTINUOUS WATER LEVEL	MCP	I:07:03	0-150 FT-ABS	PASS	PASS	N	Need final level adjustment.
LI-722	PT-722	INJECTION WELL MW-5 CONTINUOUS WATER LEVEL	MCP	I:07:04	0-200 FT-ABS	PASS	PASS	N	Need final level adjustment.
LI-723	PT-723	INJECTION WELL MW-11 CONTINUOUS WATER LEVEL	MCP	I:07:05	0-200 FT-ABS	PASS	PASS	N	Need final level adjustment.
LI-724	PT-724	INJECTION WELL RW-1 CONTINUOUS WATER LEVEL	MCP	I:07:06	0-200 FT-ABS	PASS	PASS	N	Need final level adjustment.
LI-725	PT-725	INJECTION WELL RW-2 CONTINUOUS WATER LEVEL	MCP	I:07:07	0-200 FT-ABS	PASS	PASS	N	Need final level adjustment.
LI-726	PT-726	INJECTION WELL RW-3 CONTINUOUS WATER LEVEL	MCP	I:07:08	0-200 FT-ABS	PASS	PASS	N	Need final level adjustment.
PI-111	PT-111	EXTRACTION WELL EW-1 MANIFOLD PIPING PRESSURE	MCP	I:07:12	0-60 PSIG	PASS	PASS	Y	
PI-112	PT-112	EXTRACTION WELL EW-2 MANIFOLD PIPING PRESSURE	MCP	I:07:13	0-60 PSIG	PASS	PASS	Y	
PI-113	PT-113	EXTRACTION WELL IW-1 MANIFOLD PIPING PRESSURE	MCP	I:07:14	0-60 PSIG	PASS	PASS	Y	
PI-114	PT-114	EXTRACTION WELL MW-20 MANIFOLD PIPING PRESSURE	MCP	I:07:15	0-60 PSIG	PASS	PASS	Y	
PI-711	PT-711	EXTRACTION WELL IW-3 MANIFOLD PIPING PRESSURE	MCP	I:08:00	0-60 PSIG	PASS	PASS	Y	
PI-712	PT-712	EXTRACTION WELL MW-5 MANIFOLD PIPING PRESSURE	MCP	I:08:01	0-60 PSIG	PASS	PASS	Y	

Field Form 3.a-b

Signal	Instrument	Description	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verified (y/n)	Notes
PI-713	PT-713	EXTRACTION WELL MW-11 MANIFOLD PIPING PRESSURE	MCP	I:08:02	0-60 PSIG	PASS	PASS	Y	
PI-714	PT-714	EXTRACTION WELL RW-1 MANIFOLD PIPING PRESSURE	MCP	I:08:03	0-60 PSIG	PASS	PASS	Y	
PI-715	PT-715	EXTRACTION WELL RW-2 MANIFOLD PIPING PRESSURE	MCP	I:08:04	0-60 PSIG	PASS	PASS	Y	
PI-716	PT-716	EXTRACTION WELL RW-3 MANIFOLD PIPING PRESSURE	MCP	I:08:05	0-60 PSIG	PASS	PASS	Y	
PI-901	PT-901	AIR COMPRESSOR A-900 DISCHARGE PRESSURE	MCP	I:08:06	0-150 PSIG	PASS		N	Need to add to SCADA and confirm.
LI-200	PT-200	INFLUENT EQ TANK T-200 CONTINUOUS WATER LEVEL	MCP	I:08:07	0-50 PSIA	PASS	PASS	Y	
PI-201	PT-201	FBR TRANSFER PUMP P-201 EFFLUENT PRESSURE	MCP	I:08:08	0-60 PSIG	PASS	PASS	Y	
PI-211	PT-211	BACKWASH DECANT PUMP P-211 EFFLUENT PRESSURE	MCP	I:08:09	0-30 PSIG	PASS	PASS	Y	
LI-210	PT-210	BACKWASH CONDITIONING TANK T-210 CONTINUOUS WATER LEVEL	MCP	I:08:10	0-50 PSIA	PASS	PASS	Y	
LI-400	PT-400	FBR EFFLUENT EQ TANK T-400 CONTINUOUS WATER LEVEL	MCP	I:08:11	0-50 PSIA	PASS	PASS	Y	
PI-401	PT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT PRESSURE	MCP	I:08:12	0-100 PSIG	PASS	PASS	Y	
PI-501	PT-501	MULTI-MEDIA FILTER T-501 INFLUENT PRESSURE	MCP	I:08:13	0-100 PSIG	PASS	PASS	Y	
PI-502	PT-502	MULTI-MEDIA FILTER T-501 EFFLUENT PRESSURE	MCP	I:08:14	0-100 PSIG	PASS	PASS	Y	
PI-601	PT-601	IX T-601 INFUENT PRESSURE	MCP	I:08:15	0-100 PSIG	PASS	PASS	Y	
PI-602	PT-602	IX T-601 EFFLUENT PRESSURE	MCP	I:09:00	0-100 PSIG	PASS	PASS	Y	
PI-603	PT-603	IX T-602 INFUENT PRESSURE	MCP	I:09:01	0-100 PSIG	PASS	PASS	Y	
PI-604	PT-604	IX T-602 EFFLUENT PRESSURE	MCP	I:09:02	0-100 PSIG	PASS	PASS	Y	
PI-605	PT-605	IX T-603 INFUENT PRESSURE	MCP	I:09:03	0-100 PSIG	PASS	PASS	Y	
PI-606	PT-606	IX T-603 EFFLUENT PRESSURE	MCP	I:09:04	0-100 PSIG	PASS	PASS	Y	
PI-607	PT-607	IX T-604 INFUENT PRESSURE	MCP	I:09:05	0-100 PSIG	PASS	PASS	Y	
PI-608	PT-608	IX T-604 EFFLUENT PRESSURE	MCP	I:09:06	0-100 PSIG	PASS	PASS	Y	
PI-801	PT-801	GAC T-801 INFLUENT PRESSURE	MCP	I:09:07	0-60 PSIG	PASS	PASS	Y	
PI-802	PT-802	GAC T-801 EFFLUENT PRESSURE	MCP	I:09:08	0-60 PSIG	PASS	PASS	Y	
PI-803	PT-803	GAC T-802 INFLUENT PRESSURE	MCP	I:09:09	NA	NA	NA	NA	DOES NOT EXIST
PI-804	PT-804	GAC T-802 EFFLUENT PRESSURE	MCP	I:09:10	NA	NA	NA	NA	DOES NOT EXIST
PI-805	PT-805	GAC T-803 INFLUENT PRESSURE	MCP	I:09:11	0-60 PSIG	PASS	PASS	Y	
PI-806	PT-806	GAC T-803 EFFLUENT PRESSURE	MCP	I:09:12	0-60 PSIG	PASS	PASS	Y	
PI-807	PT-807	FILTERS F-801&802 INFLUENT PRESSURE	MCP	I:09:13	0-60 PSIG	PASS	PASS	Y	
PI-808	PT-808	FILTERS F-801&802 EFFLUENT PRESSURE	MCP	I:09:14	0-60 PSI	PASS	PASS	Y	
LI-700	PT-700	INJECTION EQ TANK T-700 CONTINUOUS WATER LEVEL	MCP	I:09:15	0-50 PSIA	PASS	PASS	Y	
PI-701	PT-701	INJECTION PUMP P-701 EFFLUENT PRESSURE	MCP	I:10:00	0-200 PSIG	PASS	PASS	Y	
PI-511	PT-511	BACKWASH PUMP P-501 EFFLUENT PRESSURE	MCP	I:10:01	0-100 PSIG	PASS	PASS	Y	
PI-ATMO	PT-ATMO	ATMOSPHERIC PRESSURE	MCP	I:10:15	0-69.2 PSIA	PASS	PASS	Y	
FI-111	FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW RATE	MCP	I:11:00	0-30 GPM	PASS	PASS	Y	
FI-112	FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW RATE	MCP	I:11:01	0-60 GPM	PASS	PASS	Y	
FI-113	FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW RATE	MCP	I:11:02	0-30 GPM	PASS	PASS	Y	
FI-114	FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW RATE	MCP	I:11:03	0-30 GPM	PASS	PASS	Y	
FI-711	FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW RATE	MCP	I:11:04	0-50 GPM	PASS	PASS	Y	
FI-712	FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW RATE	MCP	I:11:05	0-30 GPM	PASS	PASS	Y	
FI-713	FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW RATE	MCP	I:11:06	0-30 GPM	PASS	PASS	Y	
FI-714	FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW RATE	MCP	I:11:07	0-30 GPM	PASS	PASS	Y	
FI-715	FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW RATE	MCP	I:12:00	0-30 GPM	PASS	PASS	Y	
FI-716	FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW RATE	MCP	I:12:01	0-30 GPM	PASS	PASS	Y	
FI-200	FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW RATE	MCP	I:12:02	0-100 GPM	PASS	PASS	Y	
FI-201	FIT-201	FBR TRANSFER PUMP P-201 DISCHARGE FLOW RATE	MCP	I:12:03	0-100 GPM	PASS	PASS	Y	
FI-211	FIT-211	BACKWASH DECANT PUMP P-211 DISCHARGE FLOW RATE	MCP	I:12:04	0-100 GPM	PASS	PASS	Y	
FI-401	FIT-401	FILTRATION TRANSFER PUMP P-401 DISCHARGE FLOW RATE	MCP	I:12:05	0-100 GPM	PASS	PASS	Y	

Field Form 3.a-b

Signal	Instrument	Description	Control Panel	I/O #	Range / Setpoint	I/O (Pass/Fail)	Scada Display (pass/fail)	Value Verified (y/n)	Notes
FI-701	FIT-701	INJECTION PUMP P-701 DISCHARGE FLOW RATE	MCP	I:12:06	0-100 GPM	PASS	PASS	Y	
FI-501	FIT-501	BACKWASH PUMP P-501 DISCHARGE FLOW RATE	MCP	I:12:07	0-100 GPM	PASS	PASS	Y	
VFD-101_ENABLE	VFD-101	EXTRACTION WELL EW-1 PUMP P-101 VFD ENABLE	MCP	O:14:00	NA	PASS	PASS	NA	
VFD-103_ENABLE	VFD-103	EXTRACTION WELL IW-1 PUMP P-103 VFD ENABLE	MCP	O:14:01	NA	PASS	PASS	NA	
VFD-104_ENABLE	VFD-104	EXTRACTION WELL MW-20 PUMP P-104 VFD ENABLE	MCP	O:14:02	NA	PASS	PASS	NA	
ZCO-111	FV-111	EXTRACTION WELL EW-1 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:03	NA	PASS	PASS	NA	
ZCO-112	FV-112	EXTRACTION WELL EW-2 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:04	NA	PASS	PASS	NA	
ZCO-113	FV-113	EXTRACTION WELL IW-1 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:05	NA	PASS	PASS	NA	
ZCO-114	FV-114	EXTRACTION WELL MW-20 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:06	NA	PASS	PASS	NA	
ZCO-711	FV-711	EXTRACTION WELL IW-3 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:07	NA	PASS	PASS	NA	
ZCO-712	FV-712	EXTRACTION WELL MW-5 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:08	NA	PASS	PASS	NA	
ZCO-713	FV-713	EXTRACTION WELL MW-11 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:09	NA	PASS	PASS	NA	
ZCO-714	FV-714	EXTRACTION WELL RW-1 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:10	NA	PASS	PASS	NA	
ZCO-715	FV-715	EXTRACTION WELL RW-2 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:11	NA	PASS	PASS	NA	
ZCO-716	FV-716	EXTRACTION WELL RW-3 MANIFOLD FLOW VALVE OPEN COMMAND	MCP	O:14:12	NA	PASS	PASS	NA	
VFD-201_ENABLE	VFD-201	FBR TRANSFER PUMP P-201 VFD ENABLE	MCP	O:14:13	NA	PASS	PASS	NA	
VFD-211_ENABLE	VFD-211	BACKWASH DECANT PUMP P-211 VFD ENABLE	MCP	O:14:14	NA	PASS	PASS	NA	
ZCO-212	FV-212	BACKWASH DECANT PUMP P-211 INFLUENT VALVE OPEN COMMAND	MCP	O:14:15	NA	PASS	PASS	NA	
YC-003	P-003 STARTER	SUMP PUMP P-003 RUN COMMAND	MCP	O:15:00	NA	PASS	PASS	NA	
ZCO-301	FV-301	FBR SKID INFLUENT (P-201 EFFLUENT) VALVE OPEN COMMAND	MCP	O:15:01	NA	PASS	PASS	NA	
YC-004	P-004 STARTER	SUMP PUMP P-004 RUN COMMAND	MCP	O:15:02	NA	PASS	PASS	NA	
YC-900	A-900	AIR COMPRESSOR A-900 RUN COMMAND	MCP	O:15:03	NA	PASS	PASS	NA	
VFD-401_ENABLE	VFD-401	FILTRATION TRANSFER PUMP P-401 VFD ENABLE	MCP	O:15:04	NA	PASS	PASS	NA	
ZCO-501	FV-501	MULTI-MEDIA FILTER T-501 INFLUENT VALVE OPEN COMMAND	MCP	O:15:05	NA	PASS	PASS	NA	
ZCO-503	FV-503	MMF T-503 BACKWASH INFLUENT VALVE OPEN COMMAND	MCP	O:15:06	NA	PASS	PASS	NA	
ZCO-502	FV-502	IX BACKWASH INFLUENT VALVE OPEN COMMAND	MCP	O:15:07	NA	PASS	PASS	NA	
ZCO-504	FV-504	MULTI-MEDIA FILTER T-504 EFFLUENT VALVE OPEN COMMAND	MCP	O:15:08	NA	PASS	PASS	NA	
VFD-701_ENABLE	VFD-701	INJECTION PUMP P-701 VFD ENABLE	MCP	O:15:09	NA	PASS	PASS	NA	
VFD-501_ENABLE	VFD-501	BACKWASH PUMP P-501 VFD ENABLE	MCP	O:15:10	NA	PASS	PASS	NA	
CR-0602	CR-0602	POWER LOSS	RCP-1	I:0:00	NA	PASS	PASS	NA	
YI-102	VFD-102	EXTRACTION WELL EW-2 RUNNING	RCP-1	I:0:01	NA	PASS	PASS	NA	
YA-102	VFD-102	EXTRACTION WELL EW-2 FAULT	RCP-1	I:0:02	NA	PASS	PASS	NA	
HS102_HAND	VFD-102	EXTRACTION WELL EW-2 PUMP P-102 IN HAND	RCP-1	I:0:03	NA	PASS	PASS	NA	
LAHH-112	LS-112	WELL VAULT LEAK DETECTION, EW-2	RCP-1	I:0:04	NA	PASS	PASS	NA	
VFD-102_ENABLE	VFD-102	EXTRACTION WELL EW-2 PUMP P-102 VFD ENABLE	RCP-1	O:0:00	NA	PASS	PASS	NA	
LI-102	PT-102	EXTRACTION WELL EW-2 CONTINOUS WATER LEVEL	RCP-1	I:1:00	0-150 FT-ABS	PASS		NA	Need final level adjustment.
SC-102	VFD-102	EXTRACTION WELL EW-2 PUMP P-102 VFD SPEED CONTROL	RCP-1	O:1:00	30-60 HZ	PASS	PASS	NA	

Project: UTC UPCO

2/26-3/1, 3/11-3/15, and 6/24-6/28

Description: Mechanical Dry-Run Test Procedure - 3.c Alarm and Interlock Verification

Nick Thomas

Instructions: Use P&IDs and Alarms List to identify and test all alarms in entire system. Denote any inconsistencies in alarms and responses from design on this sheet.

Field Form 3.c

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Correct Interlock Response Verified (y/n)	Notes
FA-001	HS-003/SD-1XX	Building Fire Alarm	NA	Y	PASS	Y	
HSA-001	HS-001	Treatment Building E-Stop	Y	Y	PASS	Y	
LAHH-001	LS-001	Treatment Building Containment Pad Leak Detection	Y	Y	PASS	Y	
FA-002	HS-004/SD-2XX	FBR Containment Fire Alarm	Y	Y	PASS	Y	
HSA-002	HS-002	FBR Containment Pad E-Stop	Y	Y	PASS	Y	
LAHH-002	LS-002	FBR Containment Pad Leak Detection	Y	Y	PASS	Y	
LAL-003	LSL-003	Treatment Building Sump Low Water Level	Y	Y	PASS	Y	
LAH-003	LSH-003	Treatment Building Sump High Water Level	Y	Y	PASS	Y	
LAHH-003	LSHH-003	Treatment Building Sump High High Water Level	Y	Y	PASS	Y	
LAL-004	LSL-004	FBR Containment Sump Low Water Level	Y	Y	PASS	Y	
LAH-004	LSH-004	FBR Containment Sump High Water Level	Y	Y	PASS	Y	
LAHH-004	LSHH-004	FBR Containment Sump High High Water Level	Y	Y	PASS	Y	
FAH-005	FS-005	Emergency Shower Activation	Y	Y	PASS	Y	
LAHH-111	LS-111	EW-1 Vault Leak Detection	Y	Y	PASS	Y	
LAHH-112	LS-112	EW-2 Vault Leak Detection	Y	Y	PASS	Y	
LAHH-113	LS-113	IW-1 Vault Leak Detection	Y	Y	PASS	Y	
LAHH-114	LS-114	MW-20 Vault Leak Detection	Y	Y	PASS	Y	
LAL-101	PT-101	EW-1 Low Water Level	Y	Y	PASS	Y	
LAL-102	PT-102	EW-2 Low Water Level	Y	Y	PASS	Y	
LAL-103	PT-103	IW-1 Low Water Level	Y	Y	PASS	Y	
LAL-104	PT-104	MW-20 Low Water Level	Y	Y	PASS	Y	
LAH-101	PT-101	EW-1 High Water Level	Y	Y	PASS	Y	
LAH-102	PT-102	EW-2 High Water Level	Y	Y	PASS	Y	
LAH-103	PT-103	IW-1 High Water Level	Y	Y	PASS	Y	
LAH-104	PT-104	MW-20 High Water Level	Y	Y	PASS	Y	
LALL-101	PT-101	EW-1 Low Low Water Level	Y	Y	PASS	Y	
LALL-102	PT-102	EW-2 Low Low Water Level	Y	Y	PASS	Y	
LALL-103	PT-103	IW-1 Low Low Water Level	Y	Y	PASS	Y	
LALL-104	PT-104	MW-20 Low Low Water Level	Y	Y	PASS	Y	
YA-101	P-101	EW-1 Pump Fault	Y	Y	PASS	Y	
YA-102	P-102	EW-2 Pump Fault	Y	Y	PASS	Y	
YA-103	P-103	IW-1 Pump Fault	Y	Y	PASS	Y	
YA-104	P-104	MW-20 Pump Fault	Y	Y	PASS	Y	
PAL-111	PT-111	EW-1 Manifold Low Pressure	Y	Y	PASS	Y	
PAL-112	PT-112	EW-2 Manifold Low Pressure	Y	Y	PASS	Y	
PAL-113	PT-113	IW-1 Manifold Low Pressure	Y	Y	PASS	Y	
PAL-114	PT-114	MW-20 Manifold Low Pressure	Y	Y	PASS	Y	
PAH-111	PT-111	EW-1 Manifold High Pressure	Y	Y	PASS	Y	
PAH-112	PT-112	EW-2 Manifold High Pressure	Y	Y	PASS	Y	
PAH-113	PT-113	IW-1 Manifold High Pressure	Y	Y	PASS	Y	
PAH-114	PT-114	MW-20 Manifold High Pressure	Y	Y	PASS	Y	

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Correct Interlock Response Verified (y/n)	Notes
PALL-111	PT-111	EW-1 Manifold Low Low Pressure	Y	Y	PASS	Y	
PALL-112	PT-112	EW-2 Manifold Low Low Pressure	Y	Y	PASS	Y	
PALL-113	PT-113	IW-1 Manifold Low Low Pressure	Y	Y	PASS	Y	
PALL-114	PT-114	MW-20 Manifold Low Low Pressure	Y	Y	PASS	Y	
PAHH-111	PT-111	EW-1 Manifold High High Pressure	Y	Y	PASS	Y	
PAHH-112	PT-112	EW-2 Manifold High High Pressure	Y	Y	PASS	Y	
PAHH-113	PT-113	IW-1 Manifold High High Pressure	Y	Y	PASS	Y	
PAHH-114	PT-114	MW-20 Manifold High High Pressure	Y	Y	PASS	Y	
FAL-111	FIT-111	EW-1 Manifold Low Flow	Y	Y	PASS	Y	
FAL-112	FIT-112	EW-2 Manifold Low Flow	Y	Y	PASS	Y	
FAL-113	FIT-113	IW-1 Manifold Low Flow	Y	Y	PASS	Y	
FAL-114	FIT-114	MW-20 Manifold Low Flow	Y	Y	PASS	Y	
FAH-111	FIT-111	EW-1 Manifold High Flow	Y	Y	PASS	Y	
FAH-112	FIT-112	EW-2 Manifold High Flow	Y	Y	PASS	Y	
FAH-113	FIT-113	IW-1 Manifold High Flow	Y	Y	PASS	Y	
FAH-114	FIT-114	MW-20 Manifold High Flow	Y	Y	PASS	Y	
FALL-111	FIT-111	EW-1 Manifold Low Low Flow	Y	Y	PASS	Y	
FALL-112	FIT-112	EW-2 Manifold Low Low Flow	Y	Y	PASS	Y	
FALL-113	FIT-113	IW-1 Manifold Low Low Flow	Y	Y	PASS	Y	
FALL-114	FIT-114	MW-20 Manifold Low Low Flow	Y	Y	PASS	Y	
ZAC-111	FV-111	EW-1 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAC-112	FV-112	EW-2 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAC-113	FV-113	IW-1 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAC-114	FV-114	MW-20 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAO-111	FV-111	EW-1 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAO-112	FV-112	EW-2 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAO-113	FV-113	IW-1 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAO-114	FV-114	MW-20 Manifold Valve Open Fault	Y	Y	PASS	Y	
FAL-200	FIT-200	Influent Low Flow Alarm	Y	Y	PASS	Y	
FAH-200	FIT-200	Influent High Flow Alarm	Y	Y	PASS	Y	
FALL-200	FIT-200	Influent Low Low Flow Alarm	Y	Y	PASS	Y	
LAL-200	PT-200	Influent Tank Low Level Warning	Y	Y	PASS	Y	
LAH-200	PT-200	Influent Tank High Level Warning	Y	Y	PASS	Y	
LALL-200	PT-200	Influent Tank Low Low Level	Y	Y	PASS	Y	
LAHH-200	PT-200	Influent Tank High High Level	Y	Y	PASS	Y	
LALL-201	LSLL-201	Influent Tank Low Low Level Switch	Y	Y	PASS	Y	
LAHH-201	LSHH-201	Influent Tank High High Level Switch	Y	Y	PASS	Y	
FAL-201	FIT-201	FBR Transfer Pump Low Flow	Y	Y	PASS	Y	
FAH-201	FIT-201	FBR Transfer Pump High Flow	Y	Y	PASS	Y	
FAHH-201	FIT-201	FBR Transfer Pump High High Flow	Y	Y	PASS	Y	
PAL-201	PT-201	FBR Transfer Pump Low Discharge Pressure Alarm	Y	Y	PASS	Y	
PAH-201	PT-201	FBR Transfer Pump High Discharge Pressure Alarm	Y	Y	PASS	Y	
PAHH-201	PT-201	FBR Transfer Pump High High Discharge Pressure Alarm	Y	Y	PASS	Y	
YA-201	P-201	FBR Transfer Pump Fault	Y	Y	PASS	Y	
LAL-210	PT-210	Backwash Conditioning Tank Low Level	Y	Y	PASS	Y	
LAH-210	PT-210	Backwash Conditioning Tank High Level	Y	Y	PASS	Y	

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Correct Interlock Response Verified (y/n)	Notes
LALL-210	PT-210	Backwash Conditioning Tank Low Low Level	Y	Y	PASS	Y	
LAHH-210	PT-210	Backwash Conditioning Tank High High Level	Y	Y	PASS	Y	
LALL-211	LSLL-211	Backwash Conditioning Tank Low Low Switch	Y	Y	PASS	Y	
LAHH-211	LSHH-211	Backwash Conditioning Tank High High Switch	Y	Y	PASS	Y	
PAL-211	PT-211	Backwash Decant Low Pressure	Y	Y	PASS	Y	
PAH-211	PT-211	Backwash Decant High Pressure	Y	Y	PASS	Y	
PAHH-211	PT-211	Backwash Decant High High Pressure	Y	Y	PASS	Y	
FAL-211	FIT-211	Backwash Decant Pump Low Flow	Y	Y	PASS	Y	
FAH-211	FIT-211	Backwash Decant Pump High Flow	Y	Y	PASS	Y	
YA-211	P-211	Backwash Decant Pump Fault	Y	Y	PASS	Y	
ZAC-212	FV-212	Backwash Conditioning Tank Effluent Valve Close Fault	Y	Y	PASS	Y	
ZAO-212	FV-212	Backwash Conditioning Tank Effluent Valve Open Fault	Y	Y	PASS	Y	
AAL-300	AE-300	FBR Low pH	Y	Y	PASS	Y	
AAH-300	AE-300	FBR High pH	Y	Y	PASS	Y	
TAL-300	AE-301	FBR Low Temperature	Y	Y	PASS	Y	
TAH-300	AE-301	FBR High Temperature	Y	Y	PASS	Y	
AAL-301	AE-301	FBR Low ORP	Y	Y	PASS	Y	ORP probe replaced.
AAH-301	AE-301	FBR High ORP	Y	Y	PASS	Y	ORP probe replaced.
FAL-301	FIT-301	FBR Fluidization Flow Low	Y	Y	PASS	Y	
FAH-301	FIT-301	FBR Fluidization Flow High	Y	Y	PASS	Y	
FAHH-301	FIT-301	FBR Fluidization Flow High High	Y	Y	PASS	Y	
PAL-301	PIT-301	FBR Fluidization Low Pressure	Y	Y	PASS	Y	
PAH-301	PIT-301	FBR Fluidization High Pressure	Y	Y	PASS	Y	
PAHH-301	PIT-301	FBR Fluidization High High Pressure	Y	Y	PASS	Y	
FAL-303	FS-303	Electron Donor Low Flow	Y	Y	PASS	Y	
FAL-305	FS-305	Nutrient Low Flow	Y	Y	PASS	Y	
PAL-305	PSL-305	FBR Instrument Air Pressure Low	Y	Y	PASS	Y	
ZAC-307	FV-307	FBR Transfer Valve Close Fault	Y	Y	PASS	Y	
ZAO-307	FV-307	FBR Transfer Valve Open Fault	Y	Y	PASS	Y	
ZAC-308	FV-308	FBR Fluidization Valve Close Fault	Y	Y	PASS	Y	
ZAO-308	FV-308	FBR Fluidization Valve Open Fault	Y	Y	PASS	Y	
LAL-400	PT-400	FBR Effluent Equilization Tank Low Level	Y	Y	PASS	Y	
LAH-400	PT-400	FBR Effluent Equilization Tank High Level	Y	Y	PASS	Y	
LALL-400	PT-400	FBR Effluent Equilization Tank Low Low Level	Y	Y	PASS	Y	
LAHH-400	PT-400	FBR Effluent Equilization Tank High High Level	Y	Y	PASS	Y	
LALL-401	LSLL-401	FBR Effluent Equilization Tank Low Low Switch	Y	Y	PASS	Y	Adjust low low level to ~1' above discharge pipe.
LAHH-401	LSHH-401	FBR Effluent Equilization Tank High High Switch	Y	Y	PASS	Y	
YA-401	P-401	Filtration Transfer Pump Fault	Y	Y	PASS	Y	
FAL-401	FIT-401	Filtration Pump Low Flow	Y	Y	PASS	Y	
FAH-401	FIT-401	Filtration Pump High Flow	Y	Y	PASS	Y	
FAHH-401	FIT-401	Filtration Pump High High Flow	Y	Y	PASS	Y	
PAL-401	PT-401	Filtration Transfer Pump Low Pressure	Y	Y	PASS	Y	
PAH-401	PT-402	Filtration Transfer Pump High Pressure	Y	Y	PASS	Y	
PAHH-401	PT-403	Filtration Transfer Pump High High Pressure	Y	Y	PASS	Y	
FAL-501	FIT-501	Clean Backwash Pump Low Flow	Y	Y	PASS	Y	
FAH-501	FIT-501	Clean Backwash Pump High Flow	Y	Y	PASS	Y	

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Correct Interlock Response Verified (y/n)	Notes
FAHH-501	FIT-501	Clean Backwash Pump High High Flow	Y	Y	PASS	Y	
PAL-511	PT-501	Clean Backwash Pump Low Pressure	Y	Y	PASS	Y	
PAH-511	PT-502	Clean Backwash Pump High Pressure	Y	Y	PASS	Y	
PAHH-511	PT-503	Clean Backwash Pump High High Pressure	Y	Y	PASS	Y	
YA-501	P-501	Backwash Pump Fault	Y	Y	PASS	Y	
ZAC-501	FV-501	Multimedia Filter Influent Valve Close Fault	Y	Y	PASS	Y	
ZAO-501	FV-501	Multimedia Filter Influent Valve Open Fault	Y	Y	PASS	Y	
ZAC-502	FV-502	Multimedia Filter Effluent Valve Close Fault	Y	Y	PASS	Y	
ZAO-502	FV-502	Multimedia Filter Effluent Valve Open Fault	Y	Y	PASS	Y	
PAH-501	PT-501	Multimedia Filter High Influent Pressure	Y	Y	PASS	Y	
PAHH-501	PT-501	Multimedia Filter High High Influent Pressure	Y	Y	PASS	Y	
PAH-502	PT-502	Multimedia Filter High Backwash Pressure	Y	Y	PASS	Y	
PAHH-502	PT-502	Multimedia Filter High High Backwash Pressure	Y	Y	PASS	Y	
DPAH-501	PT-501/502	Multimedia Filter High High Differential Pressure	Y	Y	PASS	Y	
ZAC-503	FV-503	Multimedia Filter Backwash Influent Valve Close Fault	Y	Y	PASS	Y	
ZAO-503	FV-503	Multimedia Filter Backwash Influent Valve Open Fault	Y	Y	PASS	Y	
ZAC-504	FV-504	Multimedia Filter Backwash Effluent Valve Close Fault	Y	Y	PASS	Y	
ZAO-504	FV-504	Multimedia Filter Backwash Effluent Valve Open Fault	Y	Y	PASS	Y	
PAH-601	PT-601	T-601 IX Vessel High Influent Pressure	Y	Y	PASS	Y	
PAHH-601	PT-601	T-601 IX Vessel High High Influent Pressure	Y	Y	PASS	Y	
PAH-602	PT-602	T-601 IX Vessel High Effluent Pressure	Y	Y	PASS	Y	
PAHH-602	PT-602	T-601 IX Vessel High High Effluent Pressure	Y	Y	PASS	Y	
DPAH-601	PT-601/602	T-601 IX Vessel High Differential Pressure	Y	Y	PASS	Y	
PAH-603	PT-603	T-602 IX Vessel High Influent Pressure	Y	Y	PASS	Y	
PAHH-603	PT-603	T-602 IX Vessel High High Influent Pressure	Y	Y	PASS	Y	
PAH-604	PT-604	T-602 IX Vessel High Effluent Pressure	Y	Y	PASS	Y	
PAHH-604	PT-604	T-602 IX Vessel High High Effluent Pressure	Y	Y	PASS	Y	
DPAH-602	PT-603/604	T-602 IX Vessel High Differential Pressure	Y	Y	PASS	Y	
PAH-605	PT-605	T-603 IX Vessel High Influent Pressure	Y	Y	PASS	Y	
PAHH-605	PT-605	T-603 IX Vessel High High Influent Pressure	Y	Y	PASS	Y	
PAH-606	PT-606	T-603 IX Vessel High Effluent Pressure	Y	Y	PASS	Y	
PAHH-606	PT-606	T-603 IX Vessel High High Effluent Pressure	Y	Y	PASS	Y	
DPAH-603	PT-605/606	T-603 IX Vessel High Differential Pressure	Y	Y	PASS	Y	
PAH-607	PT-607	T-604 IX Vessel High Influent Pressure	Y	Y	PASS	Y	
PAHH-607	PT-607	T-604 IX Vessel High High Influent Pressure	Y	Y	PASS	Y	
PAH-608	PT-608	T-604 IX Vessel High Effluent Pressure	Y	Y	PASS	Y	
PAHH-608	PT-608	T-604 IX Vessel High High Effluent Pressure	Y	Y	PASS	Y	
DPAH-604	PT-607/608	T-604 IX Vessel High Differential Pressure	Y	Y	PASS	Y	
LAL-700	PT-700	Injection Equilization Tank Low Level	Y	Y	PASS	Y	
LAH-700	PT-700	Injection Equilization Tank High Level	Y	Y	PASS	Y	
LALL-700	PT-700	Injection Equilization Tank Low Low Level	Y	Y	PASS	Y	Adjust low low level to ~1' above discharge pipe.
LAHH-700	PT-700	Injection Equilization Tank High High Level	Y	Y	PASS	Y	
LALL-701	LSLL-701	Injection Equilization Tank Low Low Switch	Y	Y	PASS	Y	
LAHH-701	LSHH-701	Injection Equilization Tank High High Switch	Y	Y	PASS	Y	
FAL-701	FIT-701	Injection Pump Low Flow	Y	Y	PASS	Y	
FAH-701	FIT-701	Injection Pump High Flow	Y	Y	PASS	Y	

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Correct Interlock Response Verified (y/n)	Notes
FAHH-701	FIT-701	Injection Pump High High Flow	Y	Y	PASS	Y	
PAL-701	PIT-701	Inection Pump Low Pressure	Y	Y	PASS	Y	
PAH-701	PIT-701	Injection Pump High Pressure	Y	Y	PASS	Y	
PAHH-701	PIT-701	Injection Pump High High Pressure	Y	Y	PASS	Y	
YA-701	P-701	Injection Pump Fault	Y	Y	PASS	Y	
LAL-710	LSL-710	Fire Water Tank Low Level	Y	Y	PASS	Y	
LAH-710	LSH-710	Fire Water Tank High Level	Y	Y	PASS	Y	Correct high and High-high switches
LALL-710	LSLL-710	Fire Water Tank Low Low Level	Y	Y	PASS	Y	
LAHH-710	LSHH-710	Fire Water Tank High High Level	Y	Y	PASS	Y	Correct high and High-high switches
ZAO-710	FV-710	Fire Water Tank Valve Open Fault	Y	Y	PASS	Y	
ZAO-711	FV-711	IW-3 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAO-712	FV-712	MW-5 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAO-713	FV-713	MW-11 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAO-714	FV-714	RW-1 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAO-715	FV-715	RW-2 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAO-716	FV-716	RW-3 Manifold Valve Open Fault	Y	Y	PASS	Y	
ZAC-710	FV-710	Fire Water Valve Close Fault	Y	Y	PASS	Y	
ZAC-711	FV-711	IW-3 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAC-712	FV-712	MW-5 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAC-713	FV-713	MW-11 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAC-714	FV-714	RW-1 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAC-715	FV-715	RW-2 Manifold Valve Close Fault	Y	Y	PASS	Y	
ZAC-716	FV-716	RW-3 Manifold Valve Close Fault	Y	Y	PASS	Y	
PAL-711	PT-711	IW-3 Manifold Low Pressure	Y	Y	PASS	Y	
PAL-712	PT-712	MW-5 Manifold Low Pressure	Y	Y	PASS	Y	
PAL-713	PT-713	MW-11 Manifold Low Pressure	Y	Y	PASS	Y	
PAL-714	PT-714	RW-1 Manifold Low Pressure	Y	Y	PASS	Y	
PAL-715	PT-715	RW-2 Manifold Low Pressure	Y	Y	PASS	Y	
PAL-716	PT-716	RW-3 Manifold Low Pressure	Y	Y	PASS	Y	
PAH-711	PT-711	IW-3 Manifold High Pressure	Y	Y	PASS	Y	
PAH-712	PT-712	MW-5 Manifold High Pressure	Y	Y	PASS	Y	
PAH-713	PT-713	MW-11 Manifold High Pressure	Y	Y	PASS	Y	
PAH-714	PT-714	RW-1 Manifold High Pressure	Y	Y	PASS	Y	
PAH-715	PT-715	RW-2 Manifold High Pressure	Y	Y	PASS	Y	
PAH-716	PT-716	RW-3 Manifold High Pressure	Y	Y	PASS	Y	
PALL-711	PT-711	IW-3 Manifold Low Low Pressure	Y	Y	PASS	Y	
PALL-712	PT-712	MW-5 Manifold Low Low Pressure	Y	Y	PASS	Y	
PALL-713	PT-713	MW-11 Manifold Low Low Pressure	Y	Y	PASS	Y	
PALL-714	PT-714	RW-1 Manifold Low Low Pressure	Y	Y	PASS	Y	
PALL-715	PT-715	RW-2 Manifold Low Low Pressure	Y	Y	PASS	Y	
PALL-716	PT-716	RW-3 Manifold Low Low Pressure	Y	Y	PASS	Y	
PAHH-711	PT-711	IW-3 Manifold High High Pressure	Y	Y	PASS	Y	
PAHH-712	PT-712	MW-5 Manifold High High Pressure	Y	Y	PASS	Y	
PAHH-713	PT-713	MW-11 Manifold High High Pressure	Y	Y	PASS	Y	
PAHH-714	PT-714	RW-1 Manifold High High Pressure	Y	Y	PASS	Y	
PAHH-715	PT-715	RW-2 Manifold High High Pressure	Y	Y	PASS	Y	



**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Correct Interlock Response Verified (y/n)	Notes
PAHH-716	PT-716	RW-3 Manifold High High Pressure	Y	Y	PASS	Y	
FAL-711	FIT-711	IW-3 Manifold Low Flow	Y	Y	PASS	Y	
FAL-712	FIT-712	MW-5 Manifold Low Flow	Y	Y	PASS	Y	
FAL-713	FIT-713	MW-11 Manifold Low Flow	Y	Y	PASS	Y	
FAL-714	FIT-714	RW-1 Manifold Low Flow	Y	Y	PASS	Y	
FAL-715	FIT-715	RW-2 Manifold Low Flow	Y	Y	PASS	Y	
FAL-716	FIT-716	RW-3 Manifold Low Flow	Y	Y	PASS	Y	
FAH-711	FIT-711	IW-3 Manifold High Flow	Y	Y	PASS	Y	
FAH-712	FIT-712	MW-5 Manifold High Flow	Y	Y	PASS	Y	
FAH-713	FIT-713	MW-11 Manifold High Flow	Y	Y	PASS	Y	
FAH-714	FIT-714	RW-1 Manifold HighFlow	Y	Y	PASS	Y	
FAH-715	FIT-715	RW-2 Manifold High Flow	Y	Y	PASS	Y	
FAH-716	FIT-716	RW-3 Manifold High Flow	Y	Y	PASS	Y	
FALL-711	FIT-711	IW-3 Manifold Low Low Flow	Y	Y	PASS	Y	
FALL-712	FIT-712	MW-5 Manifold Low Low Flow	Y	Y	PASS	Y	
FALL-713	FIT-713	MW-11 Manifold Low Low Flow	Y	Y	PASS	Y	
FALL-714	FIT-714	RW-1 Manifold Low Low Flow	Y	Y	PASS	Y	
FALL-715	FIT-715	RW-2 Manifold Low Low Flow	Y	Y	PASS	Y	
FALL-716	FIT-716	RW-3 Manifold Low Low Flow	Y	Y	PASS	Y	
LAL-721	PT-721	Injection Well Low Water Level	Y	Y	PASS	Y	
LAL-722	PT-722	Injection Well Low Water Level	Y	Y	PASS	Y	
LAL-723	PT-723	Injection Well Low Water Level	Y	Y	PASS	Y	
LAL-724	PT-724	Injection Well Low Water Level	Y	Y	PASS	Y	
LAL-725	PT-725	Injection Well Low Water Level	Y	Y	PASS	Y	
LAL-726	PT-726	Injection Well Low Water Level	Y	Y	PASS	Y	
LAH-721	PT-721	Injection Well High Water Level	Y	Y	PASS	Y	
LAH-722	PT-722	Injection Well High Water Level	Y	Y	PASS	Y	
LAH-723	PT-723	Injection Well High Water Level	Y	Y	PASS	Y	
LAH-724	PT-724	Injection Well High Water Level	Y	Y	PASS	Y	
LAH-725	PT-725	Injection Well High Water Level	Y	Y	PASS	Y	
LAH-726	PT-726	Injection Well High Water Level	Y	Y	PASS	Y	
LAHH-721	PT-721	High High Injection Well Water Level	Y	Y	PASS	Y	
LAHH-722	PT-722	High High Injection Well Water Level	Y	Y	PASS	Y	
LAHH-723	PT-723	High High Injection Well Water Level	Y	Y	PASS	Y	
LAHH-724	PT-724	High High Injection Well Water Level	Y	Y	PASS	Y	
LAHH-725	PT-725	High High Injection Well Water Level	Y	Y	PASS	Y	
LAHH-726	PT-726	High High Injection Well Water Level	Y	Y	PASS	Y	
LAHH-731	LS-731	Injection Vault Leak Detection	Y	Y	PASS	Y	
LAHH-732	LS-732	Injection Vault Leak Detection	Y	Y	PASS	Y	
LAHH-733	LS-733	Injection Vault Leak Detection	Y	Y	PASS	Y	
LAHH-734	LS-734	Injection Vault Leak Detection	Y	Y	PASS	Y	
LAHH-735	LS-735	Injection Vault Leak Detection	Y	Y	PASS	Y	
LAHH-736	LS-736	Injection Vault Leak Detection	Y	Y	PASS	Y	
PAH-807	PT-807	Bag Filter High Influent Pressure	Y	Y	PASS	Y	
PAHH-807	PT-807	Bag Filter High High Influent Pressure	Y	Y	PASS	Y	
PAH-808	PT-808	Bag Filter High Effluent Pressure	Y	Y	PASS	Y	

**Field Form 3.c**

Alarm	Instrument	Description	Setpoint Verified (y/n)	I/O (Pass/Fail)	Scada Display (pass/fail)	Correct Interlock Response Verified (y/n)	Notes
DPAH-808	PT-807/808	Bag Filter High Differential Pressure	Y	Y	PASS	Y	
PAH-801	PT-801	T-801 GAC Vessel High Influent Pressure	Y	Y	PASS	Y	
PAHH-801	PT-801	T-801 GAC Vessel HighHigh Influent Pressure	Y	Y	PASS	Y	
PAH-802	PT-802	T-801 GAC Vessel High Effluent Pressure	Y	Y	PASS	Y	
DPAH-801	PT-801/802	T-801 GAC Vessel High Differential Pressure	Y	Y	PASS	Y	
PAH-805	PT-805	T-803 GAC Vessel High Influent Pressure	Y	Y	PASS	Y	
PAHH-805	PT-805	T-803 GAC Vessel High High Influent Pressure	Y	Y	PASS	Y	
PAH-806	PT-806	T-803 GAC Vessel High Effluent Pressure	Y	Y	PASS	Y	
DPAH-803	PT-805/806	T-803 GAC Vessel High Differential Pressure	Y	Y	PASS	Y	
PAL-901	PT-901	Air Compressor Low Pressure	Y	Y	PASS	Y	
PALL-901	PT-901	Air Compressor Low Low Pressure	Y	Y	PASS	Y	

**Project:** UTC UPCO

**Date:** 2/26-3/1, 3/11-3/15

**Description:** Mechanical Dry-Run Test Procedure - 3.d.i Motor Bump-  
Test Verification

**Inspector:** Nick Thomas

Instructions: Bump-test motors by placing motor in Hand briefly. Verify rotation.

**Field Form 3.d.i**

Motor	Description	Verify Motor Operation (Bump Test) (y/n)	Proper Rotation Verified (y/n)	Notes
P-003	SUMP PUMP	Y	Y	
P-004	SUMP PUMP	Y	Y	

**Project:** UTC UPCO

**Date:** 2/26-3/1, 3/11-3/15, and 6/24-6/28

**Description:** Mechanical Dry-Run Test Procedure - 3.d.ii VFD Bump-Test Verification

**Inspector:** Nick Thomas

Instructions: Bump-test motors by jogging VFD. Verify rotation.

**Field Form 3.d.ii**

VFD	Description	Verify Motor Operation (Bump Test) (y/n)	Proper Rotation Verified (y/n)	Notes
VFD-101	EW-1 PUMP VFD	Y	Y	Adjust setting in VFD for pump start.
VFD-102	EW-2 PUMP VFD	Y	Y	Adjust setting in VFD for pump start.
VFD-103	IW-1 PUMP VFD	Y	Y	Adjust setting in VFD for pump start.
VFD-104	MW-20 PUMP VFD	Y	Y	Adjust setting in VFD for pump start.
VFD-201	FBR TRANSFER PUMP VFD	Y	Y	
VFD-211	BACKWASH DECANT PUMP VFD	Y	Y	
VFD-401	FILTRATION TRANSFER PUMP VFD	Y	Y	
VFD-501	CLEAN BACKWASH PUMP VFD	Y	Y	
VFD-701	INJECTION PUMP VFD	Y	Y	

**Project:** UTC UPCO

**Date:** 2/26-3/1, 3/11-3/15, and 6/24-6/28

**Description:** Clean Water Test Procedure -4.b Process Instrumentation Functionality

**Inspector:** Nick Thomas

Instructions: Verify instruments with manual measurement or visual inspection where possible.

**Field Form 4.b**

Signal	Instrument	Description	Value Verified (y/n)	Notes
FQ-111	FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-112	FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-113	FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-114	FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-711	FIT-711	EXTRACTION WELL IW-3 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-712	FIT-712	EXTRACTION WELL MW-5 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-713	FIT-713	EXTRACTION WELL MW-11 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-714	FIT-714	EXTRACTION WELL RW-1 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-715	FIT-715	EXTRACTION WELL RW-2 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-716	FIT-716	EXTRACTION WELL RW-3 MANIFOLD FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-200	FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-201	FIT-201	FBR TRANSFER PUMP P-201 EFFLUENT FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-211	FIT-211	BACKWASH DECANT PUMP P-211 EFFLUENT FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-401	FIT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-701	FIT-701	INJECTION PUMP P-701 EFFLUENT FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
FQ-501	FIT-501	BACKWASH PUMP P-501 EFFLUENT FLOW PULSE	Y	Flow meter adjusted to gpm & correct pulse.
LI-101	PT-101	EXTRACTION WELL EW-1 CONTINUOUS WATER LEVEL	Y	Transducer replaced;need final level adjustment.
LI-103	PT-103	EXTRACTION WELL IW-1 CONTINUOUS WATER LEVEL	Y	Transducer replaced;need final level adjustment.
LI-104	PT-104	EXTRACTION WELL MW-20 CONTINUOUS WATER LEVEL	Y	Transducer replaced;need final level adjustment.
LI-721	PT-721	INJECTION WELL IW-3 CONTINUOUS WATER LEVEL	Y	Need final level adjustment
LI-722	PT-722	INJECTION WELL MW-5 CONTINUOUS WATER LEVEL	Y	Need final level adjustment
LI-723	PT-723	INJECTION WELL MW-11 CONTINUOUS WATER LEVEL	Y	Need final level adjustment
LI-724	PT-724	INJECTION WELL RW-1 CONTINUOUS WATER LEVEL	Y	Need final level adjustment
LI-725	PT-725	INJECTION WELL RW-2 CONTINUOUS WATER LEVEL	Y	Need final level adjustment
LI-726	PT-726	INJECTION WELL RW-3 CONTINUOUS WATER LEVEL	Y	Transducer replaced;need final level adjustment.
PI-111	PT-111	EXTRACTION WELL EW-1 MANIFOLD PIPING PRESSURE	Y	
PI-112	PT-112	EXTRACTION WELL EW-2 MANIFOLD PIPING PRESSURE	Y	
PI-113	PT-113	EXTRACTION WELL IW-1 MANIFOLD PIPING PRESSURE	Y	
PI-114	PT-114	EXTRACTION WELL MW-20 MANIFOLD PIPING PRESSURE	Y	
PI-711	PT-711	EXTRACTION WELL IW-3 MANIFOLD PIPING PRESSURE	Y	
PI-712	PT-712	EXTRACTION WELL MW-5 MANIFOLD PIPING PRESSURE	Y	
PI-713	PT-713	EXTRACTION WELL MW-11 MANIFOLD PIPING PRESSURE	Y	
PI-714	PT-714	EXTRACTION WELL RW-1 MANIFOLD PIPING PRESSURE	Y	
PI-715	PT-715	EXTRACTION WELL RW-2 MANIFOLD PIPING PRESSURE	Y	
PI-716	PT-716	EXTRACTION WELL RW-3 MANIFOLD PIPING PRESSURE	Y	
PI-901	PT-901	AIR COMPRESSOR A-900 DISCHARGE PRESSURE	Y	Air compressure adjusted for operation range.
LI-200	PT-200	INFLUENT EQ TANK T-200 CONTINUOUS WATER LEVEL	Y	Transducer cable replaced.
PI-201	PT-201	FBR TRANSFER PUMP P-201 EFFLUENT PRESSURE	Y	
PI-211	PT-211	BACKWASH DECANT PUMP P-211 EFFLUENT PRESSURE	Y	
LI-210	PT-210	BACKWASH CONDITIONING TANK T-210 CONTINUOUS WATER LEVEL	Y	
LI-400	PT-400	FBR EFFLUENT EQ TANK T-400 CONTINUOUS WATER LEVEL	Y	
PI-401	PT-401	FILTRATION TRANSFER PUMP P-401 EFFLUENT PRESSURE	Y	
PI-501	PT-501	MULTI-MEDIA FILTER T-501 INFLUENT PRESSURE	Y	
PI-502	PT-502	MULTI-MEDIA FILTER T-501 EFFLUENT PRESSURE	Y	

Project: UTC UPCO		Date: 2/26-3/1, 3/11-3/15, and 6/24-6/28		
Description: Clean Water Test Procedure -4.b Process Instrumentation Functionality		Inspector: Nick Thomas		
Instructions: Verify instruments with manual measurement or visual inspection where possible.				
Field Form 4.b				
Signal	Instrument	Description	Value Verified (y/n)	Notes
PI-601	PT-601	IX T-601 INFUENT PRESSURE	Y	
PI-602	PT-602	IX T-601 EFFLUENT PRESSURE	Y	
PI-603	PT-603	IX T-602 INFUENT PRESSURE	Y	
PI-604	PT-604	IX T-602 EFFLUENT PRESSURE	Y	
PI-605	PT-605	IX T-603 INFUENT PRESSURE	Y	
PI-606	PT-606	IX T-603 EFFLUENT PRESSURE	Y	
PI-607	PT-607	IX T-604 INFUENT PRESSURE	Y	
PI-608	PT-608	IX T-604 EFFLUENT PRESSURE	Y	
PI-801	PT-801	GAC T-801 INFLUENT PRESSURE	Y	
PI-802	PT-802	GAC T-801 EFFLUENT PRESSURE	Y	
PI-803	PT-803	GAC T-802 INFLUENT PRESSURE	Y	
PI-804	PT-804	GAC T-802 EFFLUENT PRESSURE	Y	
PI-805	PT-805	GAC T-803 INFLUENT PRESSURE	Y	
PI-806	PT-806	GAC T-803 EFFLUENT PRESSURE	Y	
PI-807	PT-807	FILTERS F-801&802 INFLUENT PRESSURE	Y	
PI-808	PT-808	FILTERS F-801&802 EFFLUENT PRESSURE	Y	
LI-700	PT-700	INJECTION EQ TANK T-700 CONTINOUS WATER LEVEL	Y	
PI-701	PT-701	INJECTION PUMP P-701 EFFLUENT PRESSURE	Y	
FI-111	FIT-111	EXTRACTION WELL EW-1 MANIFOLD FLOW RATE	Y	
FI-112	FIT-112	EXTRACTION WELL EW-2 MANIFOLD FLOW RATE	Y	
FI-113	FIT-113	EXTRACTION WELL IW-1 MANIFOLD FLOW RATE	Y	
FI-114	FIT-114	EXTRACTION WELL MW-20 MANIFOLD FLOW RATE	Y	
FI-711	FIT-711	INJECTION WELL IW-3 MANIFOLD FLOW RATE	Y	Pressure regulator adjusted.
FI-712	FIT-712	INJECTION WELL MW-5 MANIFOLD FLOW RATE	Y	Pressure regulator adjusted.
FI-713	FIT-713	INJECTION WELL MW-11 MANIFOLD FLOW RATE	Y	Pressure regulator adjusted.
FI-714	FIT-714	INJECTION WELL RW-1 MANIFOLD FLOW RATE	Y	Pressure regulator adjusted.
FI-715	FIT-715	INJECTION WELL RW-2 MANIFOLD FLOW RATE	Y	Pressure regulator adjusted.
FI-716	FIT-716	INJECTION WELL RW-3 MANIFOLD FLOW RATE	Y	Pressure regulator adjusted.
FI-200	FIT-200	INFLUENT EQ TANK T-200 INFLUENT FLOW RATE	Y	
FI-201	FIT-201	FBR TRANSFER PUMP P-201 DISCHARGE FLOW RATE	Y	Adjusted valve accordingly.
FI-211	FIT-211	BACKWASH DECANT PUMP P-211 DISCHARGE FLOW RATE	Y	Adjusted valve accordingly.
FI-401	FIT-401	FILTRATION TRANSFER PUMP P-401 DISCHARGE FLOW RATE	Y	
FI-701	FIT-701	INJECTION PUMP P-701 DISCHARGE FLOW RATE	Y	Confirmed with injection flows and pressures.
FI-501	FIT-501	BACKWASH PUMP P-501 DISCHARGE FLOW RATE	Y	Adjusted valve accordingly.
LI-102	PT-102	EXTRACTION WELL EW-2 CONTINOUS WATER LEVEL	Y	Transducer replaced;need final level adjustment.

**Project:** UTC UPCO

**Date:** 2/26-3/1, 3/11-3/15

**Description:** Clean Water Test Procedure - 4.c.i Motor Control Verification

**Inspector:** Nick Thomas

Instructions: Bump-test motors by placing motor in Hand briefly. If motor runs normally, proceed to test operation as per 4.c.i. Denote any inconsistencies on this sheet.

**Field Form 4.c**

Motor	Description	Verify Motor Operation (Bump Test) (y/n)	Motor runs when HOA is in Hand (y/n)	Does not run when in HOA is in Off (y/n)	Runs according to PLC when in Auto (y/n)	Notes
P-003	SUMP PUMP	Y	Y	Y	Y	Level switches work as required.
P-004	SUMP PUMP	Y	Y	Y	Y	Level switches work as required.

**Project:** UTC UPCO **Date:** 2/26-3/1, 3/11-3/15, and 6/24-6/28  
**Description:** Clean Water Test Procedure - 4.c.ii VFD Control Verification **Inspector:** Nick Thomas

Instructions: Bump-test motors by placing jogging VFD. If motor runs normally, proceed to test operation as per 4.c.ii. Denote any inconsistencies on this sheet.

**Field Form 4.c.ii**

VFD	Description	Verify Motor Operation (Bump Test) (y/n)	VFD control using HIM when HOA is in Hand (y/n)	Run when in HOA is in Off? (y/n)	Starts/Stops and runs at speed according to PLC when in Auto (y/n)	Notes
VFD-101	EW-1 PUMP VFD	Y	Y	Y	Y	Needed final pump rate adjustment for routine operation.
VFD-102	EW-2 PUMP VFD	Y	Y	Y	Y	Needed final pump rate adjustment for routine operation.
VFD-103	IW-1 PUMP VFD	Y	Y	Y	Y	Needed final pump rate adjustment for routine operation.
VFD-104	MW-20 PUMP VFD	Y	Y	Y	Y	Needed final pump rate adjustment for routine operation.
VFD-201	FBR TRANSFER PUMP VFD	Y	Y	Y	Y	Adjustments as needed for optimum system operation.
VFD-211	BACKWASH DECANT PUMP VFD	Y	Y	Y	Y	Adjustments as needed for optimum system operation.
VFD-401	FILTRATION TRANSFER PUMP VFD	Y	Y	Y	Y	Adjustments as needed for optimum system operation.
VFD-501	CLEAN BACKWASH PUMP VFD	Y	Y	Y	Y	Adjustments as needed for optimum system operation.
VFD-701	INJECTION PUMP VFD	Y	Y	Y	Y	Adjustments as needed for optimum system operation.



**Project:** UTC UPCO **Date:** 6/24-6/28  
**Description:** Clean Water Test Procedure - 4.d Process Control Verification **Inspector:** Nick Thomas

Instructions: Verify setpoint parameter functionality. Verify control loop controls according to design in the process control description.

**Field Form 4.d**

Control Loop	Control Loop Description	Setpoint Parameter	SCADA Input	Setpoint Parameter Calculated	SP Parameter Description	PV Measurement	Automatic Decrease/ Increase SP	Control Loop Parameters, Functionality, and Tuning Verified (y/n)	Notes
SC-101	EW-1 VFD Speed Control	EW-1 Pump Flow Rate Setpoint (FC-111)	EW-1 Extraction Flow Rate Setpoint (FIT_111_SP)	FC-111 = FIT_111_SP	EW-1 Flow Rate	FIT-111	LAL/LAH-101	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL
SC-102	EW-2 VFD Speed Control	FC-112	FIT_112_SP	FC-112 = FIT_112_SP	EW-1 Flow Rate	FIT-112	LAL/LAH-102	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL
SC-103	IW-1 VFD Speed Control	FC-113	FIT_113_SP	FC-113 = FIT_113_SP	EW-1 Flow Rate	FIT-113	LAL/LAH-103	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL
SC-104	MW-20 VFD Speed Control	FC-114	FIT_114_SP	FC-114 = FIT_114_SP	EW-1 Flow Rate	FIT-114	LAL/LAH-104	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL
SC-201	P-201 VFD Speed Control	FC-201	LI_200_SP	FC-201 = (FI-200) * (LI-200) / LI200_SP	P-201 Discharge Flow Rate	FIT-201	LAL/LAH-201	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL
SC-211	P-211 VFD Speed Control	FC-211	LI_210_SP	FC-211 = (FI-211) * (LI-210) / LI210_SP	P-211 Discharge Flow Rate	FIT-211	LAL/LAH-210	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL
SC-401	P-401 VFD Speed Control	FC-401	LI_400_SP	FC-401 = (FI-400) * (LI-400) / LI400_SP	P-401 Discharge Flow Rate	FIT-401	LAL/LAH-400	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL
SC-701	P-701 VFD Speed Control	FC-701	LI_700_SP	FC-701 = (FI-700) * (LI-700) / LI700_SP	P-701 Discharge Flow Rate	FIT-701	LAL/LAH-701	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL
SC-501	P-501 VFD Speed Control	FC-501	FIT_501_SP	FC-501 = FIT_501_SP	P-501 Discharge Flow Rate	FIT-501	LAL/LAH-501	Y	DETERMINED AUTOMATIC DECREASE/INCREASE UNNECESSARY FOR PROPER CONTROL

**Project:** UTC UPCO **Date:** 6/24-6/28

**Description:**  
Clean Water Test Procedure - 4.e FBR Integration and Optimization **Inspector:** Nick Thomas

Instructions: Coordinate with FBR instruction and/or FBR vendor representative to test the SCADA/FBR integration items listed in this checklist.

**Field Form 4.e**

Item	Verified (y/n)	Notes
Process data from FBR displays properly on SCADA	Y	
FBR alarms display properly on SCADA	Y	Need to verify several alarms during the treatment process.
Permissive signal from FBP is received at MCP when FBR is in "FBR ON" mode	Y	
Permissive signal from FBR is removed when FBR is in "FBR OFF" or "FBR Recycle" mode	Y	
Verify appropriate SCADA alarms transfer to FBR as per Process Control Description section 2.3.D	Y	
Partial Forward Flow recovery process verified, as per Process Control Description section 2.3.F	Y	

**ATTACHMENT 3**  
**FIELD LOGS**



- Scott w/ Envirogen onsite for FBR checkouts



UPCO O&M Daily Field Sheet

Operator: J. Toller  
M. Hammer Date: 7/16/19

Time: 0830 Operation Mode: SYS OFF

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

- verified MMF PRV setpoint ~95psi
- verified bag filters are installed

- Filled FBR to flood recirc lateral

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP								
pH								
Temperature								
Dissolved Oxygen								
Ammonia-N								
Phosphate								
Nitrate								
TOC								

- Envirogen usually inspected internal FBR laterals and discovered (2) chipped saddles (see reverse side of this sheet for saddle location)
- ordered ~~parts~~ parts for nutrient pump housing/fittings

- S. Wong + Gromarko onsite  
 - Nesky onsite 11:30 AM

0830 AM - 730 PM

ARCADIS OFFSITE 8 PM



UPCO O&M Daily Field Sheet

Operator: J. Toller <sup>M. Hammer</sup> Date: 7/17/19

Time: 08:30 AM Operation Mode: OFF

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)		1003.1	(manual)
EW-2 (FIT-112)		-	
IW-1 (FIT-113)		502.88	(manual)
MW-20 (FIT-114)		-	
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

System Uptime: \_\_\_\_\_  
 Extraction Uptime: \_\_\_\_\_  
 Extraction Vol: \_\_\_\_\_

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			

Backwash #: N/A

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

- Manually operated EW-1, IW-1 for initial frac tank fill of 3,000 gal (1400 gal clean, 500 gal IW-1, 1000 gal EW-1)

- Fed water from P-201 to FBR to test FBR skid feed operation (~1000 gal)
- set initial tank operating set points, pump off, pump on (T-200/400/210/700)
- adjusted torque parameter on P-104

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP mV	64.2	63.6	67.0	60.9				
pH	7.33	7.22	7.38	7.19				
Temperature °C	30.08	29.90	29.65	30.30				
Dissolved Oxygen mg/L	2.72	1.86	2.62	2.32				
Ammonia-N								
Phosphate	0.13	0.12	0.13	0.13				
Nitrate	0.4	0.4	4.1	1.9				
TOC mg/L	>20	>20	10.9	14.0				

- Envirogen troubleshooted skid, reconfigured IP addresses
- missing PH + ORP probe insertion fitting
- ↳ tested pump skid in recirculation mode
- ↳ tested skid in feed mode

\*Need to install in bed eductor tomorrow



- S. Wong onsite
- MP Env. - Craig & Jesus onsite



### UPCO O&M Daily Field Sheet

Operator: J. Toller Date: 7/18/19

Time: 0800 Operation Mode: Manual operation for alarm testing

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

- 1000 AM - Tanya picked up 7/17 samples (Batch 1 + all EW's)

- Measured bed depth after fluidizing for 10 sec = 7'6" average
- installed pH & ORP probe
- soak carbon overnight

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP								
pH								
Temperature								
Dissolved Oxygen								
Ammonia-N								
Phosphate								
Nitrate								
TOC								

10:55 AM Tested Feed permissive - P-201 ran  
 LSL-401 tripping @ 3.5' tank level, may need to adjust low level switch  
 11:30 AM tested E-stop & feed flow alarms on FBR skid.  
 12:30 PM MP began media loading 3pm offsite.





M. Hammer A. Vespalec / J. Provolt



UPCO O&M Daily Field Sheet

Operator: J. Toller Date: 7/22/19

Time: 0900 Operation Mode: OFF

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'2"	9'3"	505

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

- Bed expansion - 1/4 cup of carbon @ 9'0", minimal fines @ 9'6" → assume 9'3"
- updated P-303 Low flow setpoint in flow switch
- PT-501 not showing accurate pressure #5 snubber was rusted → looks like incorrect spec.

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP								
pH								
Temperature								
Dissolved Oxygen								
Ammonia-N								
Phosphate								
Nitrate								
TOC								

- simulated "Forward Flow" and discovered that T-200 + T-400 level control was not functioning properly
- LSSL-401 - position needs to be verified



M. Hammer / J. Prorolt / S. Wong  
(Amirogen)



UPCO O&M Daily Field Sheet

Operator: J. Toller Date: 7/23/19

Time: 1030 Operation Mode: OFF/Recirc

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	470	ml total	
Urea			
Phosphoric Acid	15	ml total	
pH control	6	l total	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			

intro-  
diced  
by  
hand

Left in recirc. after inoculum & chemical were added

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

- Picked up ~40gal of anaerobic digester sludge from 91st WWTP  
 - Moved ~1500gal of clean water from FBR to T-400, processed some water through MAF (IEX by-passed) to T-200  
 - Batch 1: Added 1500gal of 20mg/L (16243 → 17751 gal)  
 - Added ~40gal anaerobic digester sludge

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP								
pH								
Temperature								
Dissolved Oxygen								
Ammonia-N								
Phosphate								
Nitrate								
TOC								

6pm 6L of pure HCl added (original pH = 9.22 prior to addition)

836pm pH = 8.17 after acid addition

9pm took ~~9pm~~ FBR-BATCH 1 Sample



# UPCO O&M Daily Field Sheet

Operator: J. PROVOLET Date: 7/24/19

Time: \_\_\_\_\_ Operation Mode: FBR Recirculation

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	<u>N/A</u>	<u>—</u>	<u>—</u>
EW-2 (FIT-112)	<u>N/A</u>	<u>—</u>	<u>—</u>
IW-1 (FIT-113)	<u>N/A</u>	<u>—</u>	<u>—</u>
MW-20 (FIT-114)	<u>N/A</u>	<u>—</u>	<u>—</u>
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	<u>N/A</u>	<u>—</u>	<u>—</u>
MW-5 (FIT-712)	<u>N/A</u>	<u>—</u>	<u>—</u>
MW-11 (FIT-713)	<u>N/A</u>	<u>—</u>	<u>—</u>
RW-1 (FIT-714)	<u>N/A</u>	<u>—</u>	<u>—</u>
RW-2 (FIT-715)	<u>N/A</u>	<u>—</u>	<u>—</u>
RW-3 (FIT-716)	<u>N/A</u>	<u>—</u>	<u>—</u>

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
		Expanded Bed Height (ft)	Flow Rate (gpm)
Acetic Acid	<u>N/A</u>		
Urea	<u>N/A</u>		
Phosphoric Acid	<u>N/A</u>		
pH control	<u>N/A</u>		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	<u>7'</u>	<u>9'</u>	<u>505</u>

Backwash #: \_\_\_\_\_

Alarms/Faults present: \_\_\_\_\_

Process Changes/Adjustments: \_\_\_\_\_

Observations/Comments:

- Added - ENVIRONMENTAL WORK ON REPLACING DOSING PUMP FITTINGS

✓ SAMPLED @ 13:00 (FBR-BATCH 1-0724/19)

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							<u>59.6</u>	
pH							<u>8.29</u>	
Temperature °C							<u>34.86</u>	
Dissolved Oxygen								
Ammonia-N								
Phosphate								
Nitrate								
TOC								

P-301 Discharge  
58.5  
8.28  
34.1  
0.43  
Single  
Dmg/L





UPCO O&M Daily Field Sheet

FBR

Operator: T. VESPALEC

Date: 7-25-19

Time: —

Operation Mode: RECIRCULATION

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: —

Extraction Uptime: —

Extraction Vol: 800 gal (IW-1)

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	—	—	—
EW-2 (FIT-112)	—	—	—
IW-1 (FIT-113)	—	—	—
MW-20 (FIT-114)	—	—	—
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	—	—	—
MW-5 (FIT-712)	—	—	—
MW-11 (FIT-713)	—	—	—
RW-1 (FIT-714)	—	—	—
RW-2 (FIT-715)	—	—	—
RW-3 (FIT-716)	—	—	—

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid →	ADDED 250 mL TO BATCH 2		
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

- SAMPLE (SP-301); FBR-BATCH1-072519 @ 0930
- Pump 800 gallons from IW-1 into T-200 (501 = 130i)
- TRANSFER 300 GALLONS TO FBR (17,751 → 18,134)
- SAMPLE (SP-301); FBR-BATCH2-072519 @ 0815

→ CANCELED

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION EFFLUENT (SP-701) (SP-301)
ORP mV							58.7	58.9
pH							7.85	8.18
Temperature °C							32.71	96.19
Dissolved Oxygen							1.97	0.73
Ammonia-N								
Phosphate								
Nitrate m3/L								0.2
TOC (mg/L)							5.7	

m3/L

→ F







# UPCO O&M Daily Field Sheet

(BATCH 2)

Operator: T. VESPALIC

Date: 7-27-19

Time: 1200

Operation Mode: FBR-RECIRCULATION

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	—	—
FIT-211	—	—
FIT-301	—	—
FIT-401	—	—
FIT-501	—	—
FIT-701	—	—

System Uptime: N/A

Extraction Uptime:  $\emptyset$

Extraction Vol:  $\emptyset$

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	—	$\emptyset$	—
EW-2 (FIT-112)	—	$\emptyset$	—
IW-1 (FIT-113)	—	$\emptyset$	—
MW-20 (FIT-114)	—	$\emptyset$	—
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	—	$\emptyset$	—
MW-5 (FIT-712)	—	$\emptyset$	—
MW-11 (FIT-713)	—	$\emptyset$	—
RW-1 (FIT-714)	—	$\emptyset$	—
RW-2 (FIT-715)	—	$\emptyset$	—
RW-3 (FIT-716)	—	$\emptyset$	—

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'	9'	505

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

- BATCH 2 HAS MOD. FISH SMELL
- SAMPLE (@ SP-30) = FBR-BATCH2-072719 @ 1400

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP						mV	54.2	
pH							8.04	
Temperature						$^{\circ}$ F	94.83	
Dissolved Oxygen						mg/L	1.95	
Ammonia-N							—	
Phosphate							7.06	
Nitrate						mg/L	0.4	
TOC						mg/L	3.6	

FBR-pH  
-temp

8.20  
108.

NOTE: (1.76 X 4); DILUTED 50% TWICE



UPCO O&M Daily Field Sheet

(BATCH 2)

Operator: T. VESPALEC Date: 7-28-19

Time: 1230

Operation Mode: FBR-RECIRCULATION

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	—	—
FIT-211	—	—
FIT-301	—	—
FIT-401	—	—
FIT-501	—	—
FIT-701	—	—

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

System Uptime: N/A - RECIRC.

Extraction Uptime:  $\phi$

Extraction Vol:  $\phi$

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'	9'	504

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

- BATCH HAS MOD. FISH SMELL
- SAMPLE (esp-30) FBR-BATCH 2- 072819 @ 1600

TIME

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)	1230	1237	1555
ORP							57.7		57.3	57.1	
pH							8.05		8.14	8.20	
Temperature							96.44		102.74	99.45	
Dissolved Oxygen							1.42		1.31	0.96	
Ammonia-N											
Phosphate <sub>mg/L</sub>							3.28				
Nitrate							0.0				
TOC							5.9				
FBR SKID - TEMP of - pH							109.2				109.4
							8.30				8.31





UPCO O&M Daily Field Sheet

(BATCH 2)

Operator: T. VESPALEC

Date: 7-29-19

Time: 0700

Operation Mode: FBR-RECIRC.

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	—	—
FIT-211	—	—
FIT-301	—	—
FIT-401	—	—
FIT-501	—	—
FIT-701	—	—

System Uptime: RECIRC

Extraction Uptime: —

Extraction Vol: —

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	ADDED — 150 mL		
Urea	—	—	
Phosphoric Acid	—	—	
pH control	100%	8.37 pH - 8.21	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			504

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

ADDED 20 BAGS ILE; DROP TEMP TO 108.8°F  
 Observations/Comments:  
 - FBR TANK TEMP = 110°F / pH = 8.35  
 - MIX HCL SOLUTION (3 gal H<sub>2</sub>O / 2L HCL)  
 1100 START PUMPING @ 306  
 - SAMPLE @ SP-301; FBR-BATCH 2 - 072919 @ 1345  
 - MOD FISH SMELL

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-701) (SP-301)
ORP							56.3	56.6
pH							8.22	8.10
Temperature							104.99	104.26
Dissolved Oxygen							1.49	1.46
Ammonia-N							—	—
Phosphate							—	3.66
Nitrate							—	0.0
TOC							—	3.5
FBR SKID - TEMP - pH							110°F 8.37	110.4 8.30



Operator: T. VESPALE / M. HAMMER Date: 7-30-19

UPCO O&M Daily Field Sheet (BATCH 2)

Time: 0800

Operation Mode: FBR-RECIRC

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	NA	
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	NA		
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	NA		
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
		Expanded Bed Height (ft)	Flow Rate (gpm)
Acetic Acid			
Urea			
Phosphoric Acid			
pH control	100%	0.33 - 0.15	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			

Backwash #: \_\_\_\_\_

Alarms/Faults present: \_\_\_\_\_

Process Changes/Adjustments:  
 - MIX HCl w/ WATER (2L ACID / 3GAL H2O) -> START ADDING @ 0815  
 - ADD 310 g OF SODIUM NITRATE } @ 1710  
 Observations/Comments:  
 - ADD 350 mL ACETIC ACID } @ 1710  
 - SAMPLE (SP-301); FBR-BATCH 2 - 072919 @ 1345

TIME

11:30 17:50

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-704) (SP-301)
ORP							59.5	58.4
pH							8.08	8.01
Temperature							103.39	103.67
Dissolved Oxygen							1.25	1.32
Ammonia-N							-	-
Phosphate							3.40	3.28
Nitrate							0.3	0.4
TOC							4.7	7.1
FBR SKID - pH - TEMP						@ 0815 TIME	8.33 107.2	8.13 107.8





# UPCO O&M Daily Field Sheet

Operator: T. VESPALEC Date: 7-31-19

Time: Operation Mode: FBR - RECIRC

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)	SEE NOTES	3000 + 150	N/A
IW-1 (FIT-113)		324	meter #
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	650 mL	(BATCH 3)	
Urea			
Phosphoric Acid			
pH control	100%	8.30 - 8.02	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			

Backwash #: \_\_\_\_\_

Alarms/Faults present: \_\_\_\_\_

Process Changes/Adjustments:

- MIX ALL CONTROL HCL (2 gal / 2 L HCL); START ADDING @ 0753

Observations/Comments:

- PHOSPHATE DILUTED 50% (1.71 \* 2 = 3.42)  
 - PUMP EW-2 INTO T-200 (869 - 3086 = 3000 gal)  
 - PUMP FLOW RATE ~ 47 gpm / 60 Hz; lower Hz so that PUMP DOES NOT RUN DRY  
 - SAMPLE (PT-201); PT-201 - 073119 @ 1700 F  
 - SAMPLE (SP-301); FBR - BATCH 3 - 073119 @ 1945

0745 1245 1720 1945

UNTIL FBR BATCH 3 PUMPED INTO T-300 8.02 TO 8.18

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)		
ORP							58.8	57.1		59.3
pH							8.02	7.90		7.60
Temperature							99.69	99.00		92.59
Dissolved Oxygen							0.66	1.16		0.94
Ammonia-N							-	-		
Phosphate							3.42			2.94
Nitrate							1.2	0.5		8.8
TOC						@ 0900 →	4.1	4.2		15.1
FBR SKID										
- TEMP							103.2		94.5	95.4
- PH							8.30		8.18	7.90

BATCH 3: FIT-201 (18134 - 21133) @ 1720

TRANSFER 3,000 gal. TO FBR  
 BOOSTER SLUDGE PUMPED INTO FBR; DONE @ 1845; ADD 650 mL ACETIC ACID



UPCO O&M Daily Field Sheet

(Batch 3)

Operator: T. VESPALEC

Date: 8-1-19

Time: 0700

Operation Mode: FBR-RECIRC.

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7	8' 4"	485

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:  
 @ 1520 ADD 520g NaNO<sub>2</sub> & 580mL acetic Acid

Observations/Comments: \*TRAIL CALIBRATION @ 11:30 + 3 POINT PH CALIB.

- INCREASES FLOW TO 500 gpm @ 1400  
 ↳ BED HEIGHT @ 8' 6"  
 - USED TAPE MEASURE (CAN SEE CARBON) - SAMPLE (SP-300); FBR-BATCH 3 - 080119 @ 1350  
 @ 11:00

TIME	1600	0800	12:25	1440						
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-701) (SP-301)		
ORP						76.6	59.8	100.1	*SEE NOTES	91.5
pH						7.44	7.56	7.58		7.52
Temperature						101.68	95.84	95.81		101.27
Dissolved Oxygen						0.02	0.46	1.66		0.04
Ammonia-N										
Phosphate						3.46	3.8	3.18		
Nitrate						0.6	0.0	0.0		
TOC						4.4(f)	12.6			2.5(f)
FBR SKID										
- TEMP						101.3	97.7	100.2		101.0
- pH						7.51	7.72	7.67		7.59

(f) = FILTERED





Operator: T. VESPALEC Date: 8-2-19

UPCO O&M Daily Field Sheet

Time: 0700 Operation Mode: FBR-RECIRC. (BATCH 3)

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control	ADD	CONTINUE TO LOWER PH	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'	8' 4"	500 5.9psd

MEASURED = 11' 8"

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:  
- CONTINUE TO ADD HCl - PH ADJUSTMENT

Observations/Comments:  
- BED EXPANDED HEIGHT MEASURES 8' 4" @ 500 gpm  
- SAMPLE (SP-301) FBR-BATCH 3 - 080219 @ 1345

TIME	0800	1040	1600					
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-301)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)
ORP						72.8	73.8	70.1
pH						7.56	7.45	7.41
Temperature						104.09	105.88	106.54
Dissolved Oxygen						0.03	0.03	0.02
Ammonia-N						-	-	-
Phosphate						3.52	3.52	
Nitrate						0.9	0.9	0.9
TOC						2.8 (F)	2.5 (F)	4.3 (F)
FBR SKID - TEMP - PH						104.1 7.53	105.6 7.43	106.2 7.39

(F)=FILTERED



Operator: T. VESPALEC Date: 8-3-19

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	~95	3014
FIT-211	—	—
FIT-301	—	—
FIT-401	—	—
FIT-501	—	—
FIT-701	—	—

System Uptime: —

Extraction Uptime: ~ 2 HR

Extraction Vol: 3017

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	1800 ml (BATCH 4)		
Urea	—	—	
Phosphoric Acid	—	—	
pH control	CONTINUE ADDING		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7	8' 4"	500

SAMPLE (SP-201); PT-201-080319 @ 1225  
(SP-301); FBR-BATCH 4-080319 @ 1345

UPCO O&M Daily Field Sheet

(BATCH 3 TO 4)

Time: 0800

Operation Mode: FBR-RECIRC

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	—	—	—
EW-2 (FIT-112)	~27	2143	—
IW-1 (FIT-113)	~11	874	—
MW-20 (FIT-114)	—	—	—
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	NA		
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

EW-2; 3244 - 5387 = 2143  
IW-1; 1301 - 2175 = 874

Backwash #: NA

Alarms/Faults present: IW-1 HAS PUMP FAULT ALARM  
T-200 HAS LOW LOW LEVEL ALARM ISSUE

Process Changes/Adjustments:

- CONTINUE PH ADJUSTMENT (LOWER)
- ADDED 1800 ml Acetic Acid AFTER BATCH 4 4000

Observations/Comments:

- TRANSFER WATER FROM T400 TO FRACTANK
- MIX BATCH 4 @ ~25 mg/l; ADD TO FBR 1210 TO 1244
- ADD 1800 ml Acetic Acid AFTER ADDING BATCH 4 @ 1245
- FIT-201 = 21133 - 24147 (3014)

(BATCH 4)

TIME						0840	1345	1415
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR EFFLUENT (SP-301)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)
ORP						72.9	67.5	67.3
pH						7.58	7.32	7.33
Temperature						106.83	97.40	97.72
Dissolved Oxygen						0.02	0.01	0.01
Ammonia-N						—	—	—
Phosphate						—	2.98	—
Nitrate						0.7	0/0	—
TOC						4.3 (F)	17 (F)	—
FBR SKID						107.4	97.0	97.4
- TEMP						7.46	7.43	7.42

(F) = FILTERED





Operator: T. VESPALEC Date: 8-4-19

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: —

Extraction Uptime: —

Extraction Vol: —

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	—	—	
Urea	—	—	
Phosphoric Acid	—	—	
pH control	100% 90	CONTINUE TO MON	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7	8'4"	503

- MEASURED 11'8"

UPCO O&M Daily Field Sheet

Time: 0730 Operation Mode: (BATCH4) FBR-RECIRC.

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

Backwash #: —

Alarms/Faults present: —

Process Changes/Adjustments:  
NONE

Observations/Comments:  
- SAMPLE (SP-301); FBR-BATCH4-080419

TIME							0745	1130
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)
ORP							68.6	67.5
pH							7.30	7.24
Temperature							99.74	101.46
Dissolved Oxygen							0.01	0.02
Ammonia-N							—	—
Phosphate							3.54	—
Nitrate							0.5	—
TOC							9.9 (F)	2.6 (F)
FBR SKID -TEMP -PH							99.4 7.31	101.4 7.23



Operator: T. VESPALEC

Date: 8-5-19

UPCO O&M Daily Field Sheet

Time: 0800

Operation Mode: FBR-RECIRC (BATCH 4) → (BATCH 5)

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	~95	2912
FIT-211	—	—
FIT-301	—	—
FIT-401	—	—
FIT-501	—	—
FIT-701	—	—

System Uptime: —

Extraction Uptime: —

Extraction Vol: 2912 gal  
24147 → 27059 = 2912 gal

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
		Expanded Bed Height (ft)	Flow Rate (gpm)
Acetic Acid	NA	6.50 mL	
Urea	—	—	
Phosphoric Acid	—	—	
pH control	100%	INCREASE PH	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'	8'4"	502 6.5 PSI

↳ MEASURED = 11'8"

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	—	—	—
EW-2 (FIT-112)	—	2175-2473 = 298	NA
IW-1 (FIT-113)	—	5307-2010 = 2623	NA
MW-20 (FIT-114)	—	—	—
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	—	—	—
MW-5 (FIT-712)	—	—	—
MW-11 (FIT-713)	—	—	—
RW-1 (FIT-714)	—	—	—
RW-2 (FIT-715)	—	—	—
RW-3 (FIT-716)	—	—	—

Backwash #: NA

Alarms/Faults present:

Process Changes/Adjustments:  
 - ADD 650 mL Acetic Acid TO BATCH 5 @ 1845  
 - ONX BATCH 5 & ADD  
 Observations/Comments:  
 SAMPLE: FBR-BATCH4-080519 @ 1345  
 SP-401-080519 @ 1230  
 SP-608-080519 @ 1315  
 FILL FIRE TANK; ~4500 gal

TIME	BATCH 4						BATCH 5		
	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)	
ORP							71.2	67.6	76.8
pH							7.35	7.18	7.23
Temperature							105.73	107.69	96.89
Dissolved Oxygen							0.02	0.01	0.11
Ammonia-N							—	—	—
Phosphate							3.34	3.92	—
Nitrate							0.2	0.2	—
TOC							4.6 (F)	2.2 (F)	0.5 (F)
FBR SKID							105.3	107.4	96.6
- TEMP							7.28	7.11	7.36
- pH									
- ORP									145

(F) = FILTERED





# UPCO O&M Daily Field Sheet

Operator: T. VESPALEC Date: 8-6-19

Time: 0800 Operation Mode: FBR-RO/RC <sup>(BARKAS)</sup>

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	<u>7'</u>		<u>502</u> <u>6.9 gpm</u>

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:  
@ 1615 Added 253 ml acetic Ac. & to BARKAS

Observations/Comments:

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							<u>66.1</u>	
pH							<u>7.28</u>	
Temperature							<u>99.96</u>	
Dissolved Oxygen							<u>0.13</u>	
Ammonia-N							<u>—</u>	
Phosphate							<u>2.68 (F)</u>	
Nitrate							<u>0.9 (F)</u>	
TOC							<u>0.0 (F)</u>	

1215

FBR SKID  
 - Temp  
 - pH  
 - ORP

99.70  
7.26  
147

(F) = FILTERED



T. VESPALEC

Operator: J. PROVOLT

Date: 8-7-19

UPCO O&M Daily Field Sheet

Time: 0700

Operation Mode: FBR-RECIRC TO FORWARD FLOW

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)			
EW-2 (FIT-112)			
IW-1 (FIT-113)			
MW-20 (FIT-114)			
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)			
MW-5 (FIT-712)			
MW-11 (FIT-713)			
RW-1 (FIT-714)			
RW-2 (FIT-715)			
RW-3 (FIT-716)			

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid			
Urea			
Phosphoric Acid			
pH control			
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'	8' 4.25"	502

→ measured 11' 7.75"

7PSI

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

- MOVE TO FORWARD FLOW (EW-1 & EW-2) @ ~15gpm

Observations/Comments:

SAMPLE: SP-201-080719 @ 1330  
SP-301-080719 @ 1340

FORWARD FLOW

TIME					0730	1235	1850		
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)	
ORP							70.8	66.3	60.9
pH							7.32	7.29	7.20
Temperature							103.43	98.31	98.77
Dissolved Oxygen							0.07	0.01	0.01
Ammonia-N							-	-	-
Phosphate							2.48	3.68	4.56
Nitrate							0.5	0.0	0.0
TOC							1.2 (F)	1.5 (F)	0.5 (F)
FBR SKID									
- TEMP							103.1	98.1	92.5
- ORP							148	135	119
- pH							7.25	7.34	7.33

(F) = FILTERED





T. VOSPALIC

Operator: J. PROJEKT

Date: 8-8-19

UPCO O&M Daily Field Sheet

(FORWARD FLOW STOPPED)

Time: 0730

Operation Mode: FBR-RECIRC

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201		
FIT-211		
FIT-301		
FIT-401		
FIT-501		
FIT-701		

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: \_\_\_\_\_

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)		7384	—
EW-2 (FIT-112)		17597	—
IW-1 (FIT-113)		2612	—
MW-20 (FIT-114)		156	—
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)		720	—
MW-5 (FIT-712)		844	—
MW-11 (FIT-713)		3298	—
RW-1 (FIT-714)		3026	—
RW-2 (FIT-715)		1337	—
RW-3 (FIT-716)		4041	—

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
	SPH		
Acetic Acid	0.05	OK	
Urea	—	—	
Phosphoric Acid	0.01	OK	
pH control	—	—	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'	8' 5"	511

MEASURED 11' 7"

7.25PSI

Backwash #:

Alarms/Faults present:

Process Changes/Adjustments:

- ADJUST FBR FLOW TO 500gpm

Observations/Comments:

- SUMP TRIPPED SYSTEM; PUMP OUT  
- @ 1100 START FORWARD FLOW TO FBR

TIME						0900	1100	1700
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)
ORP						61.3	44.9	104.4
pH						7.06	7.03	6.75
Temperature						93.34	92.94	89.64
Dissolved Oxygen						0.04	0.01	0.01
Ammonia-N						—	—	—
Phosphate						2.32 (F)	2.16 (F)	—
Nitrate						0.4 (F)	0.2 (F)	—
TOC						1.1 (F)	0.0 (F)	3.5 (F)
FBR SKID								
- TEMP						93.0	91.3	89.4
- PH						7.08	7.09	7.08
- ORP						101	98	92

(F) = FILTERED



# UPCO O&M Daily Field Sheet

Operator: T. VESPALEC Date: 8-9-19

Time: 0700

Operation Mode: FORWARD FLOW

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	20.0	66854
FIT-211	0.0	623
FIT- <del>200</del>	20.2	59081
FIT-401	20.0	67001
FIT-501	0.0	NOT WORKING (SCREEN)
FIT-701	19.9	58907

System Uptime: \_\_\_\_\_

Extraction Uptime: \_\_\_\_\_

Extraction Vol: 59,081

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	14431	—
EW-2 (FIT-112)	14.0	34198	—
IW-1 (FIT-113)	0.0	2612	—
MW-20 (FIT-114)	0.0	156	—
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.0	13933	NOT WORKING
MW-5 (FIT-712)	0.0	849	—
MW-11 (FIT-713)	4.6	8848	35.9
RW-1 (FIT-714)	4.2	8039	33.8
RW-2 (FIT-715)	1.2	2591	67.9
RW-3 (FIT-716)	0.0	6842	—

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
	gph		
Acetic Acid	0.08	GOOD	
Urea	—	—	
Phosphoric Acid	0.01	TANK NEEDS VENT TUBES	
pH control	0.0	TURNED OFF PUMP	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'	8'6"	504 <span style="border: 1px solid black; padding: 2px;">8psi</span>

MEASURED 11'6"

Backwash #: — RUN IN HAND (10 MIN); NEED TO PUT INTO AUTO TO STOP

Alarms/Faults present: NONE

Process Changes/Adjustments: — pH adjustment WAS ON

Observations/Comments: — IX VESSEL 01 - DRIPPING FROM TOP / 602 DRAIN  
— FIT-501 SCREEN NOT WORKING  
 SAMPLES: SP-201-080919 @ 1330  
 SP-301-080919 @ 1340  
 SP-701-080919 @ 1350  
 EW1-080919 @ 1325  
 EW2-080919 @ 1325

TIME								0730	1030	1315
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)		
ORP							58.6	57.1	55.2	
pH							6.67	6.66	6.66	
Temperature							87.38	87.46	87.60	
Dissolved Oxygen							0.01	0.01	0.01	
Ammonia-N							—	—	—	
Phosphate							2.09 (F)	2.07 (F)	2.0 (F)	
Nitrate							0.7 (F)	0.6 (F)	0.0 (A)	
TOC							8.7 (F)	—	5.9 (A)	
FBR SKIP							87.2	87.2	87.4	
- TEMP							7.01	6.99	6.99	
- pH							69	70	71	
- ORP										

(F) = FILTERED





# UPCO O&M Daily Field Sheet

Operator: T. VespaLEC Date: 8-10-19

Time: 1400

Operation Mode: FORWARD FLOW

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	20.1	103790
FIT-211	0.0	
FIT- <del>301</del>	20.1	95639
FIT-401	20.1	103991
FIT-501	OFF	SCREEN NOT WORKING
FIT-701	20.0	95003

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	25509	-
EW-2 (FIT-112)	14.0	60037	-
IW-1 (FIT-113)	0.0	2612	-
MW-20 (FIT-114)	0.0	156	-
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.2	32356	
MW-5 (FIT-712)	0.0	850	-
MW-11 (FIT-713)	4.5	17130	
RW-1 (FIT-714)	4.1	15387	
RW-2 (FIT-715)	1.2	4810	
RW-3 (FIT-716)	0.0	6842	-

System Uptime: NA

SYSTEM FEED  
Extraction Optims: 77600

Extraction Vol: 95639

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
	gph		
Acetic Acid 303	0.09	Good/Drum Empty	
Urea 305	0.01	Good	
Phosphoric Acid	-	-	
pH control	NONE	NONE	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7		488 6.75psi

MEAS BED - 11'6.5"

Backwash #:

Alarms/Faults present: NONE

Process Changes/Adjustments:  
- ADJUST SKIA FLOW TO 500 gpm

Observations/Comments:  
- Acetic Drum Empty; Filled

TIME	1400							
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							73.2	
pH							7.16	
Temperature							87.4	
Dissolved Oxygen							0.01	
Ammonia-N							-	
Phosphate							1.18 (F)	
Nitrate							0.4 (F)	
TOC							1.6 (F)	
- Temp							87.2	
- pH							7.45	
- ORP							83	

(F) = FILTERED



# UPCO O&M Daily Field Sheet

Operator: T. VESPALEL Date: 8-11-19

Time: 1430 Operation Mode: FORWARD FLOW

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	20.0	133421
FIT-211	0.0	623
FIT-201 <sup>20.0</sup>	20.1	125444
FIT-401	20.1	133683
FIT-501	0.0	SCREEN BLANK
FIT-701	20.1	124584

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	34391	-
EW-2 (FIT-112)	14.0	80755	-
IW-1 (FIT-113)	0.0	2612	-
MW-20 (FIT-114)	0.0	156	-
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.2	47467	-
MW-5 (FIT-712)	0.0	849	31.2
MW-11 (FIT-713)	4.5	23759	36.0
RW-1 (FIT-714)	4.1	21471	33.9
RW-2 (FIT-715)	1.3	6694	76.9
RW-3 (FIT-716)	0.0	6842	-

System Uptime: NA

SYSTEM FEED  
Extraction Uptime: 107000

Extraction Vol: 125444

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	0.09	TANK 1/4 FULL	
Urea	→	-	
Phosphoric Acid	0.01	600g / TANK FULL	
pH control	0.0	-	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7	UNAVAILABLE TO MTS/SG	495 7psi

Backwash #: PT-501 = 6.0 psi; Pump Time left = 828  
 PT-502 = 5.9 psi; Vol. Remaining to setpt. 2 = 9664  
 AP-501 = 3.98  
 Alarms/Faults present: NONE

Process Changes/Adjustments:  
 - FILLED Acetic Acid - 5g DRUM  
 Observations/Comments:  
 - ORP on FBR IS DOWN TO -200 FROM 85 a DAY AGO  
 - 5 SAMPLES: SP-201-081119 @  
 SP-301-081119 @  
 EW-1 - 081119 @

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-40.2	
pH							6.61	
Temperature							87.42	
Dissolved Oxygen							0.01	
Ammonia-N							-	
Phosphate							1.23 (F)	
Nitrate							0.0 (F)	
TOC							5.2 (F)	
FBR SKID - TEMP - pH - ORP							87.3 6.88 -214	

(F) = FILTERED





# UPCO O&M Daily Field Sheet

Operator: T. VESPALEK Date: 2-12-19

Time: 0930 Operation Mode: FORWARD FLOW

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	20.0	155984
FIT-211	0.0	623
FIT-301	20.1	148091
FIT-401	20.1	156309
FIT-501	0.0	SCREEN OFF
FIT-701	19.9	147103

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	41155	-NT
EW-2 (FIT-112)	14.0	96535	-NT
IW-1 (FIT-113)	0.0	2612	-NT
MW-20 (FIT-114)	0.0	156	-NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.2	58985	-NT
MW-5 (FIT-712)	0.0	849	31.1
MW-11 (FIT-713)	4.4	28777	36.0
RW-1 (FIT-714)	4.1	26106	33.7
RW-2 (FIT-715)	1.3	8142	75.8
RW-3 (FIT-716)	0.0	6842	-NT

System Uptime: \_\_\_\_\_

SYSTEM FEED  
Extraction Uptime: 129101 gal

Extraction Vol: 148091

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
	gph		
Acetic Acid	0.09	GOOD/TANK OK	
Urea	—	—	
Phosphoric Acid	0.01	GOOD/TANK OK	
pH control	—	—	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
	7		495 7.5psi

Backwash #: PT-501 = 7.1  
PT-502 = 6.0  
DA-501 = 5.01  
Raw Time LEFT = 99.6 hrs  
Vol Remaining TO Script = 118794 g

Alarms/Faults present: NONE

Process Changes/Adjustments:

Observations/Comments:

TIME						0930	10:20	
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)
ORP							-324.2	-324.8
pH							6.38	6.37
Temperature							87.53	87.59
Dissolved Oxygen							0.01	0.01
Ammonia-N							—	—
Phosphate							(F)	1.81
Nitrate							(F)	0.1
TOC							(F)	8.1
FBR SKID							87.4	87.5
-Temp							6.67	6.65
-pH							-331	-328
-ORP								

(F) = FILTERED  
NT = NO TRANSDUCER



# UPCO O&M Daily Field Sheet

Operator: T. VESPALEC Date: 8-13-19

Time: 0830 Operation Mode: FORWARD FLOW

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	19.9	183415
FIT-211	0.0	
FIT-301 <sup>300</sup>	20.1	175661
FIT-401	20.0	183831
FIT-501	0.0	SCREEN NOT WORKING
FIT-701	19.8	174487

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	49376	NT
EW-2 (FIT-112)	14.0	115712	NT
IW-1 (FIT-113)	0.0	2612	NT
MW-20 (FIT-114)	0.0	156	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.2	73006	NT
MW-5 (FIT-712)	0.0	849	31.1
MW-11 (FIT-713)	4.4	34849	36.0
RW-1 (FIT-714)	4.1	31733	33.8
RW-2 (FIT-715)	1.3	9928	74.3
RW-3 (FIT-716)	0.0	6842	NT

System Uptime: \_\_\_\_\_

SYSTEM FEED  
Extraction Uptime: 156105g

Extraction Vol: 175661

Nutrient	Flow Rate (ml/min) gpm	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	0.09	FILLED TANK	
Urea	—	—	
Phosphoric Acid	0.01	GOOD	
pH control	NONE	OK	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7	?	494 <u>8ps:</u>

Backwash #:  $PT-501 = 9.6$   
 $PT-502 = 6.1$   
 $DPI-501 = 7.25$

Run Time Left: 121.9 hrs  
 Vol. Remaining to Set Pts: -145328 gal.

Alarms/Faults present: NONE

Process Changes/Adjustments:

Observations/Comments:

0830 1500

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-301)
ORP							-330	-358
pH							6.33	6.19
Temperature							86, 86	87.71
Dissolved Oxygen							0.01	0.01
Ammonia-N							—	—
Phosphate							1.28 (F)	1.27 (F)
Nitrate							0.9 (F)	0.3 (F)
TOC							1.2 (F)	(F)

FBR SKID  
 - TEMP  
 - pH  
 - ORP

86.9 87.6  
 6.70 6.54  
 -326 -327





# UPCO O&M Daily Field Sheet

Exhibits @1105

Operator: T. VOSPALIC Date: 8-14-19

Time: 0650 Operation Mode: FBR RECIRC / FORWARD FLOW

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	23.3	205098
FIT-211	LOI COMM ERROR	
FIT-301	20.1	197777
FIT-401	21.6	206270
FIT-501	0.0	BAD SCREEN
FIT-701	18.8	196175

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	55877	NT
EW-2 (FIT-112)	14.0	131170	NT
IW-1 (FIT-113)	0.0	2612	NT
MW-20 (FIT-114)	0.0	156	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	12.2	84173	NT
MW-5 (FIT-712)	0.0	849	31.2
MW-11 (FIT-713)	2.6	39778	36.0
RW-1 (FIT-714)	2.5	35987	33.8
RW-2 (FIT-715)	1.8	11384	77.2
RW-3 (FIT-716)	0.0	6842	NT

System Uptime: \_\_\_\_\_

SYSTEM FEED: 177497  
Extraction Uptime: \_\_\_\_\_

Extraction Vol: 14777g

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	0.11	GOOD / NEED TO BE TO DRUM	
Urea	—	—	
Phosphoric Acid	0.02	DRUM LOW	
pH control	—	—	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300	7'		496 7ps:

Backwash #: MMF = HIGH DPI ALARM

Alarms/Faults present: - SUMP HIGH HIGH (T-200 WAS OVERFLOWING)

Process Changes/Adjustments:

Observations/Comments: - FIT-211 HAS LOI COMM ERROR

1105

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-327	
pH							6.13	
Temperature							89.20	
Dissolved Oxygen							0.01	
Ammonia-N							—	
Phosphate							1.36(F)	
Nitrate							0.5(F)	
TOC							1.3(F)	
FBR SKIN							89.1	
- TEMP							6.51	
- PH								
- ORP								-370

(F) FILTERED  
NT = NO TRANSDUCER



# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 8/15/19

Time: 09:25 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	20.1	222302
FIT-211	LOI	COMM BREAK
FIT-300	20.1	224768
FIT-401	20.2	233504
FIT-501	0.0	BLANK SCREEN
FIT-701	20.0	221800

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	63877	NT
EW-2 (FIT-112)	14.0	149875	NT
IW-1 (FIT-113)	0.0	2612.8	NT
MW-20 (FIT-114)	0.0	156	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.3	98026	NT
MW-5 (FIT-712)	0.0	849.9	31.2
MW-11 (FIT-713)	4.0	46609	36.0
RW-1 (FIT-714)	4.1	41821	33.8
RW-2 (FIT-715)	1.5	13355	81.1
RW-3 (FIT-716)	0.0	6842	NT

System Uptime: \_\_\_\_\_

SYSTEM FEED  
Extraction Uptime: 205301

Extraction Vol: 224768

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	0.09	GOOD/NEED TUBE TO DRUM	
Urea	-	-	
Phosphoric Acid	0.01		
pH control	-	-	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			495 <u>7.0</u> PSI

PT-501 = 6.4      RUNTIME LEFT = 22.5 HRS  
 Backwash #: PT-502 = 7.3      VOL REMAINING TO SETPOINT = -26102.5g  
 AP-501 = 2.92

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

12:25

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-370.8	
pH							6.11	
Temperature							87.78	
Dissolved Oxygen							0.01	
Ammonia-N							-	
Phosphate							1.33 (F)	
Nitrate							0.2 (F)	
TOC							1.2 (F)	
FBR SKID -TEMP -PH -ORP							87.7 6.54 -375	

F = FILTERED  
 NT = NO TRANSDUCER





# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 8/16/19

Time: 0915 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	<u>20.4</u>	<u>260830</u>
FIT-211	<u>LOI</u>	<u>COMM ERROR</u>
FIT-301 <u>200</u>	<u>20.1</u>	<u>253445</u>
FIT-401	<u>20.2</u>	<u>262190</u>
FIT-501	<u>-</u>	<u>RAB DISPLAY</u>
FIT-701	<u>20.1</u>	<u>250150</u>

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
		<u>72442</u>	
EW-1 (FIT-111)	<u>6.9</u> <del>2.8</del>	<u>2612.8</u>	<u>NT</u>
EW-2 (FIT-112)	<u>14.0</u>	<u>169820</u>	<u>NT</u>
IW-1 (FIT-113)	<u>0.0</u>	<u>2612.8</u>	<u>NT</u>
MW-20 (FIT-114)	<u>0.0</u>	<u>156.2</u>	<u>NT</u>
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	<u>10.4</u>	<u>112840</u>	<u>NT</u>
MW-5 (FIT-712)	<u>0.0</u>	<u>849</u>	
MW-11 (FIT-713)	<u>4.0</u>	<u>50300</u>	
RW-1 (FIT-714)	<u>4.2</u>	<u>46952</u>	
RW-2 (FIT-715)	<u>1.5</u>	<u>15545</u>	
RW-3 (FIT-716)	<u>0.0</u>	<u>6842.0</u>	<u>NT</u>

System Uptime: \_\_\_\_\_

SYSTEM FEED:  
Extraction Uptime: 232350

Extraction Vol: 253445

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	<u>0.09</u>	<u>GOOD/NEEDS HOSE TO DRUM</u>	
Urea	<u>-</u>	<u>-</u>	
Phosphoric Acid	<u>0.01</u>	<u>Good</u>	
pH control	<u>-</u>	<u>-</u>	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			<u>491</u> <u>7.5</u> <u>PSI</u>

Backwash #: PT-501 = 8.5 PT-502 = 7.4 DP-501 = 4.98  
 Alarms/Faults present: \_\_\_\_\_  
 Process Changes/Adjustments: \_\_\_\_\_  
 Observations/Comments: \_\_\_\_\_

RUNTIME LEFT = 44.7 HRS  
 VOLUME REMAINING TO SETPOINT = -52697.0 g

ADJUSTED FBR-300 TO 500 gpm @ 09:30  
 RAN HOSE TO DRUM FOR ACETIC ACID

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							<u>-33.6</u>	
pH							<u>6.14</u>	
Temperature							<u>87.3</u>	
Dissolved Oxygen							<u>0.01</u>	
Ammonia-N							<u>-</u>	
Phosphate							<u>1.45</u>	<u>F</u>
Nitrate							<u>0.0</u>	<u>F</u>
TOC							<u>7.6</u>	
FBR SKID - TEMP - PH - ORP							<u>89.2</u> <u>6.56</u> <u>-380</u>	

NT = NO DATA  
 F = FILTERED

09:45



# UPCO O&M Daily Field Sheet

Operator: HAMMER

Date: 8/19/19

Time: 11:25

Operation Mode: Forward

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	<u>17.20.1</u> <u>17.5004</u>	<u>349985</u> <u>338072</u>
FIT-211	<u>LOI</u>	<u>COMM ERROR</u>
FIT-301 200	<u>20.1</u>	<u>342945</u>
FIT-401	<u>21.2</u>	<u>352318</u>
FIT-501	<u>-</u>	<u>BAB DISPLAY</u>
FIT-701	<u>19.5</u>	<u>338072</u>

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	<u>6.0</u>	<u>99141</u>	<u>NT</u>
EW-2 (FIT-112)	<u>14.0</u>	<u>232101</u>	<u>NT</u>
IW-1 (FIT-113)	<u>0.0</u>	<u>2612.8</u>	<u>NT</u>
MW-20 (FIT-114)	<u>0.0</u>	<u>156.2</u>	<u>NT</u>
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	<u>9.6</u>	<u>159307</u>	<u>NT</u>
MW-5 (FIT-712)	<u>0.0</u>	<u>849</u>	<u>31.1</u>
MW-11 (FIT-713)	<u>3.4</u>	<u>67135</u>	<u>36.1</u>
RW-1 (FIT-714)	<u>3.2</u>	<u>648516</u>	<u>33.8</u>
RW-2 (FIT-715)	<u>1.5</u>	<u>22676</u>	<u>72.4</u>
RW-3 (FIT-716)	<u>0.0</u>	<u>6842.0</u>	<u>NT</u>

System Uptime: \_\_\_\_\_

SYSTEM FEED  
Extraction Uptime: 323050

Extraction Vol: 253445

Nutrient	Flow Rate (ml/min)	Visual Inspection (i.e. pumps, drums, tubing)	
Acetic Acid	<u>0.10</u>	<u>GOOD / 0.90 SETPOINT</u>	
Urea	<u>-</u>	<u>-</u>	
Phosphoric Acid	<u>0.01</u>	<u>GOOD / 0.30 SETPOINT</u>	
pH control	<u>-</u>	<u>-</u>	
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)
FBR-300			<u>500 7 PSI</u>

Backwash #:  
 PT-501 = 6.0 RUNTIME LEFT = 1.7 HRS  
 PT-502 = 7.1  
 DP-501 = 2.70 VOL REMAINING TO SETPOINT = 1776.2  
 Alarms/Faults present:  
 MULTI MEDIA FILTER HH DIFF PRESS = 8/17 12:40 AM

Process Changes/Adjustments:

Observations/Comments:

(20 GAL ACETIC ACID REMAINING IN DRUM.)  
 NEED TO ORDER MORE.

Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							<u>-381.6</u>	
pH							<u>6.45</u>	
Temperature							<u>87.4</u>	
Dissolved Oxygen							<u>0.01</u>	
Ammonia-N							<u>-</u>	
Phosphate							<u>1.73</u>	<u>F</u>
Nitrate							<u>0.0</u>	<u>F</u>
TOC							<u>19.2</u>	<u>F</u>
FBR skid							<u>87.3</u>	
-TEMP							<u>6.79</u>	
-PH							<u>-402</u>	
-ORP								

NT = NO OXIDIZER  
 F = FILTERED

12:00





# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 8/20/19

Time: 06:35 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	20.1	372958
FIT-200	20.1	366066
FIT-301	LOI	COMM 622012
FIT-401	20.6	375839
FIT-501	-	RAD DISPLAY
FIT-701	20.1	360755

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	116060	NT
EW-2 (FIT-112)	14.0	248246	NT
IW-1 (FIT-113)	0.0	2612.8	NT
MW-20 (FIT-114)	0.0	156.2	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.8	171433	NT
MW-5 (FIT-712)	0.0	849	31.1
MW-11 (FIT-713)	3.7	71308	36.0
RW-1 (FIT-714)	4.1	69453	33.9
RW-2 (FIT-715)	1.6	24549	81.2
RW-3 (FIT-716)	0.0	6842.0	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 346654

Extraction Vol (FIT-200): 366066

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	0.08	good / 0.70
Urea	-	-
Phosphoric Acid	0.01	good / 0.30
pH control	-	-

11:00

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300			499	6.75

Backwash #:

PT-501: 11.3

PT-502: 7.2

DP-501: 8.0

Alarms/Faults present:

Process Changes/Adjustments:

IW-1 ON AND SET FOR 1.2 GPM @ 11:00  
 FILLED PHOSPHATE CONTAINER / 1850 ML / 5 GAL

Observations/Comments:

TOC F2 = 8/19 old FILTER = 19.3 (@1900) 8-19-19  
 TOC F3 = 8/19 FILTER/NEW = 19.2 (@1900) 8-19-19  
 SAMPLED 201, 301, EW-1, EW-2 & IW-1  
 SET ACETIC PUMP TO 0.60

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701) (SP-702)
							0705	1406
ORP							-370.8	
pH							6.52	
Temperature (°F)							86.57	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)						1.32	0.3 F	
Nitrate (mg/L)							0.3 F	
TOC (mg/L)							14.8 F	9.9 F
FBR Skid								
--Temp							86.4	
--pH							6.87	
--ORP							-408	

F = FILTERED  
 NT = NO TRANSDUCER

\* IW-1 TURNED ON @ 11:00. FINAL SETTINGS @ 1.8 gpm



# UPCO O&M Daily Field Sheet

READINGS @ 1000

Operator: VESPALEC

Date: 8/21/19

Time: 0800

Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	42.4	410790
FIT-200	30.7	400476
FIT-301	LOI	COM ERROR
FIT-401	39.0	413774
FIT-501	0.0	BAD SCREEN
FIT-701	32.4	396476

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	115445	NT
EW-2 (FIT-112)	14.0	270323	NT
IW-1 (FIT-113)	2.0	5174	NT
MW-20 (FIT-114)	0.0	156	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	12.7	190373	NT
MW-5 (FIT-712)	2.5	1064	33.8
MW-11 (FIT-713)	3.0	77462	36.0
RW-1 (FIT-714)	2.0	75763	33.9
RW-2 (FIT-715)	1.1	27222	71.9
RW-3 (FIT-716)	11.1	8407	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 384966

Extraction Vol (FIT-200): 400476

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	0.14	GOOD/DEW W/
Urea	—	—
Phosphoric Acid	0.03	GOOD
pH control	—	—

Backwash #:

PT-501: 12.8

PT-502: 10.1

DP-501: 6.64

RUN TIME LEFT: 4.4 HRS

Alarms/Faults present:

- DECAST PUMP
- T-200/400/700: HIGH LVL.

Process Changes/Adjustments:

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7	9'6"	498	7

MEASURED 10'6" w/cup

Observations/Comments:

- SYSTEM IN RECIPE DUE TO BACKWASH DECAST OVERLOADED SYSTEM W/ WATER; RESET W/ NERKY

- IW-1 WON'T STAY IN AUTO; ~ 2hrs. Later IT WENT INTO SAMPLES; EW-1, EW-2, IW-1 } PERCHLORATE ONLY

SP-201 & SP-301

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-391	
pH							6.51	
Temperature (°F)							90.65	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							—	
Phosphate (mg/L)						@	2.42 (F)	
Nitrate (mg/L)						1100	0.3 (F)	
TOC (mg/L)							10.9 (F)	
FBR Skid								
--Temp							90.5	
--pH							6.72	
--ORP							-404	

(F) = FILTERED  
 NT = NO TRANSDUCER





# UPCO O&M Daily Field Sheet

Operator: VESPALEC Date: 8/22/19

Time: 0700 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	22.2	441175
FIT-200	22.2	429418
FIT-301	LOI	COM ERROR
FIT-401	22.6	445648
FIT-501	BAD	SCREEN
FIT-701	21.7	426356

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.0	123271	NT
EW-2 (FIT-112)	14.0	288582	NT
IW-1 (FIT-113)	2.0	7796	NT
MW-20 (FIT-114)	0.0	156	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	6.7	200450	NT
MW-5 (FIT-712)	2.3	3125	34.6
MW-11 (FIT-713)	2.2	80512	36.0
RW-1 (FIT-714)	1.4	77894	33.9
RW-2 (FIT-715)	0.7	28282	61.0
RW-3 (FIT-716)	8.5	20130	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 415671

Extraction Vol (FIT-200): 429418

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	0.07	6000 / ~7g LEFT 0.6K
Urea	-	-
Phosphoric Acid	0.02	6000 /
pH control	-	-

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7	-	494	8

Backwash #:

PT-501: 3.567.6

PT-502: 8.0

DP-501: 3.56

RUNTIME LEFT: 10.4 hrs

Alarms/Faults present: NONE

Process Changes/Adjustments:  
 @ 1200 LOWERED ACIDIC TO 0.45K; ADDED ~1.5g TO DRUM  
 - ACETIC @ ~8gal EV DRUM

Observations/Comments:  
 SAMPLES: EW-1, EW-2, IW-1 (PERCOLATE)  
 : SP-301 / SP-301 (REGULAR)  
 : SP-701  
 \*MICHAEL ADJUSTING IW-1 DOWN TO 1.0 gpm @ 1215

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
0800								
ORP							-410	
pH							6.67	
Temperature (°F)							87.49	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							1.8 (F)	
Nitrate (mg/L)							0.0 (F)	
TOC (mg/L)							7.1 (F)	
FBR Skid								
--Temp							87.1	
--pH							6.8	
--ORP							-411	

NT = NO TRANSDUCER  
 (F) = FILTERED



# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 2/23/19

Time: 06130 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	<u>21.4</u>	<u>470584</u>
FIT-200	<u>21.2</u>	<u>456796</u>
FIT-301 211	<u>LOI</u>	<u>COMM ERROR</u>
FIT-401	<u>22.0</u>	<u>475727</u>
FIT-501	<u>RAB</u>	<u>SCREEN</u>
FIT-701	<u>20.4</u>	<u>454991</u>

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	<u>6.0</u>	<u>131438</u>	<u>NT</u>
EW-2 (FIT-112)	<u>14.0</u>	<u>307637</u>	<u>NT</u>
IW-1 (FIT-113)	<u>1.2</u>	<u>9547</u>	<u>NT</u>
MW-20 (FIT-114)	<u>0.0</u>	<u>156</u>	<u>NT</u>
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	<u>6.4</u>	<u>209367</u>	<u>NT</u>
MW-5 (FIT-712)	<u>2.2</u>	<u>6220</u>	<u>35.5</u>
MW-11 (FIT-713)	<u>1.9</u>	<u>83274</u>	<u>35.9</u>
RW-1 (FIT-714)	<u>1.3</u>	<u>79741</u>	<u>33.9</u>
RW-2 (FIT-715)	<u>0.6</u>	<u>29219</u>	<u>59.7</u>
RW-3 (FIT-716)	<u>8.2</u>	<u>31487</u>	<u>NT</u>

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 444276

Extraction Vol (FIT-200): 458796

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
	<u>0.05</u>	
Acetic Acid	<u>0.45</u>	<u>Good / 0.45</u>
Urea	<u>-</u>	<u>-</u>
Phosphoric Acid	<u>0.01</u>	<u>Good / 0.30</u>
pH control	<u>-</u>	<u>-</u>

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300			<u>495</u>	<u>7.0</u>

Backwash #:

PT-501: 9.2

PT-502: 8.0

DP-501: 4.85

Alarms/Faults present:

Process Changes/Adjustments:

Observations/Comments:

07:00

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							<u>-381.5</u>	
pH							<u>6.76</u>	
Temperature (°F)							<u>86.82</u>	
DO (mg/L)							<u>0.01</u>	
Ammonia-N (mg/L)							<u>-</u>	
Phosphate (mg/L)							<u>1.54</u>	<u>F</u>
Nitrate (mg/L)							<u>0.1</u>	<u>F</u>
TOC (mg/L)							<u>2.8</u>	<u>F</u>
FBR Skid								
--Temp							<u>86.7</u>	
--pH							<u>7.83</u>	
--ORP							<u>-421</u>	

NT = NO TRANSDUCER  
 (F) = FILTERED





# UPCO O&M Daily Field Sheet

Operator: VESPALEC Date: 8-24-19

Time: 1445 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	22.9	516 736
FIT-200	22.8	502 517
FIT-301	LOI	com ERROR
FIT-401	23.4	523 069
FIT-501	BAD	SCREEN
FIT-701	22.3	498 208

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	6.5	143 654	NT
EW-2 (FIT-112)	14.0	334 879	NT
IW-1 (FIT-113)	2.2	13 593	NT
MW-20 (FIT-114)	0.0	156	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	6.5	222 377	NT
MW-5 (FIT-712)	3.9	129 43	38.8
MW-11 (FIT-713)	1.7	86 763	36.0
RW-1 (FIT-714)	1.2	22 228	33.8
RW-2 (FIT-715)	0.6	30 453	59.2
RW-3 (FIT-716)	8.5	47,882	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 489 892

Extraction Vol (FIT-200): 502 517

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	0.08	GOOD / 0.6K
Urea	—	—
Phosphoric Acid	0.02	GOOD
pH control	0.0	EMPT / OFF

**Backwash #:**  
 PT-501: 15.1  
 PT-502: 9.1  
 DP-501: 9.92

**Alarms/Faults present:**  
 - BIOD SUMP = LOW WATER LVL  
 - MMF HIGH HIGH DP  
**Process Changes/Adjustments:**

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7	8' 5"	497	7.5

**Observations/Comments:**  
 - BACKWASH STARTED @ 1530  
 SAMPLES: EW-1, EW-2, IW-1 (Perchlorate)  
 SP-201 (TOC, perchlorate)  
 SP-301 (TOC, Phos., TSS, perchlorate)

- MEASURED 11' 7" W/ FLASHLIGHT

TIME	1500							
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-391	
pH							6.76	
Temperature (°F)							87.38	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							—	
Phosphate (mg/L)							1.15(f)	
Nitrate (mg/L)							0.2(f)	
TOC (mg/L)							8.2 (f)	
FBR Skid								
--Temp							87.3	
--pH							6.98	
--ORP							-421	

(f) = FILTERED  
 NT = NO TRANSDUCER



# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 8/26/19

Time: 17:00

Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	39.0	588530
FIT-200	25.2	572006
FIT-301	LOI	COM ERROR
FIT-401	40.7	597173
FIT-501	BAD	SCREEN
FIT-701	38	564650

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	163653	NT
EW-2 (FIT-112)	14.0	375670	NT
IW-1 (FIT-113)	4.0	22156	NT
MW-20 (FIT-114)	6.0	156	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	14.3	243512	NT
MW-5 (FIT-712)	8.2	24242	45.8
MW-11 (FIT-713)	1.7	91168	35.9
RW-1 (FIT-714)	2.0	85605	34.0
RW-2 (FIT-715)	1.0	32155	81.0
RW-3 (FIT-716)	10.9	72823	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 559930

Extraction Vol (FIT-200): 572006

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	0.14	GOOD / 0.65		
Urea	-	-		
Phosphoric Acid	0.03	GOOD / 0.30		
pH control	0.0	OFF		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300			503	6.0

Backwash #:

PT-501: 17.8

PT-502: 11.8 @ 17:20

DP-501: 9.61

Alarms/Faults present:

Process Changes/Adjustments:

ACIDIC FROM 0.6 TO 0.65  
 FILLED PHOSPHORIC DRUM / ADJUST FLOW TO 504 gpm

Observations/Comments:

TOC / 8/25 = 7.0  
 TOC FOR 8/26 WILL BE DONE ON 8/27.  
 T603 STILL LEAKING ON & OFF WHEN BACKWASH OCCURS, PLUMBED DRAIN LINE TO SUMP FOR NOW.  
 16:45

BACKWASH @ 19:15

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-387.3	
pH							6.73	
Temperature (°F)							88.8	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							1.55	F
Nitrate (mg/L)							0.3	F
TOC (mg/L)							12.0	F
FBR Skid								
--Temp							88.7	
--pH							6.90	
--ORP							-422	

F = FILTERED

NT = NO TRANSDUCER





# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 8/27/19

Time: 06:35 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	25.2	611910
FIT-200	25.3	592640
FIT-301	LOI	COM ERROR
FIT-401	25.7	621220
FIT-501	RAD	SCREEN
FIT-701	26.6	588368

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	169360	NT
EW-2 (FIT-112)	14.0	386490	NT
IW-1 (FIT-113)	4.0	25418	NT
MW-20 (FIT-114)	0.0	156	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	9.6	252097	NT
MW-5 (FIT-712)	5.5	29165	41.2
MW-11 (FIT-713)	1.3	92326	35.9
RW-1 (FIT-714)	1.3	86805	33.9
RW-2 (FIT-715)	0.6	3270	66.9
RW-3 (FIT-716)	8.5	80175	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 583850

Extraction Vol (FIT-200): 592640

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	0.09	Good / 0.165 SCADA		
Urea	-	-		
Phosphoric Acid	0.02	Good / 0.30 SCADA		
pH control	0.0	OFF		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300			500	6.75

Backwash #:  
 PT-501: 13.5  
 PT-502: 7.7  
 DP-501: 9.69

Alarms/Faults present:

Process Changes/Adjustments:  
ADJUSTED PHOS ON SCADA TO 0.27

Observations/Comments:  
BACKWASH @ 06:55  
JUSTIN & NICK WORKING ON PROGRAMMING  
SAMPLED EW-1, EW-2, IW-1, SP-201 & SP-301 / PERCHLORATE  
TRANSFER ACETIC ACID TO PUMPING DRUM. WILL FINISH ON 8/29.

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-398.2	
pH							6.77	
Temperature (°F)							86.7	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							2.71	F
Nitrate (mg/L)							0.0	F
TOC (mg/L)							8.1	F
FBR Skid								
--Temp							86.6	
--pH							6.98	
--ORP							-422	

NT = NO DUCER  
 F = FILTERED



# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 8/29/19

Time: 15:00 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	26.9	704825
FIT-200	26.3	679170
FIT-301 <sup>211</sup>	LOI	COM ERROR
FIT-401	27.8	717480
FIT-501	BAA	SCREEN
FIT-701	22.5	676200

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 677600

Extraction Vol (FIT-200): 679170

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	5.0	40300	NT
EW-2 (FIT-112)	14.0	433632	↓
IW-1 (FIT-113)	5.0	40300	↓
MW-20 (FIT-114)	0.0	156	↓
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	9.4	291935	NT
MW-5 (FIT-712)	0.0	31965	31.1 off
MW-11 (FIT-713)	2.4	99003	35.9
RW-1 (FIT-714)	1.6	92275	33.9
RW-2 (FIT-715)	0.6	35023	65.7
RW-3 (FIT-716)	8.7	111487	NT

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	0.10	Good		
Urea	-	-		
Phosphoric Acid	0.02	Good		
pH control	OFF	OFF		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'	8.5'	500	6.25

MEASURED 11'6" FROM TOP RAIL W/FLASHLIGHT

Backwash #:

PT-501: 9.9

PT-502: 8.9

DP-501: 4.82

Alarms/Faults present:

Process Changes/Adjustments:

701 VALVE OPENED FROM 34 GPM TO 45 GPM @ 60 Hz.

MW-5 VALVE OFF.

Observations/Comments:

WEEKLY SAMPLING INCLUDING 701 SENT TODAY.

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
13:00								
ORP							-388	
pH							6.80	
Temperature (°F)							87.15	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							1.13	F
Nitrate (mg/L)							0.2	F
TOC (mg/L)							5.8	F
FBR Skid								
--Temp							87.1	
--pH							7.00	
--ORP							-425	

F = FILTERED

NT = NO TRANSDUCER





UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 8/30/19

Time: 07:15 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	26.4	730975
FIT-200	26.2	704995
FIT-301	LOI	COM ERROR
FIT-401	27.3	744572
FIT-501	BAD	SCREEN
FIT-701	25.2	700252

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	199820	NT
EW-2 (FIT-112)	14.0	447386	
IW-1 (FIT-113)	5.0	45216	
MW-20 (FIT-114)	0.0	156	↓
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.5	301960	NT
MW-5 (FIT-712)	0.0	31965	31.0
MW-11 (FIT-713)	2.5	101455	35.9
RW-1 (FIT-714)	1.9	94100	33.8
RW-2 (FIT-715)	0.7	35645	76.1
RW-3 (FIT-716)	9.8	120805	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 703165

Extraction Vol (FIT-200): 704995

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	<del>0.09</del> 0.65	GOOD / 0.65
Urea	OFF	OFF
Phosphoric Acid	<del>0.02</del> 0.27	GOOD / 0.27
pH control	OFF	OFF

SCADA

Backwash #:

PT-501:	13.9	18.6 @ 10:40
PT-502:	9.7	9.9
DP-501	8.04	12.05

AFTER BACKWASH  
10.6  
10.3  
4.17  
13:10

Alarms/Faults present:  
DPAH-501 = HA DP / ACKNOWLEDGED

Process Changes/Adjustments:  
CHANGED K VALUE ON ACETIC TO 0.60 @ 12:00

Observations/Comments:  
SAMPLED 201 + 301 FOR PERCHLORATE  
BACKWASH @ 12:55

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'	8'5"	500	7.0

MEASURED 11'7" FROM TOP RAIL w/ FLASHLIGHT

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
0700								
ORP							-401	
pH							6.85	
Temperature (°F)							86.3	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							1.06	F
Nitrate (mg/L)							0.2	F
TOC (mg/L)							6.0	F
FBR Skid								
--Temp							86.2	
--pH							7.03	
--ORP							-426	

F = FILTERED  
NT = NO TRANSDUCER



# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 9/3/19

Time: 10:30 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	29.7	877449
FIT-200	26.3	840425
FIT-301	LOI	COM ERROR
FIT-401	30.8	896298
FIT-501	RAD	SCREEN
FIT-701	29.5	834407

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	235901	NT
EW-2 (FIT-112)	14.0	519560	
IW-1 (FIT-113)	5.0	71003	
MW-20 (FIT-114)	0.0	156	↓
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	12.5	359121	NT
MW-5 (FIT-712)	0.0	31965	31.0
MW-11 (FIT-713)	3.2	115025	35.9
RW-1 (FIT-714)	2.5	104439	33.8
RW-2 (FIT-715)	0.5	38596	80.9
RW-3 (FIT-716)	10.7	171905	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 848914

Extraction Vol (FIT-200): 840425

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	0.10	Good / k=0.60		
Urea	off	off		
Phosphoric Acid	0.02	Good / k=0.27		
pH control	off	off		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'	8'5"	498	6.5

Backwash #:  
 PT-501: 15.2  
 PT-502: 9.8  
 DP-501: 9.25

Alarms/Faults present:

Process Changes/Adjustments:  
STARTED MW-20. SET @ 3:06 PM

Observations/Comments:  
BACKWASH @ 14:30

11'7" FROM TOP RAIL W/FLASHLIGHT

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
10:45								
ORP							-400.7	
pH							6.89	
Temperature (°F)							87.9	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							0.07	
Nitrate (mg/L)							0.3	
TOC (mg/L)							4.1	
FBR Skid								
--Temp							87.9	
--pH							7.02	
--ORP							-4.28	

F  
F  
F

NT = NO TRANSDUCER  
 F = FILTERED





# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 9/4/19

Time: 12:45 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	35.0	925112
FIT-200	26.3	881600
FIT-301	LOI	COM ERROR
FIT-401	36.2	945861
FIT-501	BAD	SCREEN
FIT-701	34.8	879193

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 896460

Extraction Vol (FIT-200): 881600

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	246885	NT
EW-2 (FIT-112)	14.0	541518	
IW-1 (FIT-113)	5.0	78831	
MW-20 (FIT-114)	3.0	4400	↓
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	15.3	378260	NT
MW-5 (FIT-712)	0.0	31965	31.0
MW-11 (FIT-713)	3.4	119804	35.9
RW-1 (FIT-714)	3.2	108205	33.9
RW-2 (FIT-715)	0.7	39511	92.5
RW-3 (FIT-716)	12.2	188351	NT

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	0.12	Good / 0.60K
Urea	OFF	OFF
Phosphoric Acid	0.02	Good / K=0.27
pH control	OFF	OFF

Backwash #: PT-501: 22.2 | 13.3 AFTER BW @ 13:10  
 PT-502: 11.3 | 12.0  
 DP-501: 14.80 | 5.18

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'	8'4"	499	6.0

11'8" FROM TOP RAIL W/FLASHLIGHT

Alarms/Faults present:

Process Changes/Adjustments:

ADJUSTED EXTRACTION + INJECTION WELLS

Observations/Comments:

BACKWASH @ 12:54  
 SAMPLED PERC - ALL EXTRACTION + 201 & 301  
 TOC - 201 & 301  
 1,4 DIOX - MW-20 + DOWNSTREAM OF T-801, 802 & 803

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-427	-399
pH							6.97	6.85
Temperature (°F)							88.2	88.4
DO (mg/L)								0.01
Ammonia-N (mg/L)								
Phosphate (mg/L)							2.13	
Nitrate (mg/L)							0.0	
TOC (mg/L)							9.1	
FBR Skid								
--Temp							88.2	
--pH							6.97	
--ORP							-427	

F  
F  
F

NT = NO TRANSDUCER  
 F = FILTERED





# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 9/5/19

Time: 14:15 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	35.8	984850
FIT-200	32.3	930550
FIT-301	LOI	COM ERROR
FIT-401	36.1	1006622
FIT-501	BAD	SCREEN
FIT-701	34.9	932714

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	257565	NT
EW-2 (FIT-112)	20.0	571670	
IW-1 (FIT-113)	5.0	86460	
MW-20 (FIT-114)	3.0	8974	↓
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	11.4	395914	NT
MW-5 (FIT-712)	7.9	43570	48.6
MW-11 (FIT-713)	2.9	124215	35.9
RW-1 (FIT-714)	2.2	111762	33.8
RW-2 (FIT-715)	0.6	40505	86.2
RW-3 (FIT-716)	9.9	203770	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 955505

Extraction Vol (FIT-200): 930550

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	0.16	Good / K=0.57 *
Urea	OFF	OFF
Phosphoric Acid	0.03	Good / K=0.27
pH control	OFF	OFF

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'		498	6.0

Backwash #:

PT-501: 14.8

PT-502: 11.8

DP-501: 6.8

Alarms/Faults present:

Process Changes/Adjustments:  
 SET 20' TO 63 GPM @ 60 Hz \*CHANGED K TO 0.55 ON ACETIC  
 SET BACKWASH TO 5 MIN / 15 DP

Observations/Comments:  
 WEEKLY SAMPLE FOR 700, 200 & 300 TAKEN  
 RYAN O'KEEFE WORKING ON TRANSDUCERS (EW-1)

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
							12:30	
ORP							-411.5	
pH							6.87	
Temperature (°F)							87.1	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							1.07	F
Nitrate (mg/L)							0.0	F
TOC (mg/L)							8.5	F
FBR Skid								
--Temp							87.0	
--pH							7.02	
--ORP							-427	

NT = NO DUCER  
 F = FILTERED





# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 9/6/19

Time: 11:10

Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	35.3	1028710
FIT-200	32.2	970570
FIT-301	LOI	COM ERROR
FIT-401	37.4	1050715
FIT-501	BAD	SCREEN
FIT-701	32.2	974775

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	266295	NT
EW-2 (FIT-112)	20.0	596320	
IW-1 (FIT-113)	5.0	92702	
MW-20 (FIT-114)	3.0	127.01	↓
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	10.8	410290	NT
MW-5 (FIT-712)	7.4	53150	48
MW-11 (FIT-713)	2.1	127032	35.9
RW-1 (FIT-714)	1.9	114321	33.7
RW-2 (FIT-715)	0.6	41327	76.6
RW-3 (FIT-716)	9.5	215725	NT

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 997930

Extraction Vol (FIT-200): 970570

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	0.11	Good/K=0.55
Urea	OFF	OFF
Phosphoric Acid	0.02	Good/K=0.27
pH control	OFF	OFF

**Backwash #:**  
 PT-501: 13.3  
 PT-502: 11.8  
 DP-501: 5.28

Alarms/Faults present: \_\_\_\_\_

Process Changes/Adjustments:  
K SET TO 0.50 @ 14:00

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'	8'4"	500	6.5

**Observations/Comments:**  
BACKWASH @ 10:23  
RYAN O'KEEFE ON SITE TRBL SHOOTING DUCERS & PANEL ISSUES.

11'8" FROM TOP RAIL MEASURED W/FLASHLIGHT

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-431.9	
pH							6.89	
Temperature (°F)							86.2	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							0.78	F
Nitrate (mg/L)							0.2	F
TOC (mg/L)							5.6	F
<b>FBR Skid</b>								
--Temp							86.1	
--pH							7.09	
--ORP							-429	

NT = NO DUCER  
 F = FILTERED





# UPCO O&M Daily Field Sheet

Operator: Hammer

Date: 9/9/15

Time: 13:15

Operation Mode: DOWN/RESTART/FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	35.4	1123984
FIT-200	32.2	1049982
FIT- <del>301</del> <sup>211</sup>	LOI	COM ERROR
FIT-401	35.9	1146883
FIT-501	RAD	SCREEN
FIT-701	33.7	1061630

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 1089050

Extraction Vol (FIT-200): 1049982

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	283488	
EW-2 (FIT-112)	20	645480	
IW-1 (FIT-113)	5.0	105008	
MW-20 (FIT-114)	3.0	20057	
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	13.3	438605	
MW-5 (FIT-712)	6.9	71980	42.5
MW-11 (FIT-713)	1.3	134230	36.0
RW-1 (FIT-714)	0.9	119568	33.9
RW-2 (FIT-715)	0.3	42887	52.0
RW-3 (FIT-716)	11.0	241540	

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	0.10	Good / k=0.50		
Urea	OFF	OFF		
Phosphoric Acid	0.02	Good / k=0.27		
pH control	OFF	OFF		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'	8'5"	504	6.5

11'7" FROM TOP RAIL MEASURED W/FLASHLIGHT

Backwash #:

PT-501:	<u>20.7 @ 13:55</u>
PT-502:	<u>10.7 "</u>
DP-501:	<u>13.83 "</u>

Alarms/Faults present: SCADA SCREEN Locked IN REBOOT mode.

Process Changes/Adjustments:

RESET SCADA PANEL.  
 RE-PRIMED NUTRIENT PUMPS  
 Observations/Comments:  
 FORWARD FLOW STARTED @ 11:00  
 BACKWASH @ 14:20

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
11:30								
ORP							-465	
pH							6.85	
Temperature (°F)							91	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							2.57	f
Nitrate (mg/L)							0.10	f
TOC (mg/L)							11.3	f
FBR Skid								
--Temp							91	
--pH							6.97	
--ORP							-424	

NT = NO BUCKER  
 f = FILTERED





# UPCO O&M Daily Field Sheet

Operator: HAMMER

Date: 9/13/19

Time: 08:30

Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	<u>35.4</u>	<u>1309900</u>
FIT-200	<u>32.3</u>	<u>1211507</u>
FIT-301	<u>LOI</u>	<u>CAM ERROR</u>
FIT-401	<u>36.1</u>	<u>1334970</u>
FIT-501	<u>BAD</u>	<u>SCREEN</u>
FIT-701	<u>33.9</u>	<u>1236333</u>

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 1294135

Extraction Vol (FIT-200): 1211507

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	<u>7.0</u>	<u>318457</u>	<u>48.9</u>
EW-2 (FIT-112)	<u>20.0</u>	<u>754480</u>	<u>-54</u>
IW-1 (FIT-113)	<u>5.0</u>	<u>130012</u>	<u>30.3</u>
MW-20 (FIT-114)	<u>3.0</u>	<u>35005</u>	<u>-34.5</u>
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	<u>12.0</u>	<u>501936</u>	<u>46 NT</u>
MW-5 (FIT-712)	<u>7.5</u>	<u>107830</u>	<u>46.9</u>
MW-11 (FIT-713)	<u>2.1</u>	<u>147277</u>	<u>36.0</u>
RW-1 (FIT-714)	<u>1.5</u>	<u>127656</u>	<u>33.8</u>
RW-2 (FIT-715)	<u>0.4</u>	<u>45351</u>	<u>72.0</u>
RW-3 (FIT-716)	<u>10.4</u>	<u>293744</u>	<u>96.8</u>

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)
Acetic Acid	<u>0.10</u>	<u>Good / K=0.50</u>
Urea	<u>-</u>	<u>- off</u>
Phosphoric Acid	<u>0.02</u>	<u>Good / K=0.27</u>
pH control	<u>-</u>	<u>- off</u>

Backwash #:

PT-501: 22.9 @ 08:40

PT-502: 11.1

DP-501: 15.72

Alarms/Faults present:  
DOWN ON 9/12 FOR LOW PHOS PRESSURE,

Process Changes/Adjustments:  
REPAIRED LEAK IN IN3 VAULT,  
INCREASED ACETIC ACID FROM 0.56 TO 0.55

Observations/Comments:  
MIXED NEW BATCH OF PHOS IN 55 GAL DRUM ON 9/12.  
BACKWASH @ 12:38  
2 MORE TOK KITS ORDERED

Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	<u>7</u>	<u>8'4"</u>	<u>499</u>	<u>7.0</u>

11'8" FROM TOP RAIL MEASURED W/ FLASHLIGHT

TIME					9/12/19		9/13/19	
Sample location	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	REACTOR INJECTION (SP-701)
ORP								<u>301</u>
pH								<u>-439.5</u>
Temperature (°F)								<u>7.02</u>
DO (mg/L)								<u>85</u>
Ammonia-N (mg/L)								<u>0.01</u>
Phosphate (mg/L)								<u>-</u>
Nitrate (mg/L)								<u>0.62</u>
TOC (mg/L)								<u>1.63</u>
FBR Skid								<u>0.2</u>
--Temp								<u>3.1</u>
--pH								<u>4.6</u>
--ORP								<u>85</u>
								<u>7.18</u>
								<u>-434</u>

F = FILTERED









UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 9/19/19

Time: 11:40 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	37.4	1635455
FIT-200	32.2	1495832
FIT-301	LOI	CAMERAOK
FIT-401	40.6	1666241
FIT-501	BAD	SCREEN
FIT-701	34.1	1545370

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	380085	49.1
EW-2 (FIT-112)	2.0	921572	-55
IW-1 (FIT-113)	5.0	174040	55.5
MW-20 (FIT-114)	3.0	61362	-21.6
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	11.7	610620	N/T
MW-5 (FIT-712)	7.3	173800	45.6
MW-11 (FIT-713)	2.8	171220	36.2
RW-1 (FIT-714)	1.9	145131	34.0
RW-2 (FIT-715)	0.4	49458	70.8
RW-3 (FIT-716)	9.9	383185	97.0

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 1624385

Extraction Vol (FIT-200): 1495832

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	<del>0.09</del> 0.02	Good/K=0.42		
Urea	-	OFF		
Phosphoric Acid	0.02	Good/K=0.24		
pH control	-	OFF		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300			500	6.0

Backwash #:  
 PT-501: 16.1  
 PT-502: 12.1  
 DP-501: 81.0

Alarms/Faults present:

Process Changes/Adjustments:  
CHANGED FADS TO 0.20 /

Observations/Comments:  
BACKWASH @ 10:22 / WAS AT 32 DP DUE TO DELAINT

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-436	
pH							7.08	
Temperature (°F)							0.01	
DO (mg/L)							86.3	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							1.56	
Nitrate (mg/L)							0.0	
TOC (mg/L)							2.0	
FBR Skid								
--Temp							86.2	
--pH							7.18	
--ORP							-436	

F  
F  
F

F = FILTERED



# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 9/20/19

Time: 07:40

Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	35.3	1679810
FIT-200	32.2	1534774
FIT-301	LOI	COM ERROR
FIT-401	35.8	1711423
FIT-501	BAD	SCREEN
FIT-701	34.7	1587418

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 1670505

Extraction Vol (FIT-200): 1534774

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	2.0	9450700	49.1
EW-2 (FIT-112)	7.0	388522	-52
IW-1 (FIT-113)	5.0	180070	55.5
MW-20 (FIT-114)	3.0	64976	-18.1
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	11.9	625025	1.8
MW-5 (FIT-712)	7.5	182967	43.4
MW-11 (FIT-713)	2.9	174654	36.1
RW-1 (FIT-714)	1.9	147500	33.9
RW-2 (FIT-715)	0.5	50029	71.0
RW-3 (FIT-716)	10.1	395350	97.0

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	0.09	Good / K=0.44		
Urea	-	OFF		
Phosphoric Acid	0.02	Good / K=0.20		
pH control	-	OFF		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'	8'6"	502	7.0

11'6" FROM TOP RAIL MEASURED W/ FLASHLIGHT

Backwash #:  
 PT-501: 4.8 17.1  
 PT-502: 11.9 @ 08:02  
 DP-501: 9.0

Alarms/Faults present:

Process Changes/Adjustments:  
 CHANGED ACETIC FROM 0.44 TO 0.46  
 CHANGED PHOS FROM 0.20 TO 0.17  
 Observations/Comments:  
 READINGS FOR EW-1 & 2 SWITCHED.  
 BACKWASH @ 07145

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
07:15								
ORP							-46/4	
pH							7.11	
Temperature (°F)							84.7	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							1.74	F
Nitrate (mg/L)							0.0	F
TOC (mg/L)							2.1	F
FBR Skid								
--Temp							84.6	
--pH							7.23	
--ORP							-433	

F = FILTERED





# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 9/28/19

Time: 13:45 Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	36.5	1851572
FIT-200	32.2	1685620
FIT-301	LPI	COMERATOR
FIT-401	38.9	1886385
FIT-501	RAD	SCREEN
FIT-701	29.5	1751430

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	7.0	421241	
EW-2 (FIT-112)	2.0	1039165	NT
IW-1 (FIT-113)	5.0	203445	
MW-20 (FIT-114)	3.0	78976	NT
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	9.8	681045	NT
MW-5 (FIT-712)	6.4	217955	
MW-11 (FIT-713)	2.7	188785	
RW-1 (FIT-714)	1.7	157211	
RW-2 (FIT-715)	0.4	52330	
RW-3 (FIT-716)	8.6	442540	

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 1850350

Extraction Vol (FIT-200): 1685620

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	0.08	Good/k=0.40		
Urea	-	off		
Phosphoric Acid	0.01	Good/k=0.17		
pH control	-	off		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	7'	8'6"	499	7.0

Backwash #:  
 PT-501: 18.1  
 PT-502: 13.7  
 DP-501: 8.08

Alarms/Faults present:

Process Changes/Adjustments:  
 LOWERED PHOS FROM 0.17 TO 0.14  
 LOWERED ACETIC FROM 0.40 TO 0.35  
 Observations/Comments:  
 INSTALLED NEW SS GAL DRUM FOR ACETIC, 15 GAL LEFT IN OLD DRUM.

11'8" FROM TOP RAIL MEASURED W/FLASHLIGHT

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							-442	
pH							7.18	
Temperature (°F)							84.6	
DO (mg/L)							0.01	
Ammonia-N (mg/L)							-	
Phosphate (mg/L)							1.15	F
Nitrate (mg/L)							0.12	F
TOC (mg/L)							2.8	F
FBR Skid								
--Temp							84.6	
--pH							7.28	
--ORP							-433	

F = FILTERED





# UPCO O&M Daily Field Sheet

Operator: HAMMER Date: 9/26/19

Time: 11:30

Operation Mode: FORWARD

Flow Meter	Flowrate (gpm)	Total Flow (gal)
FIT-201	<u>36.4</u>	<u>2001790</u>
FIT-200	<u>32.3</u>	<u>1820655</u>
FIT-301	<u>LOI</u>	<u>COM ERROR</u>
FIT-401	<u>37.3</u>	<u>2039975</u>
FIT-501	<u>RAD</u>	<u>SCREEN</u>
FIT-701	<u>36.4</u>	<u>1898252</u>

System Uptime: \_\_\_\_\_

System Feed (FBR SCADA): 2008520

Extraction Vol (FIT-200): 1820655

Extraction Wells	Flowrate (gpm)	Total Flow (gal)	Drawdown level (ft)
EW-1 (FIT-111)	<u>7.0</u>	<u>450525</u>	<u>48.9</u>
EW-2 (FIT-112)	<u>20</u>	<u>1122828</u>	<u>NT</u>
IW-1 (FIT-113)	<u>5.0</u>	<u>224365</u>	<u>55.3</u>
MW-20 (FIT-114)	<u>3.0</u>	<u>91508</u>	<u>NT</u>
Injection Wells	Flowrate (gpm)	Total Flow (gal)	Mounding Level (ft)
IW-3 (FIT-711)	<u>12.6</u>	<u>731208</u>	<u>NT</u>
MW-5 (FIT-712)	<u>7.6</u>	<u>249260</u>	<u>46.6</u>
MW-11 (FIT-713)	<u>3.1</u>	<u>201560</u>	<u>36.2</u>
RW-1 (FIT-714)	<u>2.3</u>	<u>165930</u>	<u>33.8</u>
RW-2 (FIT-715)	<u>0.5</u>	<u>54407</u>	<u>79.8</u>
RW-3 (FIT-716)	<u>10.3</u>	<u>484696</u>	<u>96.8</u>

Nutrient	Flow Rate (gph)	Visual Inspection (i.e. pumps, drums, tubing)		
Acetic Acid	<u>0.07</u>	<u>Good / K=0.35</u>		
Urea	<u>-</u>	<u>OFF</u>		
Phosphoric Acid	<u>0.01</u>	<u>Good / K=0.14</u>		
pH control	<u>-</u>	<u>OFF</u>		
Reactor	Static Bed Height (ft)	Expanded Bed Height (ft)	Flow Rate (gpm)	Pressure PI-101 (psi)
FBR-300	<u>7'</u>	<u>8'6"</u>	<u>500</u>	<u>7.5</u>

11'6" FROM TOP RAIL MEASURED W/ FLASHLIGHT

Backwash #:  
 PT-501: 22.8  
 PT-502: 13.8 11:35  
 DP-501: 12.75

Alarms/Faults present:

Process Changes/Adjustments:

LOWERED PHOS K VALUE FROM 0.14 TO 0.10.

Observations/Comments:

EW-2 LEAK ON BACK PLATE OF REGULATOR/MANIFOLD  
ONE WAY CHECK TIGHTENED / STOPPED LEAK

TIME	EW-1 (SP-111)	EW-2 (SP-112)	IW-1 (SP-113)	MW-20 (SP-114)	GAC EFFLUENT (SP-806)	REACTOR INFLUENT (SP-201)	REACTOR EFFLUENT (SP-301)	INJECTION (SP-701)
ORP							<u>-477</u>	
pH							<u>7.28</u>	
Temperature (°F)							<u>84.2</u>	
DO (mg/L)							<u>0.01</u>	
Ammonia-N (mg/L)							<u>-</u>	
Phosphate (mg/L)							<u>1.16</u>	F
Nitrate (mg/L)							<u>0.1</u>	F
TOC (mg/L)							<u>3.6</u>	F
FBR Skid								
--Temp							<u>84.1</u>	
--pH							<u>7.38</u>	
--ORP							<u>-430</u>	

F = FILTERED

NT = NO BUCKER OR BAD

# ATTACHMENT 4

## LABORATORY ANALYTICAL REPORTS



July 22, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1120097  
Samples Received: 07/19/2019  
Project Number: 03994018.0028  
Description: UPCO

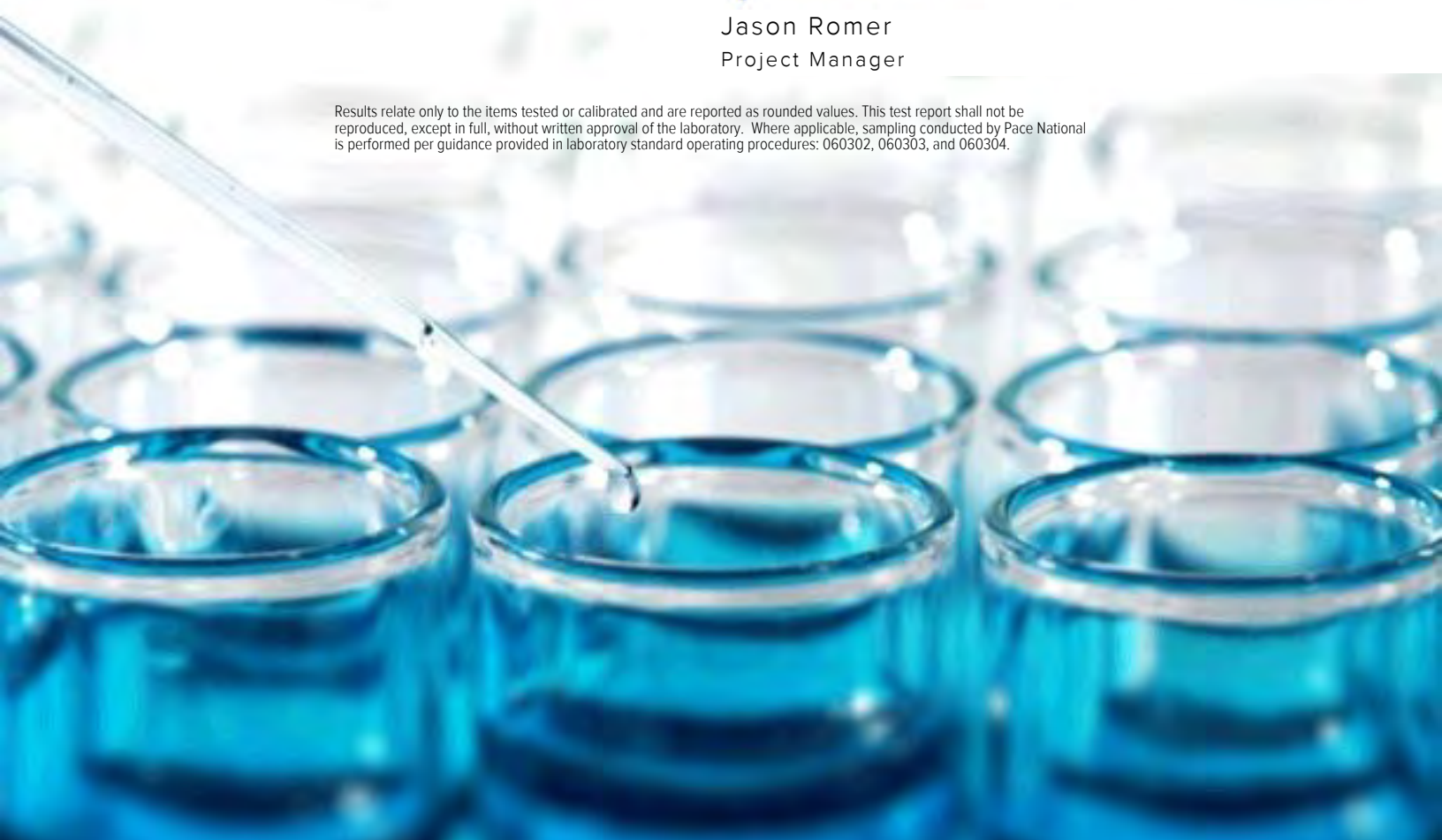
Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Jason Romer  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.





<b>Cp: Cover Page</b>	<b>1</b>	
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	
<b>BATCH 1 L1120097-01</b>	<b>5</b>	
<b>TRIP BLANK L1120097-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	
<b>Wet Chemistry by Method 300.0</b>	<b>7</b>	
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>8</b>	
<b>Wet Chemistry by Method 365.4</b>	<b>9</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>11</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>12</b>	
<b>Gl: Glossary of Terms</b>	<b>13</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>14</b>	
<b>Sc: Sample Chain of Custody</b>	<b>15</b>	

# SAMPLE SUMMARY



## BATCH 1 L1120097-01 GW

Collected by: Mark Hammer  
 Collected date/time: 07/17/19 19:30  
 Received date/time: 07/19/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1314166	1	07/19/19 10:31	07/19/19 10:31	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1314220	500	07/19/19 12:05	07/19/19 12:05	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1313913	1	07/19/19 10:59	07/19/19 16:39	JER	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1314236	1	07/19/19 13:19	07/19/19 13:19	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1314260	1	07/19/19 15:05	07/19/19 15:05	JAH	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## TRIP BLANK L1120097-02 GW

Collected by: Mark Hammer  
 Collected date/time: 07/17/19 00:00  
 Received date/time: 07/19/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1314236	1	07/19/19 12:59	07/19/19 12:59	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1314260	1	07/19/19 14:46	07/19/19 14:46	JAH	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc





Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	3.04		0.100	1	07/19/2019 10:31	<a href="#">WG1314166</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	19.6	M3	2.00	500	07/19/2019 12:05	<a href="#">WG1314220</a>

3 Ss

4 Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	07/19/2019 16:39	<a href="#">WG1313913</a>

5 Sr

6 Qc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	07/19/2019 13:19	<a href="#">WG1314236</a>
(S) Toluene-d8	104		80.0-120		07/19/2019 13:19	<a href="#">WG1314236</a>
(S) 4-Bromofluorobenzene	113		77.0-126		07/19/2019 13:19	<a href="#">WG1314236</a>
(S) 1,2-Dichloroethane-d4	89.3		70.0-130		07/19/2019 13:19	<a href="#">WG1314236</a>

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	0.00429		0.00300	1	07/19/2019 15:05	<a href="#">WG1314260</a>
(S) Toluene-d8	101		77.0-127		07/19/2019 15:05	<a href="#">WG1314260</a>



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	07/19/2019 12:59	<a href="#">WG1314236</a>
(S) Toluene-d8	105		80.0-120		07/19/2019 12:59	<a href="#">WG1314236</a>
(S) 4-Bromofluorobenzene	109		77.0-126		07/19/2019 12:59	<a href="#">WG1314236</a>
(S) 1,2-Dichloroethane-d4	88.5		70.0-130		07/19/2019 12:59	<a href="#">WG1314236</a>

1 Cp

2 Tc

3 Ss

4 Cn

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	07/19/2019 14:46	<a href="#">WG1314260</a>
(S) Toluene-d8	101		77.0-127		07/19/2019 14:46	<a href="#">WG1314260</a>

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3432387-1 07/19/19 09:24

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1120097-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1120097-01 07/19/19 10:31 • (DUP) R3432387-3 07/19/19 10:44

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	3.04	3.01	1	0.883		20

Laboratory Control Sample (LCS)

(LCS) R3432387-2 07/19/19 09:38

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Nitrate	8.00	8.35	104	90.0-110	

L1120097-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1120097-01 07/19/19 10:31 • (MS) R3432387-4 07/19/19 10:59 • (MSD) R3432387-5 07/19/19 11:13

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Nitrate	5.00	3.04	8.20	8.15	103	102	1	80.0-120			0.636	20



Method Blank (MB)

(MB) R3432449-1 07/19/19 08:52

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1120097-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1120097-01 07/19/19 12:05 • (DUP) R3432449-7 07/19/19 12:33

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	19.6	19.4	500	0.882		15

Laboratory Control Sample (LCS)

(LCS) R3432449-2 07/19/19 09:43

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00989	98.9	90.0-110	

L1120097-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1120097-01 07/19/19 12:05 • (MS) R3432449-8 07/19/19 12:58 • (MSD) R3432449-9 07/19/19 13:24

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0000200	19.6	19.1	19.2	0.000	0.000	500	80.0-120	M3	M3	0.400	15



Method Blank (MB)

(MB) R3432479-1 07/19/19 16:13

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1118858-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1118858-01 07/19/19 16:16 • (DUP) R3432479-3 07/19/19 16:18

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	0.724	0.694	1	4.23		20

L1118940-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1118940-01 07/19/19 16:32 • (DUP) R3432479-6 07/19/19 16:33

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	0.834	0.935	1	11.4		20

L1118927-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1118927-01 07/19/19 16:29 • (DUP) R3432479-7 07/19/19 16:30

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	4.17	4.01	1	3.91		20

Laboratory Control Sample (LCS)

(LCS) R3432479-2 07/19/19 16:14

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.97	98.5	90.0-110	



L1118861-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1118861-01 07/19/19 16:19 • (MS) R3432479-4 07/19/19 16:20 • (MSD) R3432479-5 07/19/19 16:22

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Phosphorus,Total	2.50	0.939	3.37	3.46	97.2	101	1	90.0-110			2.64	20

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc





Method Blank (MB)

(MB) R3432382-3 07/19/19 11:08

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	105			80.0-120
(S) 4-Bromofluorobenzene	110			77.0-126
(S) 1,2-Dichloroethane-d4	89.7			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3432382-1 07/19/19 09:48 • (LCSD) R3432382-2 07/19/19 10:08

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0271	0.0284	108	114	71.0-124			4.86	20
(S) Toluene-d8				97.6	97.7	80.0-120				
(S) 4-Bromofluorobenzene				107	104	77.0-126				
(S) 1,2-Dichloroethane-d4				95.0	93.8	70.0-130				

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3432444-3 07/19/19 13:27

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	101			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3432444-1 07/19/19 12:29 • (LCSD) R3432444-2 07/19/19 12:49

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0439	0.0415	87.9	83.1	55.0-138			5.57	24
(S) Toluene-d8				101	101	77.0-127				

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

## Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

## Qualifier Description

M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.
----	--

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

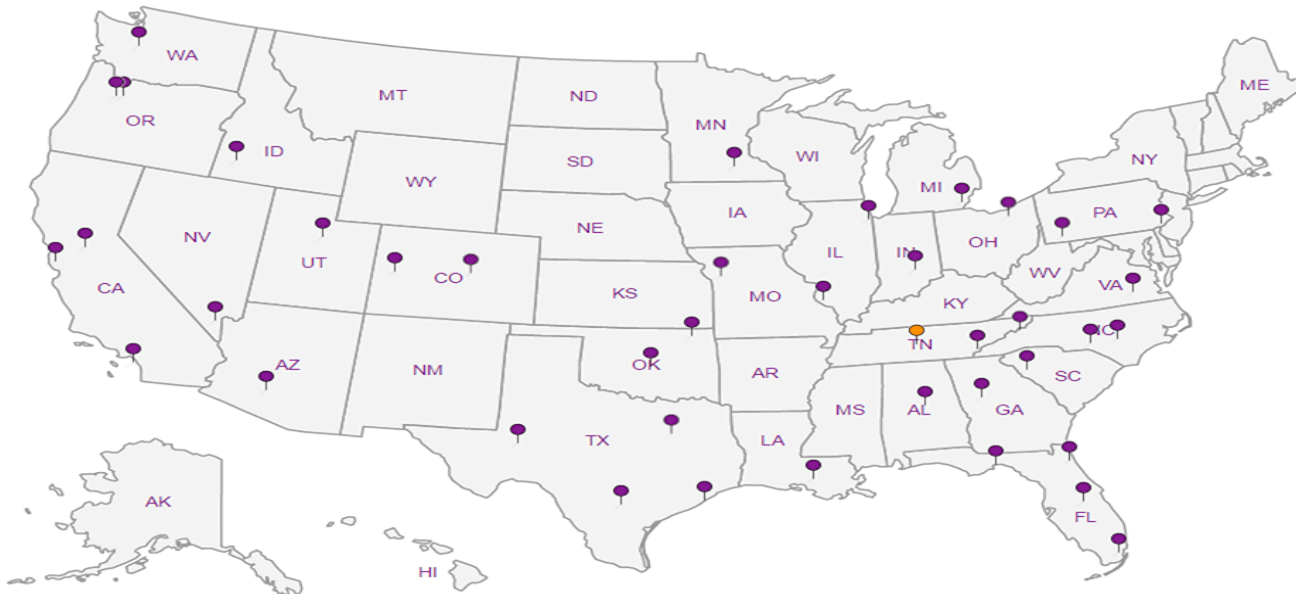
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**

Fax: **MARK HAMMER**

Collected by (print):  
**Mark Hammer**

Collected by (signature):

Immediately Packed on Ice N  Y

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

City/State  
Collected: **Phoenix, AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #

Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Date Results Needed  
**SAME DAY ON BATCH 1 + TRIP**

No. of Cntrs

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **112 0097**  
**D037**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: **526 - Chris McCord**

PB: **6-28-196m**

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
EW-1	GRAB	GW		7/17/19	17:00	7	X	X	X			X				X	STANDARD TAT	
IW-1		GW			17:05	7	X	X	X			X				X		
EW-2		GW			17:46	9	X	X	X			X				X		
MW-20		GW			18:26	7	X	X	X			X				X		
TEMP BLANK		GW				1												
BATCH 1		GW			19:30	7	X	X	X			X				X	SAME DAY TAT	01
TRIP BLANK		GW				1	X	X	X			X				X	//	02
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**  
**PLEASE PUT BATCH 1 ON SAME DAY TURN AROUND. + TRIP**  
**ALL OTHER SAMPLES WILL BE STANDARD TURN AROUND**

Samples returned via:  
 UPS  FedEx  Courier

Tracking # **SU**

Sample Receipt Checklist

COC Seal Present/Intact:  Y  N

COC Signed/Accurate:  Y  N

Bottles arrive intact:  Y  N

Correct bottles used:  Y  N

Sufficient volume sent:  Y  N

If Applicable

VOA Zero Headspace:  Y  N

Preservation Correct/Checked:  Y  N

**RAD SCREEN: <0.5 mCi**

Relinquished by: (Signature) <b>[Signature]</b>	Date: <b>7/18/19</b>	Time: <b>1000</b>	Received by: (Signature) <b>[Signature]</b>	Trip Blank Received: <input checked="" type="checkbox"/> Yes / No <input type="checkbox"/> <b>1</b>	Temp: _____ °C	Bottles Received: <b>37</b>	If preservation required by Login: Date/Time
Relinquished by: (Signature) <b>[Signature]</b>	Date: <b>7/18/19</b>	Time: <b>1800</b>	Received by: (Signature) <b>[Signature]</b>	Temp: <b>2.8+1.1=2.145</b>			
Relinquished by: (Signature) <b>[Signature]</b>	Date: <b>7/19/19</b>	Time: <b>800</b>	Received by: (Signature) <b>[Signature]</b>	Date: <b>7/19/19</b>	Time: <b>800</b>	Hold:	Condition: <b>NCF / OK</b>

ESCARB

July 26, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1120100  
Samples Received: 07/19/2019  
Project Number: 03994018.0028  
Description: UPCO

Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Jason Romer  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.







<b>Cp: Cover Page</b>	<b>1</b>	
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	
EW-1 L1120100-01	<b>5</b>	
IW-1 L1120100-02	<b>6</b>	
EW-2 L1120100-03	<b>7</b>	
MW-20 L1120100-04	<b>8</b>	
<b>Qc: Quality Control Summary</b>	<b>9</b>	
Wet Chemistry by Method 300.0	<b>9</b>	
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<b>Al: Accreditations &amp; Locations</b>	<b>15</b>	
<b>Sc: Sample Chain of Custody</b>	<b>16</b>	

# SAMPLE SUMMARY



## EW-1 L1120100-01 GW

Collected by  
Mark Hammer

Collected date/time  
07/17/19 17:00

Received date/time  
07/19/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1314239	1	07/19/19 15:22	07/19/19 15:22	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1314240	2	07/23/19 20:41	07/23/19 20:41	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1317583	1	07/25/19 09:24	07/25/19 16:55	SDL	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1314655	1	07/20/19 04:26	07/20/19 04:26	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1315059	1	07/23/19 23:52	07/23/19 23:52	BMB	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

## IW-1 L1120100-02 GW

Collected by  
Mark Hammer

Collected date/time  
07/17/19 17:05

Received date/time  
07/19/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1314239	5	07/19/19 15:37	07/19/19 15:37	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1314240	2000	07/23/19 21:06	07/23/19 21:06	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1317583	1	07/25/19 09:24	07/25/19 16:57	SDL	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1314655	1	07/20/19 04:46	07/20/19 04:46	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1315059	1	07/24/19 00:12	07/24/19 00:12	BMB	Mt. Juliet, TN

5  
Sr

6  
Qc

7  
Gl

8  
Al

## EW-2 L1120100-03 GW

Collected by  
Mark Hammer

Collected date/time  
07/17/19 17:40

Received date/time  
07/19/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1314239	1	07/19/19 15:52	07/19/19 15:52	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1314240	1	07/23/19 10:06	07/23/19 10:06	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1317583	1	07/25/19 09:24	07/25/19 16:59	SDL	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1314655	1	07/20/19 05:06	07/20/19 05:06	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1315059	1	07/24/19 00:32	07/24/19 00:32	BMB	Mt. Juliet, TN

9  
Sc

## MW-20 L1120100-04 GW

Collected by  
Mark Hammer

Collected date/time  
07/17/19 18:20

Received date/time  
07/19/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1314239	1	07/19/19 16:07	07/19/19 16:07	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1314240	5	07/23/19 22:23	07/23/19 22:23	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1317583	1	07/25/19 09:24	07/25/19 17:37	SDL	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1314655	1	07/20/19 05:27	07/20/19 05:27	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1315059	1	07/24/19 00:52	07/24/19 00:52	BMB	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



## Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	1.73		0.100	1	07/19/2019 15:22	<a href="#">WG1314239</a>

1 Cp

2 Tc

## Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.115		0.00800	2	07/23/2019 20:41	<a href="#">WG1314240</a>

3 Ss

4 Cn

## Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	07/25/2019 16:55	<a href="#">WG1317583</a>

5 Sr

6 Qc

## Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	07/20/2019 04:26	<a href="#">WG1314655</a>
(S) Toluene-d8	96.9		80.0-120		07/20/2019 04:26	<a href="#">WG1314655</a>
(S) 4-Bromofluorobenzene	95.4		77.0-126		07/20/2019 04:26	<a href="#">WG1314655</a>
(S) 1,2-Dichloroethane-d4	102		70.0-130		07/20/2019 04:26	<a href="#">WG1314655</a>

7 Gl

8 Al

9 Sc

## Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	07/23/2019 23:52	<a href="#">WG1315059</a>
(S) Toluene-d8	93.6		77.0-127		07/23/2019 23:52	<a href="#">WG1315059</a>



## Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	9.36		0.500	5	07/19/2019 15:37	<a href="#">WG1314239</a>

1 Cp

2 Tc

## Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	80.7		8.00	2000	07/23/2019 21:06	<a href="#">WG1314240</a>

3 Ss

4 Cn

## Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	07/25/2019 16:57	<a href="#">WG1317583</a>

5 Sr

6 Qc

## Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	07/20/2019 04:46	<a href="#">WG1314655</a>
(S) Toluene-d8	99.4		80.0-120		07/20/2019 04:46	<a href="#">WG1314655</a>
(S) 4-Bromofluorobenzene	95.8		77.0-126		07/20/2019 04:46	<a href="#">WG1314655</a>
(S) 1,2-Dichloroethane-d4	105		70.0-130		07/20/2019 04:46	<a href="#">WG1314655</a>

7 Gl

8 Al

9 Sc

## Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	07/24/2019 00:12	<a href="#">WG1315059</a>
(S) Toluene-d8	93.6		77.0-127		07/24/2019 00:12	<a href="#">WG1315059</a>



## Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	0.675		0.100	1	07/19/2019 15:52	<a href="#">WG1314239</a>

1 Cp

2 Tc

## Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0505		0.00400	1	07/23/2019 10:06	<a href="#">WG1314240</a>

3 Ss

4 Cn

## Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	07/25/2019 16:59	<a href="#">WG1317583</a>

5 Sr

6 Qc

## Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	07/20/2019 05:06	<a href="#">WG1314655</a>
(S) Toluene-d8	101		80.0-120		07/20/2019 05:06	<a href="#">WG1314655</a>
(S) 4-Bromofluorobenzene	99.8		77.0-126		07/20/2019 05:06	<a href="#">WG1314655</a>
(S) 1,2-Dichloroethane-d4	99.8		70.0-130		07/20/2019 05:06	<a href="#">WG1314655</a>

7 Gl

8 Al

9 Sc

## Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	07/24/2019 00:32	<a href="#">WG1315059</a>
(S) Toluene-d8	93.3		77.0-127		07/24/2019 00:32	<a href="#">WG1315059</a>





Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Nitrate as (N)	ND		0.100	1	07/19/2019 16:07	<a href="#">WG1314239</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Perchlorate	0.202		0.0200	5	07/23/2019 22:23	<a href="#">WG1314240</a>

3 Ss

4 Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Phosphorus,Total	ND		0.100	1	07/25/2019 17:37	<a href="#">WG1317583</a>

5 Sr

6 Qc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,1-Dichloroethene	ND		0.00100	1	07/20/2019 05:27	<a href="#">WG1314655</a>
(S) Toluene-d8	99.1		80.0-120		07/20/2019 05:27	<a href="#">WG1314655</a>
(S) 4-Bromofluorobenzene	93.9		77.0-126		07/20/2019 05:27	<a href="#">WG1314655</a>
(S) 1,2-Dichloroethane-d4	98.0		70.0-130		07/20/2019 05:27	<a href="#">WG1314655</a>

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,4-Dioxane	0.00918		0.00300	1	07/24/2019 00:52	<a href="#">WG1315059</a>
(S) Toluene-d8	93.7		77.0-127		07/24/2019 00:52	<a href="#">WG1315059</a>



Method Blank (MB)

(MB) R3432550-1 07/19/19 10:56

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1117142-21 Original Sample (OS) • Duplicate (DUP)

(OS) L1117142-21 07/19/19 13:52 • (DUP) R3432550-3 07/19/19 14:07

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	ND	0.000	1	0.000		20

L1117142-16 Original Sample (OS) • Duplicate (DUP)

(OS) L1117142-16 07/19/19 17:51 • (DUP) R3432550-8 07/19/19 18:06

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	18.9	19.0	10	0.328		20

Laboratory Control Sample (LCS)

(LCS) R3432550-2 07/19/19 11:11

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Nitrate	8.00	8.04	101	90.0-110	

L1120199-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1120199-01 07/19/19 14:52 • (MS) R3432550-4 07/19/19 15:07

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Nitrate	5.00	0.117	5.24	102	1	80.0-120	

L1120100-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1120100-04 07/19/19 16:07 • (MS) R3432550-5 07/19/19 16:22 • (MSD) R3432550-6 07/19/19 16:36

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Nitrate	5.00	ND	5.13	5.11	103	102	1	80.0-120			0.307	20



Method Blank (MB)

(MB) R3433680-1 07/23/19 06:50

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

L1120100-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1120100-04 07/23/19 22:23 • (DUP) R3433680-4 07/23/19 22:48

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.202	0.200	5	0.613		15

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3433680-2 07/23/19 07:41

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00976	97.6	90.0-110	

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3434379-1 07/25/19 16:50

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1120176-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1120176-01 07/25/19 17:13 • (DUP) R3434379-6 07/25/19 17:14

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	0.973	1.12	1	14.0		20

L1120100-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1120100-01 07/25/19 16:55 • (DUP) R3434379-8 07/25/19 17:29

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3434379-2 07/25/19 16:51

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.98	99.0	90.0-110	

L1120169-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1120169-01 07/25/19 17:06 • (MS) R3434379-4 07/25/19 17:08 • (MSD) R3434379-5 07/25/19 17:09

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	1.56	3.93	3.82	94.8	90.4	1	90.0-110			2.84	20

L1120224-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1120224-01 07/25/19 17:15 • (MS) R3434379-7 07/25/19 17:17

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	3.77	4.13	14.4	1	90.0-110	M2



Method Blank (MB)

(MB) R3433435-3 07/20/19 00:21

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	98.5			80.0-120
(S) 4-Bromofluorobenzene	101			77.0-126
(S) 1,2-Dichloroethane-d4	103			70.0-130

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3433435-1 07/19/19 23:20 • (LCSD) R3433435-2 07/19/19 23:41

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0262	0.0253	105	101	71.0-124			3.51	20
(S) Toluene-d8				92.2	93.0	80.0-120				
(S) 4-Bromofluorobenzene				98.1	95.7	77.0-126				
(S) 1,2-Dichloroethane-d4				112	113	70.0-130				

6 Qc

7 Gl

8 Al

L1120063-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1120063-01 07/20/19 01:43 • (MS) R3433435-4 07/20/19 07:50 • (MSD) R3433435-5 07/20/19 08:10

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	U	0.0260	0.0261	104	104	1	11.0-160			0.258	29
(S) Toluene-d8					92.7	92.5		80.0-120				
(S) 4-Bromofluorobenzene					93.9	95.8		77.0-126				
(S) 1,2-Dichloroethane-d4					112	113		70.0-130				

9 Sc



Method Blank (MB)

(MB) R3433508-3 07/23/19 22:34

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,4-Dioxane	0.000727	E4	0.000597	0.00300
(S) Toluene-d8	93.3			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3433508-1 07/23/19 21:35 • (LCSD) R3433508-2 07/23/19 21:55

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,4-Dioxane	0.0500	0.0432	0.0431	86.5	86.3	55.0-138			0.206	24
(S) Toluene-d8				93.7	93.4	77.0-127				

5 Sr

6 Qc

7 Gl

8 Al

9 Sc





Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

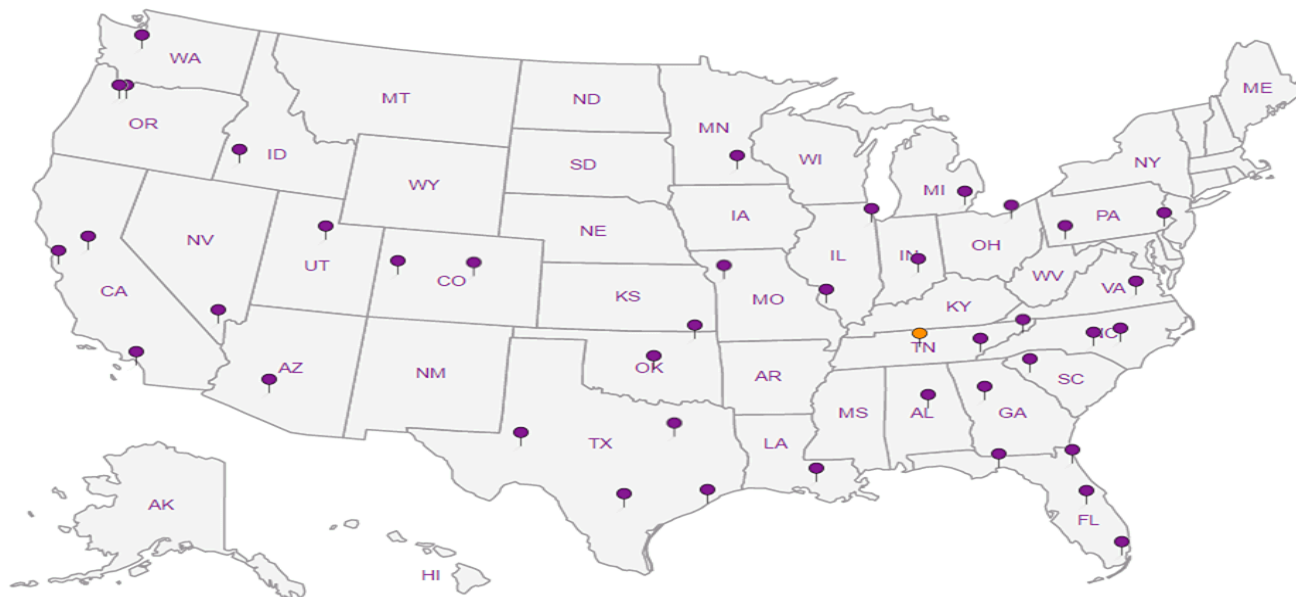
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: thomas.vespalec@arcadis.com

Project  
Description: **UPCO**

City/State  
Collected: **Phoenix, AZ**

Phone: **480-535-7399**

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Fax: **MARK HAMMER**

Collected by (print):  
*Mark Hammer*

Site/Facility ID #

P.O. #

Collected by (signature):

**Rush?** (Lab MUST Be Notified)  
 Same Day \_\_\_ Five Day  
\_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
\_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
\_\_\_ Three Day

Quote #

Date Results Needed  
**SAME DAY ON  
BATCH 1 + TRIP**

Immediately  
Packed on Ice N \_\_\_ Y

Pres  
Chk



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **1126100**  
**D037**

Acctnum: **UTCARCA**  
Template: **T152379**  
Prelogin: **P717001**  
TSR: **526 - Chris McCord**  
PB: **6-28-196u**  
Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
<b>EW-1</b>	<b>GRAB</b>	<b>GW</b>		<b>7/17/19</b>	<b>17:00</b>	<b>7</b>	X	X	X			X			X		<b>STANDARD TAT</b>	<b>01</b>
<b>IW-1</b>		<b>GW</b>			<b>17:05</b>	<b>7</b>	X	X	X			X			X			<b>02</b>
<b>EW-2</b>		<b>GW</b>			<b>17:40</b>	<b>9</b>	X	X	X			X			X			<b>03</b>
<b>MW-20</b>		<b>GW</b>			<b>18:20</b>	<b>7</b>	X	X	X			X			X			<b>04</b>
<b>TEMP BLANK</b>		<b>GW</b>				<b>1</b>												
<b>BATCH 1</b>		<b>GW</b>			<b>19:30</b>	<b>7</b>	X	X	X			X			X		<b>SAME DAY TAT</b>	
<b>TRIP BLANK</b>	↓	<b>GW</b>		↓		<b>1</b>	X	X	X			X			X		<b>//</b>	
		<b>GW</b>																
		<b>GW</b>																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**  
**PLEASE PUT BATCH 1 ON SAME DAY TURN AROUND. + TRIP**  
**ALL OTHER SAMPLES WILL BE STANDARD TURN AROUND**

Samples returned via:  
\_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier

Tracking # **SW**

pH \_\_\_ Temp \_\_\_  
Flow \_\_\_ Other \_\_\_

**Sample Receipt Checklist**

COC Seal Present/Intact: \_\_\_ NP \_\_\_ Y \_\_\_ N  
COC Signed/Accurate: \_\_\_ Y \_\_\_ N  
Bottles arrive intact: \_\_\_ Y \_\_\_ N  
Correct bottles used: \_\_\_ Y \_\_\_ N  
Sufficient volume sent: \_\_\_ Y \_\_\_ N  
If Applicable  
VOA Zero Headspace: \_\_\_ Y \_\_\_ N  
Preservation Correct/Checked: \_\_\_ Y \_\_\_ N

**RAD SCREEN: <0.5**

Relinquished by: (Signature) <i>[Signature]</i>	Date: <b>7/18/19</b>	Time: <b>1000</b>	Received by: (Signature) <i>[Signature]</i>	Trip Blank Received: <b>0</b> / No <b>1</b> / MeOH TBR	If preservation required by Login: Date/Time
Relinquished by: (Signature) <i>[Signature]</i>	Date: <b>7/18/19</b>	Time: <b>1800</b>	Received by: (Signature) <i>[Signature]</i>	Temp: <b>28.1</b> °C Bottles Received: <b>2.15</b> / <b>37</b>	
Relinquished by: (Signature) <i>[Signature]</i>	Date:	Time:	Received for lab by: (Signature) <i>[Signature]</i>	Date: <b>7/19/19</b>	Time: <b>800</b>

**ESCAR**

July 24, 2019

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

## UTC - Arcadis

Sample Delivery Group: L1121166  
Samples Received: 07/23/2019  
Project Number: 03994018.0028  
Description: UPCO

Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Jason Romer  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	
<b>BATCH 1A L1121166-01</b>	<b>5</b>	
<b>Qc: Quality Control Summary</b>	<b>6</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>6</b>	
<b>Gl: Glossary of Terms</b>	<b>7</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>8</b>	
<b>Sc: Sample Chain of Custody</b>	<b>9</b>	

# SAMPLE SUMMARY



BATCH 1A L1121166-01 GW

Collected by T. Vespalec  
Collected date/time 07/22/19 09:30  
Received date/time 07/23/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1315986	1	07/23/19 22:54	07/23/19 22:54	BMB	Mt. Juliet, TN

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	07/23/2019 22:54	<a href="#">WG1315986</a>
(S) Toluene-d8	93.5		77.0-127		07/23/2019 22:54	<a href="#">WG1315986</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3433509-3 07/23/19 22:34

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,4-Dioxane	0.000727	E4	0.000597	0.00300
(S) Toluene-d8	93.3			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3433509-1 07/23/19 21:35 • (LCSD) R3433509-2 07/23/19 21:55

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,4-Dioxane	0.0500	0.0432	0.0431	86.5	86.3	55.0-138			0.206	24
(S) Toluene-d8				93.7	93.4	77.0-127				

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
----	---



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

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Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

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1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**Arcadis**  
**410 North 44th St.**  
**Suite 1000**  
**Phoenix, AZ 85008**

Billing Information:

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



Report to:  
**Thomas Vespalec**

Email To:  
**thomas.vespalec@arcadis-us.com**

Project Description:  
**UPCO**

City/State Collected:

Phone: **480-905-9311**  
 Fax: **480-905-9353**

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**T. VESPALEC**

Site/Facility ID #

P.O. #

Collected by (signature):  
*[Signature]*

**Rush?** (Lab MUST Be Notified)

Quote #

Immediately Packed on Ice N  Y

Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Date Results Needed  
**7/23/19**

No. of Cntrs

1,4-Dioxane 8260B

L # **L1121166**  
**D163**

Acctnum: **UTCARCA**

Template:

Prelogin:

TSR: **Chris McCord**

PB:

Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs
BATCH 1a	Grab	GW	—	7/22/19	0930	3

Remarks Sample # (lab only)

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks:

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  
 UPS  FedEx  Courier

Tracking # **FedEx 479488443280**

**Sample Receipt Checklist**  
 COC Seal Present/Intact:  NP  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N  
 If Applicable  
 VOA Zero Headspace:  Y  N  
 Preservation Correct/Checked:  Y  N

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature) <i>[Signature]</i>	Date: 7/22/19	Time: 1100	Received by: (Signature) <i>[Signature]</i>	Trip Blank Received: Yes/No 0	HCL / MeOH TBR
Relinquished by: (Signature) <i>[Signature]</i>	Date: 7/22/19	Time: 1800	Received by: (Signature) <i>[Signature]</i>	Temp: <b>13.8°C</b>	Bottles Received: <b>3</b>
Relinquished by: (Signature) <i>[Signature]</i>	Date: 7/23/19	Time: 8MS	Received for lab by: (Signature) <i>[Signature]</i>	Date: 7/23/19	Time: 8MS

If preservation required by Login: Date/Time

Hold: Condition: NCF / OK

951A7



July 26, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1122056  
Samples Received: 07/25/2019  
Project Number: 03994018.0028  
Description: UPCO

Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Jason Romer  
Project Manager

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<b>Cp: Cover Page</b>	<b>1</b>	
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	
<b>FBR-BATCH1-072319 L1122056-01</b>	<b>5</b>	
<b>FBR-BATCH1-0724/19 L1122056-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	
<b>Wet Chemistry by Method 300.0</b>	<b>7</b>	
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>8</b>	
<b>Wet Chemistry by Method 350.1</b>	<b>9</b>	
<b>Wet Chemistry by Method 365.4</b>	<b>10</b>	
<b>Wet Chemistry by Method 9060A</b>	<b>11</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>12</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>13</b>	
<b>Gl: Glossary of Terms</b>	<b>14</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>15</b>	
<b>Sc: Sample Chain of Custody</b>	<b>16</b>	

# SAMPLE SUMMARY

## FBR-BATCH1-072319 L1122056-01 GW

Collected by: Mark Hammer  
 Collected date/time: 07/23/19 21:00  
 Received date/time: 07/25/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1317319	1	07/25/19 12:21	07/25/19 12:21	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1317363	1	07/25/19 13:28	07/25/19 13:28	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1317356	1	07/25/19 12:25	07/25/19 12:25	JER	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1316258	2	07/25/19 11:52	07/25/19 18:42	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1317333	1	07/25/19 12:57	07/25/19 12:57	VRP	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1317386	1	07/25/19 13:39	07/25/19 13:39	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1317441	1	07/25/19 15:26	07/25/19 15:26	DWR	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

## FBR-BATCH1-0724/19 L1122056-02 GW

Collected by: Mark Hammer  
 Collected date/time: 07/24/19 13:00  
 Received date/time: 07/25/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1317319	1	07/25/19 12:38	07/25/19 12:38	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1317363	1	07/25/19 14:44	07/25/19 14:44	GB	Mt. Juliet, TN
Wet Chemistry by Method 350.1	WG1317356	1	07/25/19 12:28	07/25/19 12:28	JER	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1316258	1	07/25/19 11:52	07/25/19 18:35	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1317333	1	07/25/19 13:11	07/25/19 13:11	VRP	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1317386	1	07/25/19 14:00	07/25/19 14:00	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1317441	1	07/25/19 15:45	07/25/19 15:45	DWR	Mt. Juliet, TN

6  
Qc

7  
Gl

8  
Al

9  
Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	07/25/2019 12:21	<a href="#">WG1317319</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0267		0.00400	1	07/25/2019 13:28	<a href="#">WG1317363</a>

3 Ss

4 Cn

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Ammonia Nitrogen	1.01		0.100	1	07/25/2019 12:25	<a href="#">WG1317356</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	6.26		0.200	2	07/25/2019 18:42	<a href="#">WG1316258</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	4.57	B1	1.00	1	07/25/2019 12:57	<a href="#">WG1317333</a>

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	07/25/2019 13:39	<a href="#">WG1317386</a>
(S) Toluene-d8	102		80.0-120		07/25/2019 13:39	<a href="#">WG1317386</a>
(S) 4-Bromofluorobenzene	106		77.0-126		07/25/2019 13:39	<a href="#">WG1317386</a>
(S) 1,2-Dichloroethane-d4	85.9		70.0-130		07/25/2019 13:39	<a href="#">WG1317386</a>

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	07/25/2019 15:26	<a href="#">WG1317441</a>
(S) Toluene-d8	94.1		77.0-127		07/25/2019 15:26	<a href="#">WG1317441</a>



Collected date/time: 07/24/19 13:00

L1122056

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	07/25/2019 12:38	<a href="#">WG1317319</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0277		0.00400	1	07/25/2019 14:44	<a href="#">WG1317363</a>

3 Ss

4 Cn

Wet Chemistry by Method 350.1

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Ammonia Nitrogen	0.704		0.100	1	07/25/2019 12:28	<a href="#">WG1317356</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	4.94		0.100	1	07/25/2019 18:35	<a href="#">WG1316258</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	3.52	B1	1.00	1	07/25/2019 13:11	<a href="#">WG1317333</a>

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	07/25/2019 14:00	<a href="#">WG1317386</a>
(S) Toluene-d8	103		80.0-120		07/25/2019 14:00	<a href="#">WG1317386</a>
(S) 4-Bromofluorobenzene	107		77.0-126		07/25/2019 14:00	<a href="#">WG1317386</a>
(S) 1,2-Dichloroethane-d4	87.5		70.0-130		07/25/2019 14:00	<a href="#">WG1317386</a>

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	07/25/2019 15:45	<a href="#">WG1317441</a>
(S) Toluene-d8	94.6		77.0-127		07/25/2019 15:45	<a href="#">WG1317441</a>





Method Blank (MB)

(MB) R3434217-1 07/25/19 09:41

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

L1119766-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1119766-01 07/25/19 11:11 • (DUP) R3434217-3 07/25/19 11:28

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Nitrate	0.693	0.729	1	5.02		20

<sup>5</sup>Sr

<sup>6</sup>Qc

Laboratory Control Sample (LCS)

(LCS) R3434217-2 07/25/19 09:59

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Nitrate	8.00	8.18	102	90.0-110	

<sup>7</sup>Gl

<sup>8</sup>Al

L1119766-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1119766-01 07/25/19 11:11 • (MS) R3434217-4 07/25/19 11:45 • (MSD) R3434217-5 07/25/19 12:03

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Nitrate	5.00	0.693	5.87	6.00	104	106	1	80.0-120			2.12	20

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3434391-1 07/25/19 11:02

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

Method Blank (MB)

(MB) R3434391-3 07/25/19 12:35

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

L1122056-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1122056-02 07/25/19 14:44 • (DUP) R3434391-6 07/25/19 15:10

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.0277	0.0273	1	1.51		15

Laboratory Control Sample (LCS)

(LCS) R3434391-2 07/25/19 11:30

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00965	96.5	90.0-110	

L1122056-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1122056-01 07/25/19 13:28 • (MS) R3434391-4 07/25/19 13:53 • (MSD) R3434391-5 07/25/19 14:19

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	0.0267	0.0377	0.0372	110	106	1	80.0-120			1.32	15

L1122056-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1122056-02 07/25/19 14:44 • (MS) R3434391-7 07/25/19 16:26

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.0277	0.0368	90.4	1	80.0-120	



Method Blank (MB)

(MB) R3434169-1 07/25/19 12:22

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Ammonia Nitrogen	U		0.0317	0.100

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1122056-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1122056-01 07/25/19 12:25 • (DUP) R3434169-3 07/25/19 12:26

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Ammonia Nitrogen	1.01	1.01	1	0.198		10

Laboratory Control Sample (LCS)

(LCS) R3434169-2 07/25/19 12:23

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Ammonia Nitrogen	7.50	7.23	96.3	90.0-110	

L1122056-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1122056-02 07/25/19 12:28 • (MS) R3434169-4 07/25/19 12:30 • (MSD) R3434169-5 07/25/19 12:31

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Ammonia Nitrogen	5.00	0.704	5.73	5.32	100	92.4	1	90.0-110			7.31	10



Method Blank (MB)

(MB) R3434415-1 07/25/19 17:51

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	0.0612	E4	0.0350	0.100

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1120037-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1120037-02 07/25/19 17:54 • (DUP) R3434415-3 07/25/19 17:55

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	0.144	0.102	1	34.1	R8	20

L1120106-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1120106-01 07/25/19 17:56 • (DUP) R3434415-4 07/25/19 17:58

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	ND	0.0936	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3434415-2 07/25/19 17:52

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	2.09	105	90.0-110	

L1120270-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1120270-05 07/25/19 18:26 • (MS) R3434415-5 07/25/19 18:28 • (MSD) R3434415-6 07/25/19 18:29

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	U	2.29	2.35	91.6	94.0	1	90.0-110			2.59	20



Method Blank (MB)

(MB) R3434294-1 07/25/19 11:57

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.523	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

Laboratory Control Sample (LCS)

(LCS) R3434294-2 07/25/19 12:30

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	73.8	98.4	85.0-115	

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3434287-4 07/25/19 10:40

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	101			80.0-120
(S) 4-Bromofluorobenzene	106			77.0-126
(S) 1,2-Dichloroethane-d4	82.9			70.0-130

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3434287-1 07/25/19 09:19 • (LCSD) R3434287-2 07/25/19 09:40

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0295	0.0275	118	110	71.0-124			7.14	20
(S) Toluene-d8				103	103	80.0-120				
(S) 4-Bromofluorobenzene				110	108	77.0-126				
(S) 1,2-Dichloroethane-d4				81.8	82.1	70.0-130				

5 Sr

6 Qc

7 Gl

8 Al

9 Sc





Method Blank (MB)

(MB) R3434324-3 07/25/19 14:24

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,4-Dioxane	0.00114	E4	0.000597	0.00300
(S) Toluene-d8	94.8			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3434324-1 07/25/19 13:25 • (LCSD) R3434324-2 07/25/19 13:45

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,4-Dioxane	0.0500	0.0432	0.0458	86.5	91.6	55.0-138			5.68	24
(S) Toluene-d8				94.4	94.6	77.0-127				

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

B1	Target analyte detected in method blank at or above the method reporting limit.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
R8	Sample RPD exceeded the method acceptance limit.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

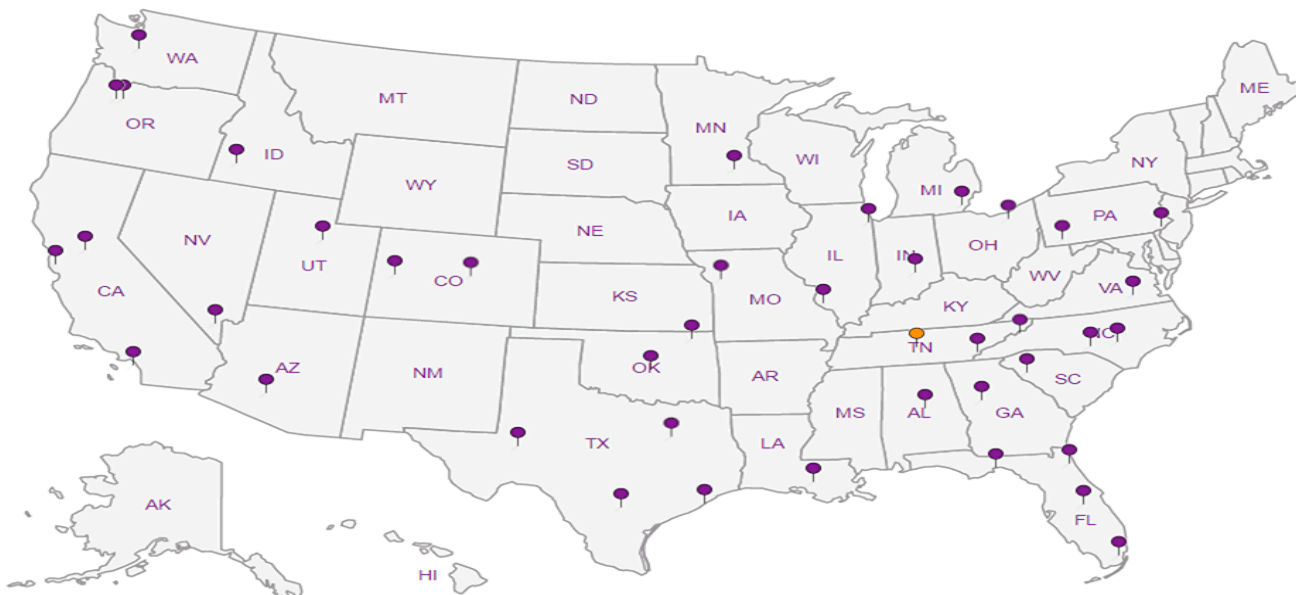
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Billing Information:

Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: [thomas.vespalec@arcadis.com](mailto:thomas.vespalec@arcadis.com)

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



Project  
Description: **UPCO**

Phone: **480-535-7399**

Fax: **MARK HAMMER**

Collected by (print): **Mark Hammer**  
*Thomas Vespalec*

Collected by (signature): *Thomas Vespalec*

Immediately  
Packed on Ice N  Y

Client Project #  
**03994018.0028**

Site/Facility ID #

**Rush?** (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #

Date Results Needed

Fres  
Chk

No.  
of  
Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCI	1,4-Dioxane 8260B 40mlAmb-HCI	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCI	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
FBR-BATCH1-072319	GRAB	GW		07/23/19	9:21:00	9	X	X	X	X	X	X	X	X	X	X	SAME DAY	01
<del>Top blank</del>		GW				1	X	X	X	X	X	X	X	X	X	X	SAME DAY	
FBR-BATCH1-072419	GRAB	GW		7/24/19	13:00	7	X	X	X	X	X	X	X	X	X	X	SAME DAY	02
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\*** has a 48hr hold time. **RAD SCREEN: <0.5 mR/hr**

Samples returned via:  
 UPS  FedEx  Courier

Tracking # **56**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

**Sample Receipt Checklist**  
COC Seal Present/Intact:  NP  Y  N  
COC Signed/Accurate:  Y  N  
Bottles arrive intact:  Y  N  
Correct bottles used:  Y  N  
Sufficient volume sent:  Y  N  
**If Applicable**  
VOA Zero Headspace:  Y  N  
Preservation Correct/Checked:  Y  N

Relinquished by: (Signature) <i>Thomas Vespalec</i>	Date: 7/24/19	Time: 1406	Received by: (Signature) <i>Samuel</i>	Trip Blank Received: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	HCL/MeOH TBR
Relinquished by: (Signature) <i>Samuel</i>	Date: 7/24/19	Time: 1800	Received by: (Signature) <i>Samuel</i>	Temp: °C 0.8+2=1.0AE	Bottles Received: 16
Relinquished by: (Signature) <i>Thomas Vespalec</i>	Date: 7/25/19	Time: 8:00	Received by: (Signature) <i>Thomas Vespalec</i>	Date: 7/25/19	Time: 8:00

If preservation required by Login: Date/Time

Hold: \_\_\_\_\_ Condition: NCF 10

ESCAR

## UTC - Arcadis

Sample Delivery Group: L1122910  
Samples Received: 07/27/2019  
Project Number: 03994018.0028  
Description: UPCO

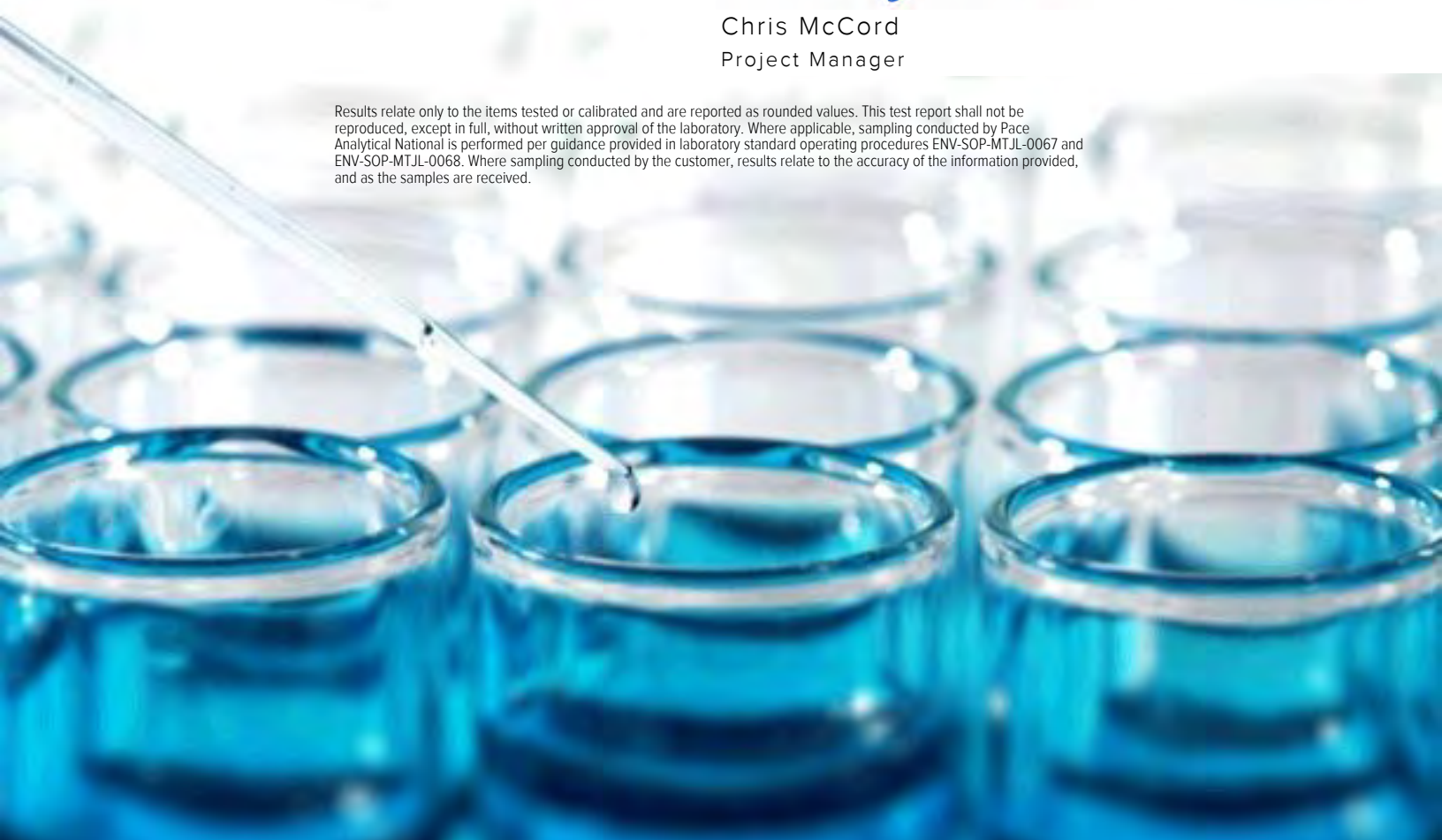
Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>2</sup>Tc</b>
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>3</sup>Ss</b>
<b>FBR-BATCH2-072519 L1122910-01</b>	<b>5</b>	
<b>FBR-BATCH2-072619 L1122910-02</b>	<b>6</b>	<b><sup>4</sup>Cn</b>
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>5</sup>Sr</b>
<b>Wet Chemistry by Method 300.0</b>	<b>7</b>	
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<b>Wet Chemistry by Method 365.4</b>	<b>9</b>	
<b>Wet Chemistry by Method 9060A</b>	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Gl: Glossary of Terms</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	<b><sup>9</sup>Sc</b>



# SAMPLE SUMMARY

## FBR-BATCH2-072519 L1122910-01 GW

Collected by: Mark Hammer  
 Collected date/time: 07/25/19 20:15  
 Received date/time: 07/27/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1318501	1	07/27/19 10:34	07/27/19 10:34	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1319156	10	07/29/19 14:01	07/29/19 14:01	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1318448	2	07/27/19 12:59	07/29/19 11:03	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1318499	1	07/27/19 12:06	07/27/19 12:06	VRP	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

## FBR-BATCH2-072619 L1122910-02 GW

Collected by: Mark Hammer  
 Collected date/time: 07/26/19 13:30  
 Received date/time: 07/27/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1318501	1	07/27/19 11:08	07/27/19 11:08	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1319156	10	07/29/19 16:11	07/29/19 16:11	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1318448	2	07/27/19 12:59	07/29/19 11:05	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1318499	1	07/27/19 12:18	07/27/19 12:18	VRP	Mt. Juliet, TN

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	0.105		0.100	1	07/27/2019 10:34	<a href="#">WG1318501</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.232		0.0400	10	07/29/2019 14:01	<a href="#">WG1319156</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	5.38		0.200	2	07/29/2019 11:03	<a href="#">WG1318448</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	2.99		1.00	1	07/27/2019 12:06	<a href="#">WG1318499</a>

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	07/27/2019 11:08	<a href="#">WG1318501</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.255	M3	0.0400	10	07/29/2019 16:11	<a href="#">WG1319156</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	5.62		0.200	2	07/29/2019 11:05	<a href="#">WG1318448</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	1.13	B1	1.00	1	07/27/2019 12:18	<a href="#">WG1318499</a>

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3434939-1 07/27/19 09:25

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Nitrate	U		0.0227	0.100

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

L1122910-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1122910-01 07/27/19 10:34 • (DUP) R3434939-6 07/27/19 12:36

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	0.105	0.0921	1	12.8		20

<sup>5</sup>Sr

<sup>6</sup>Qc

Laboratory Control Sample (LCS)

(LCS) R3434939-2 07/27/19 09:42

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Nitrate	8.00	8.31	104	90.0-110	

<sup>7</sup>Gl

<sup>8</sup>Al

L1122910-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1122910-02 07/27/19 11:08 • (MS) R3434939-4 07/27/19 11:26 • (MSD) R3434939-5 07/27/19 11:44

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Nitrate	5.00	ND	5.09	5.02	102	100	1	80.0-120			1.52	20

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3435434-1 07/29/19 10:51

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

Method Blank (MB)

(MB) R3435434-3 07/29/19 12:08

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1122910-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1122910-02 07/29/19 16:11 • (DUP) R3435434-6 07/29/19 16:36

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.255	0.246	10	3.77		15

Laboratory Control Sample (LCS)

(LCS) R3435434-2 07/29/19 11:42

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00905	90.5	90.0-110	

L1122910-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1122910-02 07/29/19 16:11 • (MS) R3435434-7 07/29/19 17:02

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.00100	0.255	0.250	0.000	10	80.0-120	M3

L1122910-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1122910-01 07/29/19 14:01 • (MS) R3435434-4 07/29/19 14:29 • (MSD) R3435434-5 07/29/19 14:54

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.00100	0.232	0.243	0.244	110	118	10	80.0-120			0.351	15





Method Blank (MB)

(MB) R3435204-1 07/29/19 10:04

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1121744-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1121744-02 07/29/19 10:11 • (DUP) R3435204-3 07/29/19 10:12

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	0.372	0.333	1	11.1		20

L1121840-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1121840-02 07/29/19 10:25 • (DUP) R3435204-6 07/29/19 10:26

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.90	1.89	1	0.528		20

Laboratory Control Sample (LCS)

(LCS) R3435204-2 07/29/19 10:06

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.90	95.0	90.0-110	

L1121830-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1121830-02 07/29/19 10:20 • (MS) R3435204-4 07/29/19 10:21 • (MSD) R3435204-5 07/29/19 10:22

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	2.11	2.03	1.84	0.000	0.000	1	90.0-110	M2	M2	9.82	20

L1122060-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1122060-01 07/29/19 10:30 • (MS) R3435204-7 07/29/19 10:31

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	ND	2.42	96.8	1	90.0-110	



Method Blank (MB)

(MB) R3435134-1 07/27/19 11:10

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.235	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1122507-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1122507-01 07/27/19 12:41 • (DUP) R3435134-3 07/27/19 13:01

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	27.9	27.6	1	1.33		20

L1122822-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1122822-01 07/27/19 20:45 • (DUP) R3435134-8 07/27/19 21:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	1.04	1.14	1	8.93		20

Laboratory Control Sample (LCS)

(LCS) R3435134-2 07/27/19 11:41

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	74.4	99.1	85.0-115	

L1122507-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1122507-02 07/27/19 13:15 • (MS) R3435134-4 07/27/19 13:34 • (MSD) R3435134-5 07/27/19 13:50

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	0.381	49.9	50.6	99.0	100	1	80.0-120			1.45	20

L1122531-10 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1122531-10 07/27/19 19:30 • (MS) R3435134-6 07/27/19 19:51 • (MSD) R3435134-7 07/27/19 20:07

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	ND	51.4	51.3	101	101	1	80.0-120			0.175	20



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier	Description
B1	Target analyte detected in method blank at or above the method reporting limit.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

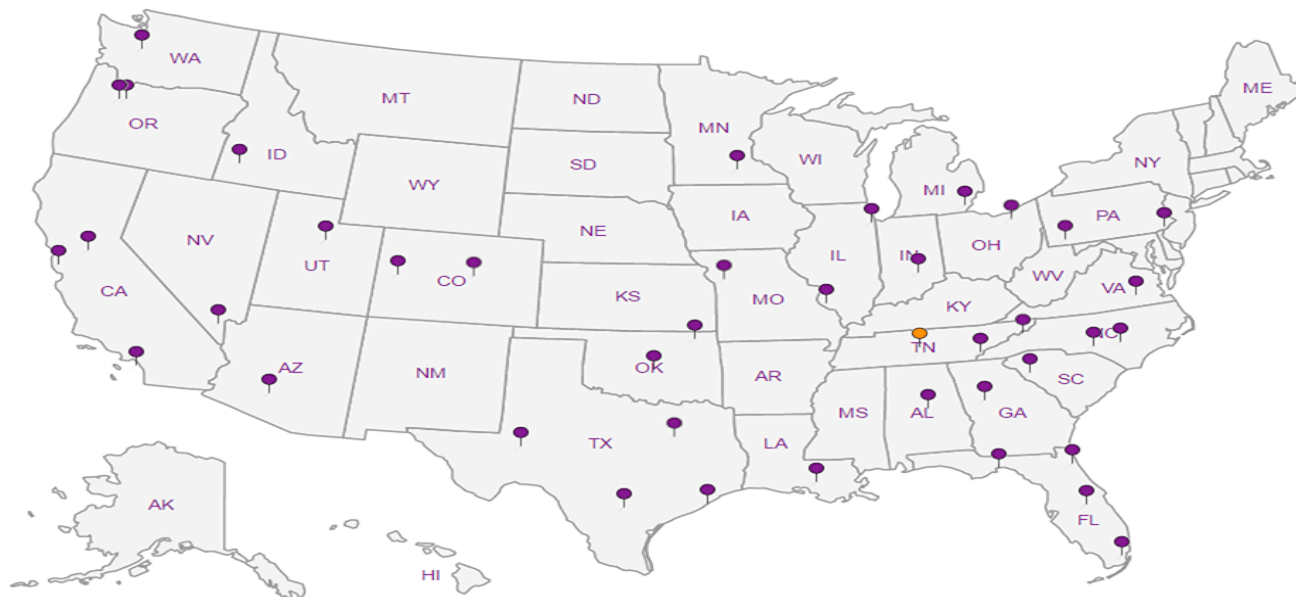
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**

Fax: *Mark Hammer*

Collected by (print):

*Mark Hammer*

Collected by (signature):

Immediately  
Packed on Ice N  Y

Billing Information:

Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: [thomas.vespalec@arcadis.com](mailto:thomas.vespalec@arcadis.com)

City/State  
Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #

Date Results Needed

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



Total Phosphorous 250mlHDPE-H2SO4

L# **1122910**

Table #

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: **526 - Chris McCord**

PB: *6-28-19*

Shipped Via: **FedEX Saver**

Remarks Sample # (lab only)

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Remarks	Sample # (lab only)	
<i>FBR-BATCH 2-072519</i>	<i>GRAB</i>	GW		<i>072519</i>	<i>20:15</i>	<i>4</i>	X					X		X	X		<i>RUSH</i>	<i>01</i>
<i>FBR-BATCH 2-072619</i>	<i>GRAB</i>	GW		<i>072619</i>	<i>13:30</i>	<i>4</i>	X					X		X	X		<i>RUSH</i>	<i>02</i>
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

Sample Receipt Checklist

COC Seal Present/Intact:  NP  Y  N

COC Signed/Accurate:  Y  N

Bottles arrive intact:  Y  N

Correct bottles used:  Y  N

Sufficient volume sent:  Y  N

If Applicable

VOA Zero Headspace:  Y  N

Preservation Correct/Checked:  Y  N

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: <b>7/26/19</b>	Time: <b>1359</b>	Received by: (Signature) <i>anyarvey</i>	Trip Blank Received: Yes/No <input checked="" type="checkbox"/> HCL/MeOH TBR	Temp: <b>ASBF °C</b> <b>3.5 ± 1 = 3.6</b>	Bottles Received: <b>8</b>	If preservation required by Login: Date/Time
Relinquished by: (Signature) <i>anyarvey</i>	Date: <b>7/26/19</b>	Time: <b>1800</b>	Received by: (Signature) <i>Suit</i>	Date: <b>7-27-19</b>	Time: <b>8:00</b>	Hold:	Condition: NCF / <input checked="" type="checkbox"/> OK

*ESCARB*



July 30, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1123351  
Samples Received: 07/30/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
<b>FBR-BATCH2-072919 L1123351-01</b>	<b>5</b>	<b><sup>6</sup>Qc</b>
<b>Qc: Quality Control Summary</b>	<b>6</b>	<b><sup>7</sup>Gl</b>
<b>Wet Chemistry by Method 300.0</b>	<b>6</b>	<b><sup>8</sup>Al</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	<b><sup>9</sup>Sc</b>
<b>Wet Chemistry by Method 365.4</b>	<b>8</b>	
<b>Wet Chemistry by Method 9060A</b>	<b>10</b>	
<b>Gl: Glossary of Terms</b>	<b>11</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	

# SAMPLE SUMMARY



FBR-BATCH2-072919 L1123351-01 GW

Collected by: Tom Vespaiec  
 Collected date/time: 07/29/19 13:45  
 Received date/time: 07/30/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1319748	1	07/30/19 10:32	07/30/19 10:32	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1319786	10	07/30/19 13:28	07/30/19 13:28	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1319974	1	07/30/19 10:05	07/30/19 15:37	JER	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1319769	1	07/30/19 11:58	07/30/19 11:58	VRP	Mt. Juliet, TN

- <sup>1</sup>Cp
- <sup>2</sup>Tc
- <sup>3</sup>Ss
- <sup>4</sup>Cn
- <sup>5</sup>Sr
- <sup>6</sup>Qc
- <sup>7</sup>Gl
- <sup>8</sup>Al
- <sup>9</sup>Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	07/30/2019 10:32	<a href="#">WG1319748</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.217		0.0400	10	07/30/2019 13:28	<a href="#">WG1319786</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	4.46		0.100	1	07/30/2019 15:37	<a href="#">WG1319974</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	ND		1.00	1	07/30/2019 11:58	<a href="#">WG1319769</a>

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3435637-1 07/30/19 09:39

Analyte	MB Result mg/l	<u>MB Qualifier</u>	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

Laboratory Control Sample (LCS)

(LCS) R3435637-2 07/30/19 09:56

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Nitrate	8.00	8.36	104	90.0-110	

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3435764-1 07/30/19 10:55

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3435764-3 07/30/19 12:11

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

L1123351-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1123351-01 07/30/19 13:28 • (DUP) R3435764-4 07/30/19 13:56

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.217	0.205	10	5.41		15

Laboratory Control Sample (LCS)

(LCS) R3435764-2 07/30/19 11:46

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00938	93.8	90.0-110	

L1123351-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1123351-01 07/30/19 13:28 • (MS) R3435764-5 07/30/19 14:22 • (MSD) R3435764-6 07/30/19 14:47

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	0.217	0.320	0.313	103	96.6	10	80.0-120			2.07	15





Method Blank (MB)

(MB) R3435737-1 07/30/19 15:10

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1119442-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1119442-01 07/30/19 15:15 • (DUP) R3435737-3 07/30/19 15:17

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	2.50	2.46	1	1.61		20

L1121471-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1121471-02 07/30/19 15:27 • (DUP) R3435737-6 07/30/19 15:28

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	ND	0.000	1	0.000		20

L1121471-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1121471-04 07/30/19 15:31 • (DUP) R3435737-8 07/30/19 15:32

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3435737-2 07/30/19 15:11

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	2.00	100	90.0-110	



L1119455-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1119455-01 07/30/19 15:18 • (MS) R3435737-4 07/30/19 15:19 • (MSD) R3435737-5 07/30/19 15:20

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Phosphorus,Total	2.50	3.20	5.64	5.67	97.6	98.8	1	90.0-110	<u>E1</u>	<u>E1</u>	0.531	20

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Method Blank (MB)

(MB) R3435714-1 07/30/19 11:02

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.270	E4	0.102	1.00

L1122822-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1122822-04 07/30/19 12:12 • (DUP) R3435714-3 07/30/19 12:26

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	11.9	11.1	1	7.56		20

Laboratory Control Sample (LCS)

(LCS) R3435714-2 07/30/19 11:36

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	73.8	98.4	85.0-115	

L1122829-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1122829-02 07/30/19 12:53 • (MS) R3435714-4 07/30/19 13:12 • (MSD) R3435714-5 07/30/19 13:28

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TOC (Total Organic Carbon)	50.0	1.07	51.9	49.6	102	97.1	1	80.0-120			4.39	20

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E1	Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

City/State  
Collected: **AZ**  
Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**Tom VESPALEC**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*[Signature]*

**Rush?** (Lab MUST Be Notified)

Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #

Date Results Needed

Immediately  
Packed on Ice N  Y

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **1129951**

**H058**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: **526 - Chris McCord**

PB: **6-28-196m**

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
<b>FGR-BATCH2-072919</b>	<b>GRAB</b>	<b>GW</b>	<b>-</b>	<b>7/29/19</b>	<b>1345</b>	<b>4</b>	<b>X</b>					<b>X</b>		<b>X</b>		<b>X</b>	<b>RUSH</b>	<b>01</b>
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\*** has a 48hr hold time.

Samples returned via:  
 UPS  FedEx  Courier

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist	
COC Seal Present/Intact: <input type="checkbox"/> NP <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
COC Signed/Accurate: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
Bottles arrive intact: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
Correct bottles used: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
Sufficient volume sent: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
If Applicable	
VOA Zero Headspace: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
Preservation Correct/Checked: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
<b>RAD SCREEN: &lt;0.5 mR/hr</b>	

Tracking # **4791 8844 2424**

Relinquished by: (Signature) <i>[Signature]</i>	Date: <b>7/29/19</b>	Time: <b>1400</b>	Received by: (Signature) <i>[Signature]</i>	Trip Blank Received: Yes / No <input checked="" type="checkbox"/> HCL / MeOH TBR
Relinquished by: (Signature) <i>[Signature]</i>	Date: <b>7/29/19</b>	Time: <b>1800</b>	Received by: (Signature) <i>[Signature]</i>	Temp: <b>A361 °C</b> <b>5.7±0.5.2</b> <b>4</b>
Relinquished by: (Signature) <i>[Signature]</i>	Date:	Time:	Received for lab by: (Signature) <i>[Signature]</i>	Date: <b>7-30-19</b> Time: <b>8:45</b>
				Hold: Condition: NCF / <b>OK</b>

ESCM



## UTC - Arcadis

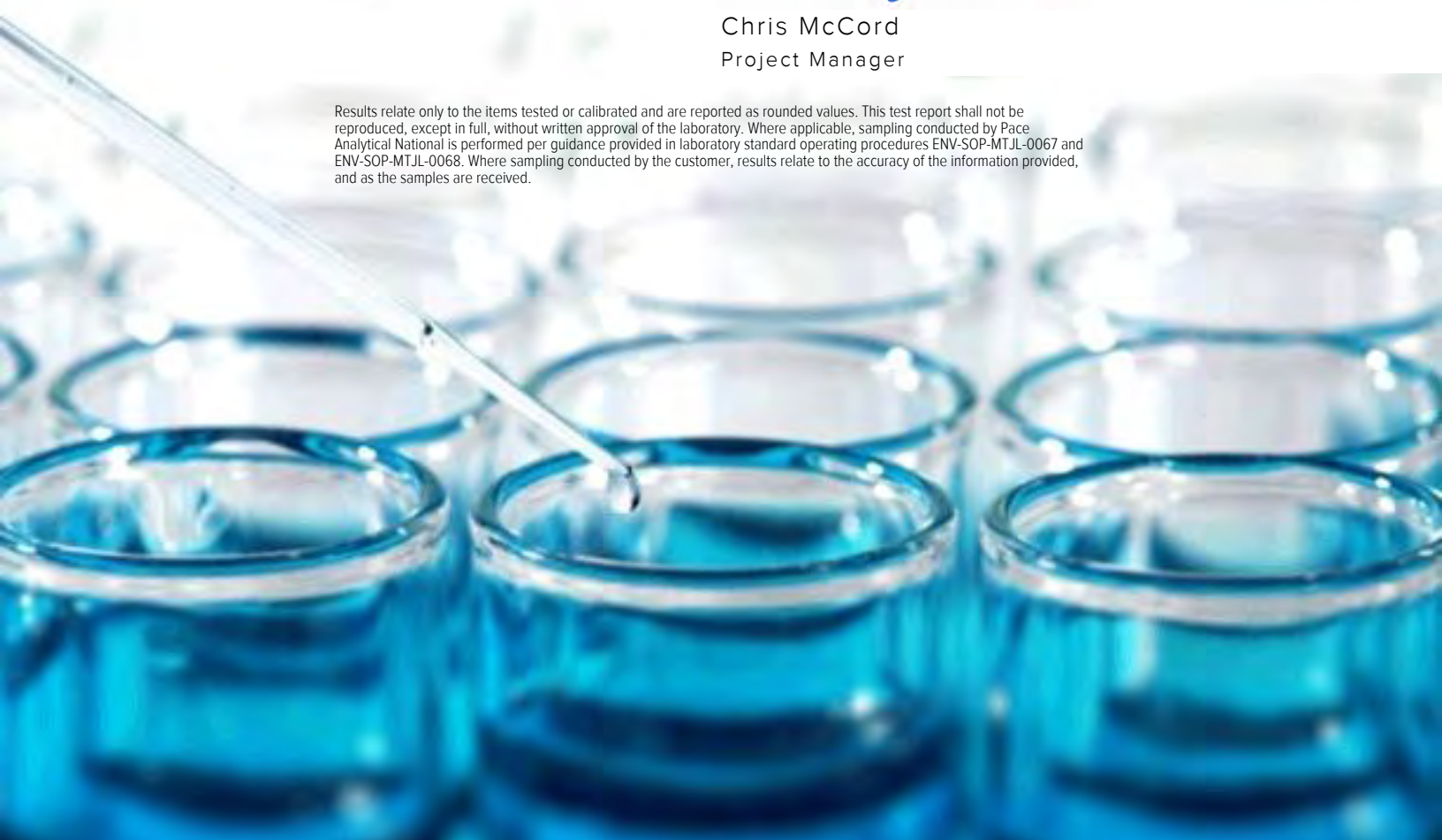
Sample Delivery Group: L1124619  
Samples Received: 08/02/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespalect  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





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# SAMPLE SUMMARY

## FBR-BATCH3-073119 L1124619-01 GW

Collected by: Tom Vespaiec  
 Collected date/time: 07/31/19 19:45  
 Received date/time: 08/02/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1321750	1	08/02/19 10:18	08/02/19 10:18	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1322098	10	08/02/19 12:30	08/02/19 12:30	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1321781	1	08/02/19 10:08	08/02/19 15:03	JER	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1321872	1	08/02/19 12:23	08/02/19 12:23	VRP	Mt. Juliet, TN

1  
Cp

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Tc

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Ss

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Qc

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Sc

## PT-201-073119 L1124619-02 GW

Collected by: Tom Vespaiec  
 Collected date/time: 07/31/19 17:00  
 Received date/time: 08/02/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1321868	1000	08/02/19 14:00	08/02/19 14:00	LBR	Mt. Juliet, TN

## FBR-BATCH3-080119 L1124619-03 GW

Collected by: Tom Vespaiec  
 Collected date/time: 07/31/19 13:50  
 Received date/time: 08/02/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1321750	1	08/02/19 10:31	08/02/19 10:31	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1322098	10	08/02/19 16:35	08/02/19 16:35	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1321781	5	08/02/19 10:08	08/02/19 15:12	JER	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1321872	1	08/02/19 12:35	08/02/19 12:35	VRP	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	0.185		0.100	1	08/02/2019 10:18	<a href="#">WG1321750</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.189		0.0400	10	08/02/2019 12:30	<a href="#">WG1322098</a>

3 Ss

4 Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	3.98		0.100	1	08/02/2019 15:03	<a href="#">WG1321781</a>

5 Sr

6 Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	8.30		1.00	1	08/02/2019 12:23	<a href="#">WG1321872</a>

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	8.88		4.00	1000	08/02/2019 14:00	<a href="#">WG1321868</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/02/2019 10:31	<a href="#">WG1321750</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.181		0.0400	10	08/02/2019 16:35	<a href="#">WG1322098</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	5.75		0.500	5	08/02/2019 15:12	<a href="#">WG1321781</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	1.43	<u>B1</u>	1.00	1	08/02/2019 12:35	<a href="#">WG1321872</a>

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3436795-1 08/02/19 08:53

Analyte	MB Result mg/l	<u>MB Qualifier</u>	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

Laboratory Control Sample (LCS)

(LCS) R3436795-2 08/02/19 09:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Nitrate	8.00	8.43	105	90.0-110	

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3436993-1 08/02/19 09:13

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

L1124619-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1124619-02 08/02/19 14:00 • (DUP) R3436993-3 08/02/19 16:10

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	8.88	8.85	1000	0.394		15

<sup>7</sup> Gl

<sup>8</sup> Al

Laboratory Control Sample (LCS)

(LCS) R3436993-2 08/02/19 10:04

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00979	97.9	90.0-110	

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3436992-4 08/02/19 15:18

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

Laboratory Control Sample (LCS)

(LCS) R3436992-1 08/02/19 10:04

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.00979	97.9	90.0-110	

<sup>7</sup>Gl

<sup>8</sup>Al

L1124619-03 Original Sample (OS) • Matrix Spike (MS)

(OS) L1124619-03 08/02/19 16:35 • (MS) R3436992-5 08/02/19 17:01

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	0.181	0.284	102	10	80.0-120	

<sup>9</sup>Sc

L1124619-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1124619-01 08/02/19 12:30 • (MS) R3436992-2 08/02/19 12:56 • (MSD) R3436992-3 08/02/19 13:21

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	0.189	0.289	0.296	100	107	10	80.0-120			2.36	15



Method Blank (MB)

(MB) R3436916-1 08/02/19 14:38

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	0.0370	E4	0.0350	0.100

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1124221-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1124221-01 08/02/19 14:40 • (DUP) R3436916-3 08/02/19 14:41

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	4.98	4.64	1	7.07		20

L1124436-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1124436-01 08/02/19 14:57 • (DUP) R3436916-6 08/02/19 14:58

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	4.43	4.64	1	4.63		20

Laboratory Control Sample (LCS)

(LCS) R3436916-2 08/02/19 14:39

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.96	98.0	90.0-110	

L1124442-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1124442-01 08/02/19 15:10 • (MS) R3436916-7 08/02/19 15:08

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	4.17	5.90	69.2	1	90.0-110	E1 M2

L1124280-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1124280-01 08/02/19 14:49 • (MS) R3436916-4 08/02/19 14:53 • (MSD) R3436916-5 08/02/19 14:54

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	0.133	2.42	2.49	91.5	94.3	1	90.0-110			2.85	20



Method Blank (MB)

(MB) R3436895-1 08/02/19 11:17

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.294	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

L1124407-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1124407-01 08/02/19 12:49 • (DUP) R3436895-3 08/02/19 13:03

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	8.40	8.08	1	3.98		20

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3436895-2 08/02/19 11:48

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	75.3	100	85.0-115	

6 Qc

7 Gl

8 Al

L1124407-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1124407-02 08/02/19 13:18 • (MS) R3436895-4 08/02/19 13:34 • (MSD) R3436895-5 08/02/19 13:49

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	3.14	54.8	52.6	103	98.8	1	80.0-120			4.19	20

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier Description

B1	Target analyte detected in method blank at or above the method reporting limit.
E1	Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc





Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

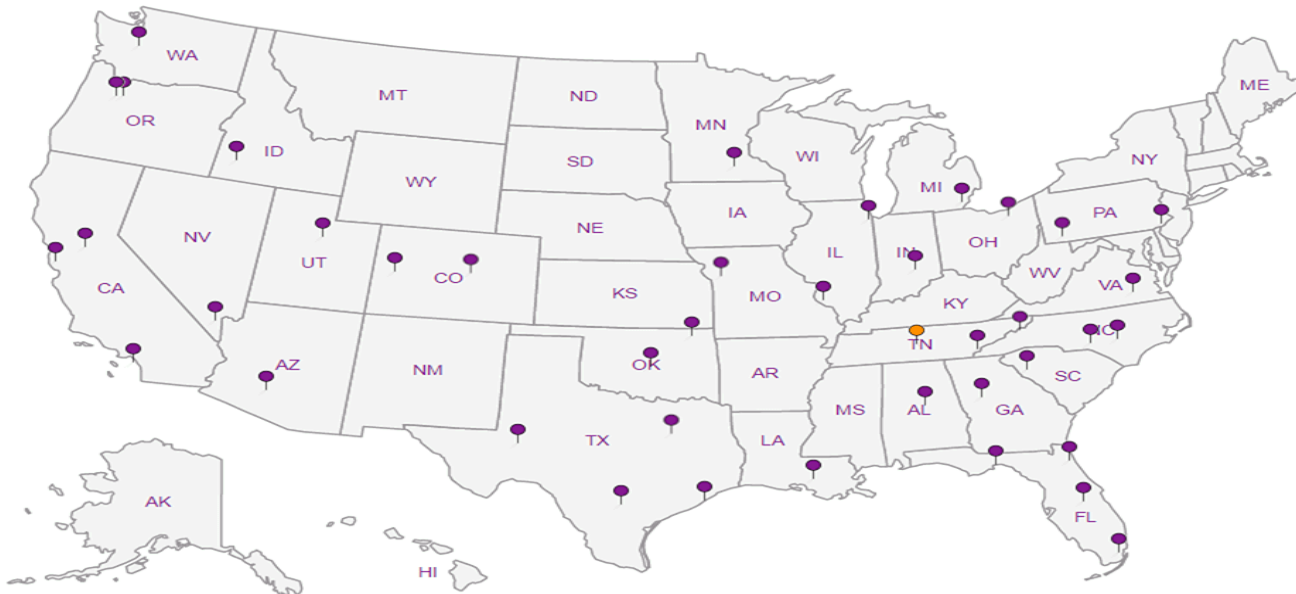
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
Thomas Vespalec

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
**TOM VESPALEC**

Collected by (signature):  
*Tom Vespalec*  
Immediately  
Packed on Ice N  Y

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129  
Email To: [thomas.vespalec@arcadis.com](mailto:thomas.vespalec@arcadis.com)

City/State  
Collected: **AZ**  
Lab Project #  
**UTCARCA-UPCO11DCE**  
P.O. #  
Quote #

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs
FBR-BATCH3-073119	GRAK	GW	—	073119	19:45	4 X
PT-201-073119	↓	GW	—	073119	17:00	1
FBR-BATCH3-080119	↓	GW	—	080119	13:50	4 X
		GW				
		GW				
		GW				
		GW				
		GW				
		GW				
		GW				

Pres Chk		Analysis / Container / Preservative												
		**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4			

Chain of Custody Page 1 of 1  
  
 Pace Analytical®  
 National Center for Testing & Innovation  
 12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859  


L# **112469**  
**H158**  
 Acctnum: **UTCARCA**  
 Template: **T152379**  
 Prelogin: **P717001**  
 TSR: **526 - Chris McCord**  
 PB: **6-28-196m**  
 Shipped Via: **FedEX Saver**

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**  
**RAD SCREEN: <0.5 mR/hr**  
 pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_  
 Samples returned via:  
 UPS  FedEx  Courier  
 Tracking # **4794 8844 2023**

Sample Receipt Checklist  
 COC Seal Present/Intact:  NP  N  
 COC Signed/Accurate:   N  
 Bottles arrive intact:   N  
 Correct bottles used:   N  
 Sufficient volume sent:   N  
 If Applicable  
 VOA Zero Headpace:   N  
 Preservation Correct/Checked:   N

Relinquished by: (Signature) <i>Tom Vespalec</i>	Date: <b>8/1/19</b>	Time: <b>1405</b>	Received by: (Signature) <i>Janey</i>	Trip Blank Received: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Relinquished by: (Signature) <i>Janey</i>	Date: <b>8/1/19</b>	Time: <b>1800</b>	Received by: (Signature) <i>FedEx</i>	Temp: <b>22°C</b> Bottles Received: <b>9</b>
Relinquished by: (Signature) <i>Janey</i>	Date: <b>8-2-19</b>	Time: <b>8:45</b>	Received for lab by: (Signature) <i>Janey</i>	Hold: _____ Condition: <b>NCF 10</b>

ESCAZ

## UTC - Arcadis

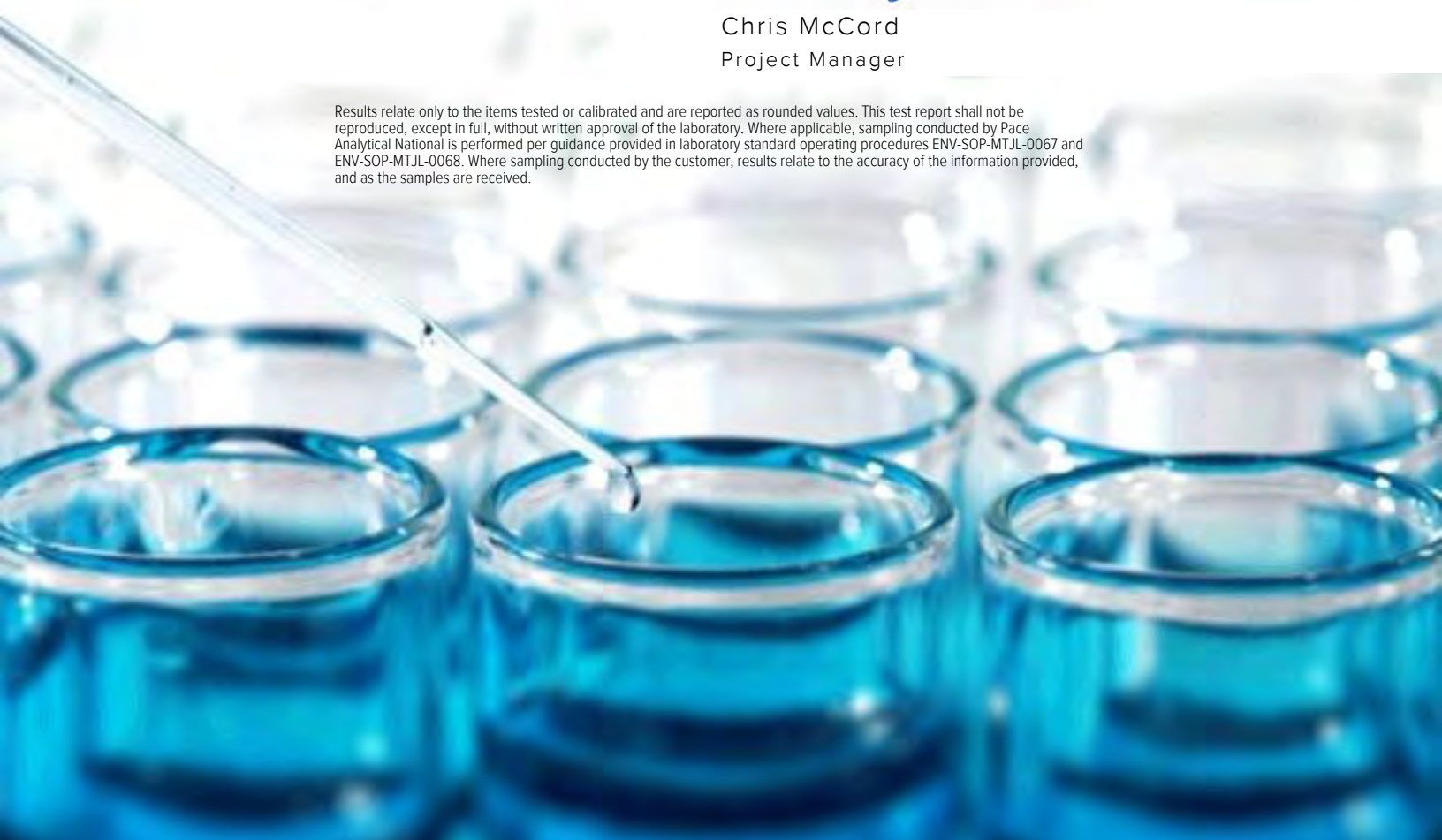
Sample Delivery Group: L1125450  
Samples Received: 08/06/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>2</sup>Tc</b>
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>3</sup>Ss</b>
<b>SP-608-080519 L1125450-01</b>	<b>5</b>	
<b>TRIP-BLANK L1125450-02</b>	<b>6</b>	<b><sup>4</sup>Cn</b>
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>5</sup>Sr</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>9</b>	<b><sup>6</sup>Qc</b>
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>10</b>	
<b>Gl: Glossary of Terms</b>	<b>11</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY

## SP-608-080519 L1125450-01 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/05/19 13:15  
 Received date/time: 08/06/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1324032	1	08/06/19 15:45	08/06/19 15:45	GB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1323655	1	08/06/19 13:57	08/06/19 13:57	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1323721	1	08/06/19 15:02	08/06/19 15:02	DWR	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

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Qc

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Gl

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Al

9  
Sc

## TRIP-BLANK L1125450-02 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/05/19 00:00  
 Received date/time: 08/06/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1323655	1	08/06/19 13:36	08/06/19 13:36	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1323721	1	08/06/19 14:42	08/06/19 14:42	DWR	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Perchlorate	ND		0.00400	1	08/06/2019 15:45	<a href="#">WG1324032</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,1-Dichloroethene	ND		0.00100	1	08/06/2019 13:57	<a href="#">WG1323655</a>
(S) Toluene-d8	95.8		80.0-120		08/06/2019 13:57	<a href="#">WG1323655</a>
(S) 4-Bromofluorobenzene	95.4		77.0-126		08/06/2019 13:57	<a href="#">WG1323655</a>
(S) 1,2-Dichloroethane-d4	108		70.0-130		08/06/2019 13:57	<a href="#">WG1323655</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,4-Dioxane	ND		0.00300	1	08/06/2019 15:02	<a href="#">WG1323721</a>
(S) Toluene-d8	99.7		77.0-127		08/06/2019 15:02	<a href="#">WG1323721</a>

6 Qc

7 Gl

8 Al

9 Sc





Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	08/06/2019 13:36	<a href="#">WG1323655</a>
(S) Toluene-d8	94.4		80.0-120		08/06/2019 13:36	<a href="#">WG1323655</a>
(S) 4-Bromofluorobenzene	92.3		77.0-126		08/06/2019 13:36	<a href="#">WG1323655</a>
(S) 1,2-Dichloroethane-d4	114		70.0-130		08/06/2019 13:36	<a href="#">WG1323655</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	08/06/2019 14:42	<a href="#">WG1323721</a>
(S) Toluene-d8	99.3		77.0-127		08/06/2019 14:42	<a href="#">WG1323721</a>



Method Blank (MB)

(MB) R3437959-3 08/06/19 16:36

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3437959-1 08/05/19 16:42

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00985	98.5	90.0-110	

L1125450-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125450-01 08/06/19 15:45 • (MS) R3437959-2 08/06/19 16:11

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	ND	0.0108	108	1	80.0-120	

L1125452-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125452-01 08/06/19 14:04 • (MS) R3437959-4 08/06/19 18:18

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.233	0.336	103	10	80.0-120	

L1125452-03 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125452-03 08/06/19 14:29 • (MS) R3437959-5 08/06/19 18:43

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.340	0.441	102	10	80.0-120	

L1125452-04 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125452-04 08/06/19 14:55 • (MS) R3437959-6 08/06/19 19:09

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.347	0.446	99.6	10	80.0-120	



L1125452-05 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125452-05 08/06/19 15:20 • (MS) R3437959-7 08/06/19 19:34

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>
Perchlorate	0.0100	0.360	0.462	102	10	80.0-120	

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3437881-3 08/06/19 12:55

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	99.0			80.0-120
(S) 4-Bromofluorobenzene	94.5			77.0-126
(S) 1,2-Dichloroethane-d4	102			70.0-130

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3437881-1 08/06/19 11:34 • (LCSD) R3437881-2 08/06/19 11:54

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0255	0.0275	102	110	71.0-124			7.58	20
(S) Toluene-d8				95.5	92.7	80.0-120				
(S) 4-Bromofluorobenzene				92.4	93.6	77.0-126				
(S) 1,2-Dichloroethane-d4				119	120	70.0-130				

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3437894-3 08/06/19 13:55

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.7			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3437894-1 08/06/19 12:57 • (LCSD) R3437894-2 08/06/19 13:16

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,4-Dioxane	0.0500	0.0408	0.0434	81.5	86.7	55.0-138			6.18	24
(S) Toluene-d8				99.8	100	77.0-127				

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

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1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Billing Information:  
**Accounts Payable**  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Report to:  
**Thomas Vespalec**

Email To: thomas.vespalec@arcadis.com

Project Description: **UPCO**

City/State Collected: **AZ**

Phone: **480-535-7399**  
 Fax:

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**TOM VESPALEC**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*[Signature]*  
 Immediately Packed on Ice N \_\_\_ Y **X**

Rush? (Lab MUST Be Notified)  
 Same Day \_\_\_ Five Day  
 \_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
 \_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
 \_\_\_ Three Day

Quote #  
 Date Results Needed

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs
-----------	-----------	----------	-------	------	------	--------------

Analysis / Container / Preservative										
**NITRATE**	125mlHDPE-NoPres									
	1,1-DCE-8260B	40mlAmb-HCl								
	1,4-Dioxane	8260B	40mlAmb-HCl							
	Ammonia	250mlHDPE-H2SO4								
	Diss. Fe - LF	250mlHDPE-NoPres								
	Perchlorate	125mlHDPE-NoPres								
	RCRA8+fe	250mlHDPE-HNO3								
	TOC	250mlAmb-HCl								
	TSS	1L-HDPE NoPres								
	Total Phosphorous	250mlHDPE-H2SO4								

Chain of Custody Page **1** of **1**



12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



L# **L1125450**

Table **A159**

Acctnum: **UTCARCA**  
 Template: **T152379**  
 Prelogin: **P717001**  
 TSR: **526 - Chris McCord**  
 PB: **6-28-19**

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE**	1,1-DCE-8260B	1,4-Dioxane	Ammonia	Diss. Fe - LF	Perchlorate	RCRA8+fe	TOC	TSS	Total Phosphorous	Remarks	Sample # (lab only)
SP-608-080519	G	GW	—	8/5/19	1315	4		X	X			X					RUSH	-01
TRIP-BLANK	—	GW	—	8/5/19	—	1		X	X								RUSH	-02
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  
 \_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier \_\_\_\_\_ Tracking # **50**

Sample Receipt Checklist

COC Seal Present/Intact:  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N

If Applicable

VOA Zero Headspace:  Y  N  
 Preservation Correct/Checked:  Y  N

Relinquished by: (Signature)  
*[Signature]*

Relinquished by: (Signature)  
*[Signature]*

Relinquished by: (Signature)  
*[Signature]*

Date: **8/5/19** Time: **1430**

Date: **8/5/19** Time: **1800**

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Received by: (Signature)  
*[Signature]*

Received by: (Signature)  
*[Signature]*

Received for lab by: (Signature)  
*[Signature]*

Trip Blank Received:  Yes /  No  
 HCL / MeOH TBR

Temp: \_\_\_\_\_ °C Bottles Received: **4**

Date: **8/6/19** Time: **0800**

If preservation required by Login: Date/Time

Hold: \_\_\_\_\_ Condition: **NCF / OK**

**FSCAB**

## UTC - Arcadis

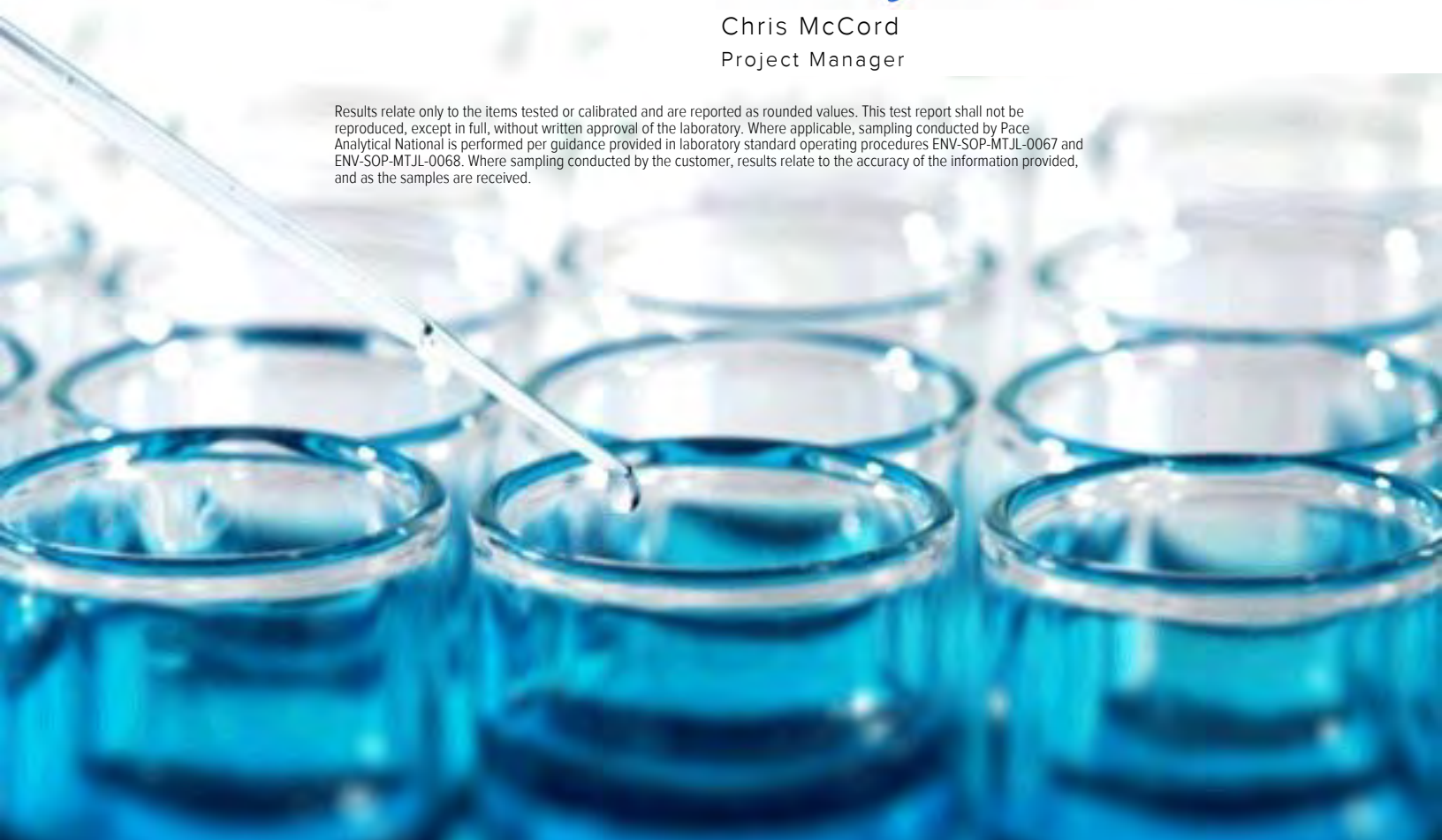
Sample Delivery Group: L1125452  
Samples Received: 08/06/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b>3</b> Ss
<b>FBR-BATCH 4-080319 L1125452-01</b>	<b>5</b>	
<b>PT-201-080319 L1125452-02</b>	<b>6</b>	<b>4</b> Cn
<b>FBR-BATCH4-080419 L1125452-03</b>	<b>7</b>	<b>5</b> Sr
<b>FBR-BATCH4-080519 L1125452-04</b>	<b>8</b>	
<b>SP-401-080519 L1125452-05</b>	<b>9</b>	<b>6</b> Qc
<b>Qc: Quality Control Summary</b>	<b>10</b>	<b>7</b> Gl
<b>Wet Chemistry by Method 300.0</b>	<b>10</b>	
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>11</b>	<b>8</b> Al
<b>Wet Chemistry by Method 365.4</b>	<b>14</b>	
<b>Wet Chemistry by Method 9060A</b>	<b>15</b>	<b>9</b> Sc
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>16</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>17</b>	
<b>Gl: Glossary of Terms</b>	<b>18</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>19</b>	
<b>Sc: Sample Chain of Custody</b>	<b>20</b>	

# SAMPLE SUMMARY



## FBR-BATCH 4-080319 L1125452-01 GW

Collected by: Tom Vespalec  
 Collected date/time: 08/05/19 13:45  
 Received date/time: 08/06/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1324032	10	08/06/19 14:04	08/06/19 14:04	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1323211	1	08/06/19 09:55	08/06/19 14:33	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1323621	1	08/06/19 11:57	08/06/19 11:57	VRP	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

## PT-201-080319 L1125452-02 GW

Collected by: Tom Vespalec  
 Collected date/time: 08/05/19 12:25  
 Received date/time: 08/06/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1322115	500	08/06/19 13:11	08/06/19 13:11	GB	Mt. Juliet, TN

4 Cn

5 Sr

6 Qc

## FBR-BATCH4-080419 L1125452-03 GW

Collected by: Tom Vespalec  
 Collected date/time: 08/04/19 12:00  
 Received date/time: 08/06/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1323579	1	08/06/19 10:36	08/06/19 10:36	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1324032	10	08/06/19 14:29	08/06/19 14:29	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1323211	1	08/06/19 09:55	08/06/19 14:35	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1323621	1	08/06/19 12:28	08/06/19 12:28	VRP	Mt. Juliet, TN

7 Gl

8 Al

9 Sc

## FBR-BATCH4-080519 L1125452-04 GW

Collected by: Tom Vespalec  
 Collected date/time: 08/05/19 13:45  
 Received date/time: 08/06/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1323579	1	08/06/19 11:05	08/06/19 11:05	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1324032	10	08/06/19 14:55	08/06/19 14:55	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1323211	1	08/06/19 09:55	08/06/19 14:36	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1323621	1	08/06/19 12:46	08/06/19 12:46	VRP	Mt. Juliet, TN

## SP-401-080519 L1125452-05 GW

Collected by: Tom Vespalec  
 Collected date/time: 08/05/19 12:30  
 Received date/time: 08/06/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1323579	1	08/06/19 11:50	08/06/19 11:50	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1324032	10	08/06/19 15:20	08/06/19 15:20	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1323211	1	08/06/19 09:55	08/06/19 14:37	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1323621	1	08/06/19 13:01	08/06/19 13:01	VRP	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1323655	1	08/06/19 14:17	08/06/19 14:17	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1323721	1	08/06/19 15:22	08/06/19 15:22	DWR	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.233		0.0400	10	08/06/2019 14:04	<a href="#">WG1324032</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus,Total	3.43		0.100	1	08/06/2019 14:33	<a href="#">WG1323211</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	9.12		1.00	1	08/06/2019 11:57	<a href="#">WG1323621</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	19.6		2.00	500	08/06/2019 13:11	<a href="#">WG1322115</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/06/2019 10:36	<a href="#">WG1323579</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.340		0.0400	10	08/06/2019 14:29	<a href="#">WG1324032</a>

3 Ss

4 Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	4.48		0.100	1	08/06/2019 14:35	<a href="#">WG1323211</a>

5 Sr

6 Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	ND		1.00	1	08/06/2019 12:28	<a href="#">WG1323621</a>

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/06/2019 11:05	<a href="#">WG1323579</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.347		0.0400	10	08/06/2019 14:55	<a href="#">WG1324032</a>

3 Ss

4 Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	3.26		0.100	1	08/06/2019 14:36	<a href="#">WG1323211</a>

5 Sr

6 Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	ND		1.00	1	08/06/2019 12:46	<a href="#">WG1323621</a>

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	0.196		0.100	1	08/06/2019 11:50	<a href="#">WG1323579</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.360		0.0400	10	08/06/2019 15:20	<a href="#">WG1324032</a>

3 Ss

4 Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	3.04		0.100	1	08/06/2019 14:37	<a href="#">WG1323211</a>

5 Sr

6 Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	1.74	B1	1.00	1	08/06/2019 13:01	<a href="#">WG1323621</a>

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	08/06/2019 14:17	<a href="#">WG1323655</a>
(S) Toluene-d8	102		80.0-120		08/06/2019 14:17	<a href="#">WG1323655</a>
(S) 4-Bromofluorobenzene	91.6		77.0-126		08/06/2019 14:17	<a href="#">WG1323655</a>
(S) 1,2-Dichloroethane-d4	113		70.0-130		08/06/2019 14:17	<a href="#">WG1323655</a>

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	08/06/2019 15:22	<a href="#">WG1323721</a>
(S) Toluene-d8	100		77.0-127		08/06/2019 15:22	<a href="#">WG1323721</a>



Method Blank (MB)

(MB) R3437845-1 08/06/19 09:06

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Nitrate	U		0.0227	0.100

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

L1125452-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1125452-03 08/06/19 10:36 • (DUP) R3437845-3 08/06/19 10:50

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	ND	0.000	1	0.000		20

<sup>5</sup>Sr

<sup>6</sup>Qc

Laboratory Control Sample (LCS)

(LCS) R3437845-2 08/06/19 09:21

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Nitrate	8.00	8.01	100	90.0-110	

<sup>7</sup>Gl

<sup>8</sup>Al

L1125452-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1125452-04 08/06/19 11:05 • (MS) R3437845-4 08/06/19 11:20 • (MSD) R3437845-5 08/06/19 11:35

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Nitrate	5.00	ND	4.87	4.94	97.4	98.8	1	80.0-120			1.47	20

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3437958-1 08/05/19 15:52

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

L1124349-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1124349-01 08/05/19 17:08 • (DUP) R3437958-3 08/05/19 17:33

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Perchlorate	0.00349	0.00383	1	9.44	E4	15

<sup>5</sup> Sr

<sup>6</sup> Qc

Laboratory Control Sample (LCS)

(LCS) R3437958-2 08/05/19 16:42

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.00985	98.5	90.0-110	

<sup>7</sup> Gl

<sup>8</sup> Al

L1124368-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1124368-01 08/05/19 17:59 • (MS) R3437958-4 08/05/19 18:24 • (MSD) R3437958-5 08/05/19 18:49

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	0.00733	0.0159	0.0153	85.5	80.2	1	80.0-120			3.39	15

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3437959-3 08/06/19 16:36

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

Laboratory Control Sample (LCS)

(LCS) R3437959-1 08/05/19 16:42

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00985	98.5	90.0-110	

L1125450-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125450-01 08/06/19 15:45 • (MS) R3437959-2 08/06/19 16:11

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	ND	0.0108	108	1	80.0-120	

L1125452-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125452-01 08/06/19 14:04 • (MS) R3437959-4 08/06/19 18:18

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.233	0.336	103	10	80.0-120	

L1125452-03 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125452-03 08/06/19 14:29 • (MS) R3437959-5 08/06/19 18:43

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.340	0.441	102	10	80.0-120	

L1125452-04 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125452-04 08/06/19 14:55 • (MS) R3437959-6 08/06/19 19:09

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.347	0.446	99.6	10	80.0-120	



L1125452-05 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125452-05 08/06/19 15:20 • (MS) R3437959-7 08/06/19 19:34

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>
Perchlorate	0.0100	0.360	0.462	102	10	80.0-120	

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc





Method Blank (MB)

(MB) R3437851-1 08/06/19 13:53

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1125027-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1125027-01 08/06/19 14:00 • (DUP) R3437851-3 08/06/19 14:01

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	3.59	4.02	1	11.3		20

L1125038-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1125038-01 08/06/19 14:27 • (DUP) R3437851-7 08/06/19 14:28

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	5.20	5.18	2	0.385		20

Laboratory Control Sample (LCS)

(LCS) R3437851-2 08/06/19 13:54

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.89	94.5	90.0-110	

L1125030-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1125030-01 08/06/19 14:02 • (MS) R3437851-4 08/06/19 14:03 • (MSD) R3437851-5 08/06/19 14:05

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	17.3	18.0	17.6	28.0	12.0	1	90.0-110	E1 M3	E1 M3	2.25	20

L1125038-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1125038-01 08/06/19 14:08 • (MS) R3437851-6 08/06/19 14:11

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	5.34	6.04	28.0	1	90.0-110	E1 M2



Method Blank (MB)

(MB) R3437929-1 08/06/19 10:37

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.533	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

L1125452-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1125452-01 08/06/19 11:57 • (DUP) R3437929-3 08/06/19 12:10

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	9.12	8.85	1	3.03		20

6 Qc

Laboratory Control Sample (LCS)

(LCS) R3437929-2 08/06/19 11:36

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	77.4	103	85.0-115	

7 Gl

8 Al

L1125452-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1125452-05 08/06/19 13:01 • (MS) R3437929-4 08/06/19 13:30 • (MSD) R3437929-5 08/06/19 13:51

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	1.74	54.5	53.6	105	104	1	80.0-120			1.55	20

9 Sc



Method Blank (MB)

(MB) R3437881-3 08/06/19 12:55

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	99.0			80.0-120
(S) 4-Bromofluorobenzene	94.5			77.0-126
(S) 1,2-Dichloroethane-d4	102			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3437881-1 08/06/19 11:34 • (LCSD) R3437881-2 08/06/19 11:54

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0255	0.0275	102	110	71.0-124			7.58	20
(S) Toluene-d8				95.5	92.7	80.0-120				
(S) 4-Bromofluorobenzene				92.4	93.6	77.0-126				
(S) 1,2-Dichloroethane-d4				119	120	70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3437894-3 08/06/19 13:55

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.7			77.0-127

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3437894-1 08/06/19 12:57 • (LCSD) R3437894-2 08/06/19 13:16

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,4-Dioxane	0.0500	0.0408	0.0434	81.5	86.7	55.0-138			6.18	24
(S) Toluene-d8				99.8	100	77.0-127				

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

## Qualifier Description

B1	Target analyte detected in method blank at or above the method reporting limit.
E1	Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

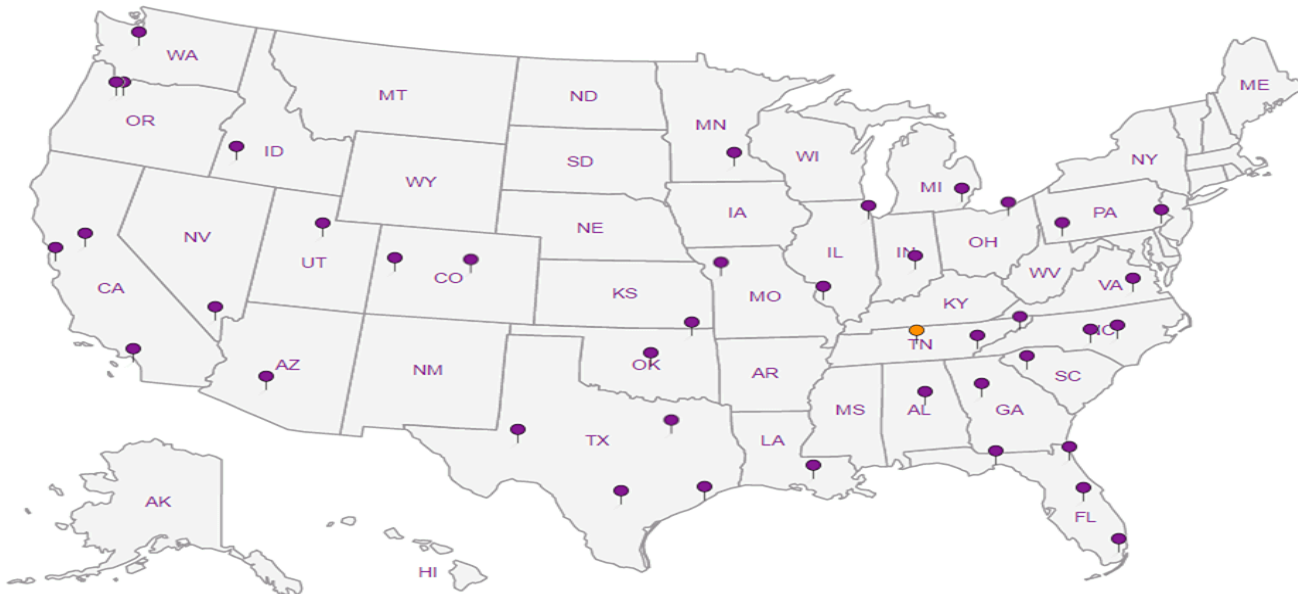
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn



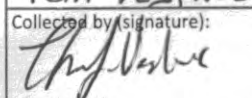
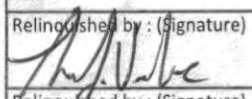
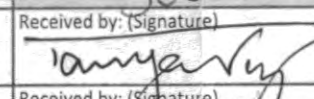
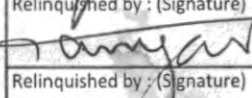
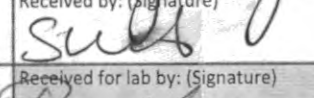


5 Sr

6 Qc

7 Gl

8 Al

9 Sc

<b>UTC - Arcadis</b> 410 North 44th St. Suite 1000 Phoenix AZ 85008 Report to: <b>Thomas Vespapec</b>			Billing Information: <b>Accounts Payable</b> 630 Plaza Drive, Suite 600 Highlands Ranch, CO 80129 Email To: thomas.vespapec@arcadis.com			Analysis / Container / Preservative Pres Chk										Chain of Custody Page 1 of 1  12065 Lebanon Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-767-5859 Fax: 615-758-5859 																																																																																																																																																																																																										
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* Matrix: SS - Soil AIR - Air F - Filter GW - Groundwater B - Bioassay WW - WasteWater DW - Drinking Water OT - Other		Remarks: <b>**NITRATE** has a 48hr hold time.</b> pH _____ Temp _____ Flow _____ Other _____										Sample Receipt Checklist COC Seal Present/Intact: <input checked="" type="checkbox"/> NP <input type="checkbox"/> Y <input type="checkbox"/> N COC Signed/Accurate: <input type="checkbox"/> Y <input type="checkbox"/> N Bottles arrive intact: <input type="checkbox"/> Y <input type="checkbox"/> N Correct bottles used: <input type="checkbox"/> Y <input type="checkbox"/> N Sufficient volume sent: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N If Applicable VOA Zero Headspace: <input type="checkbox"/> Y <input type="checkbox"/> N Preservation Correct/Checked: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N																																																																																																																																																																																																														
Relinquished by: (Signature) 		Date: <b>8/5/19</b>		Time: <b>1430</b>		Received by: (Signature) 		Trip Blank Received: Yes (No) HCl / MeOH TBR		If preservation required by Login: Date/Time																																																																																																																																																																																																																
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Relinquished by: (Signature) 		Date:		Time:		Received for lab by: (Signature) 		Date: <b>8-6-19</b>		Time: <b>0800</b>		Condition: <b>NCF / OK</b>																																																																																																																																																																																																														

ESLAB



August 10, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1126435  
Samples Received: 08/08/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b>3</b> Ss
SP-201-080719 L1126435-01	<b>5</b>	
SP-301-080719 L1126435-02	<b>6</b>	<b>4</b> Cn
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b>5</b> Sr
Gravimetric Analysis by Method 2540 D-2011	<b>7</b>	
Wet Chemistry by Method 300.0	<b>8</b>	<b>6</b> Qc
Wet Chemistry by Method 314.0 Mod	<b>9</b>	
Wet Chemistry by Method 365.4	<b>10</b>	<b>7</b> Gl
Wet Chemistry by Method 9060A	<b>11</b>	
<b>Gl: Glossary of Terms</b>	<b>12</b>	<b>8</b> Al
<b>Al: Accreditations &amp; Locations</b>	<b>13</b>	
<b>Sc: Sample Chain of Custody</b>	<b>14</b>	<b>9</b> Sc

# SAMPLE SUMMARY



SP-201-080719 L1126435-01 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/07/19 13:30  
 Received date/time: 08/08/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1325281	1	08/08/19 11:47	08/08/19 11:59	MMF	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1325116	1	08/08/19 11:10	08/08/19 11:10	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1325138	100	08/08/19 11:47	08/08/19 11:47	ELN	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1326003	1	08/09/19 13:43	08/09/19 19:15	JER	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

SP-301-080719 L1126435-02 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/07/19 13:40  
 Received date/time: 08/08/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1325281	1	08/08/19 11:47	08/08/19 11:59	MMF	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1325116	1	08/08/19 11:30	08/08/19 11:30	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1325138	10	08/08/19 12:40	08/08/19 12:40	ELN	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1326003	1	08/09/19 13:43	08/09/19 19:16	JER	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1323252	1	08/08/19 14:20	08/08/19 14:20	VRP	Mt. Juliet, TN

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	08/08/2019 11:59	<a href="#">WG1325281</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	1.89		0.100	1	08/08/2019 11:10	<a href="#">WG1325116</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	2.39		0.400	100	08/08/2019 11:47	<a href="#">WG1325138</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	08/09/2019 19:15	<a href="#">WG1326003</a>

7 Gl

8 Al

9 Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	08/08/2019 11:59	<a href="#">WG1325281</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/08/2019 11:30	<a href="#">WG1325116</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.230		0.0400	10	08/08/2019 12:40	<a href="#">WG1325138</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	2.07		0.100	1	08/09/2019 19:16	<a href="#">WG1326003</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	ND		1.00	1	08/08/2019 14:20	<a href="#">WG1323252</a>

9 Sc



Method Blank (MB)

(MB) R3438669-1 08/08/19 11:59

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Suspended Solids	U		0.350	2.50

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1126466-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126466-01 08/08/19 11:59 • (DUP) R3438669-3 08/08/19 11:59

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Suspended Solids	271	271	1	0.000		5

Laboratory Control Sample (LCS)

(LCS) R3438669-2 08/08/19 11:59

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Suspended Solids	773	784	101	85.0-115	





Method Blank (MB)

(MB) R3438627-1 08/08/19 09:56

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1126446-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126446-01 08/08/19 12:32 • (DUP) R3438627-3 08/08/19 12:49

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	ND	0.0861	1	0.000		20

L1126448-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126448-01 08/08/19 18:42 • (DUP) R3438627-6 08/08/19 19:35

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	0.547	0.536	1	1.98		20

Laboratory Control Sample (LCS)

(LCS) R3438627-2 08/08/19 10:14

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Nitrate	8.00	8.26	103	90.0-110	

L1126446-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1126446-01 08/08/19 12:32 • (MS) R3438627-4 08/08/19 13:07 • (MSD) R3438627-5 08/08/19 13:25

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Nitrate	5.00	ND	4.13	4.17	80.7	81.5	1	80.0-120			0.877	20

L1126448-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1126448-01 08/08/19 18:42 • (MS) R3438627-7 08/08/19 19:52

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Nitrate	5.00	0.547	5.59	101	1	80.0-120	



Method Blank (MB)

(MB) R3438660-1 08/08/19 09:25

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1126435-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126435-01 08/08/19 11:47 • (DUP) R3438660-3 08/08/19 12:14

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Perchlorate	2.39	2.38	100	0.457		15

Laboratory Control Sample (LCS)

(LCS) R3438660-2 08/08/19 10:16

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0100	100	90.0-110	

L1126435-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1126435-02 08/08/19 12:40 • (MS) R3438660-4 08/08/19 13:05 • (MSD) R3438660-5 08/08/19 13:30

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	0.230	0.327	0.330	96.8	100	10	80.0-120			1.05	15



Method Blank (MB)

(MB) R3439093-1 08/09/19 18:51

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1127051-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1127051-01 08/09/19 19:47 • (DUP) R3439093-3 08/09/19 19:49

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.28	1.14	1	11.6		20

L1127076-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1127076-02 08/09/19 19:54 • (DUP) R3439093-6 08/09/19 19:55

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	223	240	50	7.34		20

Laboratory Control Sample (LCS)

(LCS) R3439093-2 08/09/19 18:52

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.82	91.0	90.0-110	

L1127051-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127051-01 08/09/19 19:47 • (MS) R3439093-4 08/09/19 19:50 • (MSD) R3439093-5 08/09/19 19:51

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	1.28	3.54	3.50	90.4	88.8	1	90.0-110		M2	1.14	20

L1127076-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1127076-02 08/09/19 19:54 • (MS) R3439093-7 08/09/19 19:56

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	0.0500	223	236	500	50	90.0-110	M3



Method Blank (MB)

(MB) R3438681-1 08/07/19 14:57

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.502	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1125031-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1125031-01 08/07/19 21:49 • (DUP) R3438681-5 08/07/19 22:05

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	105	104	2	0.862		20

L1125031-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1125031-03 08/08/19 12:40 • (DUP) R3438681-6 08/08/19 12:59

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	7.83	7.96	1	1.63		20

Laboratory Control Sample (LCS)

(LCS) R3438681-2 08/07/19 15:42

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	77.7	104	85.0-115	

L1124604-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1124604-02 08/07/19 17:25 • (MS) R3438681-3 08/07/19 17:52 • (MSD) R3438681-4 08/07/19 18:13

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	6.01	59.1	58.2	106	104	1	80.0-120			1.45	20

L1125031-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1125031-04 08/08/19 13:16 • (MS) R3438681-7 08/08/19 13:41 • (MSD) R3438681-8 08/08/19 14:02

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	9.34	61.4	64.0	104	109	1	80.0-120			4.26	20



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

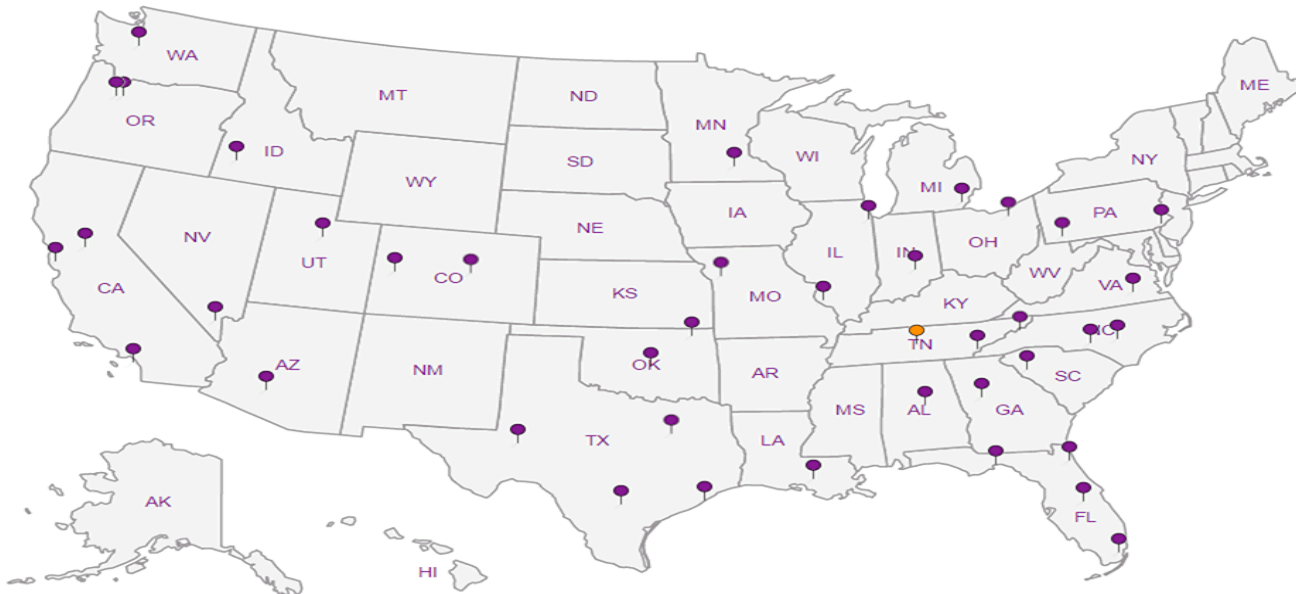
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespapec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
**Tom Vespapec**

Collected by (signature):  
*Tom Vespapec*  
Immediately  
Packed on Ice N \_\_\_ Y **X**

Client Project #  
**03994018.0028**

Site/Facility ID #  
**UPCO**

Rush? (Lab MUST Be Notified)  
 Same Day \_\_\_ Five Day  
\_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
\_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
\_\_\_ Three Day

City/State  
Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

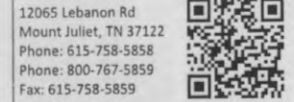
P.O. #

Quote #  
Date Results Needed

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



L# **1126435**  
**G238**

Acctnum: **UTCARCA**  
Template: **T152379**  
Prelogin: **P717001**  
TSR: **526 - Chris McCord**  
PB: **6-28-19**

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-241-080719	G	GW	-	8/7/19	1330	4	X					X			X	X	RUSH	01
SP-341-080719	G	GW	-	8/7/19	1340	5	X					X		X	X	X	RUSH	02
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
\_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier \_\_\_ Tracking #

pH \_\_\_ Temp \_\_\_  
Flow \_\_\_ Other \_\_\_

Sample Receipt Checklist  
COC Seal Present/Intact: \_\_\_ NP  Y \_\_\_ N  
COC Signed/Accurate: \_\_\_  Y \_\_\_ N  
Bottles arrive intact: \_\_\_  Y \_\_\_ N  
Correct bottles used: \_\_\_  Y \_\_\_ N  
Sufficient volume sent: \_\_\_  Y \_\_\_ N  
If Applicable  
VOA Zero Headspace: \_\_\_  Y \_\_\_ N  
Preservation Correct/Checked: \_\_\_  Y \_\_\_ N  
**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature) <i>Tom Vespapec</i>	Date: 8/7/19	Time: 1356	Received by: (Signature) <i>Samyary</i>	Trip Blank Received: Yes / <input checked="" type="checkbox"/> No HCL / MeoH TBR
Relinquished by: (Signature) <i>Samyary</i>	Date: 8/7/19	Time: 1800	Received by: (Signature) <i>Samyary</i>	Temp: <b>43.6°C</b> <b>3.5 + 3 = 7.8</b> Bottles Received: <b>9</b>
Relinquished by: (Signature) <i>Samyary</i>	Date:	Time:	Received for lab by: (Signature) <i>Carol Henry</i>	Date: <b>8/8/19</b> Time: <b>CK</b> Hold: <b>8:00</b> Condition: <b>NCF / OK</b>

ESCARB



## UTC - Arcadis

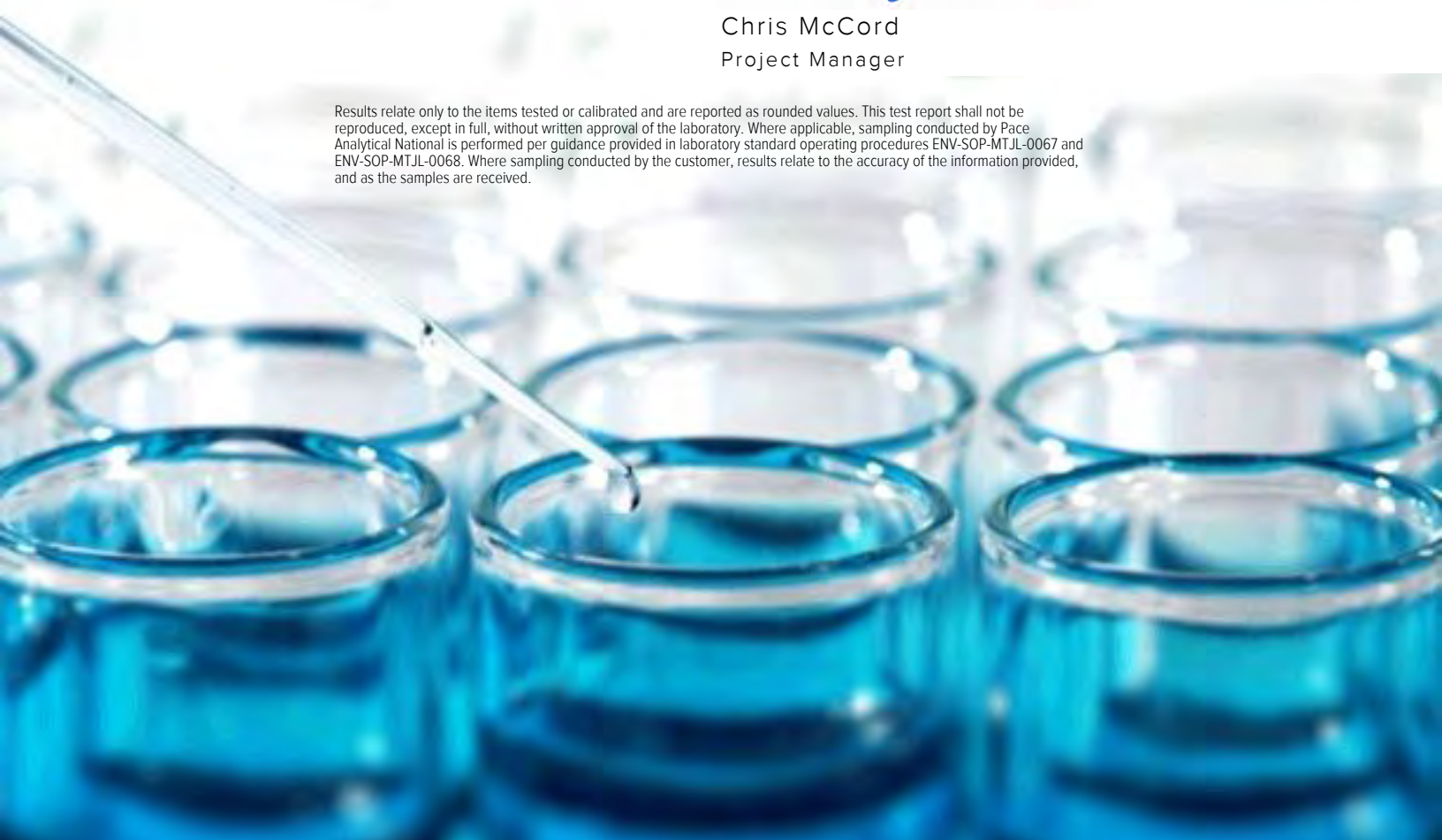
Sample Delivery Group: L1127048  
Samples Received: 08/09/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b>3</b> Ss
SP201-080819 L1127048-01	<b>5</b>	
SP301-080819 L1127048-02	<b>6</b>	<b>4</b> Cn
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b>5</b> Sr
Gravimetric Analysis by Method 2540 D-2011	<b>7</b>	
Wet Chemistry by Method 300.0	<b>8</b>	<b>6</b> Qc
Wet Chemistry by Method 314.0 Mod	<b>9</b>	
Wet Chemistry by Method 365.4	<b>10</b>	<b>7</b> Gl
Wet Chemistry by Method 9060A	<b>12</b>	
<b>Gl: Glossary of Terms</b>	<b>13</b>	<b>8</b> Al
<b>Al: Accreditations &amp; Locations</b>	<b>14</b>	
<b>Sc: Sample Chain of Custody</b>	<b>15</b>	<b>9</b> Sc

# SAMPLE SUMMARY



SP201-080819 L1127048-01 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/08/19 13:40  
 Received date/time: 08/09/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1325871	1	08/09/19 10:24	08/09/19 10:41	MMF	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1325720	1	08/09/19 10:14	08/09/19 10:14	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1325862	100	08/09/19 13:01	08/09/19 13:01	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1325749	1	08/09/19 09:16	08/09/19 16:22	JER	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

SP301-080819 L1127048-02 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/08/19 13:50  
 Received date/time: 08/09/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1325871	1	08/09/19 10:24	08/09/19 10:41	MMF	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1325720	1	08/09/19 10:28	08/09/19 10:28	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1325862	10	08/09/19 13:27	08/09/19 13:27	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1325749	1	08/09/19 09:16	08/09/19 16:23	JER	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1325876	1	08/09/19 15:08	08/09/19 15:08	VRP	Mt. Juliet, TN

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	08/09/2019 10:41	<a href="#">WG1325871</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	1.83		0.100	1	08/09/2019 10:14	<a href="#">WG1325720</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.427		0.400	100	08/09/2019 13:01	<a href="#">WG1325862</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	08/09/2019 16:22	<a href="#">WG1325749</a>

7 Gl

8 Al

9 Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	08/09/2019 10:41	<a href="#">WG1325871</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/09/2019 10:28	<a href="#">WG1325720</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.240		0.0400	10	08/09/2019 13:27	<a href="#">WG1325862</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	1.23		0.100	1	08/09/2019 16:23	<a href="#">WG1325749</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	1.84	<u>B1</u>	1.00	1	08/09/2019 15:08	<a href="#">WG1325876</a>

9 Sc



Method Blank (MB)

(MB) R3439007-1 08/09/19 10:41

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Suspended Solids	U		0.350	2.50

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

L1126977-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126977-01 08/09/19 10:41 • (DUP) R3439007-3 08/09/19 10:41

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Suspended Solids	49.0	48.0	1	2.06		5

<sup>4</sup> Cn

<sup>5</sup> Sr

Laboratory Control Sample (LCS)

(LCS) R3439007-2 08/09/19 10:41

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Suspended Solids	773	756	97.8	85.0-115	

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Method Blank (MB)

(MB) R3438888-1 08/09/19 08:36

Analyte	MB Result mg/l	<u>MB Qualifier</u>	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

Laboratory Control Sample (LCS)

(LCS) R3438888-2 08/09/19 08:51

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Nitrate	8.00	8.11	101	90.0-110	

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3439063-1 08/09/19 11:45

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

L1127048-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1127048-01 08/09/19 13:01 • (DUP) R3439063-3 08/09/19 13:55

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.427	0.470	100	9.58		15

<sup>5</sup>Sr

<sup>6</sup>Qc

Laboratory Control Sample (LCS)

(LCS) R3439063-2 08/09/19 12:36

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00983	98.3	90.0-110	

<sup>7</sup>Gl

<sup>8</sup>Al

L1127048-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127048-02 08/09/19 13:27 • (MS) R3439063-4 08/09/19 14:23 • (MSD) R3439063-5 08/09/19 14:48

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	0.240	0.337	0.330	96.9	90.0	10	80.0-120			2.06	15

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3439071-1 08/09/19 15:42

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1126575-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126575-01 08/09/19 15:45 • (DUP) R3439071-3 08/09/19 15:46

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.76	1.75	1	0.570		20

L1126604-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1126604-02 08/09/19 15:50 • (DUP) R3439071-5 08/09/19 15:51

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	2.86	2.77	1	3.20		20

L1126651-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126651-01 08/09/19 16:01 • (DUP) R3439071-8 08/09/19 16:03

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.07	1.10	1	2.76		20

Laboratory Control Sample (LCS)

(LCS) R3439071-2 08/09/19 15:43

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.80	90.0	90.0-110	



L1126629-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1126629-01 08/09/19 15:58 • (MS) R3439071-6 08/09/19 15:59 • (MSD) R3439071-7 08/09/19 16:00

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Phosphorus,Total	2.50	1.10	3.22	3.10	84.8	80.0	1	90.0-110	<u>M2</u>	<u>M2</u>	3.80	20

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Method Blank (MB)

(MB) R3439074-1 08/09/19 11:36

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.468	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1125457-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1125457-01 08/09/19 13:10 • (DUP) R3439074-3 08/09/19 13:29

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	64.7	64.3	1	0.636		20

Laboratory Control Sample (LCS)

(LCS) R3439074-2 08/09/19 12:27

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	76.1	101	85.0-115	

L1125457-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1125457-03 08/09/19 14:05 • (MS) R3439074-4 08/09/19 14:31 • (MSD) R3439074-5 08/09/19 14:50

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	7.96	56.9	59.5	97.9	103	1	80.0-120			4.38	20



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

B1	Target analyte detected in method blank at or above the method reporting limit.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Billing Information:

Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: thomas.vespalec@arcadis.com

Project  
Description: **UPCO**

City/State  
Collected: **AZ**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**Tom VESPALC**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*[Signature]*

Rush? (Lab MUST Be Notified)

Quote #

Immediately  
Packed on Ice N  Y

Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Date Results Needed

No. of  
Cntrs

Analysis / Container / Preservative

Chain of Custody Page 1 of 1

Pres  
Chk

**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40ml/Amb-HCl	1,4-Dioxane 8260B 40ml/Amb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250ml/Amb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4
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**Pace Analytical**  
National Center for Testing & Innovation

12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **112708**  
**G037**

Acctnum: **UTCARCA**  
Template: **T152379**  
Prelogin: **P717001**  
TSR: **526 - Chris McCord**  
PB: **6-28-196**  
Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40ml/Amb-HCl	1,4-Dioxane 8260B 40ml/Amb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250ml/Amb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP201-080819	8/8/19	GW	-	8/8/19	1340	4	X					X			X	X	RUSH	01
SP301-080819	8/8/19	GW	-	8/8/19	1350	5	X					X		X	X	X	RUSH	02
	GPAS	GW																
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

**Sample Receipt Checklist**

COC Seal Present/Intact:  Y  N  
COC Signed/Accurate:  Y  N  
Bottles arrive intact:  Y  N  
Correct bottles used:  Y  N  
Sufficient volume sent:  Y  N  
If Applicable  
VOA Zero Headpace:  Y  N  
Preservation Correct/Checked:  Y  N

**RAD SCR**

Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/8/19	Time: 1354	Received by: (Signature) <i>[Signature]</i>	Trip Blank Received: Yes/No HCL / MeOH TBR
Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/8/19	Time: 1800	Received by: (Signature) <i>[Signature]</i>	Temp: °C Bottles Received: 1.8/1.9/2.9 9
Relinquished by: (Signature) <i>[Signature]</i>	Date:	Time:	Received for lab by: (Signature) <i>[Signature]</i>	Date: 8/9/19 Time: 8:00 Hold: Condition: NCF / <input checked="" type="checkbox"/>

ESCARB

August 13, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1127529  
Samples Received: 08/10/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b>3</b> Ss
SP201-080919 L1127529-01	<b>5</b>	
SP301-080919 L1127529-02	<b>6</b>	<b>4</b> Cn
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b>5</b> Sr
Gravimetric Analysis by Method 2540 D-2011	<b>7</b>	
Wet Chemistry by Method 300.0	<b>8</b>	<b>6</b> Qc
Wet Chemistry by Method 314.0 Mod	<b>9</b>	
Wet Chemistry by Method 365.4	<b>10</b>	<b>7</b> Gl
Wet Chemistry by Method 9060A	<b>11</b>	
<b>Gl: Glossary of Terms</b>	<b>12</b>	<b>8</b> Al
<b>Al: Accreditations &amp; Locations</b>	<b>13</b>	
<b>Sc: Sample Chain of Custody</b>	<b>14</b>	<b>9</b> Sc

# SAMPLE SUMMARY



## SP201-080919 L1127529-01 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/09/19 13:30  
 Received date/time: 08/10/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1326369	1	08/10/19 11:09	08/10/19 11:09	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1327141	100	08/12/19 19:46	08/12/19 19:46	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1327125	1	08/10/19 13:33	08/12/19 12:38	SDL	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## SP301-080919 L1127529-02 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/09/19 13:30  
 Received date/time: 08/10/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1326562	1	08/11/19 00:22	08/11/19 01:50	TH	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1326369	1	08/10/19 11:23	08/10/19 11:23	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1327141	10	08/12/19 20:11	08/12/19 20:11	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1327125	1	08/10/19 13:33	08/12/19 12:45	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1326975	1	08/12/19 11:01	08/12/19 11:01	EEM	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	2.25		0.100	1	08/10/2019 11:09	<a href="#">WG1326369</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.902		0.400	100	08/12/2019 19:46	<a href="#">WG1327141</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	08/12/2019 12:38	<a href="#">WG1327125</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	08/11/2019 01:50	<a href="#">WG1326562</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/10/2019 11:23	<a href="#">WG1326369</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.209		0.0400	10	08/12/2019 20:11	<a href="#">WG1327141</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	1.22		0.100	1	08/12/2019 12:45	<a href="#">WG1327125</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	8.85		1.00	1	08/12/2019 11:01	<a href="#">WG1326975</a>

9 Sc





Method Blank (MB)

(MB) R3439261-1 08/11/19 01:50

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		0.350	2.50

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

L1127296-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1127296-02 08/11/19 01:50 • (DUP) R3439261-3 08/11/19 01:50

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	84.8	87.2	1	2.79		5

L1127296-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1127296-04 08/11/19 01:50 • (DUP) R3439261-4 08/11/19 01:50

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	64.8	66.4	1	2.44		5

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3439261-2 08/11/19 01:50

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	764	98.8	85.0-115	



Method Blank (MB)

(MB) R3439403-1 08/10/19 09:51

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1127403-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1127403-01 08/10/19 11:37 • (DUP) R3439403-3 08/10/19 11:52

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	ND	0.000	1	0.000		20

L1127548-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1127548-01 08/10/19 16:54 • (DUP) R3439403-6 08/10/19 17:09

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3439403-2 08/10/19 10:05

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Nitrate	8.00	8.22	103	90.0-110	

L1127403-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127403-01 08/10/19 11:37 • (MS) R3439403-4 08/10/19 12:06 • (MSD) R3439403-5 08/10/19 12:20

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Nitrate	5.00	ND	5.33	5.39	107	108	1	80.0-120			1.18	20

L1127548-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1127548-01 08/10/19 16:54 • (MS) R3439403-7 08/10/19 17:23

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Nitrate	5.00	ND	5.01	100	1	80.0-120	



Method Blank (MB)

(MB) R3439885-1 08/12/19 18:04

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

L1127530-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1127530-03 08/13/19 08:56 • (DUP) R3439885-6 08/13/19 09:23

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Perchlorate	2.65	2.69	100	1.72		15

<sup>6</sup> Qc

Laboratory Control Sample (LCS)

(LCS) R3439885-2 08/12/19 18:55

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0104	104	90.0-110	

<sup>7</sup> Gl

<sup>8</sup> Al

L1127530-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127530-04 08/12/19 21:02 • (MS) R3439885-4 08/12/19 21:53 • (MSD) R3439885-5 08/12/19 23:09

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	0.0763	0.0869	0.0868	106	105	1	80.0-120			0.0849	15

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3439557-1 08/12/19 12:27

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1127102-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1127102-01 08/12/19 12:35 • (DUP) R3439557-5 08/12/19 12:36

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	ND	0.000	1	0.000		20

L1127541-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1127541-01 08/12/19 12:47 • (DUP) R3439557-7 08/12/19 12:49

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.39	1.33	1	4.41		20

Laboratory Control Sample (LCS)

(LCS) R3439557-3 08/12/19 12:32

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.83	91.5	90.0-110	

L1127101-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127101-01 08/12/19 12:29 • (MS) R3439557-2 08/12/19 12:31 • (MSD) R3439557-4 08/12/19 12:33

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	ND	2.56	2.56	102	102	1	90.0-110			0.000	20

L1127102-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1127102-01 08/12/19 12:35 • (MS) R3439557-6 08/12/19 12:37

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	ND	2.52	98.5	1	90.0-110	



Method Blank (MB)

(MB) R3439625-1 08/12/19 09:56

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.497	E4	0.102	1.00

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

L1125481-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1125481-02 08/12/19 11:22 • (DUP) R3439625-3 08/12/19 11:38

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	246	242	10	1.76		20

<sup>4</sup>Cn

<sup>5</sup>Sr

Laboratory Control Sample (LCS)

(LCS) R3439625-2 08/12/19 10:42

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	78.6	105	85.0-115	

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
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Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.





**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Billing Information:

Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: thomas.vespalec@arcadis.com

Analysis / Container / Preservative



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

City/State  
Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**TOM VESPALEC**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*[Signature]*

Rush? (Lab MUST Be Notified)  
 Same Day \_\_\_ Five Day  
\_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
\_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
\_\_\_ Three Day

Quote #

Date Results Needed

Immediately Packed on Ice N \_\_\_ Y

No. of Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRAB+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP201-080919	GRAB	GW		080919	13:30	3	X					X				X	RUSH	-01
SP301-080919	GRAB	GW		080919	13:30	5	X					X		X	X	X	RUSH	-02
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: \*\*NITRATE\*\* has a 48hr hold time.

**RAD SCREEN: <0.5 mR/hr**

pH \_\_\_ Temp \_\_\_

Flow \_\_\_ Other \_\_\_

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

Sample Receipt Checklist

COC Seal Present/Intact:	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
COC Signed/Accurate:	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
Bottles arrive intact:	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
Correct bottles used:	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
Sufficient volume sent:	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
If Applicable	
VOA Zero Headpace:	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
Preservation Correct/Checked:	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N

Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/9/19	Time: 1355	Received by: (Signature) <i>[Signature]</i>	Trip Blank Received: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No HCE/MeoH TBR	Bottles Received: <b>3</b>	If preservation required by Login: Date/Time
Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/9/19	Time: 1800	Received by: (Signature) <i>[Signature]</i>	Temp: °C 32±0=32 AP AS		
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) <i>[Signature]</i>	Date: 8/10/19	Time: 8:00	Hold: Condition: NCF / <input checked="" type="checkbox"/> OK

ESCARB

## UTC - Arcadis

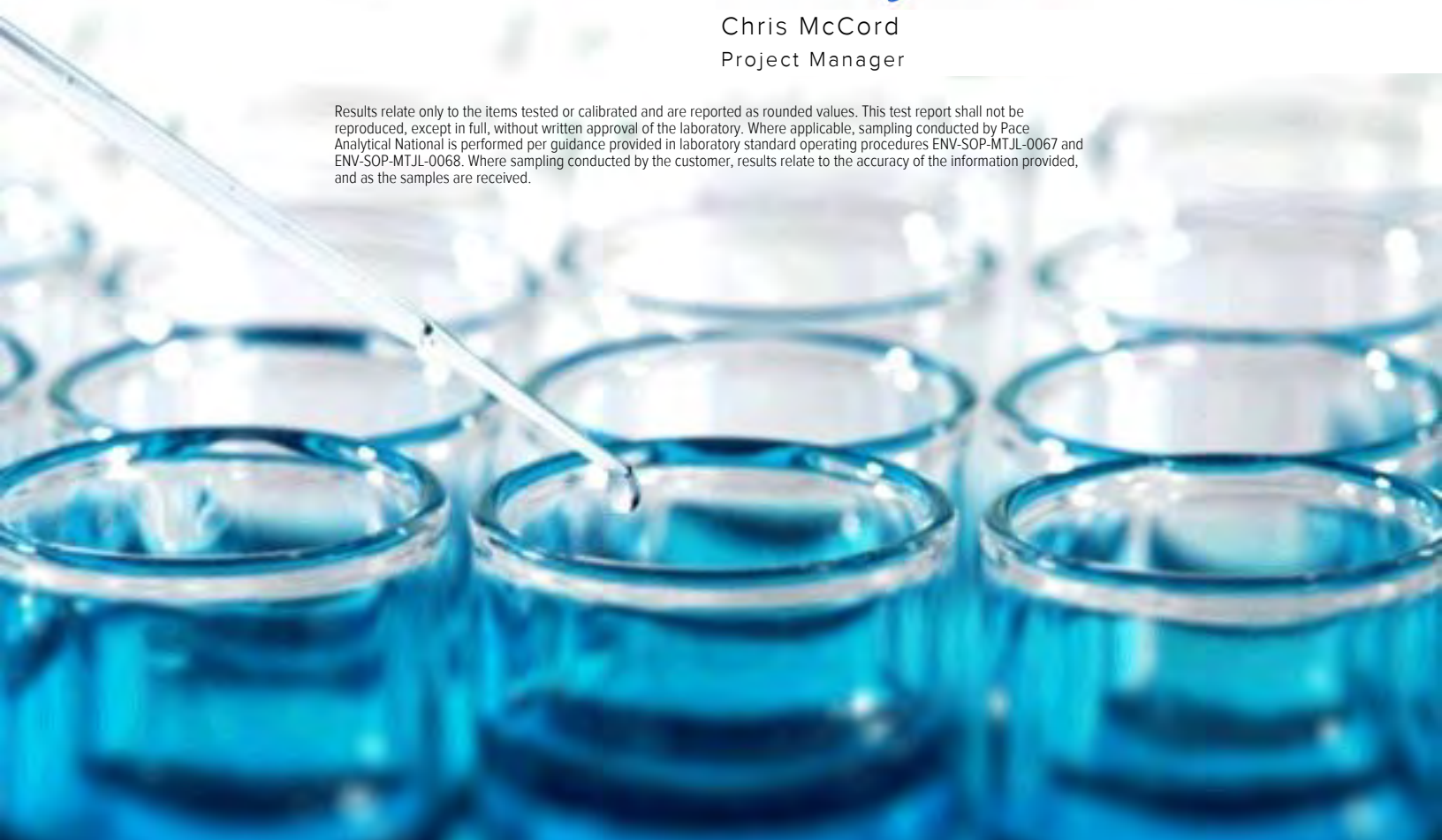
Sample Delivery Group: L1127530  
Samples Received: 08/10/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>2</sup>Tc</b>
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>3</sup>Ss</b>
<b>SP-701-080919 L1127530-01</b>	<b>5</b>	
<b>TRIP BLANK L1127530-02</b>	<b>6</b>	<b><sup>4</sup>Cn</b>
<b>EW1-080919 L1127530-03</b>	<b>7</b>	<b><sup>5</sup>Sr</b>
<b>EW2-080919 L1127530-04</b>	<b>8</b>	
<b>Qc: Quality Control Summary</b>	<b>9</b>	<b><sup>6</sup>Qc</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>9</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Gl: Glossary of Terms</b>	<b>12</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>13</b>	<b><sup>9</sup>Sc</b>
<b>Sc: Sample Chain of Custody</b>	<b>14</b>	

# SAMPLE SUMMARY

## SP-701-080919 L1127530-01 GW

Collected by  
Tom Vespaiec  
Collected date/time  
08/09/19 13:50  
Received date/time  
08/10/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1327141	1	08/12/19 19:20	08/12/19 19:20	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1326490	1	08/10/19 15:53	08/10/19 15:53	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1327007	1	08/12/19 14:10	08/12/19 14:10	BMB	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## TRIP BLANK L1127530-02 GW

Collected by  
Tom Vespaiec  
Collected date/time  
08/09/19 00:00  
Received date/time  
08/10/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1326490	1	08/10/19 15:33	08/10/19 15:33	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1327007	1	08/12/19 13:50	08/12/19 13:50	BMB	Mt. Juliet, TN

## EW1-080919 L1127530-03 GW

Collected by  
Tom Vespaiec  
Collected date/time  
08/09/19 13:25  
Received date/time  
08/10/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1327141	100	08/13/19 08:56	08/13/19 08:56	LBR	Mt. Juliet, TN

## EW2-080919 L1127530-04 GW

Collected by  
Tom Vespaiec  
Collected date/time  
08/09/19 13:25  
Received date/time  
08/10/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1327141	1	08/12/19 21:02	08/12/19 21:02	LBR	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Perchlorate	mg/l		mg/l		date / time	
	ND		0.00400	1	08/12/2019 19:20	<a href="#">WG1327141</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,1-Dichloroethene	mg/l		mg/l		date / time	
	ND		0.00100	1	08/10/2019 15:53	<a href="#">WG1326490</a>
(S) Toluene-d8	104		80.0-120		08/10/2019 15:53	<a href="#">WG1326490</a>
(S) 4-Bromofluorobenzene	111		77.0-126		08/10/2019 15:53	<a href="#">WG1326490</a>
(S) 1,2-Dichloroethane-d4	118		70.0-130		08/10/2019 15:53	<a href="#">WG1326490</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,4-Dioxane	mg/l		mg/l		date / time	
	ND		0.00300	1	08/12/2019 14:10	<a href="#">WG1327007</a>
(S) Toluene-d8	96.3		77.0-127		08/12/2019 14:10	<a href="#">WG1327007</a>

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	08/10/2019 15:33	<a href="#">WG1326490</a>
(S) Toluene-d8	102		80.0-120		08/10/2019 15:33	<a href="#">WG1326490</a>
(S) 4-Bromofluorobenzene	102		77.0-126		08/10/2019 15:33	<a href="#">WG1326490</a>
(S) 1,2-Dichloroethane-d4	117		70.0-130		08/10/2019 15:33	<a href="#">WG1326490</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	08/12/2019 13:50	<a href="#">WG1327007</a>
(S) Toluene-d8	95.7		77.0-127		08/12/2019 13:50	<a href="#">WG1327007</a>

6 Qc

7 Gl

8 Al

9 Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	2.65		0.400	100	08/13/2019 08:56	<a href="#">WG1327141</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0763		0.00400	1	08/12/2019 21:02	<a href="#">WG1327141</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3439885-1 08/12/19 18:04

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1127530-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1127530-03 08/13/19 08:56 • (DUP) R3439885-6 08/13/19 09:23

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Perchlorate	2.65	2.69	100	1.72		15

Laboratory Control Sample (LCS)

(LCS) R3439885-2 08/12/19 18:55

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0104	104	90.0-110	

L1127530-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127530-04 08/12/19 21:02 • (MS) R3439885-4 08/12/19 21:53 • (MSD) R3439885-5 08/12/19 23:09

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	0.0763	0.0869	0.0868	106	105	1	80.0-120			0.0849	15



Method Blank (MB)

(MB) R3439257-3 08/10/19 14:54

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	108			80.0-120
(S) 4-Bromofluorobenzene	107			77.0-126
(S) 1,2-Dichloroethane-d4	119			70.0-130

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3439257-1 08/10/19 13:56 • (LCSD) R3439257-2 08/10/19 14:15

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0263	0.0259	105	103	71.0-124			1.48	20
(S) Toluene-d8				106	105	80.0-120				
(S) 4-Bromofluorobenzene				113	109	77.0-126				
(S) 1,2-Dichloroethane-d4				123	115	70.0-130				

6 Qc

7 Gl

8 Al

L1126755-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1126755-03 08/10/19 19:47 • (MS) R3439257-4 08/10/19 21:44 • (MSD) R3439257-5 08/10/19 22:03

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	ND	0.0220	0.0286	88.0	114	1	11.0-160			26.0	29
(S) Toluene-d8					104	104		80.0-120				
(S) 4-Bromofluorobenzene					108	114		77.0-126				
(S) 1,2-Dichloroethane-d4					114	115		70.0-130				

9 Sc



Method Blank (MB)

(MB) R3439617-3 08/12/19 13:30

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	95.7			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3439617-1 08/12/19 12:25 • (LCSD) R3439617-2 08/12/19 12:45

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0370	0.0348	73.9	69.5	55.0-138			6.08	24
(S) Toluene-d8				96.1	95.5	77.0-127				

5 Sr

6 Qc

L1126990-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1126990-01 08/12/19 15:09 • (MS) R3439617-4 08/12/19 15:48 • (MSD) R3439617-5 08/12/19 16:07

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	ND	0.0431	0.0460	86.1	92.0	1	13.0-160			6.61	31
(S) Toluene-d8					96.5	96.7		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

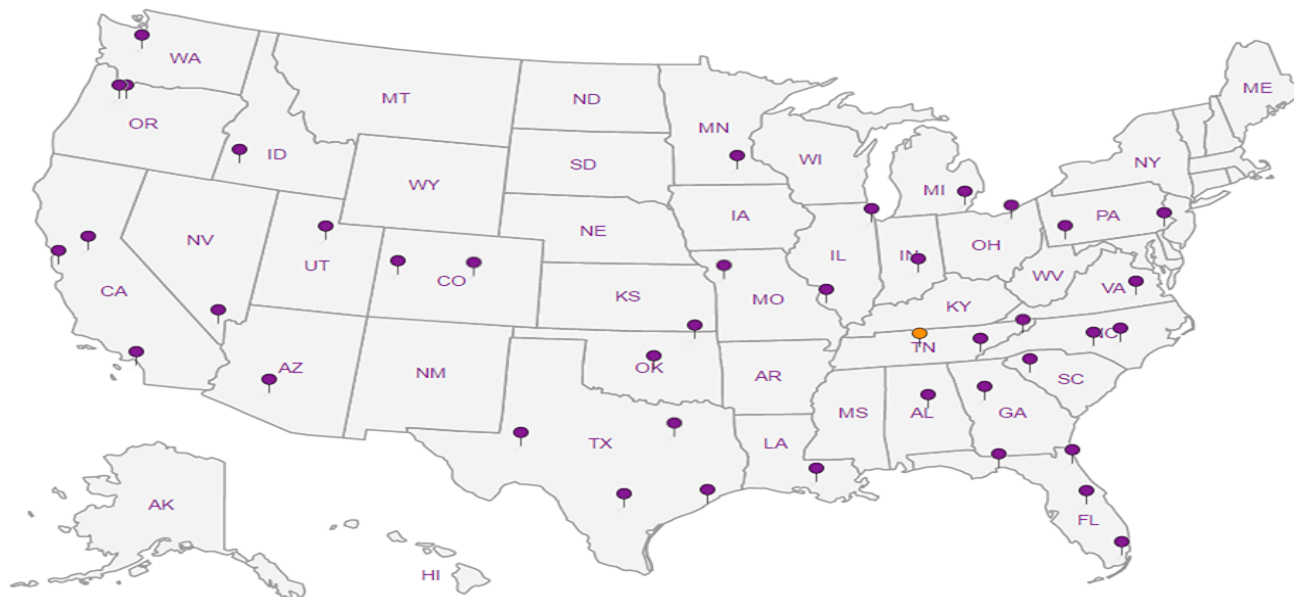
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespapec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
**Tom Vespapec**

Collected by (signature):  
*Tom Vespapec*  
Immediately  
Packed on Ice N  Y

Client Project #  
**03994018.0028**

Site/Facility ID #  
**UPCO**

**Rush?** (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Billing Information:  
Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespapec@arcadis.com**

City/State  
Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #  
Date Results Needed

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **L1127530**  
**B172**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: **526 - Chris McCord**

PB: **6-28-196m**

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-701-080919	G	GW	-	8/9/19	1350	4	X	X				X					RUSH	101
TRIP BLANK	G	GW	-	8/9/19	-	1	X	X										
		GW																
EW1-080919	G	GW	-	8/9/19	1325	1						X					RUSH	103
EW2-080919	G	GW	-	8/9/19	1325	1						X					RUSH	104
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

**RAD SCREEN: <0.5 mR/hr**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

Sample Receipt Checklist  
COC Seal Present/Intact:  NP  Y  N  
COC Signed/Accurate:  Y  N  
Bottles arrive intact:  Y  N  
Correct bottles used:  Y  N  
Sufficient volume sent:  Y  N  
If Applicable  
VOA Zero Headpace:  Y  N  
Preservation Correct/Checked:  Y  N

Relinquished by: (Signature) <i>Tom Vespapec</i>	Date: 8/9/19	Time: 1355	Received by: (Signature) <i>Janey</i>	Trip Blank Received: Yes/No <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Temp: °C 3.2 ± 0.32	Bottles Received: 6	If preservation required by Login: Date/Time
Relinquished by: (Signature) <i>Janey</i>	Date: 8/9/19	Time: 1800	Received by: (Signature) <i>ESAB</i>	Temp: °C 3.2 ± 0.32	Bottles Received: 6	Hold:	Condition: NCF / (OK)
Relinquished by: (Signature) <i>ESAB</i>	Date:	Time:	Received for lab by: (Signature) <i>ESAB</i>	Date: 8-10-19	Time: 0800	Hold:	Condition: NCF / (OK)

ESAB

## UTC - Arcadis

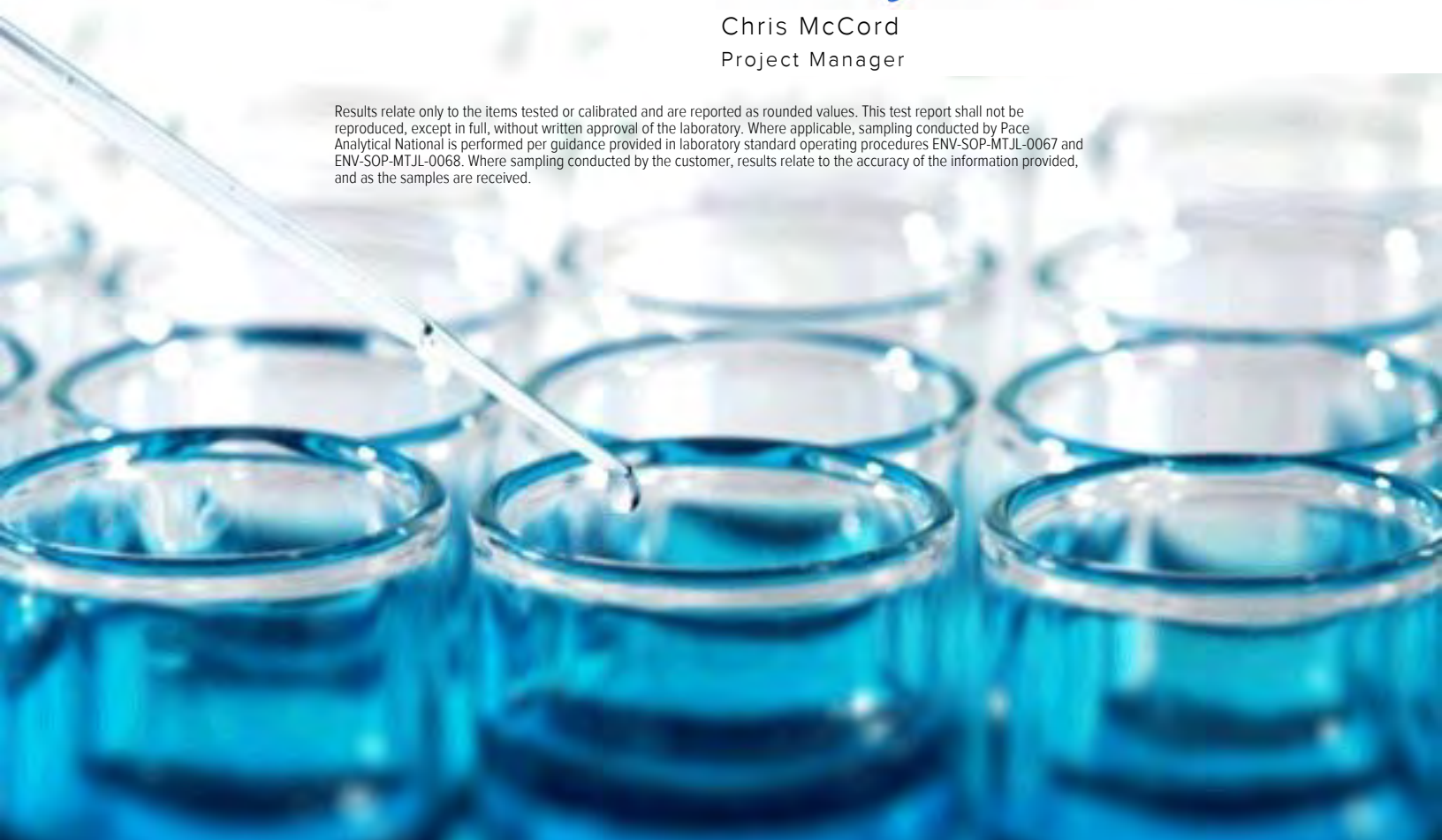
Sample Delivery Group: L1127945  
Samples Received: 08/13/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





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# SAMPLE SUMMARY

## SP-201-081119 L1127945-01 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/11/19 15:55  
 Received date/time: 08/13/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1327564	1	08/13/19 10:39	08/13/19 10:39	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1327141	100	08/13/19 12:30	08/13/19 12:30	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1327287	1	08/13/19 11:00	08/13/19 14:43	SDL	Mt. Juliet, TN

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## SP-301-081119 L1127945-02 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/11/19 16:00  
 Received date/time: 08/13/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1327544	1	08/13/19 10:39	08/13/19 11:14	TH	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1327564	1	08/13/19 10:54	08/13/19 10:54	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1327141	1	08/13/19 13:58	08/13/19 13:58	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1327287	1	08/13/19 11:00	08/13/19 14:44	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1327576	1	08/13/19 11:43	08/13/19 11:43	VRP	Mt. Juliet, TN

## EW-1-081119 L1127945-03 GW

Collected by: Tom Vespaiec  
 Collected date/time: 08/11/19 15:45  
 Received date/time: 08/13/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1327141	100	08/13/19 13:23	08/13/19 13:23	LBR	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	2.30		0.100	1	08/13/2019 10:39	<a href="#">WG1327564</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	1.28		0.400	100	08/13/2019 12:30	<a href="#">WG1327141</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.141	<u>B1</u>	0.100	1	08/13/2019 14:43	<a href="#">WG1327287</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	08/13/2019 11:14	<a href="#">WG1327544</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/13/2019 10:54	<a href="#">WG1327564</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	08/13/2019 13:58	<a href="#">WG1327141</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.848		0.100	1	08/13/2019 14:44	<a href="#">WG1327287</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	7.56		1.00	1	08/13/2019 11:43	<a href="#">WG1327576</a>

9 Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	4.06		0.400	100	08/13/2019 13:23	<a href="#">WG1327141</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3439971-1 08/13/19 11:14

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		0.350	2.50

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

L1126698-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126698-01 08/13/19 11:14 • (DUP) R3439971-3 08/13/19 11:14

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	3860	4120	1	6.52	R8	5

Laboratory Control Sample (LCS)

(LCS) R3439971-2 08/13/19 11:14

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	772	99.9	85.0-115	

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3439914-1 08/13/19 08:31

Analyte	MB Result mg/l	<u>MB Qualifier</u>	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

Laboratory Control Sample (LCS)

(LCS) R3439914-2 08/13/19 08:46

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Nitrate	8.00	8.08	101	90.0-110	

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3439885-1 08/12/19 18:04

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

L1127530-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1127530-03 08/13/19 08:56 • (DUP) R3439885-6 08/13/19 09:23

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Perchlorate	2.65	2.69	100	1.72		15

<sup>5</sup>Sr

<sup>6</sup>Qc

Laboratory Control Sample (LCS)

(LCS) R3439885-2 08/12/19 18:55

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0104	104	90.0-110	

<sup>7</sup>Gl

<sup>8</sup>Al

L1127530-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127530-04 08/12/19 21:02 • (MS) R3439885-4 08/12/19 21:53 • (MSD) R3439885-5 08/12/19 23:09

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	0.0763	0.0869	0.0868	106	105	1	80.0-120			0.0849	15

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3439964-1 08/13/19 14:27

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Phosphorus,Total	0.0368	E4	0.0350	0.100

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1127897-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1127897-01 08/13/19 14:37 • (DUP) R3439964-5 08/13/19 14:39

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP RPD Limits	DUP Qualifier
Phosphorus,Total	0.655	0.652	1	0.459	20	

Laboratory Control Sample (LCS)

(LCS) R3439964-2 08/13/19 14:28

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Phosphorus,Total	2.00	1.88	94.0	90.0-110	

L1127512-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127512-02 08/13/19 14:32 • (MS) R3439964-3 08/13/19 14:34 • (MSD) R3439964-4 08/13/19 14:35

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Phosphorus,Total	2.50	ND	2.32	2.34	89.4	90.2	1	90.0-110	M2		0.858	20



Method Blank (MB)

(MB) R3439963-1 08/13/19 10:36

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.469	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

L1126532-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1126532-01 08/13/19 12:03 • (DUP) R3439963-3 08/13/19 12:23

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	41.2	41.1	1	0.219		20

6 Qc

Laboratory Control Sample (LCS)

(LCS) R3439963-2 08/13/19 11:10

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	74.7	99.6	85.0-115	

7 Gl

8 Al

L1127655-40 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1127655-40 08/13/19 12:51 • (MS) R3439963-4 08/13/19 13:35 • (MSD) R3439963-5 08/13/19 13:50

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	0.592	49.1	50.7	97.0	100	1	80.0-120			3.15	20

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

B1	Target analyte detected in method blank at or above the method reporting limit.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.
R8	Sample RPD exceeded the method acceptance limit.





Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

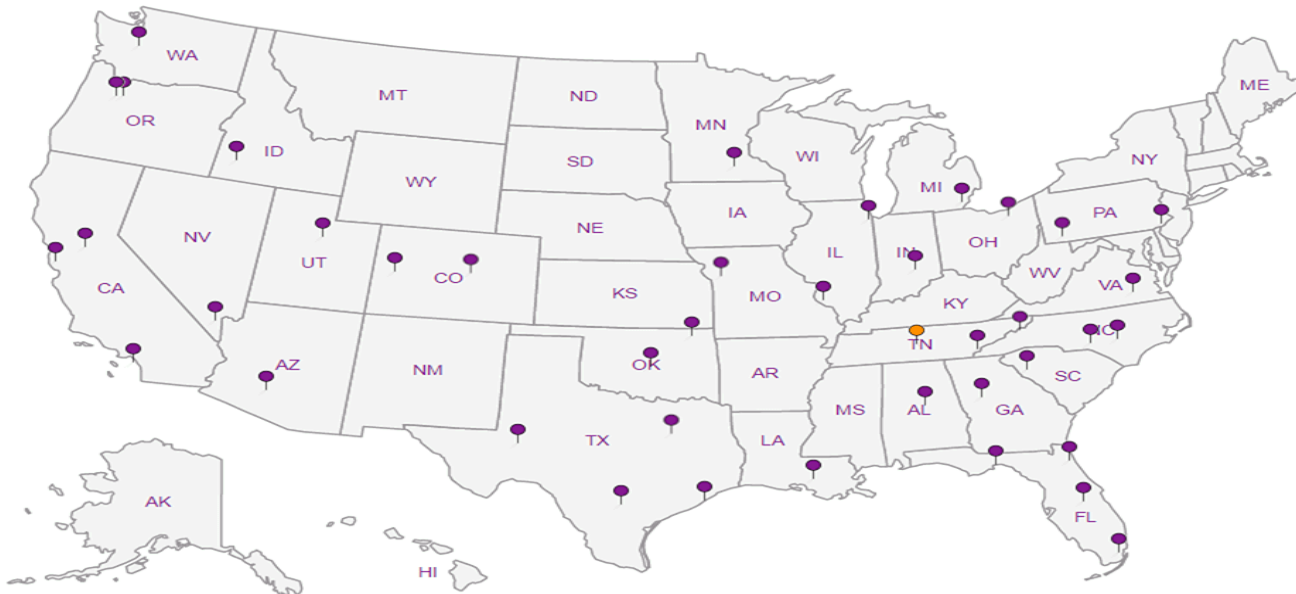
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
**Tom VESPALC**

Collected by (signature):  
*Tom Vespalec*  
Immediately  
Packed on Ice N    Y    X

Client Project #  
**03994018.0028**

Site/Facility ID #  
**UPCO**

Rush? (Lab MUST Be Notified)  
 Same Day    Five Day  
   Next Day    5 Day (Rad Only)  
   Two Day    10 Day (Rad Only)  
   Three Day

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

City/State  
Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #

Date Results Needed

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **1127945**  
**H170**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: **526 - Chris McCord**

PB: **6-28-196m**

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-201-081119	G	GW	—	8/11/19	1555	3	X					X				X	RUSH	01
SP-301-081119	G	GW	—	8/11/19	1600	5	X					X		X	X	X	RUSH	02
EW-1-081119	G	GW	—	8/11/19	1545	1						X					RUSH	03
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
 UPS  FedEx  Courier

Tracking # **4794 8844 1884**

pH    Temp     
Flow    Other   

Sample Receipt Checklist  
COC Seal Present/Intact:    Y    N  
COC Signed/Accurate:    Y    N  
Bottles arrive intact:    Y    N  
Correct bottles used:    Y    N  
Sufficient volume sent:    Y    N  
If Applicable  
VOA Zero Headspace:    Y    N  
Preservation Correct/Checked:    Y    N  
**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature) <i>Tom Vespalec</i>	Date: 8/12/19	Time: 1300	Received by: (Signature) <i>Amya</i>	Trip Blank Received: Yes/No <u>  </u> HCL / MeOH TBR
Relinquished by: (Signature) <i>Amya</i>	Date: 8/12/19	Time: 1800	Received by: (Signature) <i>FedEx</i>	Temp: °C 23.10-23.32 Bottles Received: 9
Relinquished by: (Signature) <i>Tom Vespalec</i>	Date: 8-15-19	Time: 8:45	Received for lab by: (Signature) <i>Tom Vespalec</i>	If preservation required by Login: Date/Time Hold: Condition: NCF / <u>  </u>

ESLAB

## UTC - Arcadis

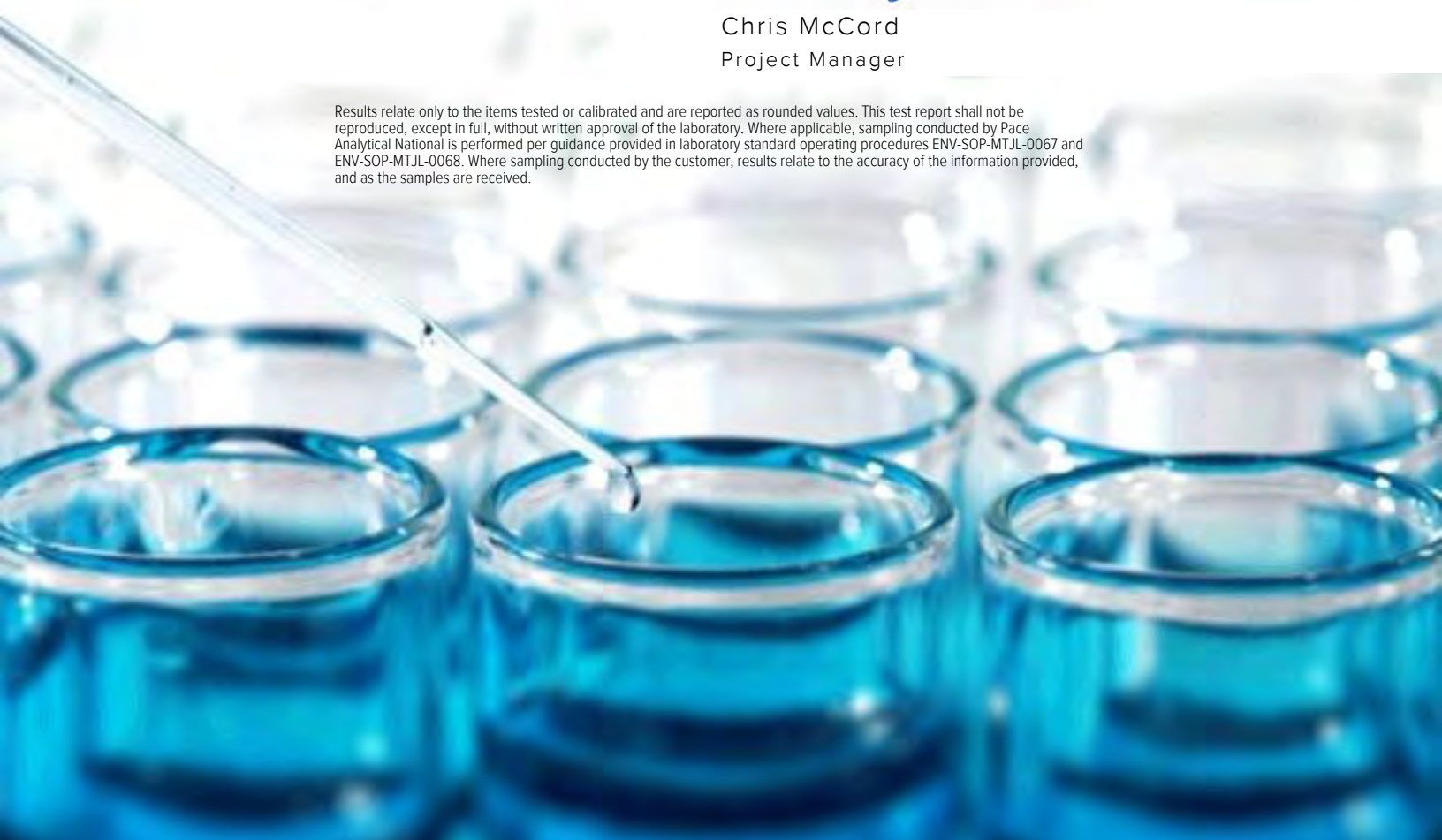
Sample Delivery Group: L1128418  
Samples Received: 08/14/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





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<b>Tc: Table of Contents</b>	<b>2</b>	
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<b>SP-201-081319 L1128418-01</b>	<b>5</b>	
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# SAMPLE SUMMARY



## SP-201-081319 L1128418-01 GW

Collected by Tom Vespaiec  
Collected date/time 08/13/19 13:45  
Received date/time 08/14/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1328265	1	08/14/19 09:56	08/14/19 09:56	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1328289	100	08/14/19 10:39	08/14/19 10:39	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1328140	1	08/14/19 09:00	08/14/19 15:03	SDL	Mt. Juliet, TN

1  
Cp

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Ss

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Cn

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Qc

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Gl

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Al

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Sc

## SP-301-081319 L1128418-02 GW

Collected by Tom Vespaiec  
Collected date/time 08/13/19 13:50  
Received date/time 08/14/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1328273	1	08/14/19 09:44	08/14/19 09:52	TH	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1328265	1	08/14/19 10:10	08/14/19 10:10	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1328289	1	08/14/19 11:06	08/14/19 11:06	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1328140	1	08/14/19 09:00	08/14/19 15:04	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1328171	1	08/14/19 12:55	08/14/19 12:55	EEM	Mt. Juliet, TN

## EW-1-081319 L1128418-03 GW

Collected by Tom Vespaiec  
Collected date/time 08/13/19 13:40  
Received date/time 08/14/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1328289	100	08/14/19 11:32	08/14/19 11:32	LBR	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	2.45		0.100	1	08/14/2019 09:56	<a href="#">WG1328265</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	1.55		0.400	100	08/14/2019 10:39	<a href="#">WG1328289</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	08/14/2019 15:03	<a href="#">WG1328140</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	2.50		2.50	1	08/14/2019 09:52	<a href="#">WG1328273</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/14/2019 10:10	<a href="#">WG1328265</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	08/14/2019 11:06	<a href="#">WG1328289</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.925		0.100	1	08/14/2019 15:04	<a href="#">WG1328140</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	1.42	<u>B1</u>	1.00	1	08/14/2019 12:55	<a href="#">WG1328171</a>

9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	5.07		0.400	100	08/14/2019 11:32	<a href="#">WG1328289</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3440425-1 08/14/19 09:52

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Suspended Solids	U		0.350	2.50

1 Cp

2 Tc

3 Ss

L1127554-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1127554-01 08/14/19 09:52 • (DUP) R3440425-3 08/14/19 09:52

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Suspended Solids	364	336	1	8.00	R8	5

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3440425-2 08/14/19 09:52

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Suspended Solids	773	748	96.8	85.0-115	

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3440277-1 08/14/19 08:42

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

Laboratory Control Sample (LCS)

(LCS) R3440277-2 08/14/19 08:57

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Nitrate	8.00	8.49	106	90.0-110	

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3440424-1 08/14/19 09:17

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

L1128418-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1128418-01 08/14/19 10:39 • (DUP) R3440424-5 08/14/19 12:48

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Perchlorate	1.55	1.60	100	3.11		15

Laboratory Control Sample (LCS)

(LCS) R3440424-2 08/14/19 10:08

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0102	102	90.0-110	

L1128418-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1128418-02 08/14/19 11:06 • (MS) R3440424-3 08/14/19 11:57 • (MSD) R3440424-4 08/14/19 12:23

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	ND	0.0107	0.0112	107	112	1	80.0-120			3.66	15

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3440443-1 08/14/19 14:39

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Phosphorus,Total	0.0575	E4	0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1128159-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1128159-01 08/14/19 14:42 • (DUP) R3440443-3 08/14/19 14:44

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	0.979	0.913	1	6.98		20

L1128231-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1128231-01 08/14/19 14:46 • (DUP) R3440443-4 08/14/19 14:48

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	2.58	2.52	1	2.35		20

Laboratory Control Sample (LCS)

(LCS) R3440443-2 08/14/19 14:40

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Phosphorus,Total	2.00	1.90	95.0	90.0-110	

L1128238-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1128238-02 08/14/19 14:50 • (MS) R3440443-5 08/14/19 14:54 • (MSD) R3440443-6 08/14/19 14:55

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits
Phosphorus,Total	2.50	1.77	4.04	4.08	90.8	92.4	1	90.0-110			0.985	20

L1128269-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1128269-01 08/14/19 14:56 • (MS) R3440443-7 08/14/19 14:58

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Phosphorus,Total	2.50	0.848	3.16	92.5	1	90.0-110	



Method Blank (MB)

(MB) R3440436-1 08/14/19 10:38

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.464	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

L1128017-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1128017-03 08/14/19 12:07 • (DUP) R3440436-3 08/14/19 12:31

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	2310	2420	50	4.62		20

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3440436-2 08/14/19 11:21

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	79.2	106	85.0-115	

6 Qc

7 Gl

8 Al

9 Sc





Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

B1	Target analyte detected in method blank at or above the method reporting limit.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
R8	Sample RPD exceeded the method acceptance limit.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

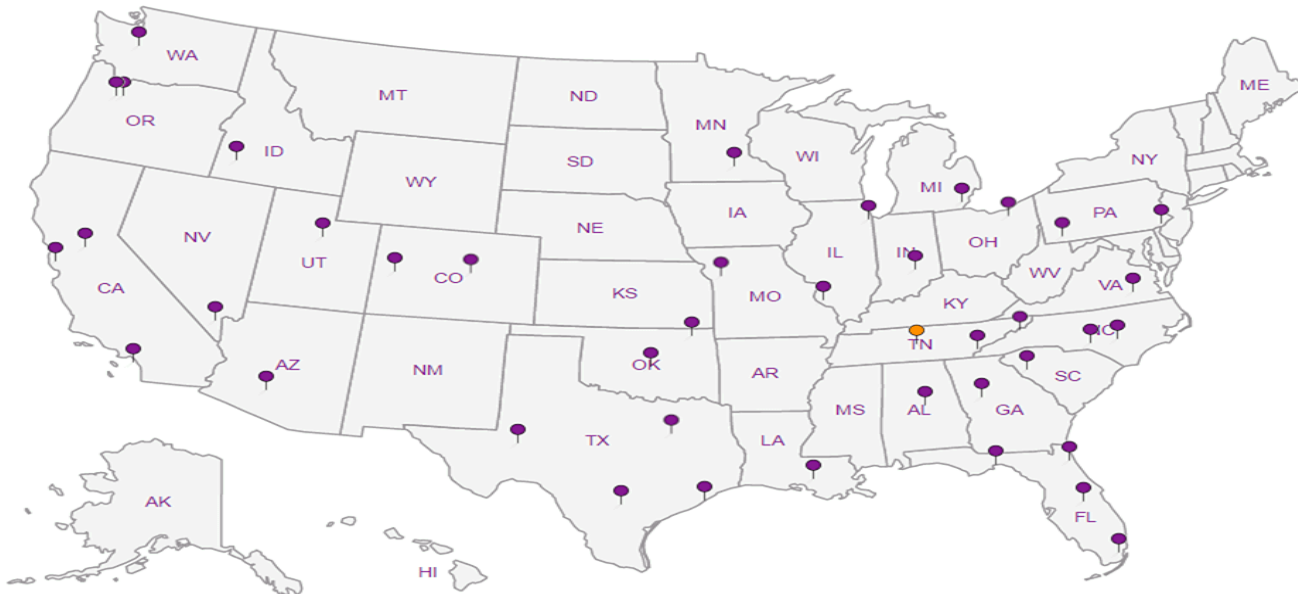
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
**Tom VESPALAC**

Collected by (signature):  
*[Signature]*

Immediately Packed on Ice N \_\_\_ Y **X**

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

City/State Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

Site/Facility ID #  
**UPCO**

**Rush?** (Lab MUST Be Notified)

Same Day \_\_\_ Five Day  
\_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
\_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
\_\_\_ Three Day

Quote #

Date Results Needed

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page **1** of **1**



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **11284/8**  
**H191**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: **526 - Chris McCord**

PB: **6-28-19**

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-201-081319	G	GW	-	8/13/19	1345	3	X					X				X	RUSH	01
SP-301-081319	G	GW	-	8/13/19	1350	5	X					X		X	X	X	RUSH	02
EW-1-081319	G	GW	-	8/13/19	1340	1						X					RUSH	03
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\*** has a 48hr hold time.

pH \_\_\_ Temp \_\_\_

Flow \_\_\_ Other \_\_\_

Samples returned via:  
\_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier \_\_\_

Tracking #

Sample Receipt Checklist

COC Seal Present/Intact: \_\_\_ NP  Y \_\_\_ N  
COC Signed/Accurate: \_\_\_  Y \_\_\_ N  
Bottles arrive intact: \_\_\_  Y \_\_\_ N  
Correct bottles used: \_\_\_  Y \_\_\_ N  
Sufficient volume sent: \_\_\_  Y \_\_\_ N  
If Applicable  
VOA Zero Headspace: \_\_\_ Y \_\_\_ N  
Preservation Correct/Checked: \_\_\_  Y \_\_\_ N

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/13/19	Time: 1355	Received by: (Signature) <i>[Signature]</i>	Trip Blank Received: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> HCL / MeoH TBR	Bottles Received: 9	If preservation required by Login: Date/Time
Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/13/19	Time: 1800	Received by: (Signature) <i>[Signature]</i>	Temp: ASD °C 2.5 + 2.7		
Relinquished by: (Signature) <i>[Signature]</i>	Date:	Time:	Received for lab by: (Signature) <i>[Signature]</i>	Date: 8-14-19	Time: 8:00	Hold: Condition: NCF / <input checked="" type="checkbox"/> OK

ASLAB

August 20, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1129572  
Samples Received: 08/16/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008










Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



<b>Cp: Cover Page</b>	<b>1</b>	
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	
SP-201-081519 L1129572-01	<b>5</b>	
SP-301-081519 L1129572-02	<b>6</b>	
EW-1-081519 L1129572-03	<b>7</b>	
<b>Qc: Quality Control Summary</b>	<b>8</b>	
Gravimetric Analysis by Method 2540 D-2011	<b>8</b>	
Wet Chemistry by Method 300.0	<b>9</b>	
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# SAMPLE SUMMARY



## SP-201-081519 L1129572-01 GW

Collected by: Mark Hammer  
 Collected date/time: 08/15/19 12:05  
 Received date/time: 08/16/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1329951	1	08/16/19 12:16	08/16/19 12:16	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1331044	100	08/19/19 14:16	08/19/19 14:16	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1330121	1	08/16/19 12:04	08/16/19 15:42	SDL	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## SP-301-081519 L1129572-02 GW

Collected by: Mark Hammer  
 Collected date/time: 08/15/19 00:00  
 Received date/time: 08/16/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1329991	1	08/16/19 12:20	08/16/19 12:40	MMF	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1329951	1	08/16/19 12:45	08/16/19 12:45	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1331044	1	08/19/19 15:09	08/19/19 15:09	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1330121	1	08/16/19 12:04	08/16/19 15:43	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1329855	1	08/16/19 12:26	08/16/19 12:26	EEM	Mt. Juliet, TN

## EW-1-081519 L1129572-03 GW

Collected by: Mark Hammer  
 Collected date/time: 08/15/19 12:00  
 Received date/time: 08/16/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1331044	100	08/19/19 16:25	08/19/19 16:25	GB	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc





Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	2.41		0.100	1	08/16/2019 12:16	<a href="#">WG1329951</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	1.69		0.400	100	08/19/2019 14:16	<a href="#">WG1331044</a>

3 Ss

4 Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	08/16/2019 15:42	<a href="#">WG1330121</a>

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	08/16/2019 12:40	<a href="#">WG1329991</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/16/2019 12:45	<a href="#">WG1329951</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	08/19/2019 15:09	<a href="#">WG1331044</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.604		0.100	1	08/16/2019 15:43	<a href="#">WG1330121</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	3.70		1.00	1	08/16/2019 12:26	<a href="#">WG1329855</a>

9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	5.57		0.400	100	08/19/2019 16:25	<a href="#">WG1331044</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3441326-1 08/16/19 12:40

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		0.350	2.50

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

L1129487-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1129487-03 08/16/19 12:40 • (DUP) R3441326-3 08/16/19 12:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	797	850	1	6.48	<u>R8</u>	5

<sup>5</sup>Sr

<sup>6</sup>Qc

Laboratory Control Sample (LCS)

(LCS) R3441326-2 08/16/19 12:40

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	800	103	85.0-115	

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3441223-1 08/16/19 09:06

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1129572-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1129572-01 08/16/19 12:16 • (DUP) R3441223-3 08/16/19 12:30

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Nitrate	2.41	2.39	1	0.684		20

Laboratory Control Sample (LCS)

(LCS) R3441223-2 08/16/19 09:21

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Nitrate	8.00	8.12	101	90.0-110	

L1129572-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1129572-02 08/16/19 12:45 • (MS) R3441223-4 08/16/19 13:00 • (MSD) R3441223-5 08/16/19 13:15

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Nitrate	5.00	ND	4.86	4.85	97.1	97.1	1	80.0-120			0.0494	20



Method Blank (MB)

(MB) R3441949-1 08/19/19 12:56

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1129572-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1129572-01 08/19/19 14:16 • (DUP) R3441949-3 08/19/19 14:44

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	1.69	1.68	100	0.576		15

Laboratory Control Sample (LCS)

(LCS) R3441949-2 08/19/19 13:47

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0105	105	90.0-110	

L1129572-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1129572-02 08/19/19 15:09 • (MS) R3441949-4 08/19/19 15:34 • (MSD) R3441949-5 08/19/19 16:00

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	ND	0.0108	0.0108	108	108	1	80.0-120			0.235	15



Method Blank (MB)

(MB) R3441301-1 08/16/19 15:27

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	0.0390	E4	0.0350	0.100

1 Cp

2 Tc

3 Ss

L1129286-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1129286-02 08/16/19 15:31 • (DUP) R3441301-3 08/16/19 15:32

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	ND	0.0587	1	0.000		20

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3441301-2 08/16/19 15:28

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.83	91.5	90.0-110	

6 Qc

7 Gl

L1129328-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1129328-01 08/16/19 15:36 • (MS) R3441301-4 08/16/19 15:37 • (MSD) R3441301-5 08/16/19 15:38

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	4.85	6.70	6.88	74.0	81.2	1	90.0-110	E1 M2	E1 M2	2.65	20

8 Al

9 Sc





Method Blank (MB)

(MB) R3441216-1 08/16/19 09:35

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.260	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

L1129090-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1129090-03 08/16/19 11:18 • (DUP) R3441216-3 08/16/19 11:31

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	0.457	0.418	1	8.84	E4	20

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3441216-2 08/16/19 10:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	73.7	98.2	85.0-115	

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E1	Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.
R8	Sample RPD exceeded the method acceptance limit.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

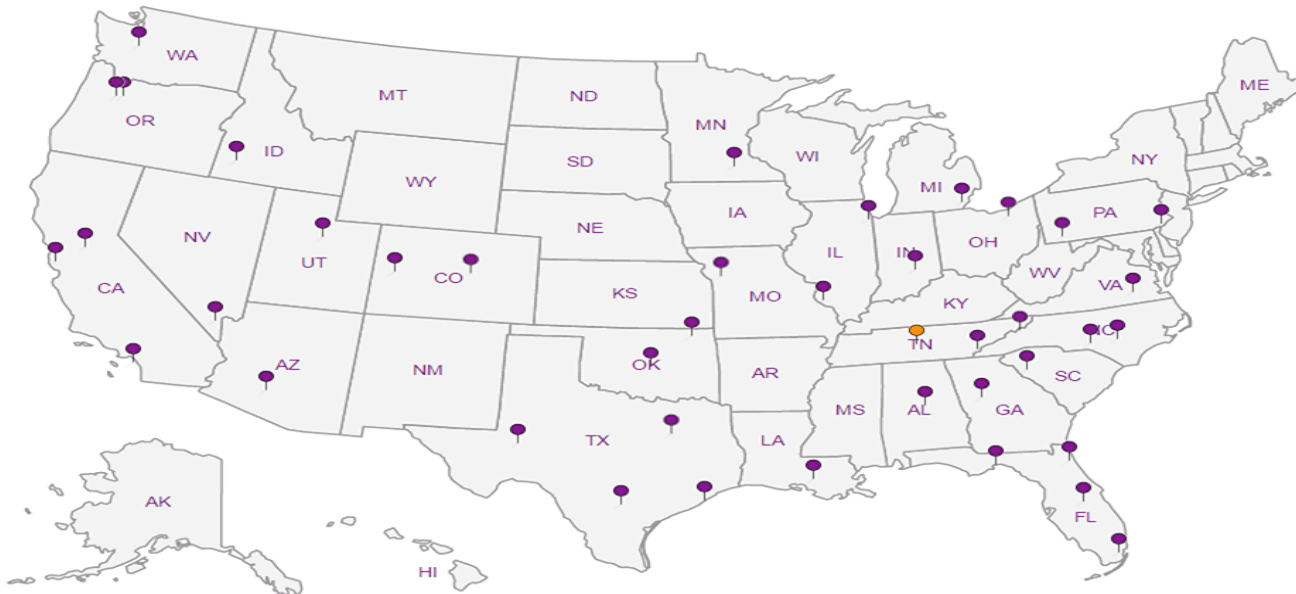
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
**Mark Hammer**

Collected by (signature):  
*Mark Hammer*

Immediately Packed on Ice N \_\_\_ Y **X**

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

City/State Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #

Date Results Needed

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **U129572**

**B233**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: **526 - Chris McCord**

PB: **6-28-196m**

Shipped Via: **FedEX Saver**

Remarks Sample # (lab only)

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mIHDPE-NoPres	1,1-DCE-8260B 40mIAmb-HCl	1,4-Dioxane 8260B 40mIAmb-HCl	Ammonia 250mIHDPE-H2SO4	Diss. Fe - LF 250mIHDPE-NoPres	Perchlorate 125mIHDPE-NoPres	RCRA8+Fe 250mIHDPE-HNO3	TOC 250mIAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mIHDPE-H2SO4	Remarks	Sample # (lab only)
SP-201-081519	G	GW		8/15/19	12:05	3	X					X				X	RUSH	-01
SP-301-081519	G	GW		8/15/19		5	X					X		X	X	X	RUSH	-02
EW-1-081519	G	GW		8/15/19	12:00	1						X					RUSH	-03
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix: SS - Soil AIR - Air F - Filter GW - Groundwater B - Bioassay

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

WW - WasteWater DW - Drinking Water OT - Other \_\_\_\_\_

Samples returned via: \_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier \_\_\_\_\_ Tracking # \_\_\_\_\_

Sample Receipt Checklist

COC Seal Present/Intact: \_\_\_ NP  Y \_\_\_ N

COC Signed/Accurate: \_\_\_ Y \_\_\_ N

Bottles arrive intact: \_\_\_ Y \_\_\_ N

Correct bottles used: \_\_\_ Y \_\_\_ N

Sufficient volume sent: \_\_\_ Y \_\_\_ N

If Applicable

VOA Zero Headspace: \_\_\_ Y \_\_\_ N

Preservation Correct/Checked: \_\_\_ Y \_\_\_ N

**RAD SCREEN: <0.5 mFVhr**

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: 8/15/19	Time: 1353	Received by: (Signature) <i>amy...</i>	Trip Blank Received: Yes/No HCL/MeoH TBR	Bottles Received: 9	If preservation required by Login: Date/Time
Relinquished by: (Signature) <i>amy...</i>	Date: 8/15/19	Time: 1800	Received by: (Signature) <i>sw...</i>	Temp: 27.0°C		
Relinquished by: (Signature) <i>Harley...</i>	Date: 8/16/19	Time: 8:00	Received by: (Signature)			Condition: NCF / <input checked="" type="checkbox"/>

ESLAB

August 23, 2019

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## UTC - Arcadis

Sample Delivery Group: L1129683  
Samples Received: 08/16/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>2</sup>Tc</b>
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>3</sup>Ss</b>
<b>SP-701-081519 L1129683-01</b>	<b>5</b>	
<b>TRIP BLANK L1129683-02</b>	<b>6</b>	<b><sup>4</sup>Cn</b>
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>5</sup>Sr</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	<b><sup>6</sup>Qc</b>
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>10</b>	
<b>Gl: Glossary of Terms</b>	<b>11</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	<b><sup>9</sup>Sc</b>



# SAMPLE SUMMARY



## SP-701-081519 L1129683-01 GW

Collected by: Mark Hammer  
 Collected date/time: 08/15/19 11:50  
 Received date/time: 08/16/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1331002	1	08/21/19 08:17	08/21/19 08:17	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1332315	1	08/21/19 21:02	08/21/19 21:02	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1331121	1	08/19/19 20:22	08/19/19 20:22	DWR	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## TRIP BLANK L1129683-02 GW

Collected by: Mark Hammer  
 Collected date/time: 08/15/19 00:00  
 Received date/time: 08/16/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1333020	1	08/22/19 21:02	08/22/19 21:02	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1331121	1	08/19/19 19:03	08/19/19 19:03	DWR	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Perchlorate	mg/l		mg/l		date / time	
	ND		0.00400	1	08/21/2019 08:17	<a href="#">WG1331002</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,1-Dichloroethene	mg/l		mg/l		date / time	
	ND		0.00100	1	08/21/2019 21:02	<a href="#">WG1332315</a>
(S) Toluene-d8	105		80.0-120		08/21/2019 21:02	<a href="#">WG1332315</a>
(S) 4-Bromofluorobenzene	97.2		77.0-126		08/21/2019 21:02	<a href="#">WG1332315</a>
(S) 1,2-Dichloroethane-d4	98.1		70.0-130		08/21/2019 21:02	<a href="#">WG1332315</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,4-Dioxane	mg/l		mg/l		date / time	
	ND		0.00300	1	08/19/2019 20:22	<a href="#">WG1331121</a>
(S) Toluene-d8	99.4		77.0-127		08/19/2019 20:22	<a href="#">WG1331121</a>

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	08/22/2019 21:02	<a href="#">WG1333020</a>
(S) Toluene-d8	105		80.0-120		08/22/2019 21:02	<a href="#">WG1333020</a>
(S) 4-Bromofluorobenzene	94.9		77.0-126		08/22/2019 21:02	<a href="#">WG1333020</a>
(S) 1,2-Dichloroethane-d4	100		70.0-130		08/22/2019 21:02	<a href="#">WG1333020</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	08/19/2019 19:03	<a href="#">WG1331121</a>
(S) Toluene-d8	98.8		77.0-127		08/19/2019 19:03	<a href="#">WG1331121</a>



Method Blank (MB)

(MB) R3442559-1 08/20/19 11:42

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

L1128485-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1128485-01 08/20/19 14:04 • (DUP) R3442559-3 08/20/19 14:30

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.00248	0.00227	1	9.05	E4	15

7 Gl

8 Al

9 Sc

L1129683-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1129683-01 08/21/19 08:17 • (DUP) R3442559-4 08/21/19 08:42

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3442559-2 08/20/19 12:33

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0107	107	90.0-110	



Method Blank (MB)

(MB) R3442868-3 08/21/19 11:37

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	104			80.0-120
(S) 4-Bromofluorobenzene	94.4			77.0-126
(S) 1,2-Dichloroethane-d4	98.6			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3442868-1 08/21/19 09:21 • (LCSD) R3442868-2 08/21/19 09:43

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0237	0.0238	94.9	95.3	71.0-124			0.376	20
(S) Toluene-d8				103	103	80.0-120				
(S) 4-Bromofluorobenzene				101	101	77.0-126				
(S) 1,2-Dichloroethane-d4				99.0	98.5	70.0-130				

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3443450-3 08/22/19 19:44

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	106			80.0-120
(S) 4-Bromofluorobenzene	95.0			77.0-126
(S) 1,2-Dichloroethane-d4	98.1			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3443450-1 08/22/19 18:41 • (LCSD) R3443450-2 08/22/19 19:02

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0242	0.0259	97.0	104	71.0-124			6.73	20
(S) Toluene-d8				101	101	80.0-120				
(S) 4-Bromofluorobenzene				91.7	89.5	77.0-126				
(S) 1,2-Dichloroethane-d4				102	104	70.0-130				

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Method Blank (MB)

(MB) R3442027-3 08/19/19 18:18

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.5			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3442027-1 08/19/19 17:18 • (LCSD) R3442027-2 08/19/19 17:38

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0457	0.0448	91.4	89.7	55.0-138			1.93	24
(S) Toluene-d8				99.8	99.4	77.0-127				

5 Sr

6 Qc

L1130225-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1130225-05 08/20/19 01:14 • (MS) R3442027-4 08/20/19 01:34 • (MSD) R3442027-5 08/20/19 01:53

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	U	0.0530	0.0536	106	107	1	13.0-160			1.12	31
(S) Toluene-d8					99.8	99.2		77.0-127				

7 Gl

8 Al

9 Sc





Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
----	---



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

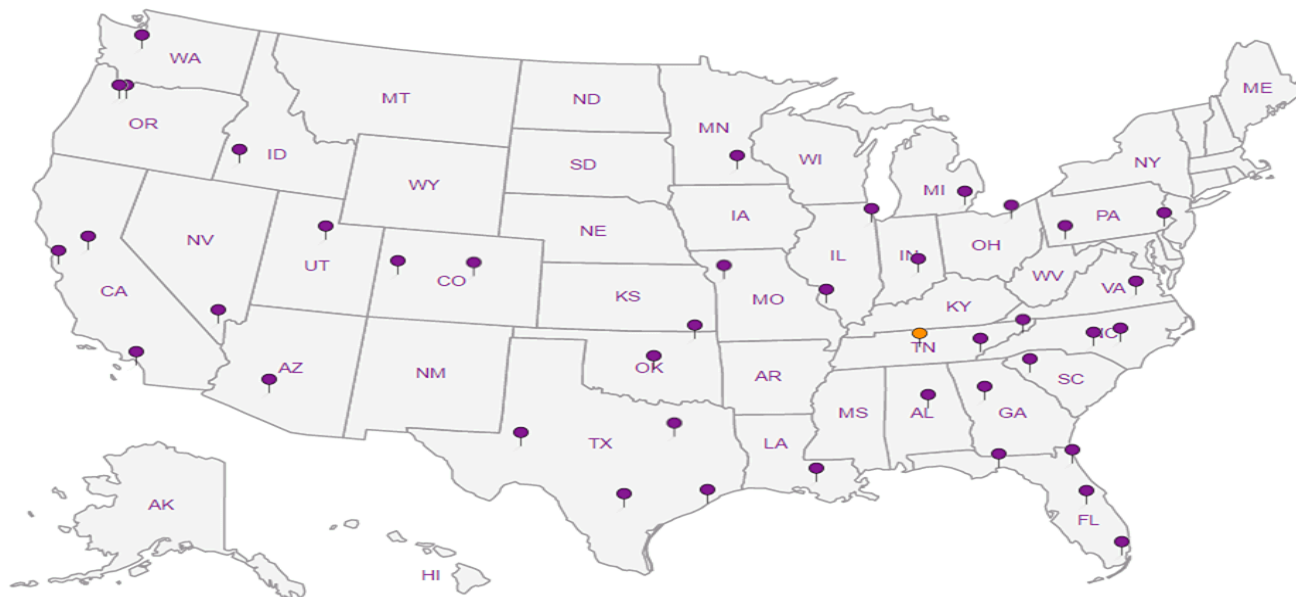
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Report to:  
**Thomas Vespalec**


Billing Information:  
 Accounts Payable  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Email To: thomas.vespalec@arcadis.com

Chain of Custody Page 1 of 1

**Pace Analytical\***  
 National Center for Testing & Innovation

12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



Project Description: **UPCO**

City/State Collected: **AZ**

Client Project # **03994018.0028**

Lab Project # **UTCARCA-UPCO11DCE**

Site/Facility ID # **UPCO**

P.O. #

Quote #

Rush? (Lab MUST Be Notified)  
 \_\_\_ Same Day \_\_\_ Five Day **(TN)**  
 \_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
 \_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
 \_\_\_ Three Day

Date Results Needed

Immediately Packed on Ice N \_\_\_ Y **X**

No. of Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SA-701-081519	G	GW	-	8/15/19	11:50		X	X			X					SDAY	-01
TRIP BLANK	G	GW	-	8/15/19	-		X	X								SDAY	-02
		GW															
		GW															
		GW															
		GW															
		GW															
		GW															
		GW															

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: 526 - Chris McCord

PB: **6-28-19**

Shipped Via: **FedEX Saver**

Remarks

Sample # (lab only)

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Tracking #

Samples returned via:  
 \_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier

Sample Receipt Checklist

COC Seal Present/Intact: \_\_\_ NP **X** \_\_\_ N

COC Signed/Accurate: \_\_\_ **X** \_\_\_ N

Bottles arrive intact: \_\_\_ **X** \_\_\_ N

Correct bottles used: \_\_\_ **X** \_\_\_ N

Sufficient volume sent: \_\_\_ **X** \_\_\_ N

If Applicable

VOA Zero Headspace: \_\_\_ **X** \_\_\_ N

Preservation Correct/Checked: \_\_\_ **X** \_\_\_ N

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: 8/15/19	Time: 1353	Received by: (Signature) <i>Janyarty</i>	Trip Blank Received: Yes/No 1 HCl/MeOH TBR
Relinquished by: (Signature) <i>Janyarty</i>	Date: 8/15/19	Time: 1800	Received by: (Signature) <i>Sue</i>	Temp: °C 27.0 Bottles Received: 4
Relinquished by: (Signature) <i>Mc Farris</i>	Date: 8/16/19	Time: 0800	Received by lab by: (Signature)	Hold: _____ Condition: NCF / <b>(R)</b>

ESCA

August 21, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1130954  
Samples Received: 08/21/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
SP-201-082019 L1130954-01	<b>5</b>	
SP-301-082019 L1130954-02	<b>6</b>	
EW-1-082019 L1130954-03	<b>7</b>	
EW-2-082019 L1130954-04	<b>8</b>	
IW-1-082019 L1130954-05	<b>9</b>	
<b>Qc: Quality Control Summary</b>	<b>10</b>	<b><sup>6</sup>Qc</b>
Gravimetric Analysis by Method 2540 D-2011	<b>10</b>	<b><sup>7</sup>Gl</b>
Wet Chemistry by Method 300.0	<b>11</b>	<b><sup>8</sup>Al</b>
Wet Chemistry by Method 314.0 Mod	<b>12</b>	
Wet Chemistry by Method 365.4	<b>13</b>	
Wet Chemistry by Method 9060A	<b>14</b>	<b><sup>9</sup>Sc</b>
<b>Gl: Glossary of Terms</b>	<b>15</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>16</b>	
<b>Sc: Sample Chain of Custody</b>	<b>17</b>	

# SAMPLE SUMMARY



## SP-201-082019 L1130954-01 GW

Collected by: Mark Hammer  
 Collected date/time: 08/20/19 08:25  
 Received date/time: 08/21/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1332167	1	08/21/19 10:38	08/21/19 10:38	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1331419	100	08/21/19 13:38	08/21/19 13:38	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1331933	1	08/21/19 11:30	08/21/19 16:15	SDL	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## SP-301-082019 L1130954-02 GW

Collected by: Mark Hammer  
 Collected date/time: 08/20/19 08:30  
 Received date/time: 08/21/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1332346	1	08/21/19 10:59	08/21/19 11:06	MMF	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1332167	1	08/21/19 10:53	08/21/19 10:53	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1331419	1	08/21/19 14:03	08/21/19 14:03	GB	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1331933	1	08/21/19 11:30	08/21/19 16:18	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1332314	1	08/21/19 12:42	08/21/19 12:42	VRP	Mt. Juliet, TN

## EW-1-082019 L1130954-03 GW

Collected by: Mark Hammer  
 Collected date/time: 08/20/19 08:40  
 Received date/time: 08/21/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1331419	100	08/21/19 14:29	08/21/19 14:29	GB	Mt. Juliet, TN

## EW-2-082019 L1130954-04 GW

Collected by: Mark Hammer  
 Collected date/time: 08/20/19 08:45  
 Received date/time: 08/21/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1331419	1	08/21/19 14:54	08/21/19 14:54	GB	Mt. Juliet, TN

## IW-1-082019 L1130954-05 GW

Collected by: Mark Hammer  
 Collected date/time: 08/20/19 10:15  
 Received date/time: 08/21/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1331419	2000	08/21/19 15:19	08/21/19 15:19	GB	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc





Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	2.58		0.100	1	08/21/2019 10:38	<a href="#">WG1332167</a>

1 Cp

2 Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	1.83		0.400	100	08/21/2019 13:38	<a href="#">WG1331419</a>

3 Ss

4 Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	08/21/2019 16:15	<a href="#">WG1331933</a>

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		3.33	1	08/21/2019 11:06	<a href="#">WG1332346</a>

Sample Narrative:

L1130954-02 WG1332346: Reporting limit determined by filtrate volume.

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/21/2019 10:53	<a href="#">WG1332167</a>

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	08/21/2019 14:03	<a href="#">WG1331419</a>

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.851		0.100	1	08/21/2019 16:18	<a href="#">WG1331933</a>

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	13.9		1.00	1	08/21/2019 12:42	<a href="#">WG1332314</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	6.24		0.400	100	08/21/2019 14:29	<a href="#">WG1331419</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0713	M3	0.00400	1	08/21/2019 14:54	<a href="#">WG1331419</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	81.2		8.00	2000	08/21/2019 15:19	<a href="#">WG1331419</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3442783-1 08/21/19 11:06

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		0.350	2.50

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1130513-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1130513-01 08/21/19 11:06 • (DUP) R3442783-3 08/21/19 11:06

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	ND	5.00	1	0.000		5

Sample Narrative:

OS: Reporting limit determined by filtrate volume.

Laboratory Control Sample (LCS)

(LCS) R3442783-2 08/21/19 11:06

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	808	105	85.0-115	



Method Blank (MB)

(MB) R3442632-1 08/21/19 09:03

Analyte	MB Result mg/l	<u>MB Qualifier</u>	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

Laboratory Control Sample (LCS)

(LCS) R3442632-2 08/21/19 09:18

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Nitrate	8.00	8.13	102	90.0-110	

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Method Blank (MB)

(MB) R3442882-1 08/21/19 11:50

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1130954-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1130954-02 08/21/19 14:03 • (DUP) R3442882-3 08/21/19 15:45

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3442882-2 08/21/19 13:12

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0104	104	90.0-110	

L1130954-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1130954-04 08/21/19 14:54 • (MS) R3442882-4 08/21/19 16:10 • (MSD) R3442882-5 08/21/19 17:43

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	0.0713	0.0851	0.0831	138	118	1	80.0-120	M3		2.43	15



Method Blank (MB)

(MB) R3442813-1 08/21/19 15:48

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	0.0372	E4	0.0350	0.100

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1130716-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1130716-01 08/21/19 15:57 • (DUP) R3442813-3 08/21/19 15:58

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.28	1.34	1	4.58		20

L1130927-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1130927-03 08/21/19 16:12 • (DUP) R3442813-7 08/21/19 16:13

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	2.33	2.22	1	4.84		20

Laboratory Control Sample (LCS)

(LCS) R3442813-2 08/21/19 15:49

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.92	96.0	90.0-110	

L1130716-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1130716-02 08/21/19 15:59 • (MS) R3442813-4 08/21/19 16:03 • (MSD) R3442813-5 08/21/19 16:04

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	1.42	1.33	1.35	0.000	0.000	1	90.0-110	M2	M2	1.49	20

L1130927-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1130927-02 08/21/19 16:09 • (MS) R3442813-6 08/21/19 16:11

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	2.62	4.58	78.4	1	90.0-110	M2



Method Blank (MB)

(MB) R3442778-1 08/21/19 11:46

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.194	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

L1130954-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1130954-02 08/21/19 12:42 • (DUP) R3442778-3 08/21/19 12:55

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	13.9	13.7	1	1.59		20

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3442778-2 08/21/19 12:19

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	78.1	104	85.0-115	

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier	Description
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008  
 Report to:  
**Thomas Vespalec**

Billing Information:  
**Accounts Payable**  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129  
 Email To: thomas.vespalec@arcadis.com

Pres Chk  
 Analysis / Container / Preservative

Chain of Custody Page 1 of 1  
  
 12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859  


Project Description: **UPCO**

City/State Collected: **AZ**

Phone: **480-535-7399**  
 Fax:


Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**MARK HAMMER**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  


Rush? (Lab MUST Be Notified)  
 Same Day \_\_\_ Five Day  
 \_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
 \_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
 \_\_\_ Three Day

Quote #  
 Date Results Needed

Immediately Packed on Ice N \_\_\_ Y

**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4
------------------------------	---------------------------	-------------------------------	-------------------------	--------------------------------	------------------------------	-------------------------	------------------	--------------------	-----------------------------------

L# **L1130954**  
 Tab **A175**  
 Acctnum: **UTCARCA**  
 Template: **T152379**  
 Prelogin: **P717001**  
 TSR: **526 - Chris McCord**  
 PB: **6-28-19**  
 Shipped Via: **FedEX Saver**

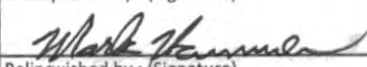
Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-201-082019	G	GW		8/20/19	08:25	3	X					X				X	RUSH	-01
SP-301-082019	G	GW		8/20/19	08:30	5	X					X		X	X	X	RUSH	-02
EW-1-082019	G	GW		8/20/19	08:40	1						X					RUSH	-03
EW-2-082019	G	GW		8/20/19	08:45	1						X					RUSH	-04
TW-1-082019	G	GW		8/20/19	10:15	1						X					RUSH	-05
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

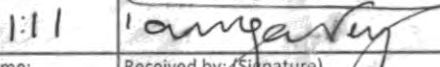
Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**  
 Samples returned via:  
 \_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier \_\_\_ Tracking #

pH \_\_\_ Temp \_\_\_  
 Flow \_\_\_ Other \_\_\_


Sample Receipt Checklist  
 COC Seal Present/Intact: \_\_\_ NP  Y \_\_\_ N  
 COC Signed/Accurate: \_\_\_  Y \_\_\_ N  
 Bottles arrive intact: \_\_\_  Y \_\_\_ N  
 Correct bottles used: \_\_\_  Y \_\_\_ N  
 Sufficient volume sent: \_\_\_  Y \_\_\_ N  
 If Applicable  
 VOA Zero Headspace: \_\_\_ Y \_\_\_ N  
 Preservation Correct/Checked: \_\_\_  Y \_\_\_ N  
**RAD SCREEN: <0.5 mP/h**

Relinquished by: (Signature)  



Date: **8/20/19**  
 Time: **11:11**

Received by: (Signature)  


Trip Blank Received: Yes  No   
 HCL / MeOH TBR


Relinquished by: (Signature)  


Date: **8/20/19**  
 Time: **1800**

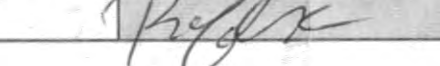
Received by: (Signature)  


Temp: **A38FC** Bottles Received: **11**  
**4.9+3=5.2**

If preservation required by Login: Date/Time

Relinquished by: (Signature)  


Date: **8/20/19**  
 Time: **0800**

Received by: (Signature)  


Date: **8/20/19** Time: **0800**

Hold: Condition: **NCF / (K)**

ESLAB



## UTC - Arcadis

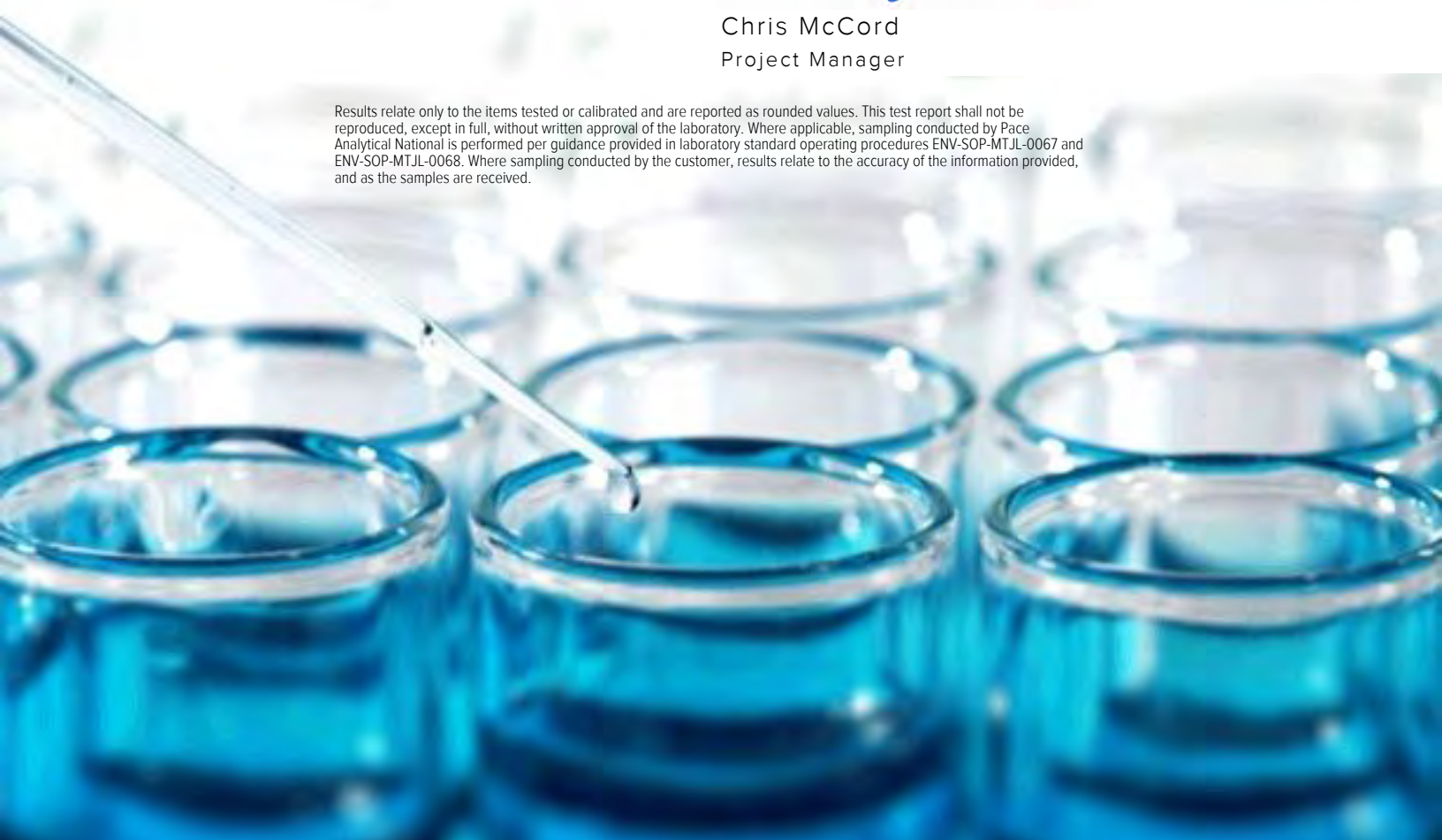
Sample Delivery Group: L1131933  
Samples Received: 08/23/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespalect  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	
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<b>Cn: Case Narrative</b>	<b>5</b>	
<b>Sr: Sample Results</b>	<b>6</b>	
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EW-1-082119 L1131933-02	7	
IW-082119 L1131933-03	8	
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<b>Al: Accreditations &amp; Locations</b>	<b>22</b>	
<b>Sc: Sample Chain of Custody</b>	<b>23</b>	



# SAMPLE SUMMARY



EW-2-082119 L1131933-01 GW				Collected by T. Vespalec	Collected date/time 08/21/19 13:40	Received date/time 08/23/19 08:00
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	1	08/23/19 10:54	08/23/19 10:54	LBR	Mt. Juliet, TN
EW-1-082119 L1131933-02 GW				Collected by T. Vespalec	Collected date/time 08/21/19 13:45	Received date/time 08/23/19 08:00
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	100	08/23/19 12:38	08/23/19 12:38	LBR	Mt. Juliet, TN
IW-082119 L1131933-03 GW				Collected by T. Vespalec	Collected date/time 08/21/19 13:50	Received date/time 08/23/19 08:00
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	2000	08/23/19 13:03	08/23/19 13:03	LBR	Mt. Juliet, TN
SP-201-082119 L1131933-04 GW				Collected by T. Vespalec	Collected date/time 08/21/19 13:55	Received date/time 08/23/19 08:00
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	100	08/23/19 13:28	08/23/19 13:28	LBR	Mt. Juliet, TN
SP-301-082119 L1131933-05 GW				Collected by T. Vespalec	Collected date/time 08/21/19 14:00	Received date/time 08/23/19 08:00
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	1	08/23/19 11:47	08/23/19 11:47	LBR	Mt. Juliet, TN
EW-2-082219 L1131933-06 GW				Collected by T. Vespalec	Collected date/time 08/22/19 12:10	Received date/time 08/23/19 08:00
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	1	08/23/19 11:21	08/23/19 11:21	LBR	Mt. Juliet, TN
EW-1-082219 L1131933-07 GW				Collected by T. Vespalec	Collected date/time 08/22/19 12:15	Received date/time 08/23/19 08:00
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	100	08/23/19 14:19	08/23/19 14:19	LBR	Mt. Juliet, TN
IW-1-082219 L1131933-08 GW				Collected by T. Vespalec	Collected date/time 08/22/19 12:20	Received date/time 08/23/19 08:00
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	2000	08/23/19 14:45	08/23/19 14:45	LBR	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

# SAMPLE SUMMARY

## SP-201-082219 L1131933-09 GW

Collected by: T. Vespalec  
 Collected date/time: 08/22/19 12:30  
 Received date/time: 08/23/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1333272	100	08/23/19 13:54	08/23/19 13:54	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1334003	1	08/23/19 09:16	08/23/19 15:50	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1333739	1	08/23/19 11:13	08/23/19 11:13	ELN	Mt. Juliet, TN

- 1  
Cp
- 2  
Tc
- 3  
Ss
- 4  
Cn
- 5  
Sr
- 6  
Qc
- 7  
Gl
- 8  
Al
- 9  
Sc

## SP-301-082219 L1131933-10 GW

Collected by: T. Vespalec  
 Collected date/time: 08/22/19 12:45  
 Received date/time: 08/23/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1333825	1	08/23/19 11:27	08/23/19 11:41	MMF	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1333272	1	08/23/19 12:12	08/23/19 12:12	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1334003	1	08/23/19 09:16	08/23/19 15:51	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1333739	1	08/23/19 11:28	08/23/19 11:28	ELN	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1333755	1	08/23/19 14:35	08/23/19 14:35	VRP	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0715		0.00400	1	08/23/2019 10:54	<a href="#">WG1333272</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	6.44		0.400	100	08/23/2019 12:38	<a href="#">WG1333272</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	81.6		8.00	2000	08/23/2019 13:03	<a href="#">WG1333272</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	8.45		0.400	100	08/23/2019 13:28	<a href="#">WG1333272</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0208		0.00400	1	08/23/2019 11:47	<a href="#">WG1333272</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0712		0.00400	1	08/23/2019 11:21	<a href="#">WG1333272</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	6.25		0.400	100	08/23/2019 14:19	<a href="#">WG1333272</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	77.4		8.00	2000	08/23/2019 14:45	<a href="#">WG1333272</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	8.76		0.400	100	08/23/2019 13:54	<a href="#">WG1333272</a>

1 Cp

2 Tc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus,Total	ND		0.100	1	08/23/2019 15:50	<a href="#">WG1334003</a>

3 Ss

4 Cn

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	3.18		0.100	1	08/23/2019 11:13	<a href="#">WG1333739</a>

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		4.18	1	08/23/2019 11:41	<a href="#">WG1333825</a>

Sample Narrative:

L1131933-10 WG1333825: all that would filter

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.00674		0.00400	1	08/23/2019 12:12	<a href="#">WG1333272</a>

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.972		0.100	1	08/23/2019 15:51	<a href="#">WG1334003</a>

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/23/2019 11:28	<a href="#">WG1333739</a>

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	8.01		1.00	1	08/23/2019 14:35	<a href="#">WG1333755</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Method Blank (MB)

(MB) R3443710-1 08/23/19 11:41

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		0.350	2.50

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

L1131672-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1131672-01 08/23/19 11:41 • (DUP) R3443710-3 08/23/19 11:41

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	92.0	104	1	12.2	R8	5

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

Laboratory Control Sample (LCS)

(LCS) R3443710-2 08/23/19 11:41

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	812	105	85.0-115	

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3443636-1 08/23/19 04:56

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1129646-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1129646-03 08/23/19 06:12 • (DUP) R3443636-3 08/23/19 06:37

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.00235	0.00248	1	5.60	E4	15

L1131933-10 Original Sample (OS) • Duplicate (DUP)

(OS) L1131933-10 08/23/19 12:12 • (DUP) R3443636-6 08/23/19 16:10

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.00674	0.00662	1	1.85		15

Laboratory Control Sample (LCS)

(LCS) R3443636-2 08/23/19 05:47

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0105	105	90.0-110	

L1129646-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1129646-03 08/23/19 06:12 • (MS) R3443636-4 08/23/19 07:03 • (MSD) R3443636-5 08/23/19 07:28

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	0.00235	0.0136	0.0133	112	110	1	80.0-120			1.76	15



Method Blank (MB)

(MB) R3443757-1 08/23/19 15:19

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1130503-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1130503-01 08/23/19 15:22 • (DUP) R3443757-3 08/23/19 15:23

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	2.44	2.61	1	6.73		20

L1130536-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1130536-01 08/23/19 15:53 • (DUP) R3443757-7 08/23/19 15:54

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	17.3	17.7	5	2.58		20

Laboratory Control Sample (LCS)

(LCS) R3443757-2 08/23/19 15:21

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.86	93.0	90.0-110	

L1130584-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1130584-01 08/23/19 15:38 • (MS) R3443757-4 08/23/19 15:40 • (MSD) R3443757-5 08/23/19 15:41

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	ND	2.18	2.27	85.2	88.8	1	90.0-110	M2	M2	4.04	20

L1131474-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1131474-02 08/23/19 15:44 • (MS) R3443757-6 08/23/19 15:45

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	2.92	3.07	6.00	1	90.0-110	M2





Method Blank (MB)

(MB) R3443601-1 08/23/19 08:00

Analyte	MB Result mg/l	<u>MB Qualifier</u>	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

Laboratory Control Sample (LCS)

(LCS) R3443601-2 08/23/19 08:15

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Nitrate	8.00	8.04	100	80.0-120	

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3443767-1 08/23/19 11:04

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.551	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

L1131933-10 Original Sample (OS) • Duplicate (DUP)

(OS) L1131933-10 08/23/19 14:35 • (DUP) R3443767-3 08/23/19 14:53

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	8.01	7.93	1	0.904		20

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3443767-2 08/23/19 13:21

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	77.9	104	85.0-115	

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.
R8	Sample RPD exceeded the method acceptance limit.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

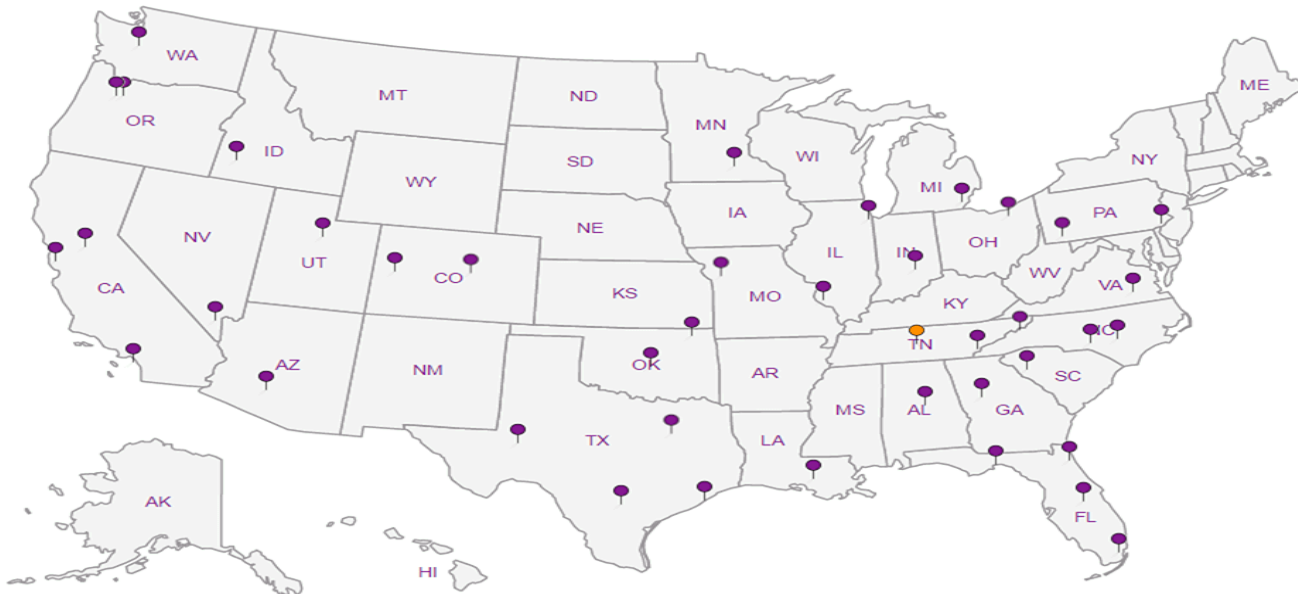
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Billing Information:

Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: thomas.vespalec@arcadis.com

Project  
Description: **UPCO**

City/State  
Collected: **AZ**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**T. VESPALEC**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*[Signature]*  
Immediately  
Packed on Ice N  Y

Rush? (Lab MUST Be Notified)

Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #

Date Results Needed

Pres  
Chk

Analysis / Container / Preservative

**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **L1131933**  
**B093**

Acctnum: **UTCARCA**  
Template: **T152379**  
Prelogin: **P717001**  
TSR: 526 - Chris McCord  
PB: **6-28-196**  
Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
EW-2-φ82119	G	GW	-	8/21/19	1340	1						X					RUSH	-01
EW-1-φ82119	G	GW	-		1345	1						X					RUSH	02
IW-1-φ82119	G	GW	-		1350	1						X					RUSH	03
SP-2φ1-φ82119	G	GW	-		1355	1						X					RUSH	04
SP-3φ1-φ82119	G	GW	-		1400	1						X					RUSH	05
EW-2-φ82219	G	GW	-	8/22/19	1210	1						X					RUSH	06
EW-1-φ82219	G	GW	-		1215	1						X					RUSH	07
IW-1-φ82219	G	GW	-		1220	1						X					RUSH	08
SP-2φ1-φ82219	G	GW	-		1230	3	X					X				X	RUSH	09
SP-3φ1-φ82219	G	GW	-		1245	5	X					X		X	X	X	RUSH	10

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  
 UPS  FedEx  Courier \_\_\_\_\_

Tracking #

Sample Receipt Checklist  
COC Seal Present/Intact:  NP  N  
COC Signed/Accurate:   N  
Bottles arrive intact:   N  
Correct bottles used:   N  
Sufficient volume sent:   N  
If Applicable  
VOA Zero Headspace:   N  
Preservation Correct/Checked:   N

Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/22/19	Time: 1309	Received by: (Signature) <i>[Signature]</i>	Trip Blank Received: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	HCL/MeOH TBR	Temp: <b>23.8°C</b> Bottles Received: <b>16</b>	If preservation required by Login: Date/Time
Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/22/19	Time: 1800	Received by: (Signature) <i>[Signature]</i>	Date: 8/23/19	Time: 8:00	Hold:	Condition: NCF <input checked="" type="checkbox"/> OK

ESCB

## UTC - Arcadis

Sample Delivery Group: L1131970  
Samples Received: 08/23/2019  
Project Number: 30002531.0000  
Description: UPCO

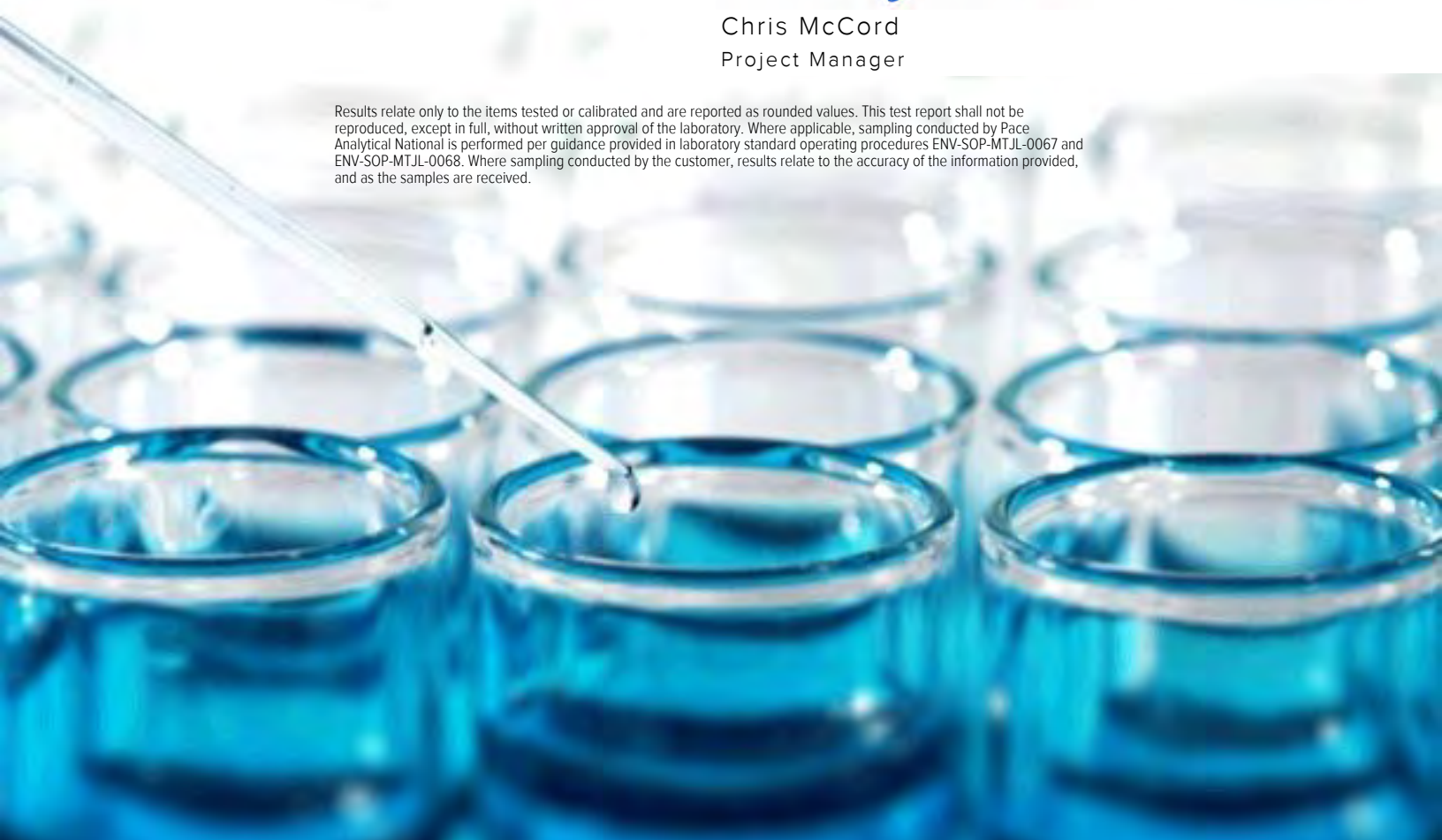
Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
<b>SP-701-082219 L1131970-01</b>	<b>5</b>	
<b>TRIP BLANK L1131970-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>6</sup>Qc</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>9</b>	
<b>Gl: Glossary of Terms</b>	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>12</b>	<b><sup>9</sup>Sc</b>



# SAMPLE SUMMARY



## SP-701-082219 L1131970-01 GW

Collected by: T. Vespalec  
 Collected date/time: 08/22/19 11:00  
 Received date/time: 08/23/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1335266	1	08/27/19 21:39	08/27/19 21:39	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1337834	1	08/31/19 04:05	08/31/19 04:05	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1335506	1	08/27/19 15:07	08/27/19 15:07	JAH	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## TRIP BLANK L1131970-02 GW

Collected by: T. Vespalec  
 Collected date/time: 08/22/19 00:00  
 Received date/time: 08/23/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1337834	1	08/30/19 22:57	08/30/19 22:57	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1335506	1	08/27/19 14:47	08/27/19 14:47	JAH	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Perchlorate	ND		0.00400	1	08/27/2019 21:39	<a href="#">WG1335266</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
1,1-Dichloroethene	ND		0.00100	1	08/31/2019 04:05	<a href="#">WG1337834</a>
(S) Toluene-d8	102		80.0-120		08/31/2019 04:05	<a href="#">WG1337834</a>
(S) 4-Bromofluorobenzene	92.9		77.0-126		08/31/2019 04:05	<a href="#">WG1337834</a>
(S) 1,2-Dichloroethane-d4	97.3		70.0-130		08/31/2019 04:05	<a href="#">WG1337834</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
1,4-Dioxane	ND		0.00300	1	08/27/2019 15:07	<a href="#">WG1335506</a>
(S) Toluene-d8	98.9		77.0-127		08/27/2019 15:07	<a href="#">WG1335506</a>

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	08/30/2019 22:57	<a href="#">WG1337834</a>
(S) Toluene-d8	106		80.0-120		08/30/2019 22:57	<a href="#">WG1337834</a>
(S) 4-Bromofluorobenzene	95.2		77.0-126		08/30/2019 22:57	<a href="#">WG1337834</a>
(S) 1,2-Dichloroethane-d4	94.7		70.0-130		08/30/2019 22:57	<a href="#">WG1337834</a>

1 Cp

2 Tc

3 Ss

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	08/27/2019 14:47	<a href="#">WG1335506</a>
(S) Toluene-d8	99.0		77.0-127		08/27/2019 14:47	<a href="#">WG1335506</a>

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3445144-1 08/27/19 19:31

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

L1131970-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1131970-01 08/27/19 21:39 • (DUP) R3445144-3 08/27/19 22:05

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

<sup>5</sup>Sr

<sup>6</sup>Qc

L1133401-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1133401-05 08/28/19 13:27 • (DUP) R3445144-5 08/28/19 14:39

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.00747	0.00779	1	4.18		15

<sup>7</sup>Gl

<sup>8</sup>Al

Laboratory Control Sample (LCS)

(LCS) R3445144-2 08/27/19 20:22

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0100	100	90.0-110	

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3446222-2 08/30/19 22:35

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	108			80.0-120
(S) 4-Bromofluorobenzene	101			77.0-126
(S) 1,2-Dichloroethane-d4	95.3			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3446222-1 08/30/19 21:30 • (LCSD) R3446222-3 08/31/19 07:22

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0254	0.0250	101	99.9	71.0-124			1.54	20
(S) Toluene-d8				91.9	93.5	80.0-120				
(S) 4-Bromofluorobenzene				88.8	88.5	77.0-126				
(S) 1,2-Dichloroethane-d4				97.9	98.4	70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3444730-3 08/27/19 11:30

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.4			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3444730-1 08/27/19 10:31 • (LCSD) R3444730-2 08/27/19 10:51

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0451	0.0437	90.2	87.5	55.0-138			3.09	24
(S) Toluene-d8				99.2	98.9	77.0-127				

5 Sr

6 Qc

L1131970-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1131970-01 08/27/19 15:07 • (MS) R3444730-4 08/27/19 15:46 • (MSD) R3444730-5 08/27/19 16:06

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	ND	0.0498	0.0520	99.5	104	1	13.0-160			4.31	31
(S) Toluene-d8					99.3	99.1		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

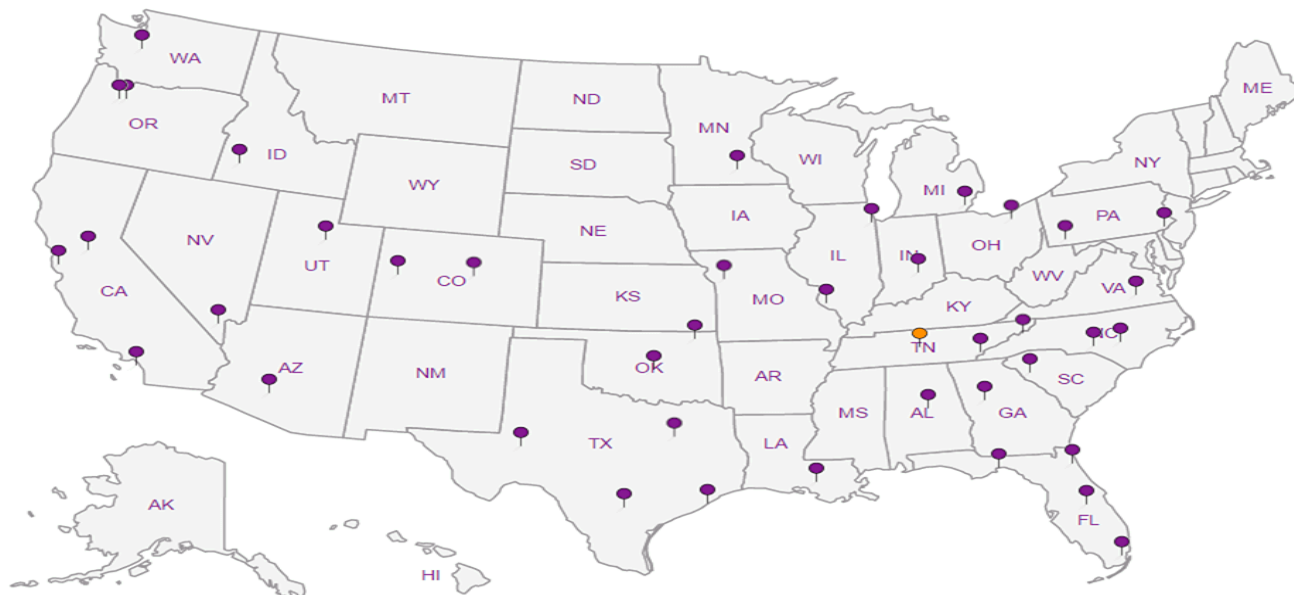
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
**T. VESPALEC**

Collected by (signature):  
*[Signature]*  
Immediately Packed on Ice N  Y

Client Project #  
**03994018.0028**

Site/Facility ID #  
**UPCO**

Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

City/State Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #  
Date Results Needed  
**STD TAT**

Billing Information:

Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

Analysis / Container / Preservative

Pres Chk



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **L1131970**  
Table #  
Acctnum: **UTCARCA**  
Template: **T152379**  
Prelogin: **P717001**  
TSR: **526 - Chris McCord**  
PB: **6-28-196m**  
Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCI	1,4-Dioxane 8260B 40mlAmb-HCI	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCI	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4
SP-7φ1-φ82219	G	GW	-	8/22/19	1100	4		X	X			X				
TRIA BLANK	-	GW	-	8/22/19	-	1		X	X							
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
 UPS  FedEx  Courier  Tracking #

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist  
 COC Seal Present/Intact:  NP  Y  N  
 COC Signed/Accurate:  NP  Y  N  
 Bottles arrive intact:  NP  Y  N  
 Correct bottles used:  NP  Y  N  
 Sufficient volume sent:  NP  Y  N  
 If Applicable  
 VOA Zero Headpace:  NP  Y  N  
 Preservation Correct/Checked:  NP  Y  N  
**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/22/19	Time: 1309	Received by: (Signature) <i>[Signature]</i>	Trip Blank Received: Yes/No 1 HCL/MeOH/TSR
Relinquished by: (Signature) <i>[Signature]</i>	Date: 8/22/19	Time: 1800	Received by: (Signature) <i>[Signature]</i>	Temp: ASDP °C 1.9 ± 0.1 = 1.9 Bottles Received: 4
Relinquished by: (Signature) <i>[Signature]</i>	Date:	Time:	Received for lab by: (Signature) <i>[Signature]</i>	Date: 8/23/19 Time: 8:00 Hold: Condition: NCF / OK

August 27, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1132515  
Samples Received: 08/24/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespalect  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b>3</b> Ss
EW-1-082319 L1132515-01	<b>5</b>	
EW-2-082319 L1132515-02	<b>6</b>	<b>4</b> Cn
IW-1-082319 L1132515-03	<b>7</b>	<b>5</b> Sr
SP-201-082319 L1132515-04	<b>8</b>	
SP-301-082319 L1132515-05	<b>9</b>	<b>6</b> Qc
<b>Qc: Quality Control Summary</b>	<b>10</b>	<b>7</b> Gl
Wet Chemistry by Method 314.0 Mod	<b>10</b>	
<b>Gl: Glossary of Terms</b>	<b>11</b>	<b>8</b> Al
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	<b>9</b> Sc

# SAMPLE SUMMARY

## EW-1-082319 L1132515-01 GW

Collected by: Mark Hammer  
 Collected date/time: 08/23/19 07:45  
 Received date/time: 08/24/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334820	100	08/26/19 14:22	08/26/19 14:22	GB	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## EW-2-082319 L1132515-02 GW

Collected by: Mark Hammer  
 Collected date/time: 08/23/19 07:48  
 Received date/time: 08/24/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334820	1	08/26/19 14:47	08/26/19 14:47	GB	Mt. Juliet, TN

## IW-1-082319 L1132515-03 GW

Collected by: Mark Hammer  
 Collected date/time: 08/23/19 07:51  
 Received date/time: 08/24/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334820	2000	08/26/19 15:13	08/26/19 15:13	GB	Mt. Juliet, TN

## SP-201-082319 L1132515-04 GW

Collected by: Mark Hammer  
 Collected date/time: 08/23/19 07:54  
 Received date/time: 08/24/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334820	100	08/26/19 15:38	08/26/19 15:38	GB	Mt. Juliet, TN

## SP-301-082319 L1132515-05 GW

Collected by: Mark Hammer  
 Collected date/time: 08/23/19 07:57  
 Received date/time: 08/24/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334820	1	08/26/19 16:03	08/26/19 16:03	GB	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	5.99		0.400	100	08/26/2019 14:22	<a href="#">WG1334820</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0673		0.00400	1	08/26/2019 14:47	<a href="#">WG1334820</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	74.1		8.00	2000	08/26/2019 15:13	<a href="#">WG1334820</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	6.00		0.400	100	08/26/2019 15:38	<a href="#">WG1334820</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	08/26/2019 16:03	<a href="#">WG1334820</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3444378-1 08/26/19 13:06

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1132515-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1132515-02 08/26/19 14:47 • (DUP) R3444378-3 08/26/19 16:29

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.0673	0.0712	1	5.64		15

Laboratory Control Sample (LCS)

(LCS) R3444378-2 08/26/19 13:56

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0107	107	90.0-110	

L1132515-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1132515-05 08/26/19 16:03 • (MS) R3444378-4 08/26/19 16:54 • (MSD) R3444378-5 08/26/19 18:10

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	ND	0.0119	0.0117	106	104	1	80.0-120			1.94	15



Guide to Reading and Understanding Your Laboratory Report

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Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
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- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



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 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
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Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
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Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

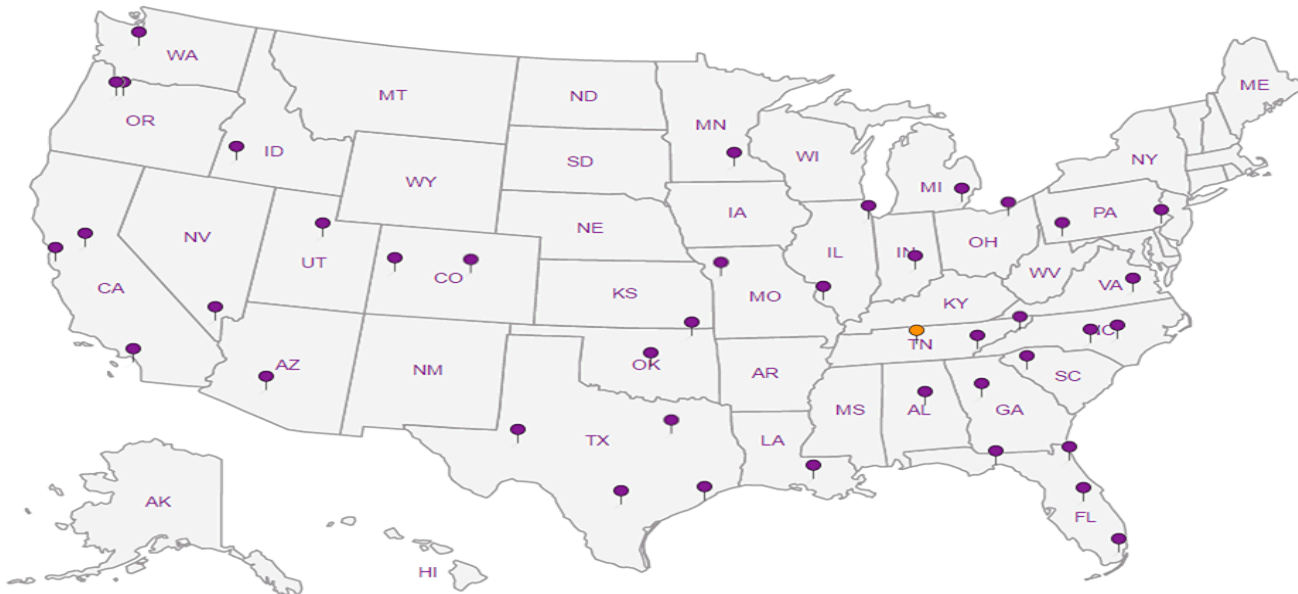
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A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

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2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Billing Information:  
**Accounts Payable**  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Report to:  
**Thomas Vespalec**

Email To: **thomas.vespalec@arcadis.com**

Project Description: **UPCO**

City/State Collected: **AZ**

Phone: **480-535-7399**  
 Fax:

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**MARK HAMMER**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*Mark Hammer*

Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #  
 Date Results Needed

Immediately Packed on Ice N  Y

Pres Chk	Analysis / Container / Preservative																			
	**NITRATE**	1,1-DCE-8260B	40ml/Amb-HCl	1,4-Dioxane	8260B	40ml/Amb-HCl	Ammonia	250ml/HDPE-H2SO4	Diss. Fe - LF	250ml/HDPE-NoPres	Perchlorate	125ml/HDPE-NoPres	RCRA8+Fe	250ml/HDPE-HNO3	TOC	250ml/Amb-HCl	TSS	1L-HDPE NoPres	Total Phosphorous	250ml/HDPE-H2SO4

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



L# **L1132515**  
 Table **1186**

Accctnum: **UTCARCA**  
 Template: **T152379**  
 Prelogin: **P717001**  
 TSR: **526 - Chris McCord**  
 PB: **6-28-196m**  
 Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs
EW-1-082319	G	GW		8/23/19	07:45	1
EW-2-082319	↓	GW		↓	07:48	1
IW-1-082319	↓	GW		↓	07:51	1
SP-201-082319	↓	GW		↓	07:54	1
SP-301-082319	↓	GW		↓	07:57	1
		GW				
		GW				
		GW				
		GW				
		GW				
		GW				

Remarks	Sample # (lab only)
RUSH	-01
↓	02
↓	03
↓	04
↓	05

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  
 UPS  FedEx  Courier \_\_\_\_\_

Tracking # \_\_\_\_\_

Sample Receipt Checklist

COC Seal Present/Intact:  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N

If Applicable  
 VOA Zero Headspace:  Y  N  
 RAD SCREEN: **<0.5 mR/hr**  Y  N

Relinquished by: (Signature)  
*Mark Hammer*

Date: **8/23/19**  
 Time: **1043**

Received by: (Signature)  
*Samyary*

Trip Blank Received: Yes  No   
 HCL/MeOH TBR

Relinquished by: (Signature)  
*Samyary*

Date: **8/23/19**  
 Time: **1800**

Received by: (Signature)  
*SUB*

Temp: **21.10-2.19** °C  
 Bottles Received: **5**

If preservation required by Login: Date/Time

Relinquished by: (Signature)  
*Mark Hammer*

Date: \_\_\_\_\_  
 Time: \_\_\_\_\_

Received for lab by: (Signature)  
*Mark Hammer*

Date: **8-24-19** Time: **0100**

Hold: \_\_\_\_\_ Condition: **NCF 1 OK**

## UTC - Arcadis

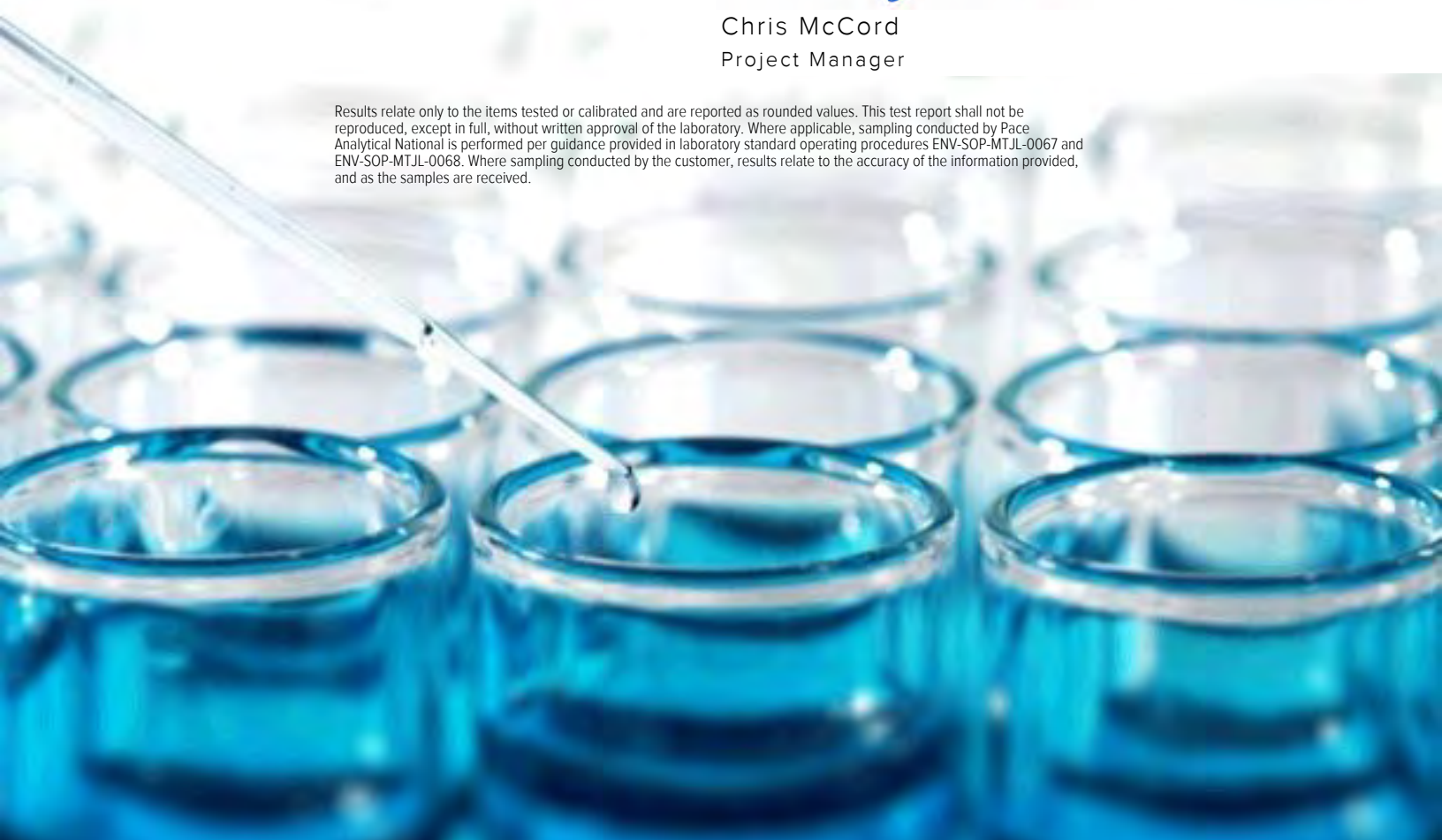
Sample Delivery Group: L1132953  
Samples Received: 08/27/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.







<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
EW-1-082519 L1132953-01	<b>5</b>	
EW-2-082519 L1132953-02	<b>6</b>	
IW-1-082519 L1132953-03	<b>7</b>	
SP-201-082519 L1132953-04	<b>8</b>	
SP-301-082519 L1132953-05	<b>9</b>	
<b>Qc: Quality Control Summary</b>	<b>10</b>	<b><sup>6</sup>Qc</b>
Wet Chemistry by Method 314.0 Mod	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Gl: Glossary of Terms</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	<b><sup>9</sup>Sc</b>



# SAMPLE SUMMARY



EW-1-082519 L1132953-01 GW	Collected by Mark Hammer	Collected date/time 08/25/19 17:20	Received date/time 08/27/19 08:00
----------------------------	-----------------------------	---------------------------------------	--------------------------------------

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	100	08/27/19 12:19	08/27/19 12:19	LBR	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

EW-2-082519 L1132953-02 GW	Collected by Mark Hammer	Collected date/time 08/25/19 17:25	Received date/time 08/27/19 08:00
----------------------------	-----------------------------	---------------------------------------	--------------------------------------

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	1	08/27/19 10:35	08/27/19 10:35	LBR	Mt. Juliet, TN

IW-1-082519 L1132953-03 GW	Collected by Mark Hammer	Collected date/time 08/25/19 17:30	Received date/time 08/27/19 08:00
----------------------------	-----------------------------	---------------------------------------	--------------------------------------

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	2000	08/27/19 14:14	08/27/19 14:14	LBR	Mt. Juliet, TN

SP-201-082519 L1132953-04 GW	Collected by Mark Hammer	Collected date/time 08/25/19 17:35	Received date/time 08/27/19 08:00
------------------------------	-----------------------------	---------------------------------------	--------------------------------------

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	200	08/27/19 16:28	08/27/19 16:28	LBR	Mt. Juliet, TN

SP-301-082519 L1132953-05 GW	Collected by Mark Hammer	Collected date/time 08/25/19 17:40	Received date/time 08/27/19 08:00
------------------------------	-----------------------------	---------------------------------------	--------------------------------------

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	1	08/27/19 11:28	08/27/19 11:28	LBR	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	6.23		0.400	100	08/27/2019 12:19	<a href="#">WG1334823</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0665		0.00400	1	08/27/2019 10:35	<a href="#">WG1334823</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	73.9		8.00	2000	08/27/2019 14:14	<a href="#">WG1334823</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	11.1		0.800	200	08/27/2019 16:28	<a href="#">WG1334823</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	08/27/2019 11:28	<a href="#">WG1334823</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3444783-1 08/26/19 21:11

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

L1132956-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1132956-05 08/27/19 11:54 • (DUP) R3444783-4 08/27/19 15:55

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Perchlorate	ND	0.00392	1	0.000		15

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

Laboratory Control Sample (LCS)

(LCS) R3444783-2 08/26/19 22:02

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0101	101	90.0-110	





Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
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Georgia <sup>1</sup>	923	North Dakota	R-140
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Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

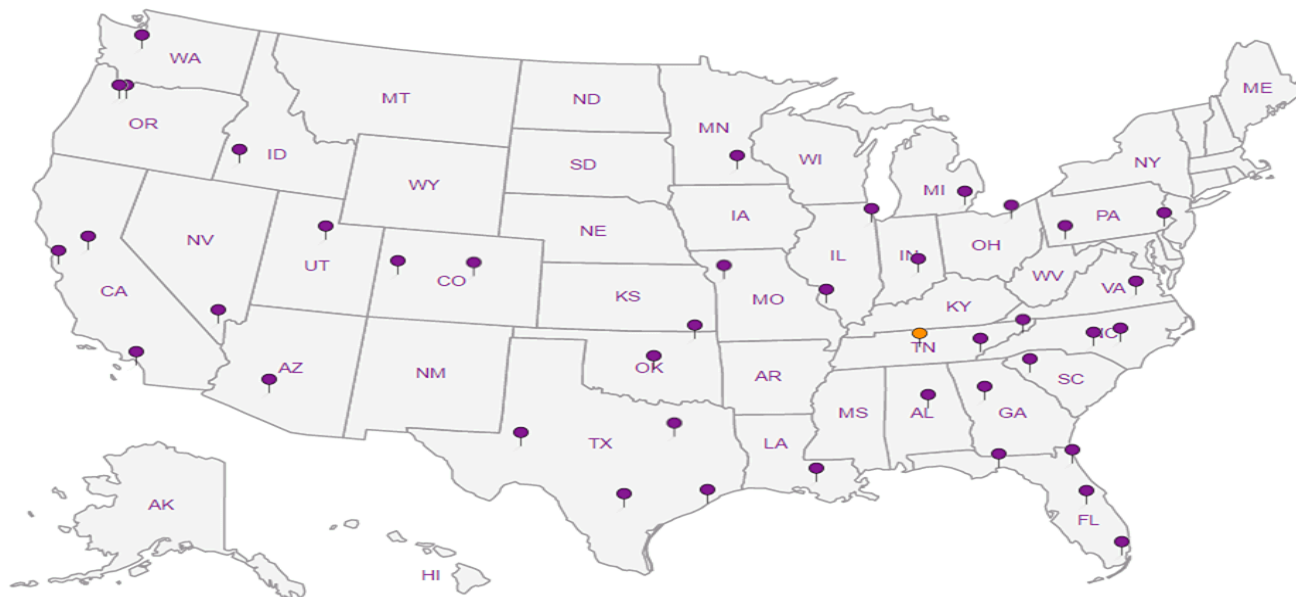
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EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

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1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
*Mark Hammer*

Collected by (signature):  
*Mark Hammer*

Immediately  
Packed on Ice N \_\_\_ Y **X**

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

City/State  
Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #

Date Results Needed

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page **1** of **1**



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **132953**  
**G204**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P717001**

TSR: **526 - Chris McCord**

PB: *6-28-196m*

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCI	1,4-Dioxane 8260B 40mlAmb-HCI	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCI	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
<i>EW-1-082519</i>	<i>G</i>	<i>GW</i>		<i>8/25/19</i>	<i>17:20</i>	<i>1</i>						<i>X</i>					<i>RUSH</i>	<i>01</i>
<i>EW-2-082519</i>	<i> </i>	<i>GW</i>		<i> </i>	<i>17:25</i>	<i>1</i>						<i>X</i>					<i> </i>	<i>02</i>
<i>IW-1-082519</i>	<i> </i>	<i>GW</i>		<i> </i>	<i>17:30</i>	<i>1</i>						<i>X</i>					<i> </i>	<i>03</i>
<i>SP-201-082519</i>	<i> </i>	<i>GW</i>		<i> </i>	<i>17:35</i>	<i>1</i>						<i>X</i>					<i> </i>	<i>04</i>
<i>SP-301-082519</i>	<i>v</i>	<i>GW</i>		<i>v</i>	<i>17:40</i>	<i>1</i>						<i>X</i>					<i>v</i>	<i>05</i>
		<i>GW</i>																
		<i>GW</i>																
		<i>GW</i>																
		<i>GW</i>																
		<i>GW</i>																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
\_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier

Tracking #

pH \_\_\_ Temp \_\_\_

Flow \_\_\_ Other \_\_\_

Sample Receipt Checklist

COC Seal Present/Intact: \_\_\_ NP  Y \_\_\_ N  
COC Signed/Accurate: \_\_\_  Y \_\_\_ N  
Bottles arrive intact: \_\_\_  Y \_\_\_ N  
Correct bottles used: \_\_\_  Y \_\_\_ N  
Sufficient volume sent: \_\_\_  Y \_\_\_ N

If Applicable

VOA Zero Headspace: \_\_\_ Y \_\_\_ N  
Preservation Correct/Checked: \_\_\_ Y \_\_\_ N

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: <i>8/26/19</i>	Time: <i>1400</i>	Received by: (Signature) <i>Tanya...</i>	Trip Blank Received: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	HCL/MeOH TBR
Relinquished by: (Signature) <i>Tanya...</i>	Date: <i>8/26/19</i>	Time: <i>1800</i>	Received by: (Signature) <i>...</i>	Temp: <i>A3BPC</i> <i>2.2-1.2.1</i>	Bottles Received: <i>5</i>
Relinquished by: (Signature) <i>...</i>	Date: <i>8/27/19</i>	Time: <i>8:00</i>	Received for lab by: (Signature) <i>...</i>	Date: <i>8/27/19</i>	Time: <i>8:00</i>

If preservation required by Login: Date/Time

Hold: Condition:  
NCF / *OK*

ESLAB

## UTC - Arcadis

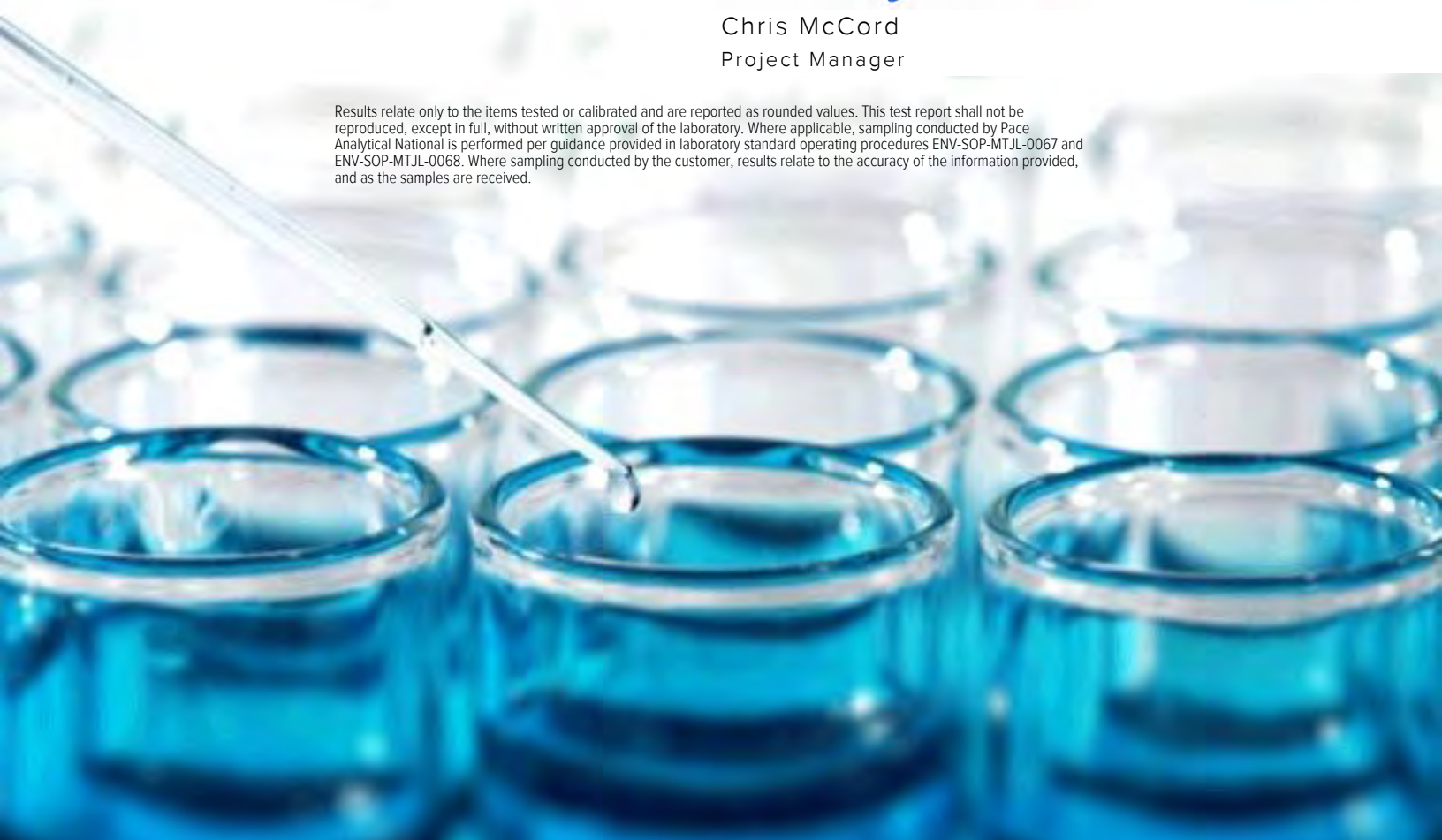
Sample Delivery Group: L1132956  
Samples Received: 08/27/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	
<b>Tc: Table of Contents</b>	<b>2</b>	
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<b>Sr: Sample Results</b>	<b>5</b>	
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# SAMPLE SUMMARY



## EW-1-082419 L1132956-01 GW

Collected by: Mark Hammer  
 Collected date/time: 08/24/19 15:45  
 Received date/time: 08/27/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	100	08/27/19 13:46	08/27/19 13:46	LBR	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

## EW-2-082419 L1132956-02 GW

Collected by: Mark Hammer  
 Collected date/time: 08/24/19 15:50  
 Received date/time: 08/27/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	1	08/27/19 11:03	08/27/19 11:03	LBR	Mt. Juliet, TN

4 Cn

5 Sr

## IW-1-082419 L1132956-03 GW

Collected by: Mark Hammer  
 Collected date/time: 08/24/19 15:40  
 Received date/time: 08/27/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	2000	08/27/19 14:39	08/27/19 14:39	LBR	Mt. Juliet, TN

6 Qc

7 Gl

8 Al

## SP-201-082419 L1132956-04 GW

Collected by: Mark Hammer  
 Collected date/time: 08/24/19 15:35  
 Received date/time: 08/27/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1334823	100	08/27/19 15:30	08/27/19 15:30	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1335244	1	08/27/19 14:03	08/27/19 17:18	SDL	Mt. Juliet, TN

9 Sc

## SP-301-082419 L1132956-05 GW

Collected by: Mark Hammer  
 Collected date/time: 08/24/19 15:25  
 Received date/time: 08/27/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1335396	1	08/27/19 10:47	08/27/19 11:02	MMF	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1334823	1	08/27/19 11:54	08/27/19 11:54	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1335244	1	08/27/19 14:03	08/27/19 17:19	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1335315	1	08/27/19 11:41	08/27/19 11:41	VRP	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	6.32		0.400	100	08/27/2019 13:46	<a href="#">WG1334823</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0664		0.00400	1	08/27/2019 11:03	<a href="#">WG1334823</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	73.3		8.00	2000	08/27/2019 14:39	<a href="#">WG1334823</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	9.17		0.400	100	08/27/2019 15:30	<a href="#">WG1334823</a>

1 Cp

2 Tc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus,Total	ND		0.100	1	08/27/2019 17:18	<a href="#">WG1335244</a>

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	3.75		3.13	1	08/27/2019 11:02	<a href="#">WG1335396</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	08/27/2019 11:54	<a href="#">WG1334823</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.746		0.100	1	08/27/2019 17:19	<a href="#">WG1335244</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	9.56		1.00	1	08/27/2019 11:41	<a href="#">WG1335315</a>

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3444711-1 08/27/19 11:02

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		0.350	2.50

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

L1132932-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1132932-01 08/27/19 11:02 • (DUP) R3444711-3 08/27/19 11:02

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	43.4	44.0	1	1.30		5

<sup>5</sup> Sr

<sup>6</sup> Qc

Laboratory Control Sample (LCS)

(LCS) R3444711-2 08/27/19 11:02

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	740	95.7	85.0-115	

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3444783-1 08/26/19 21:11

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

L1131494-17 Original Sample (OS) • Duplicate (DUP)

(OS) L1131494-17 08/27/19 04:49 • (DUP) R3444783-3 08/27/19 05:14

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	U	0.000	1	0.000		15

L1132956-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1132956-05 08/27/19 11:54 • (DUP) R3444783-4 08/27/19 15:55

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.00392	1	0.000		15

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

Laboratory Control Sample (LCS)

(LCS) R3444783-2 08/26/19 22:02

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0101	101	90.0-110	



Method Blank (MB)

(MB) R3444762-1 08/27/19 16:55

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	0.0374	E4	0.0350	0.100

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1131699-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1131699-03 08/27/19 17:05 • (DUP) R3444762-5 08/27/19 17:07

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.92	1.92	1	0.000		20

L1131760-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1131760-01 08/27/19 17:14 • (DUP) R3444762-7 08/27/19 17:16

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	2.21	2.13	1	3.69		20

Laboratory Control Sample (LCS)

(LCS) R3444762-2 08/27/19 16:56

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	2.12	106	90.0-110	

L1131699-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1131699-01 08/27/19 17:01 • (MS) R3444762-3 08/27/19 17:03 • (MSD) R3444762-4 08/27/19 17:04

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	3.30	5.24	5.57	77.6	90.8	1	90.0-110	E1 M2	E1	6.11	20

L1131699-03 Original Sample (OS) • Matrix Spike (MS)

(OS) L1131699-03 08/27/19 17:05 • (MS) R3444762-6 08/27/19 17:10

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	1.92	4.37	98.0	1	90.0-110	



Method Blank (MB)

(MB) R3444660-1 08/27/19 09:43

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.578	E4	0.102	1.00

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

L1132956-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1132956-05 08/27/19 11:41 • (DUP) R3444660-3 08/27/19 11:58

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC	9.56	9.72	1	1.62		20

<sup>4</sup> Cn

<sup>5</sup> Sr

Laboratory Control Sample (LCS)

(LCS) R3444660-2 08/27/19 11:02

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC	75.0	78.2	104	85.0-115	

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier Description

E1	Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

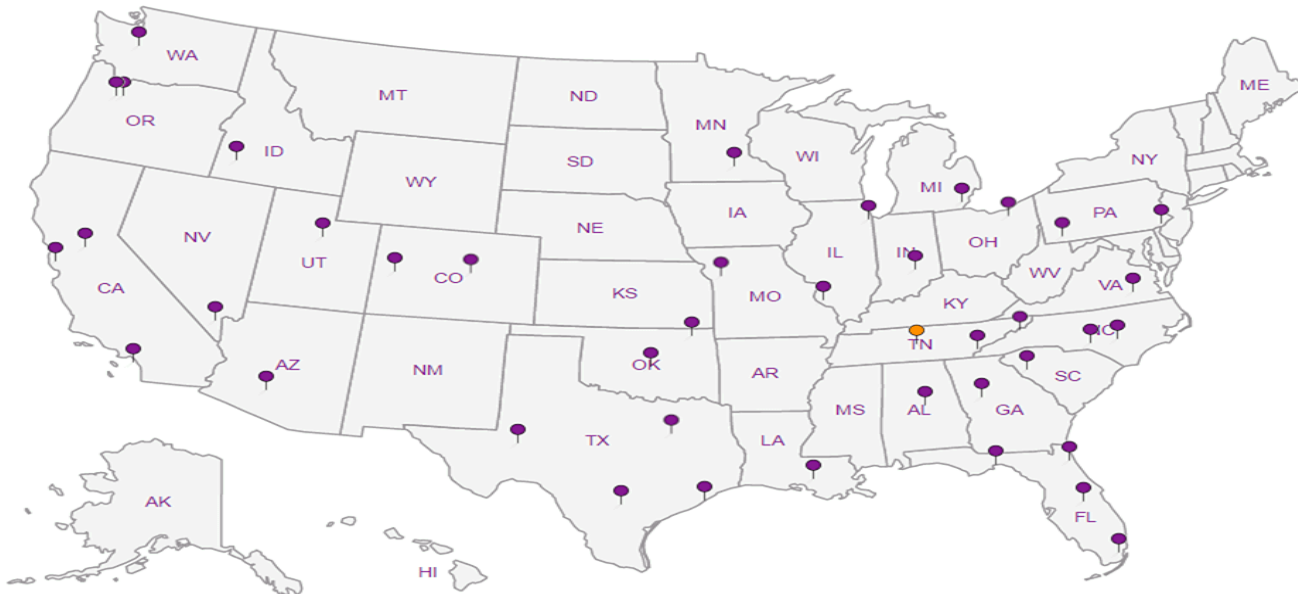
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Collected by (print):  
**Mark Hammer**

Collected by (signature):  
*Mark Hammer*

Immediately  
Packed on Ice N  Y

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129  
Email To: [thomas.vespalec@arcadis.com](mailto:thomas.vespalec@arcadis.com)

City/State  
Collected: **AZ**

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Site/Facility ID #  
**UPCO**

P.O. #

Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #  
Date Results Needed

No. of  
Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCI	1,4-Dioxane 8260B 40mlAmb-HCI	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCR8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCI	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
EW-1-082419	G	GW		8/24/19	15:45	1						X					RUSH	01
EW-2-082419		GW			15:50	1						X						02
IW-1-082419		GW			15:40	1						X						03
SP-201-082419		GW			15:35	2						X		X		X		04
SP-301-082419	V	GW			15:25	4						X		X	X	X		05
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: \*\*NITRATE\*\* has a 48hr hold time.

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist

COC Seal Present/Intact:  NP  Y  N  
COC Signed/Accurate:  Y  N  
Bottles arrive intact:  Y  N  
Correct bottles used:  Y  N  
Sufficient volume sent:  Y  N  
If Applicable  
VOA Zero Headspace:  Y  N  
Preservation Correct/Checked:  Y  N

**RAD SCREEN: <0.5 mCi/g**

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: 8/26/19	Time: 1400	Received by: (Signature) <i>amy arvey</i>	Trip Blank Received: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	HCL / MeoH TBR
Relinquished by: (Signature) <i>amy arvey</i>	Date: 8/26/19	Time: 1800	Received by: (Signature) <i>SCB</i>	Temp: <b>A38F °C</b> 2.2 ± .1 = 2.1	Bottles Received: <b>9</b>
Relinquished by: (Signature) <i>Carol Kemp</i>	Date:	Time:	Received for lab by: (Signature)	Date: 8/27/19	Time: 8:00

If preservation required by Login: Date/Time

Hold: Condition: **NCF 1/OK**



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **1132956**  
**G203**

Acctnum: **UTCARCA**  
Template: **T152379**  
Prelogin: **P717001**  
TSR: 526 - Chris McCord  
PB: *6-28-196m*

Shipped Via: **FedEX Saver**

ESLAB

## UTC - Arcadis

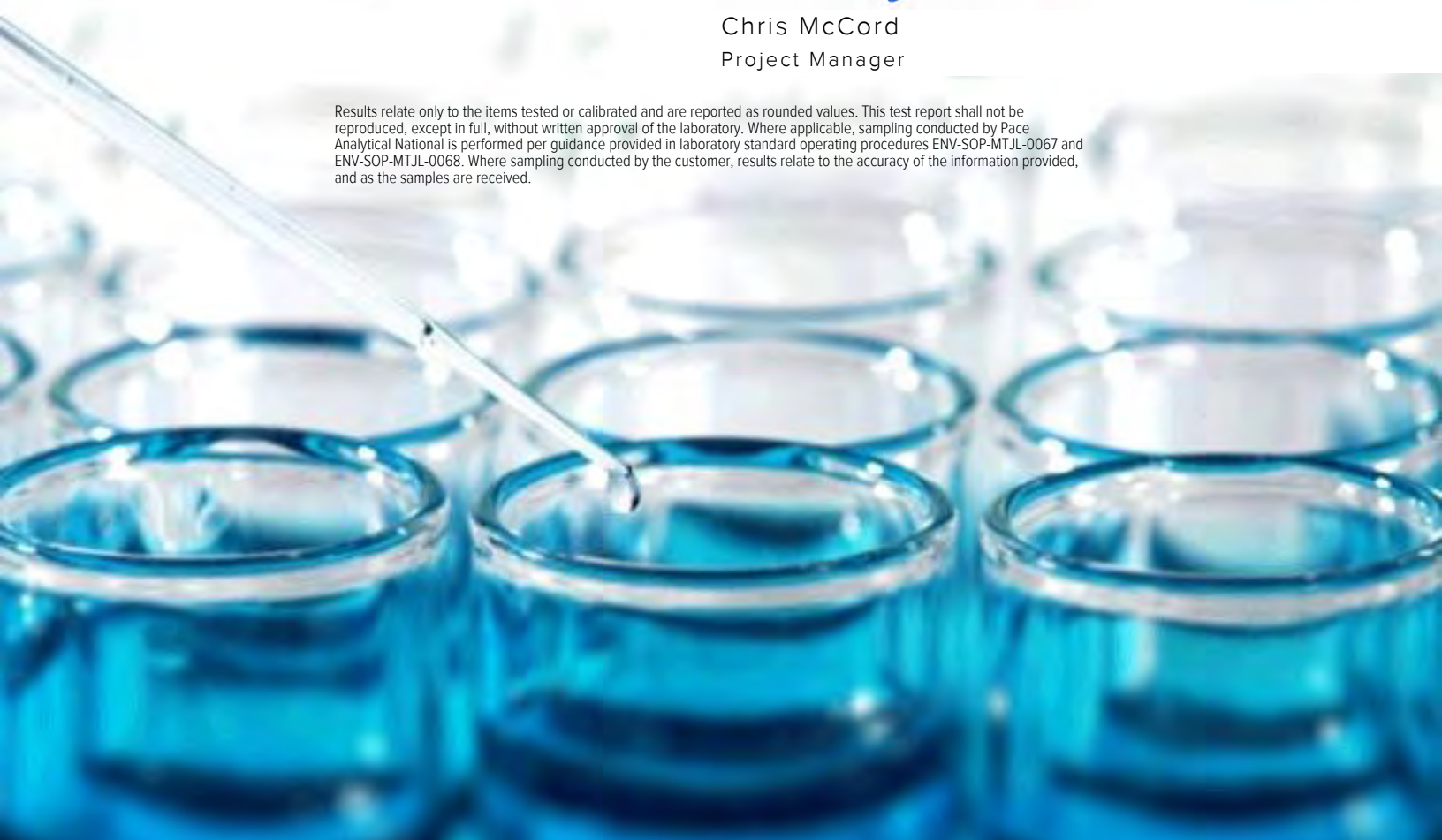
Sample Delivery Group: L1133401  
Samples Received: 08/28/2019  
Project Number: 30002531.0000  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b>3</b> Ss
EW-1-082719 L1133401-01	<b>5</b>	
EW-2-082719 L1133401-02	<b>6</b>	<b>4</b> Cn
IW-1-082719 L1133401-03	<b>7</b>	<b>5</b> Sr
SP-201-082719 L1133401-04	<b>8</b>	
SP-301-082719 L1133401-05	<b>9</b>	<b>6</b> Qc
<b>Qc: Quality Control Summary</b>	<b>10</b>	
Wet Chemistry by Method 314.0 Mod	<b>10</b>	<b>7</b> Gl
<b>Gl: Glossary of Terms</b>	<b>11</b>	<b>8</b> Al
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	<b>9</b> Sc



# SAMPLE SUMMARY



## EW-1-082719 L1133401-01 GW

Collected by  
Mark Hammer  
Collected date/time  
08/27/19 07:45  
Received date/time  
08/28/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1335266	100	08/28/19 11:45	08/28/19 11:45	LBR	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## EW-2-082719 L1133401-02 GW

Collected by  
Mark Hammer  
Collected date/time  
08/27/19 07:50  
Received date/time  
08/28/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1335266	1	08/28/19 12:11	08/28/19 12:11	LBR	Mt. Juliet, TN

## IW-1-082719 L1133401-03 GW

Collected by  
Mark Hammer  
Collected date/time  
08/27/19 07:40  
Received date/time  
08/28/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1335266	2000	08/28/19 12:36	08/28/19 12:36	LBR	Mt. Juliet, TN

## SP-201-082719 L1133401-04 GW

Collected by  
Mark Hammer  
Collected date/time  
08/27/19 07:35  
Received date/time  
08/28/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1335266	200	08/28/19 13:01	08/28/19 13:01	LBR	Mt. Juliet, TN

## SP-301-082719 L1133401-05 GW

Collected by  
Mark Hammer  
Collected date/time  
08/27/19 07:30  
Received date/time  
08/28/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1335266	1	08/28/19 13:27	08/28/19 13:27	LBR	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	6.27		0.400	100	08/28/2019 11:45	<a href="#">WG1335266</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0682		0.00400	1	08/28/2019 12:11	<a href="#">WG1335266</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	70.7		8.00	2000	08/28/2019 12:36	<a href="#">WG1335266</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	12.9		0.800	200	08/28/2019 13:01	<a href="#">WG1335266</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.00747		0.00400	1	08/28/2019 13:27	<a href="#">WG1335266</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3445144-1 08/27/19 19:31

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

L1131970-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1131970-01 08/27/19 21:39 • (DUP) R3445144-3 08/27/19 22:05

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

<sup>7</sup>Gl

<sup>8</sup>Al

L1133401-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1133401-05 08/28/19 13:27 • (DUP) R3445144-5 08/28/19 14:39

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	0.00747	0.00779	1	4.18		15

<sup>9</sup>Sc

Laboratory Control Sample (LCS)

(LCS) R3445144-2 08/27/19 20:22

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0100	100	90.0-110	



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

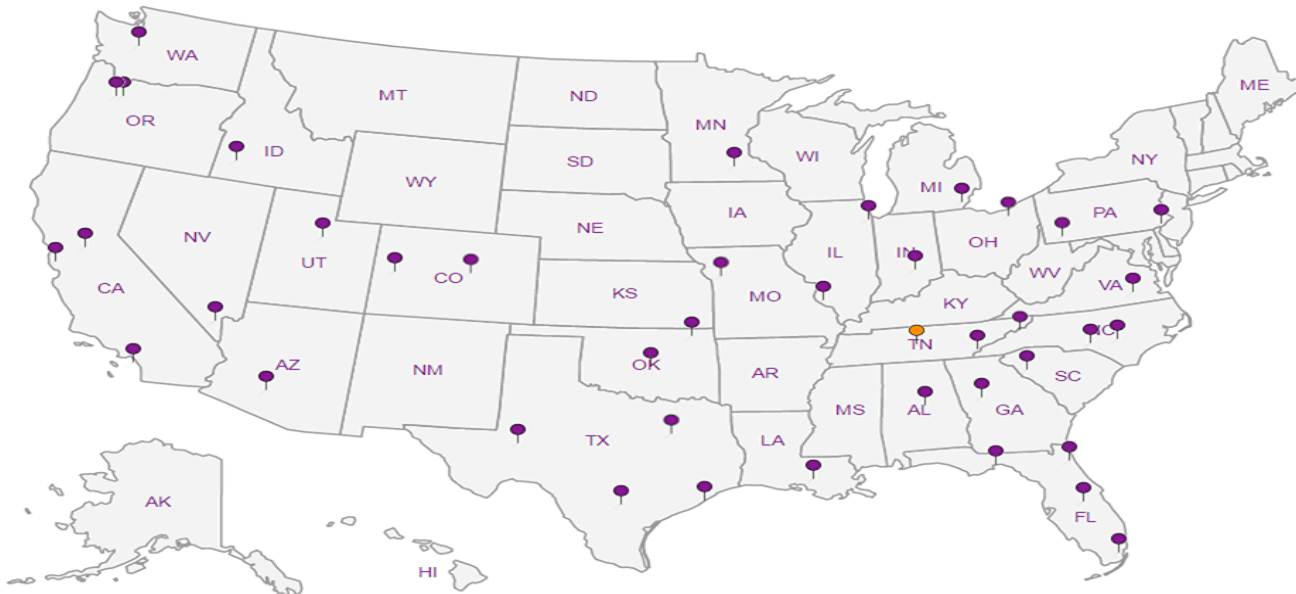
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

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1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Billing Information:  
 Accounts Payable  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Report to:  
**Thomas Vespalec**

Email To: thomas.vespalec@arcadis.com

Project  
 Description: **UPCO**

City/State  
 Collected: **AZ**

Phone: 480-535-7399  
 Fax:

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**MARK HAMMER**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*Mark Hammer*

**Rush?** (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #

Date Results Needed

Immediately  
 Packed on Ice N  Y

No. of  
 Cntrs

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



L# **L1133401**  
**B106**

Acctnum: **UTCARCA**  
 Template: **T152379**  
 Prelogin: **P716981**  
 TSR: **526 - Chris McCord**  
 PB:

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
EW-1-082719	G	GW		8/27/19	07:45	1						X					RUSH	-01
EW-2-082719		GW			07:50	1						X						-02
IW-1-082719		GW			07:40	1						X						-03
SP-201-082719		GW			07:35	1						X						-04
SP-301-082719		GW			07:30	1						X						-05
		GW																
		GW																
		GW																
		GW																

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist  
 COC Seal Present/Intact:  NP  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N  
 If Applicable  
 VOA Zero Headspace:  Y  N  
 Preservation Correct/Checked:  Y  N

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: 8/27/19	Time: 1003	Received by: (Signature) <i>Lamyarty</i>	Trip Blank Received: Yes (No) HCL/MeOH TBR	Bottles Received: 5	RAD SCREEN: <0.5 mR/hr
Relinquished by: (Signature) <i>Lamyarty</i>	Date: 8/27/19	Time: 1800	Received by: (Signature) <i>Swick</i>	Temp: 10.0 ± 0.10°C	If preservation required by Login: Date/Time	
Relinquished by: (Signature) <i>Harley</i>	Date: 8/28/19	Time: 8:00	Received for Lab by: (Signature)	Date: 8/28/19	Time: 8:00	Hold: Condition: NCF / <input checked="" type="checkbox"/> OK

CSA A1



August 31, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1134486  
Samples Received: 08/30/2019  
Project Number: 30002531.0000  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



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# SAMPLE SUMMARY



## EW-1-082919 L1134486-01 GW

Collected by: Mark Hammer  
 Collected date/time: 08/29/19 12:35  
 Received date/time: 08/30/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1336794	100	08/30/19 12:07	08/30/19 12:07	LBR	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## EW-2-082919 L1134486-02 GW

Collected by: Mark Hammer  
 Collected date/time: 08/29/19 12:38  
 Received date/time: 08/30/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1336794	1	08/30/19 12:35	08/30/19 12:35	LBR	Mt. Juliet, TN

## IW-1-082919 L1134486-03 GW

Collected by: Mark Hammer  
 Collected date/time: 08/29/19 12:41  
 Received date/time: 08/30/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1336794	2000	08/30/19 13:51	08/30/19 13:51	LBR	Mt. Juliet, TN

## SP-201-082919 L1134486-04 GW

Collected by: Mark Hammer  
 Collected date/time: 08/29/19 12:45  
 Received date/time: 08/30/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1337630	1	08/30/19 12:57	08/30/19 12:57	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1336794	200	08/30/19 13:25	08/30/19 13:25	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1337961	1	08/30/19 16:34	08/30/19 22:32	JER	Mt. Juliet, TN

## SP-301-082919 L1134486-05 GW

Collected by: Mark Hammer  
 Collected date/time: 08/29/19 12:55  
 Received date/time: 08/30/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1337747	1	08/30/19 11:29	08/30/19 11:44	MMF	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1337630	1	08/30/19 13:14	08/30/19 13:14	ELN	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1336794	1	08/30/19 13:00	08/30/19 13:00	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1337961	1	08/30/19 16:34	08/30/19 22:33	JER	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1337683	1	08/30/19 12:01	08/30/19 12:01	VRP	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	6.40		0.400	100	08/30/2019 12:07	<a href="#">WG1336794</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0689		0.00400	1	08/30/2019 12:35	<a href="#">WG1336794</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	69.8		8.00	2000	08/30/2019 13:51	<a href="#">WG1336794</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	3.79		0.100	1	08/30/2019 12:57	<a href="#">WG1337630</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	14.7		0.800	200	08/30/2019 13:25	<a href="#">WG1336794</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	08/30/2019 22:32	<a href="#">WG1337961</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	3.20		2.50	1	08/30/2019 11:44	<a href="#">WG1337747</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	08/30/2019 13:14	<a href="#">WG1337630</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	08/30/2019 13:00	<a href="#">WG1336794</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.753		0.100	1	08/30/2019 22:33	<a href="#">WG1337961</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	6.47		1.00	1	08/30/2019 12:01	<a href="#">WG1337683</a>

9 Sc



Method Blank (MB)

(MB) R3446076-1 08/30/19 11:44

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Suspended Solids	U		0.350	2.50

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

L1134338-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1134338-01 08/30/19 11:44 • (DUP) R3446076-3 08/30/19 11:44

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Suspended Solids	31.5	31.5	1	0.000		5

<sup>4</sup>Cn

<sup>5</sup>Sr

Laboratory Control Sample (LCS)

(LCS) R3446076-2 08/30/19 11:44

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Suspended Solids	773	816	106	85.0-115	

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3446028-1 08/30/19 09:50

Analyte	MB Result mg/l	<u>MB Qualifier</u>	MB MDL mg/l	MB RDL mg/l
Nitrate	U		0.0227	0.100

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

Laboratory Control Sample (LCS)

(LCS) R3446028-2 08/30/19 10:08

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Nitrate	8.00	8.10	101	90.0-110	

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3446109-1 08/29/19 05:57

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1132705-25 Original Sample (OS) • Duplicate (DUP)

(OS) L1132705-25 08/29/19 17:45 • (DUP) R3446109-3 08/29/19 18:10

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	U	0.000	1	0.000		15

L1134486-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1134486-04 08/30/19 13:25 • (DUP) R3446109-6 08/30/19 14:20

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	14.7	15.0	200	1.94		15

Laboratory Control Sample (LCS)

(LCS) R3446109-2 08/29/19 06:48

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00992	99.2	90.0-110	

L1133887-39 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1133887-39 08/29/19 19:27 • (MS) R3446109-4 08/29/19 19:52 • (MSD) R3446109-5 08/29/19 21:08

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	U	0.0106	0.0106	106	106	1	80.0-120			0.0622	15



Method Blank (MB)

(MB) R3446178-1 08/30/19 22:01

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1134209-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1134209-01 08/30/19 22:09 • (DUP) R3446178-5 08/30/19 22:10

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	2.00	1.86	1	7.25		20

L1134488-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1134488-01 08/30/19 22:36 • (DUP) R3446178-7 08/30/19 22:37

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	4.54	4.25	1	6.60		20

Laboratory Control Sample (LCS)

(LCS) R3446178-2 08/30/19 22:03

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.84	92.0	90.0-110	

L1134202-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1134202-02 08/30/19 22:05 • (MS) R3446178-3 08/30/19 22:06 • (MSD) R3446178-4 08/30/19 22:08

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	1.94	4.64	4.49	108	102	1	90.0-110			3.29	20

L1134486-05 Original Sample (OS) • Matrix Spike (MS)

(OS) L1134486-05 08/30/19 22:33 • (MS) R3446178-6 08/30/19 22:35

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Phosphorus,Total	2.50	0.753	3.25	99.9	1	90.0-110	



Method Blank (MB)

(MB) R3445979-1 08/30/19 09:40

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.273	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

L1134119-06 Original Sample (OS) • Duplicate (DUP)

(OS) L1134119-06 08/30/19 11:23 • (DUP) R3445979-3 08/30/19 11:35

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	2.74	2.75	1	0.583		20

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3445979-2 08/30/19 10:11

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	75.2	100	85.0-115	

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
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Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

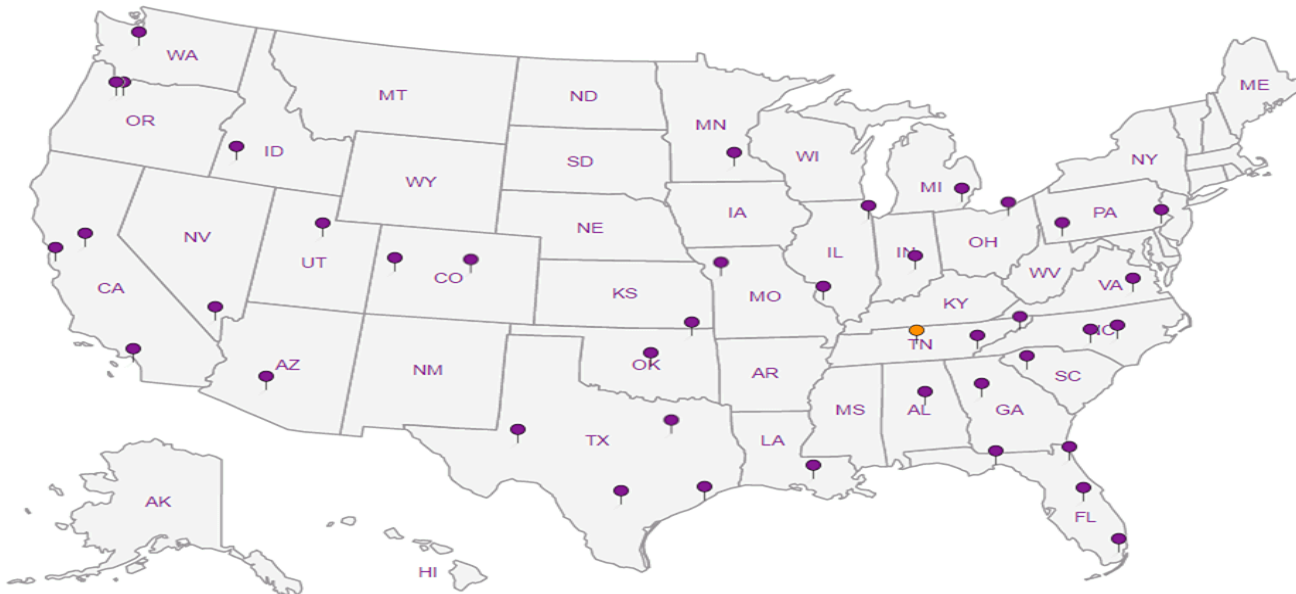
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Report to:  
**Thomas Vespalec**


Billing Information:  
 Accounts Payable  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

Chain of Custody Page 1 of 1

**Face Analytical®**  
 National Center for Testing & Innovation

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 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



Project Description: **UPCO** City/State Collected: **AZ**

Phone: **480-535-7399** Client Project #: **03994018.0028** Lab Project #: **UTCARCA-UPCO11DCE**

Collected by (print): **MARK HAMMER** Site/Facility ID #: **UPCO** P.O. #

Collected by (signature): *Mark Hammer* **Rush?** (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote # **525 T mg** Date Results Needed

Immediately Packed on Ice N  Y

No. of Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
EW-1-082919	6	GW		8/29/19	12:35						X					RUSH	01
EW-2-082919		GW			12:38						X						02
IW-1-082919		GW			12:41						X						03
SP-201-082919		GW			12:45	3	X				X			X	X		07
SP-301-082919	↓	GW		↓	12:55	5	X				X		X	X	X	↓	05
		GW															
		GW															
		GW															
		GW															
		GW															

\* Matrix: SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  UPS  FedEx  Courier

Tracking # **4794 8845 9750**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

**Sample Receipt Checklist**

COC Seal Present/Intact:  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N

**If Applicable**

VOA Zero Headspace:  Y  N  
 Preservation Correct/Checked:  Y  N

**RAD SCREEN: < 0.5 mR/hr**

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: 8/29/19	Time: 1334	Received by: (Signature) <i>anyarby</i>	Trip Blank Received: Yes/No <input checked="" type="checkbox"/> HCL/MeOH TBR
Relinquished by: (Signature) <i>anyarby</i>	Date: 8/29/19	Time: 1800	Received by: (Signature) <i>FedEx</i>	Temp: °C 19.10 = 1.8 F Bottles Received: 11
Relinquished by: (Signature) <i>anyarby</i>	Date:	Time:	Received for lab by: (Signature) <i>anyarby</i>	Date: 8-30-19 Time: 9:00 Hold: Condition: NCF / OK

ESCAR

September 09, 2019

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## UTC - Arcadis

Sample Delivery Group: L1134508  
Samples Received: 08/30/2019  
Project Number: 30002531.0000  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b>3</b> Ss
<b>SP-701-082919 L1134508-01</b>	<b>5</b>	
<b>TRIP BLANK L1134508-02</b>	<b>6</b>	<b>4</b> Cn
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b>5</b> Sr
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	<b>6</b> Qc
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>10</b>	
<b>Gl: Glossary of Terms</b>	<b>11</b>	<b>7</b> Gl
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	<b>8</b> Al
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	<b>9</b> Sc

# SAMPLE SUMMARY



## SP-701-082919 L1134508-01 GW

Collected by: Mark Hammer  
 Collected date/time: 08/29/19 12:30  
 Received date/time: 08/30/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1340476	1	09/08/19 08:38	09/08/19 08:38	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1341465	1	09/07/19 01:01	09/07/19 01:01	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1339698	1	09/04/19 16:57	09/04/19 16:57	ACG	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## TRIP BLANK L1134508-02 GW

Collected by: Mark Hammer  
 Collected date/time: 08/29/19 00:00  
 Received date/time: 08/30/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1341602	1	09/07/19 10:33	09/07/19 10:33	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1339698	1	09/04/19 14:19	09/04/19 14:19	ACG	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Perchlorate	ND		0.00400	1	09/08/2019 08:38	<a href="#">WG1340476</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,1-Dichloroethene	ND		0.00100	1	09/07/2019 01:01	<a href="#">WG1341465</a>
(S) Toluene-d8	102		80.0-120		09/07/2019 01:01	<a href="#">WG1341465</a>
(S) 4-Bromofluorobenzene	95.2		77.0-126		09/07/2019 01:01	<a href="#">WG1341465</a>
(S) 1,2-Dichloroethane-d4	89.1		70.0-130		09/07/2019 01:01	<a href="#">WG1341465</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,4-Dioxane	ND		0.00300	1	09/04/2019 16:57	<a href="#">WG1339698</a>
(S) Toluene-d8	103		77.0-127		09/04/2019 16:57	<a href="#">WG1339698</a>

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	09/07/2019 10:33	<a href="#">WG1341602</a>
(S) Toluene-d8	102		80.0-120		09/07/2019 10:33	<a href="#">WG1341602</a>
(S) 4-Bromofluorobenzene	101		77.0-126		09/07/2019 10:33	<a href="#">WG1341602</a>
(S) 1,2-Dichloroethane-d4	103		70.0-130		09/07/2019 10:33	<a href="#">WG1341602</a>

1 Cp

2 Tc

3 Ss

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/04/2019 14:19	<a href="#">WG1339698</a>
(S) Toluene-d8	102		77.0-127		09/04/2019 14:19	<a href="#">WG1339698</a>

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3448763-1 09/08/19 03:27

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3448763-3 09/08/19 04:44

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

L1134508-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1134508-01 09/08/19 08:38 • (DUP) R3448763-4 09/08/19 09:04

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

L1136458-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1136458-02 09/08/19 15:06 • (DUP) R3448763-7 09/08/19 15:32

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3448763-2 09/08/19 04:18

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00961	96.1	90.0-110	

L1136030-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1136030-06 09/08/19 12:31 • (MS) R3448763-8 09/09/19 13:20 • (MSD) R3448763-6 09/08/19 14:14

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	ND	0.00874	0.00999	87.4	99.9	1	80.0-120			13.4	15





Method Blank (MB)

(MB) R3448243-3 09/06/19 20:08

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	107			80.0-120
(S) 4-Bromofluorobenzene	109			77.0-126
(S) 1,2-Dichloroethane-d4	89.9			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3448243-1 09/06/19 19:09 • (LCSD) R3448243-2 09/06/19 19:29

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0291	0.0303	116	121	71.0-124			4.16	20
(S) Toluene-d8				104	105	80.0-120				
(S) 4-Bromofluorobenzene				102	105	77.0-126				
(S) 1,2-Dichloroethane-d4				99.9	90.4	70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3448274-3 09/07/19 05:12

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	103			80.0-120
(S) 4-Bromofluorobenzene	96.4			77.0-126
(S) 1,2-Dichloroethane-d4	104			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3448274-1 09/07/19 04:11 • (LCSD) R3448274-2 09/07/19 04:31

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0254	0.0255	102	102	71.0-124			0.0803	20
(S) Toluene-d8				102	103	80.0-120				
(S) 4-Bromofluorobenzene				99.0	97.7	77.0-126				
(S) 1,2-Dichloroethane-d4				102	110	70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3447242-3 09/04/19 11:17

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	102			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3447242-1 09/04/19 09:51 • (LCSD) R3447242-2 09/04/19 10:10

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0456	0.0498	91.1	99.6	55.0-138			8.84	24
(S) Toluene-d8				102	102	77.0-127				

5 Sr

6 Qc

L1134644-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1134644-07 09/04/19 19:14 • (MS) R3447242-4 09/04/19 20:13 • (MSD) R3447242-5 09/04/19 20:33

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	U	0.0524	0.0579	105	116	1	13.0-160			9.98	31
(S) Toluene-d8					103	102		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Billing Information:  
 Accounts Payable  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Report to: **Thomas Vespalec**  
 Email To: **thomas.vespalec@arcadis.com**

Project Description: **UPCO**  
 City/State Collected: **AZ**

Phone: **480-535-7399**  
 Client Project #: **03994018.0028**  
 Lab Project #: **UTCARCA-UPCO11DCE**

Collected by (print): **MARK HAMMER**  
 Site/Facility ID #: **UPCO**  
 P.O. #

Collected by (signature): *Mark Hammer*  
 Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #  
 Date Results Needed: **STD TAT**

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1

**Pace Analytical**  
 National Center for Testing & Innovation

12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859

QR Code

Project Description: **UPCO**  
 City/State Collected: **AZ**

Phone: **480-535-7399**  
 Client Project #: **03994018.0028**  
 Lab Project #: **UTCARCA-UPCO11DCE**

Collected by (print): **MARK HAMMER**  
 Site/Facility ID #: **UPCO**  
 P.O. #

Collected by (signature): *Mark Hammer*  
 Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #  
 Date Results Needed: **STD TAT**

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1

**Pace Analytical**  
 National Center for Testing & Innovation

12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859

QR Code

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4
SP-701-082919	G	GW		8/29/19	12:30	4		X	X			X				
TRIP BLANK	-	GW		8/29/19		1		X	X							
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
 UPS  FedEx  Courier

Tracking # **4794 8845 9750**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

**Sample Receipt Checklist**  
 COC Seal Present/Intact:  NP  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N  
 If Applicable  
 VOA Zero Headspace:  Y  N  
 Preservation Correct/Checked:  Y  N

Relinquished by: (Signature) *Mark Hammer* Date: **8/29/19** Time: **1334**  
 Received by: (Signature) *amy...* Trip Blank Received:  Yes  No  
 HCL/ MeOH TBR

Relinquished by: (Signature) *amy...* Date: **8/29/19** Time: **1800**  
 Received by: (Signature) *FedEx* Temp: **18+0-15.5** °C Bottles Received: **4**  
 If preservation required by Login: Date/Time

Relinquished by: (Signature) *[Signature]* Date: **8-30-19** Time: **9:00**  
 Received for lab by: (Signature) *[Signature]* Date: **8-30-19** Time: **9:00** Hold: Condition: **NCF / OK**

ESCA7



## UTC - Arcadis

Sample Delivery Group: L1134881  
Samples Received: 08/31/2019  
Project Number: 30002531.0000  
Description: UPCO

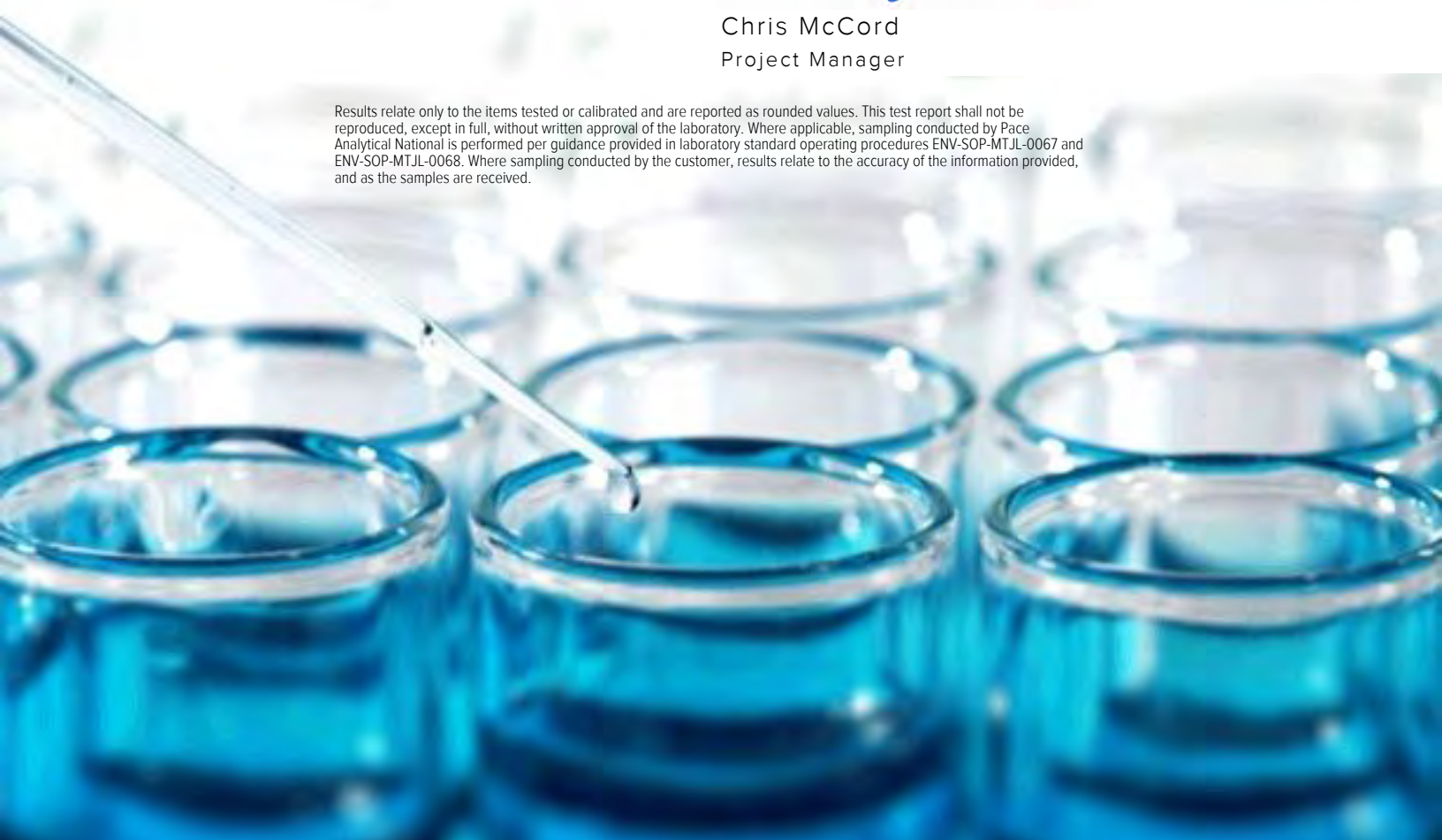
Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	<b>2</b> Tc
<b>Ss: Sample Summary</b>	<b>3</b>	<b>3</b> Ss
<b>Cn: Case Narrative</b>	<b>4</b>	<b>4</b> Cn
<b>Sr: Sample Results</b>	<b>5</b>	<b>5</b> Sr
SP-201-083019 L1134881-01	<b>5</b>	
SP-301-083019 L1134881-02	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b>6</b> Qc
Wet Chemistry by Method 314.0 Mod	<b>7</b>	
<b>Gl: Glossary of Terms</b>	<b>8</b>	<b>7</b> Gl
<b>Al: Accreditations &amp; Locations</b>	<b>9</b>	<b>8</b> Al
<b>Sc: Sample Chain of Custody</b>	<b>10</b>	<b>9</b> Sc



# SAMPLE SUMMARY



SP-201-083019 L1134881-01 GW

Collected by: Mark Hammer  
 Collected date/time: 08/30/19 06:55  
 Received date/time: 08/31/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1338563	500	09/01/19 20:29	09/01/19 20:29	MCG	Mt. Juliet, TN

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

SP-301-083019 L1134881-02 GW

Collected by: Mark Hammer  
 Collected date/time: 08/30/19 07:00  
 Received date/time: 08/31/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1338563	1	09/01/19 20:54	09/01/19 20:54	MCG	Mt. Juliet, TN

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	14.3		2.00	500	09/01/2019 20:29	<a href="#">WG1338563</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.00614		0.00400	1	09/01/2019 20:54	<a href="#">WG1338563</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3446577-1 09/01/19 13:42

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

Laboratory Control Sample (LCS)

(LCS) R3446577-2 09/01/19 14:33

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.00994	99.4	90.0-110	

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

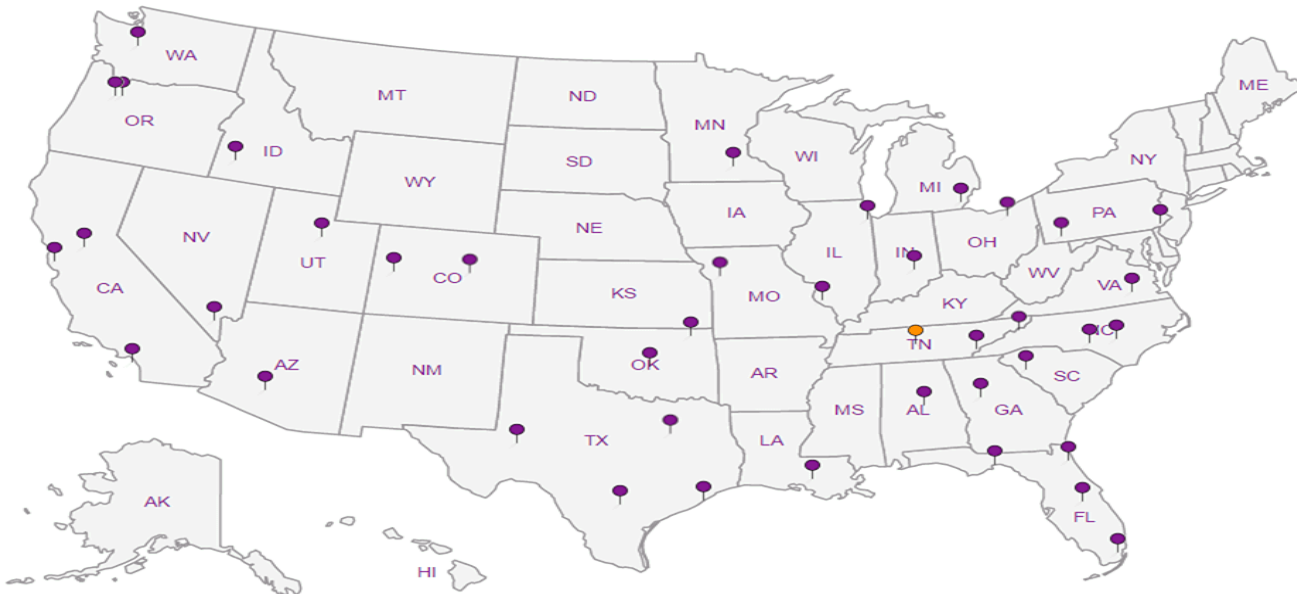
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Billing Information:  
 Accounts Payable  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Report to:  
 Thomas Vespalec

Project Description: **UPCO**

City/State Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

Client Project #  
**03994018.0028**

Site/Facility ID #  
**UPCO**

Collected by (print):  
**Mark Hammer**

Collected by (signature):  
*Mark Hammer*

Phone: **480-535-7399**  
 Fax:

Immediately Packed on Ice N \_\_\_ Y **X**

Rush? (Lab MUST Be Notified)  
 Same Day \_\_\_ Five Day  
 \_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
 \_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
 \_\_\_ Three Day

Date Results Needed

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page **1** of **1**

**Pace Analytical**  
 National Center for Testing & Innovation

12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859

QR Code

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Sample ID    Comp/Grab    Matrix \*    Depth    Date    Time    No. of Cntrs

SP-201-083019	6	GW		8/30/19	06:55	1
SP-301-083019	6	GW		8/30/19	07:00	1
		GW				
		GW				
		GW				
		GW				
		GW				
		GW				
		GW				
		GW				

Remarks: **RUSH -01**  
**RUSH 02**

Sample Receipt Checklist

COC Seal Present/Intact: \_\_\_ NP  Y \_\_\_ N

COC Signed/Accurate:  Y \_\_\_ N

Bottles arrive intact:  Y \_\_\_ N

Correct bottles used:  Y \_\_\_ N

Sufficient volume sent:  Y \_\_\_ N

If Applicable

VOA Zero Headspace: \_\_\_ Y \_\_\_ N

Preservation Correct/Checked: \_\_\_ Y \_\_\_ N

**RAD SCREEN: <0.5 mR/hr**

Temp: **43°F** °C    Bottles Received: **2**

Flow \_\_\_ Other \_\_\_

Tracking #

Samples returned via:  
 \_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier \_\_\_

Relinquished by: (Signature) *Mark Hammer*    Date: **8/30/19**    Time: **1219**    Received by: (Signature) *amy arley*    Trip Blank Received: Yes/No **0**    HCL/MeOH TBR

Relinquished by: (Signature) *amy arley*    Date: **8/30/19**    Time: **1800**    Received by: (Signature) *SUSA*    Temp: **43°F** °C    Bottles Received: **2**    If preservation required by Login: Date/Time

Relinquished by: (Signature) *amy arley*    Date:    Time:    Received for lab by: (Signature) *Harley*    Date: **8/31/19**    Time: **8:00**    Hold:    Condition: **NCF 1 OK**

**ESCAR**



## UTC - Arcadis

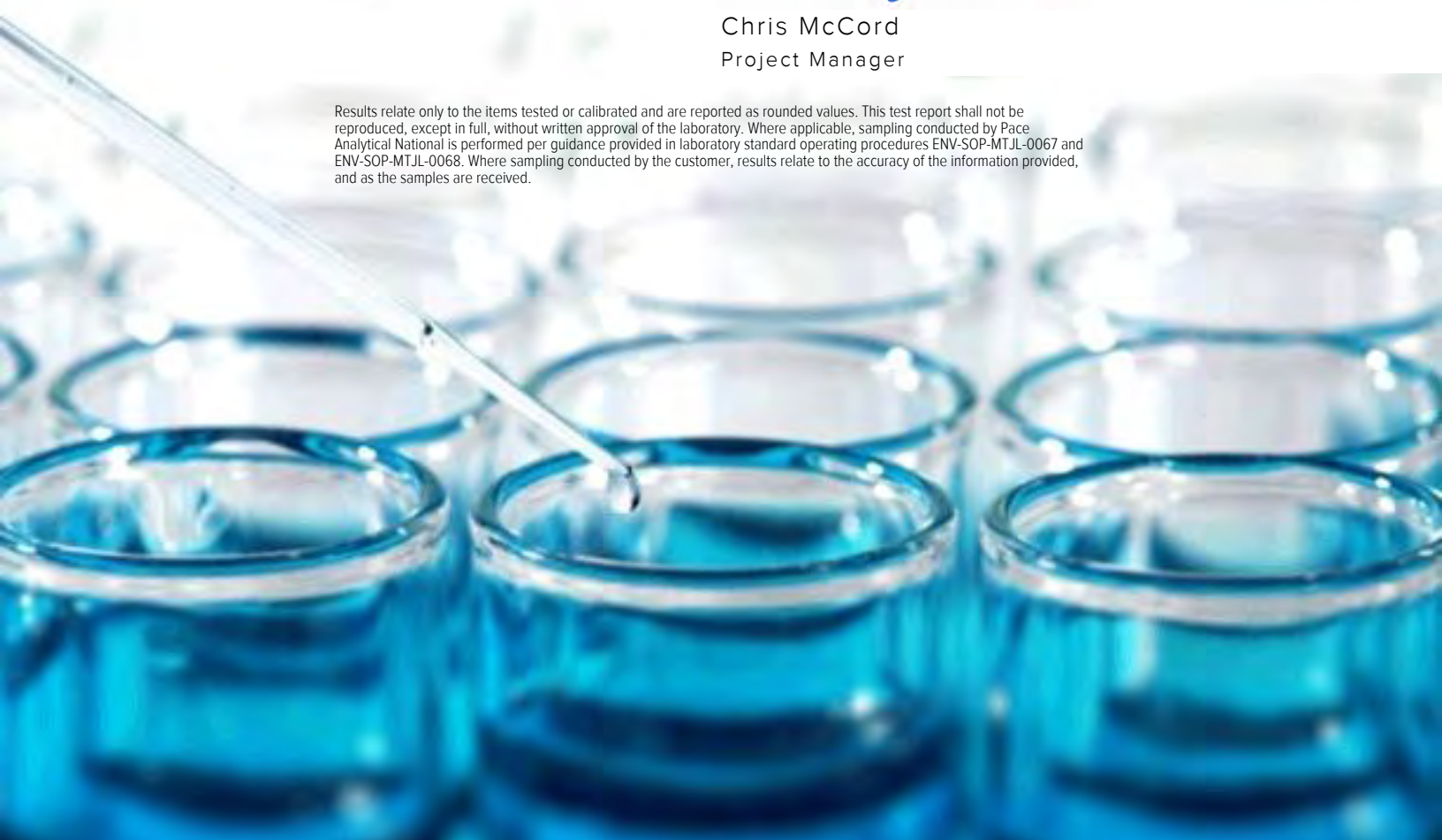
Sample Delivery Group: L1136030  
Samples Received: 09/05/2019  
Project Number: 30002531.0000  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

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<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>2</sup>Tc</b>
<b>Cn: Case Narrative</b>	<b>5</b>	
<b>Sr: Sample Results</b>	<b>6</b>	<b><sup>3</sup>Ss</b>
EW-1-090419 L1136030-01	6	
EW-2-090419 L1136030-02	7	<b><sup>4</sup>Cn</b>
IW-1-090419 L1136030-03	8	<b><sup>5</sup>Sr</b>
MW-20-090419 L1136030-04	9	
SP-201-090419 L1136030-05	10	<b><sup>6</sup>Qc</b>
SP-301-090419 L1136030-06	11	
T-801-090419 L1136030-07	12	<b><sup>7</sup>Gl</b>
T-802-090419 L1136030-08	13	<b><sup>8</sup>Al</b>
T-803-090419 L1136030-09	14	
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Wet Chemistry by Method 314.0 Mod	15	
Wet Chemistry by Method 9060A	16	
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	17	
<b>Gl: Glossary of Terms</b>	<b>18</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>19</b>	
<b>Sc: Sample Chain of Custody</b>	<b>20</b>	

# SAMPLE SUMMARY



## EW-1-090419 L1136030-01 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1340476	1000	09/09/19 12:54	09/09/19 12:54	LBR	Mt. Juliet, TN

Collected by Mark Hammer  
 Collected date/time 09/04/19 11:10  
 Received date/time 09/05/19 08:45

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## EW-2-090419 L1136030-02 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1340476	1	09/08/19 10:47	09/08/19 10:47	LBR	Mt. Juliet, TN

Collected by Mark Hammer  
 Collected date/time 09/04/19 11:13  
 Received date/time 09/05/19 08:45

## IW-1-090419 L1136030-03 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1340476	2000	09/08/19 11:13	09/08/19 11:13	LBR	Mt. Juliet, TN

Collected by Mark Hammer  
 Collected date/time 09/04/19 11:16  
 Received date/time 09/05/19 08:45

## MW-20-090419 L1136030-04 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1340476	5	09/08/19 11:39	09/08/19 11:39	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1342270	1	09/09/19 13:10	09/09/19 13:10	JAH	Mt. Juliet, TN

Collected by Mark Hammer  
 Collected date/time 09/04/19 11:20  
 Received date/time 09/05/19 08:45

## SP-201-090419 L1136030-05 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1340476	500	09/08/19 12:05	09/08/19 12:05	LBR	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1340679	1	09/06/19 01:28	09/06/19 01:28	EEM	Mt. Juliet, TN

Collected by Mark Hammer  
 Collected date/time 09/04/19 11:25  
 Received date/time 09/05/19 08:45

## SP-301-090419 L1136030-06 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1340476	1	09/08/19 12:31	09/08/19 12:31	LBR	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1340679	1	09/06/19 01:45	09/06/19 01:45	EEM	Mt. Juliet, TN

Collected by Mark Hammer  
 Collected date/time 09/04/19 11:30  
 Received date/time 09/05/19 08:45

## T-801-090419 L1136030-07 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1342270	1	09/09/19 12:51	09/09/19 12:51	JAH	Mt. Juliet, TN

Collected by Mark Hammer  
 Collected date/time 09/04/19 11:35  
 Received date/time 09/05/19 08:45

## T-802-090419 L1136030-08 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1342270	1	09/09/19 13:30	09/09/19 13:30	JAH	Mt. Juliet, TN

Collected by Mark Hammer  
 Collected date/time 09/04/19 11:38  
 Received date/time 09/05/19 08:45

# SAMPLE SUMMARY



T-803-090419 L1136030-09 GW

Collected by: Mark Hammer  
 Collected date/time: 09/04/19 11:40  
 Received date/time: 09/05/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1342270	1	09/09/19 13:50	09/09/19 13:50	JAH	Mt. Juliet, TN

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	60.7		4.00	1000	09/09/2019 12:54	<a href="#">WG1340476</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0605		0.00400	1	09/08/2019 10:47	<a href="#">WG1340476</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	55.5		8.00	2000	09/08/2019 11:13	<a href="#">WG1340476</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.276		0.0200	5	09/08/2019 11:39	<a href="#">WG1340476</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	0.00855		0.00300	1	09/09/2019 13:10	<a href="#">WG1342270</a>
(S) Toluene-d8	99.6		77.0-127		09/09/2019 13:10	<a href="#">WG1342270</a>

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	4.97		2.00	500	09/08/2019 12:05	<a href="#">WG1340476</a>

1 Cp

2 Tc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	ND		1.00	1	09/06/2019 01:28	<a href="#">WG1340679</a>

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	09/08/2019 12:31	<a href="#">WG1340476</a>

1 Cp

2 Tc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	8.54		1.00	1	09/06/2019 01:45	<a href="#">WG1340679</a>

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/09/2019 12:51	<a href="#">WG1342270</a>
(S) Toluene-d8	101		77.0-127		09/09/2019 12:51	<a href="#">WG1342270</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/09/2019 13:30	<a href="#">WG1342270</a>
(S) Toluene-d8	101		77.0-127		09/09/2019 13:30	<a href="#">WG1342270</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/09/2019 13:50	<a href="#">WG1342270</a>
(S) Toluene-d8	99.1		77.0-127		09/09/2019 13:50	<a href="#">WG1342270</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3448763-1 09/08/19 03:27

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

Method Blank (MB)

(MB) R3448763-3 09/08/19 04:44

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1134508-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1134508-01 09/08/19 08:38 • (DUP) R3448763-4 09/08/19 09:04

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

L1136458-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1136458-02 09/08/19 15:06 • (DUP) R3448763-7 09/08/19 15:32

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3448763-2 09/08/19 04:18

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00961	96.1	90.0-110	

L1136030-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1136030-06 09/08/19 12:31 • (MS) R3448763-8 09/09/19 13:20 • (MSD) R3448763-6 09/08/19 14:14

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	ND	0.00874	0.00999	87.4	99.9	1	80.0-120			13.4	15



Method Blank (MB)

(MB) R3447819-1 09/05/19 18:47

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.320	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1135666-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1135666-04 09/05/19 22:35 • (DUP) R3447819-5 09/05/19 22:47

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	2.67	2.67	1	0.112		20

L1135894-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1135894-01 09/05/19 23:26 • (DUP) R3447819-6 09/05/19 23:38

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	50.5	49.9	2	1.10		20

Laboratory Control Sample (LCS)

(LCS) R3447819-2 09/05/19 19:18

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	75.7	101	85.0-115	

L1134989-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1134989-03 09/05/19 19:31 • (MS) R3447819-3 09/05/19 19:46 • (MSD) R3447819-4 09/05/19 20:02

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	2.75	56.0	57.6	107	110	1	80.0-120			2.83	20

L1136030-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1136030-06 09/06/19 01:45 • (MS) R3447819-7 09/06/19 02:00 • (MSD) R3447819-8 09/06/19 02:15

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	8.54	60.1	60.6	103	104	1	80.0-120			0.779	20





Method Blank (MB)

(MB) R3448779-3 09/09/19 11:27

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.6			77.0-127

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3448779-1 09/09/19 10:28 • (LCSD) R3448779-2 09/09/19 10:48

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0400	0.0416	80.0	83.2	55.0-138			3.88	24
(S) Toluene-d8				99.5	99.6	77.0-127				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
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Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

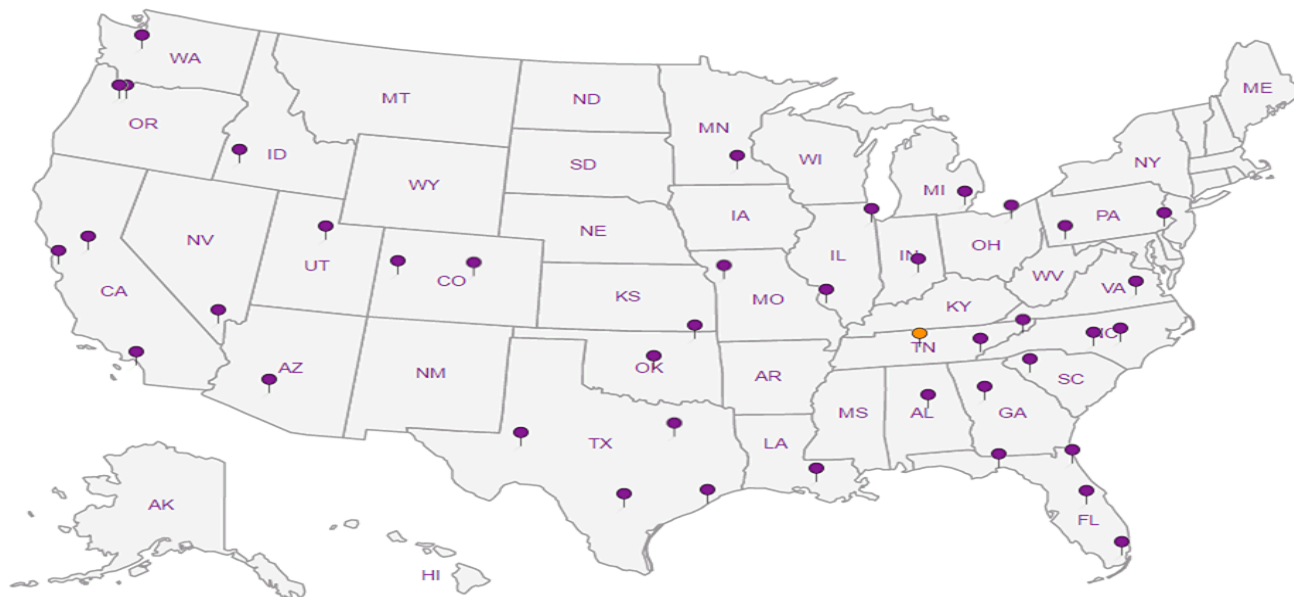
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn


5 Sr

6 Qc

7 Gl

8 Al

9 Sc

<b>UTC - Arcadis</b> 410 North 44th St. Suite 1000 Phoenix AZ 85008		Billing Information: <b>Accounts Payable</b> 630 Plaza Drive, Suite 600 Highlands Ranch, CO 80129		Pres Chk		Analysis / Container / Preservative										Chain of Custody Page <u>1</u> of <u>1</u>					
Report to: <b>Thomas Vespalec</b>		Email To: <b>thomas.vespalec@arcadis.com</b>				L2										 12065 Lebanon Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-767-5859 Fax: 615-758-5859					
Project Description: <b>UPCO</b>		City/State Collected: <b>AZ</b>				**NITRATE** 125mlHDPE-NoPres 1,1-DCE-8260B 40mlAmb-HCl 1,4-Dioxane 8260B 40mlAmb-HCl Ammonia 250mlHDPE-H2SO4 Diss. Fe - LF 250mlHDPE-NoPres Perchlorate 125mlHDPE-NoPres RCRA8+Fe 250mlHDPE-HNO3 TOC 250mlAmb-HCl TSS 1L-HDPE NoPres Total Phosphorous 250mlHDPE-H2SO4										12065 Lebanon Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-767-5859 Fax: 615-758-5859					
Phone: <b>480-535-7399</b> Fax:		Client Project # <b>03994018.0028</b>		Lab Project # <b>UTCARCA-UPCO11DCE</b>												L# <b>L1136030</b>					
Collected by (print): <b>MARK HAMMER</b>		Site/Facility ID # <b>UPCO</b>		P.O. #												Tail <b>F055</b>					
Collected by (signature): <b>Mark Hammer</b>		Rush? (Lab MUST Be Notified) <input type="checkbox"/> Same Day <input type="checkbox"/> Five Day <input type="checkbox"/> Next Day <input type="checkbox"/> 5 Day (Rad Only) <input checked="" type="checkbox"/> Two Day <input type="checkbox"/> 10 Day (Rad Only) <input type="checkbox"/> Three Day		Quote #												Acctnum: <b>UTCARCA</b> Template: <b>T152379</b> Prelogin: <b>P716981</b> TSR: <b>526 - Chris McCord</b> PB:					
Immediately Packed on Ice N <input type="checkbox"/> Y <input checked="" type="checkbox"/>		Date Results Needed <b>9/9/19</b>		No. of Cntrs												Shipped Via: <b>FedEX Saver</b>					
Sample ID	Comp/Grab	Matrix *	Depth	Date	Time											Remarks	Sample # (lab only)				
EW-1-090419	G	GW		09/04/19	11:10												-01				
EW-2-090419		GW			11:13												-02				
TW-1-090419		GW			11:16												-03				
MW-20-090419		GW			11:20	X											-04				
SP-201-090419		GW			11:25											X	-05				
SP-301-090419		GW			11:30											X	-06				
T-801-090419		GW			11:35	X											-07				
T-802-090419		GW			11:38	X											-08				
T-803-090419	↓	GW		↓	11:40	X											-09				
		GW															-10-BF				
* Matrix: SS - Soil AIR - Air F - Filter GW - Groundwater B - Bioassay WW - WasteWater DW - Drinking Water OT - Other		Remarks: <b>**NITRATE** has a 48hr hold time.</b>		Samples returned via: <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Courier		RAD SCREEN: <b>&lt;0.5 mrad</b> Tracking #										pH _____ Temp _____ Flow _____ Other _____		Sample Receipt Checklist COC Seal Present/Intact: <input checked="" type="checkbox"/> NP <input type="checkbox"/> N COC Signed/Accurate: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Bottles arrive intact: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Correct bottles used: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Sufficient volume sent: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N If Applicable VOA Zero HeadSpace: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Preservation Correct/Checked: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N			
Relinquished by: (Signature) <b>Mark Hammer</b>		Date: <b>9/4/19</b>		Time: <b>1354</b>		Received by: (Signature) <b>amary</b>		Trip Blank Received: Yes / No <input type="checkbox"/> HCL / MeOH <input type="checkbox"/> TBR												If preservation required by Login: Date/Time	
Relinquished by: (Signature) <b>amary</b>		Date: <b>9/4/19</b>		Time: <b>1800</b>		Received by: (Signature) <b>SW</b>		Temp: <b>Amc</b> Bottles Received: <b>16</b>												Date: <b>9/5</b> Time: <b>0845</b> Hold:	
Relinquished by: (Signature)		Date:		Time:		Received for lab by: (Signature) <b>Prophet</b>		Date:												Condition: <b>OK</b>	

E82AB

September 10, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1136458  
Samples Received: 09/06/2019  
Project Number: 30002531.0000  
Description: UPCO

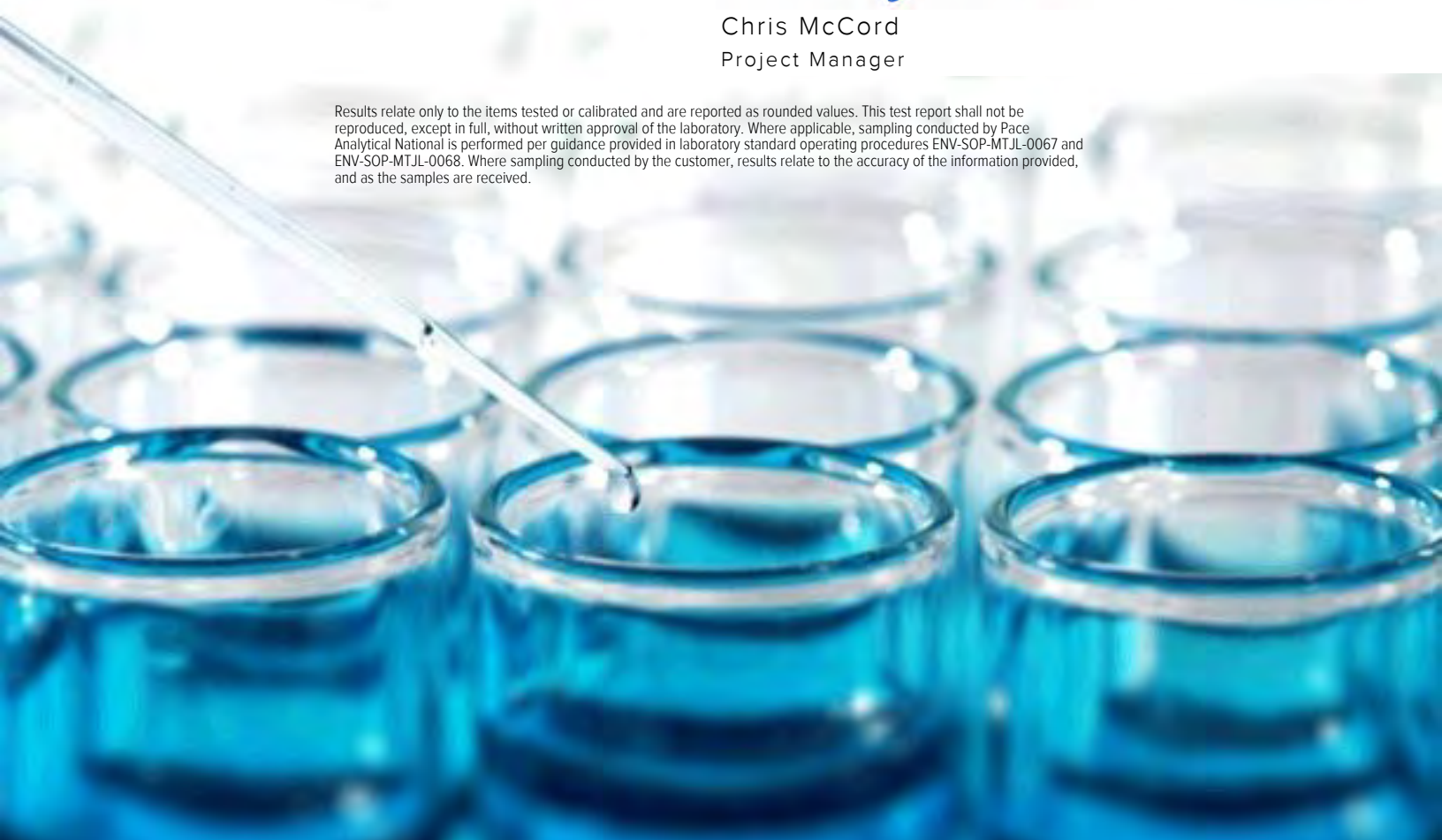
Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.







<b>Cp: Cover Page</b>	<b>1</b>	
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	
SP-201-090519 L1136458-01	<b>5</b>	
SP-301-090519 L1136458-02	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	
Gravimetric Analysis by Method 2540 D-2011	<b>7</b>	
Wet Chemistry by Method 300.0	<b>8</b>	
Wet Chemistry by Method 314.0 Mod	<b>9</b>	
Wet Chemistry by Method 365.4	<b>10</b>	
Wet Chemistry by Method 9060A	<b>12</b>	
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<b>Al: Accreditations &amp; Locations</b>	<b>14</b>	
<b>Sc: Sample Chain of Custody</b>	<b>15</b>	

# SAMPLE SUMMARY

## SP-201-090519 L1136458-01 GW

Collected by: Mark Hammer  
 Collected date/time: 09/05/19 12:05  
 Received date/time: 09/06/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 300.0	WG1341025	1	09/06/19 18:53	09/06/19 18:53	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1340476	500	09/08/19 14:40	09/08/19 14:40	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1342571	1	09/06/19 14:43	09/09/19 21:17	JER	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## SP-301-090519 L1136458-02 GW

Collected by: Mark Hammer  
 Collected date/time: 09/05/19 12:15  
 Received date/time: 09/06/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1341274	1	09/06/19 22:03	09/06/19 23:23	TH	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1341025	1	09/06/19 19:22	09/06/19 19:22	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1340476	1	09/08/19 15:06	09/08/19 15:06	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1342571	1	09/06/19 14:43	09/09/19 21:18	JER	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1341251	1	09/06/19 19:32	09/06/19 19:32	VRP	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	3.63		0.100	1	09/06/2019 18:53	<a href="#">WG1341025</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	4.54		2.00	500	09/08/2019 14:40	<a href="#">WG1340476</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	09/09/2019 21:17	<a href="#">WG1342571</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	3.20		2.50	1	09/06/2019 23:23	<a href="#">WG1341274</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	09/06/2019 19:22	<a href="#">WG1341025</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	09/08/2019 15:06	<a href="#">WG1340476</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.909		0.100	1	09/09/2019 21:18	<a href="#">WG1342571</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	9.12		1.00	1	09/06/2019 19:32	<a href="#">WG1341251</a>

9 Sc



Method Blank (MB)

(MB) R3448388-1 09/06/19 23:23

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		0.350	2.50

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1136417-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1136417-01 09/06/19 23:23 • (DUP) R3448388-3 09/06/19 23:23

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	30.0	33.2	1	10.1	R8	5

L1136457-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1136457-01 09/06/19 23:23 • (DUP) R3448388-4 09/06/19 23:23

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	48.6	55.6	1	13.4	R8	5

Laboratory Control Sample (LCS)

(LCS) R3448388-2 09/06/19 23:23

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	808	105	85.0-115	



Method Blank (MB)

(MB) R3448074-1 09/06/19 11:47

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1136410-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1136410-01 09/06/19 14:05 • (DUP) R3448074-3 09/06/19 14:19

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	U	0.000	1	0.000		20

L1136458-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1136458-01 09/06/19 18:53 • (DUP) R3448074-6 09/06/19 19:07

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	3.63	3.61	1	0.763		20

Laboratory Control Sample (LCS)

(LCS) R3448074-2 09/06/19 12:02

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Nitrate	8.00	8.28	104	90.0-110	

L1136458-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1136458-02 09/06/19 19:22 • (MS) R3448074-7 09/06/19 19:36

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Nitrate	5.00	ND	5.08	102	1	80.0-120	



Method Blank (MB)

(MB) R3448763-1 09/08/19 03:27

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

Method Blank (MB)

(MB) R3448763-3 09/08/19 04:44

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1134508-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1134508-01 09/08/19 08:38 • (DUP) R3448763-4 09/08/19 09:04

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

L1136458-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1136458-02 09/08/19 15:06 • (DUP) R3448763-7 09/08/19 15:32

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3448763-2 09/08/19 04:18

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00961	96.1	90.0-110	

L1136030-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1136030-06 09/08/19 12:31 • (MS) R3448763-8 09/09/19 13:20 • (MSD) R3448763-6 09/08/19 14:14

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	ND	0.00874	0.00999	87.4	99.9	1	80.0-120			13.4	15



Method Blank (MB)

(MB) R3448843-1 09/09/19 20:38

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Phosphorus,Total	U		0.0350	0.100

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1136419-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1136419-05 09/09/19 21:14 • (DUP) R3448843-5 09/09/19 21:15

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	U	0.000	1	0.000		20

L1136136-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1136136-01 09/09/19 21:31 • (DUP) R3448843-6 09/09/19 21:32

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.71	1.74	1	1.74		20

Laboratory Control Sample (LCS)

(LCS) R3448843-2 09/09/19 20:40

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Phosphorus,Total	2.00	1.81	90.5	90.0-110	

L1136419-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1136419-04 09/09/19 21:10 • (MS) R3448843-3 09/09/19 21:12 • (MSD) R3448843-4 09/09/19 21:13

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	U	2.52	2.56	101	102	1	90.0-110			1.57	20

L1136199-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1136199-01 09/09/19 21:35 • (MS) R3448843-7 09/09/19 21:36 • (MSD) R3448843-8 09/09/19 21:37

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Phosphorus,Total	2.50	2.95	5.38	5.27	97.2	92.8	1	90.0-110	E1	E1	2.07	20



L1136227-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1136227-01 09/09/19 21:39 • (MS) R3448843-9 09/09/19 21:40

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>
Phosphorus,Total	2.50	0.206	2.75	102	1	90.0-110	

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3448227-1 09/06/19 14:11

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.320	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1136414-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1136414-01 09/06/19 15:25 • (DUP) R3448227-3 09/06/19 15:38

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	99.1	99.2	2	0.141		20

Laboratory Control Sample (LCS)

(LCS) R3448227-2 09/06/19 14:43

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	75.5	101	85.0-115	

L1136419-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1136419-04 09/06/19 18:02 • (MS) R3448227-4 09/06/19 18:50 • (MSD) R3448227-5 09/06/19 19:06

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	0.992	52.4	52.5	103	103	1	80.0-120			0.172	20





## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

### Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier	Description
-----------	-------------

E1	Concentration estimated. Analyte exceeded calibration range. Reanalysis not possible due to insufficient sample.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
R8	Sample RPD exceeded the method acceptance limit.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

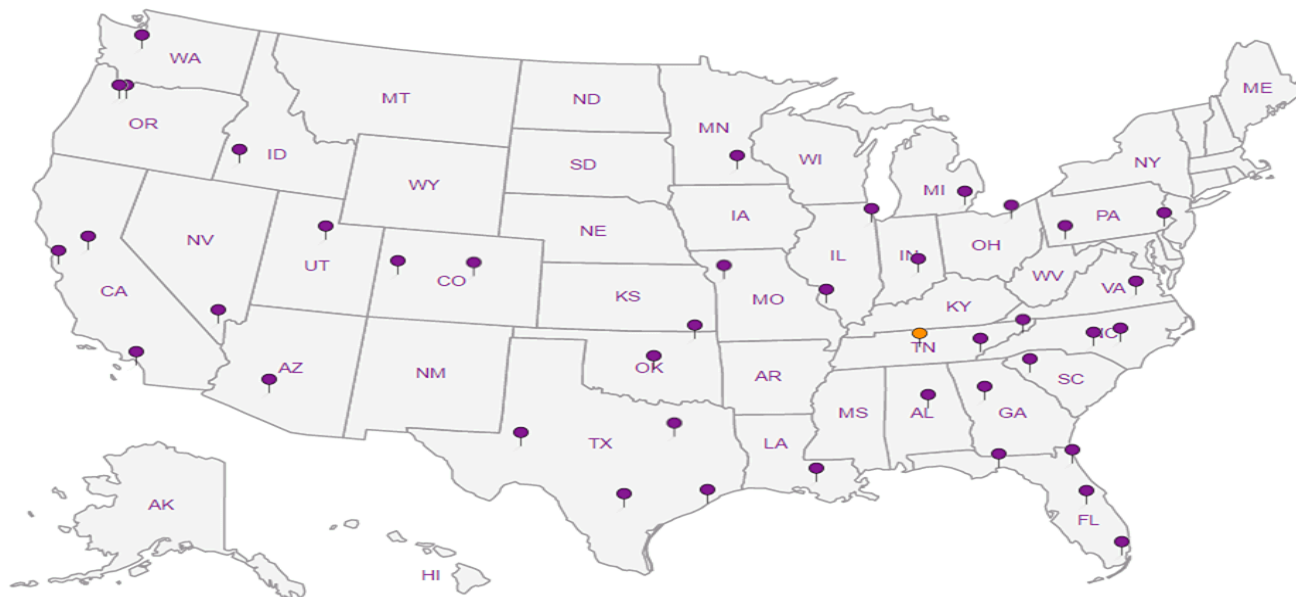
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008  
 Report to: Thomas Vespalec

Billing Information:  
**Accounts Payable**  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129


Email To: thomas.vespalec@arcadis.com

Analysis / Container / Preservative

Chain of Custody Page 1 of 1

**Pace Analytical**  
 National Center for Testing & Innovation

12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



Project Description: **UPCO** City/State Collected: **AZ**

Client Project # **03994018.0028** Lab Project # **UTCARCA-UPCO11DCE**

Collected by (print): **MARK HAMMER** Site/Facility ID # **UPCO** P.O. #

Collected by (signature): *Mark Hammer* **Rush?** (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote # **9/10/19** Date Results Needed

Immediately Packed on Ice N \_\_\_ Y \_\_\_

No. of Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-201-090519	G	GW		9/5/19	12:05	3	X					X				X		-01
SP-301-090519	G	GW		9/5/19	12:15	5	X					X		X	X	X		02
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix: SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  UPS  FedEx  Courier

Tracking # **4794 8846 0147**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

**Sample Receipt Checklist**  
 COC Seal Present/Intact:  NP  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N  
 If Applicable  
 VOA Zero Headspace:  Y  N  
 Preservation Correct/Checked:  Y  N

Relinquished by: (Signature) *Mark Hammer* Date: 9/5/19 Time: 1222  
 Received by: (Signature) *Lanyarvey* Trip Blank Received: Yes/No  
 HCL / MeoH TBR

Relinquished by: (Signature) *Lanyarvey* Date: 9/5/19 Time: 1800  
 Received by: (Signature) *FedEx* Temp: 43BF °C Bottles Received: 8  
 4.5+/-4.6

Relinquished by: (Signature) *Reple* Date: 9/5 Time: 0830  
 Received for lab by: (Signature) *Reple* Hold: Condition: NCF /  OK

**RAD SCREEN: <0.5 mR/hr**

If preservation required by Login: Date/Time

ESLAB

## UTC - Arcadis

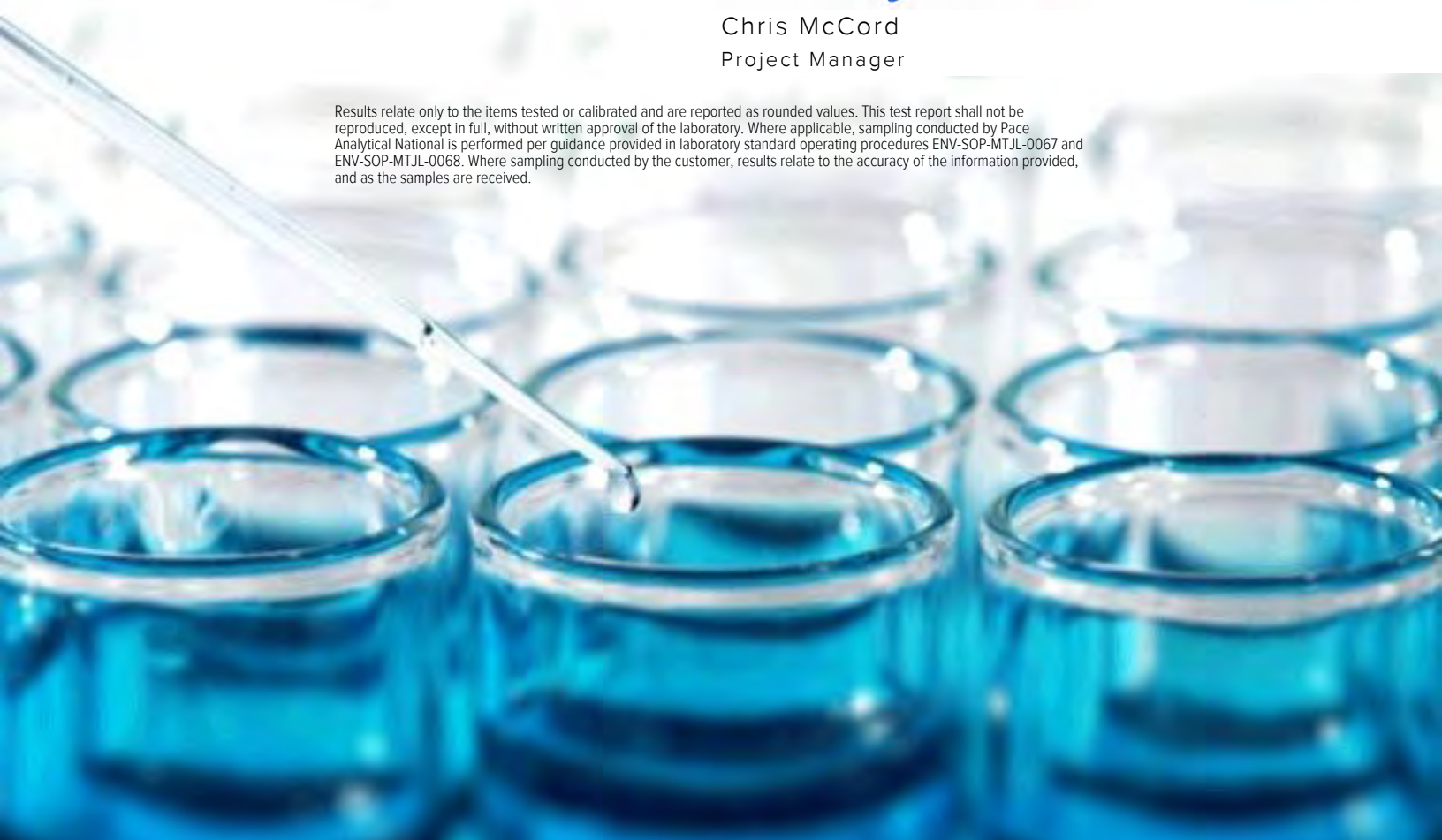
Sample Delivery Group: L1136546  
Samples Received: 09/06/2019  
Project Number: 30002531.0000  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
<b>SP-701-090519 L1136546-01</b>	<b>5</b>	
<b>TRIP BLANK L1136546-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>6</sup>Qc</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>9</b>	
<b>Gl: Glossary of Terms</b>	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>12</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY

## SP-701-090519 L1136546-01 GW

Collected by: Mark Hammer  
 Collected date/time: 09/05/19 11:30  
 Received date/time: 09/06/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1340973	1	09/11/19 17:39	09/11/19 17:39	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1345478	1	09/13/19 19:54	09/13/19 19:54	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1345084	1	09/13/19 12:28	09/13/19 12:28	BMB	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## TRIP BLANK L1136546-02 GW

Collected by: Mark Hammer  
 Collected date/time: 09/05/19 00:00  
 Received date/time: 09/06/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1345478	1	09/13/19 16:55	09/13/19 16:55	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1345084	1	09/13/19 11:29	09/13/19 11:29	BMB	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

Sample Delivery Group (SDG) Narrative

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VOC pH outside of method requirement.

<u>Lab Sample ID</u>	<u>Project Sample ID</u>	<u>Method</u>
<a href="#">L1136546-01</a>	<a href="#">SP-701-090519</a>	8260B-SIM, 8260B

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Perchlorate	ND		0.00400	1	09/11/2019 17:39	<a href="#">WG1340973</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,1-Dichloroethene	ND		0.00100	1	09/13/2019 19:54	<a href="#">WG1345478</a>
(S) Toluene-d8	96.3		80.0-120		09/13/2019 19:54	<a href="#">WG1345478</a>
(S) 4-Bromofluorobenzene	93.1		77.0-126		09/13/2019 19:54	<a href="#">WG1345478</a>
(S) 1,2-Dichloroethane-d4	103		70.0-130		09/13/2019 19:54	<a href="#">WG1345478</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,4-Dioxane	ND		0.00300	1	09/13/2019 12:28	<a href="#">WG1345084</a>
(S) Toluene-d8	98.6		77.0-127		09/13/2019 12:28	<a href="#">WG1345084</a>

6 Qc

7 Gl

8 Al

9 Sc





Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	09/13/2019 16:55	<a href="#">WG1345478</a>
(S) Toluene-d8	98.1		80.0-120		09/13/2019 16:55	<a href="#">WG1345478</a>
(S) 4-Bromofluorobenzene	94.9		77.0-126		09/13/2019 16:55	<a href="#">WG1345478</a>
(S) 1,2-Dichloroethane-d4	94.3		70.0-130		09/13/2019 16:55	<a href="#">WG1345478</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/13/2019 11:29	<a href="#">WG1345084</a>
(S) Toluene-d8	99.6		77.0-127		09/13/2019 11:29	<a href="#">WG1345084</a>



Method Blank (MB)

(MB) R3449904-1 09/11/19 14:25

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

L1136546-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1136546-01 09/11/19 17:39 • (DUP) R3449904-3 09/11/19 18:05

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

<sup>5</sup> Sr

<sup>6</sup> Qc

Laboratory Control Sample (LCS)

(LCS) R3449904-2 09/11/19 15:17

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0101	101	90.0-110	

<sup>7</sup> Gl

<sup>8</sup> Al

L1136831-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1136831-04 09/11/19 21:07 • (MS) R3449904-6 09/11/19 21:33 • (MSD) R3449904-7 09/11/19 21:58

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	U	0.0124	0.00894	124	89.4	1	80.0-120	<u>M1</u>	<u>R2</u>	32.3	15

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3450803-3 09/13/19 16:33

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	96.2			80.0-120
(S) 4-Bromofluorobenzene	97.2			77.0-126
(S) 1,2-Dichloroethane-d4	95.0			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3450803-1 09/13/19 14:56 • (LCSD) R3450803-2 09/13/19 15:18

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0278	0.0269	111	108	71.0-124			3.20	20
(S) Toluene-d8				99.6	95.3	80.0-120				
(S) 4-Bromofluorobenzene				97.7	96.3	77.0-126				
(S) 1,2-Dichloroethane-d4				97.2	109	70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3450718-3 09/13/19 10:35

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	98.6			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3450718-1 09/13/19 09:37 • (LCSD) R3450718-2 09/13/19 09:57

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,4-Dioxane	0.0500	0.0607	0.0640	121	128	55.0-138			5.25	24
(S) Toluene-d8				98.7	98.7	77.0-127				

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

M1	Matrix spike recovery was high, the method control sample recovery was acceptable.
R2	RPD/RSD exceeded the laboratory acceptance limit.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

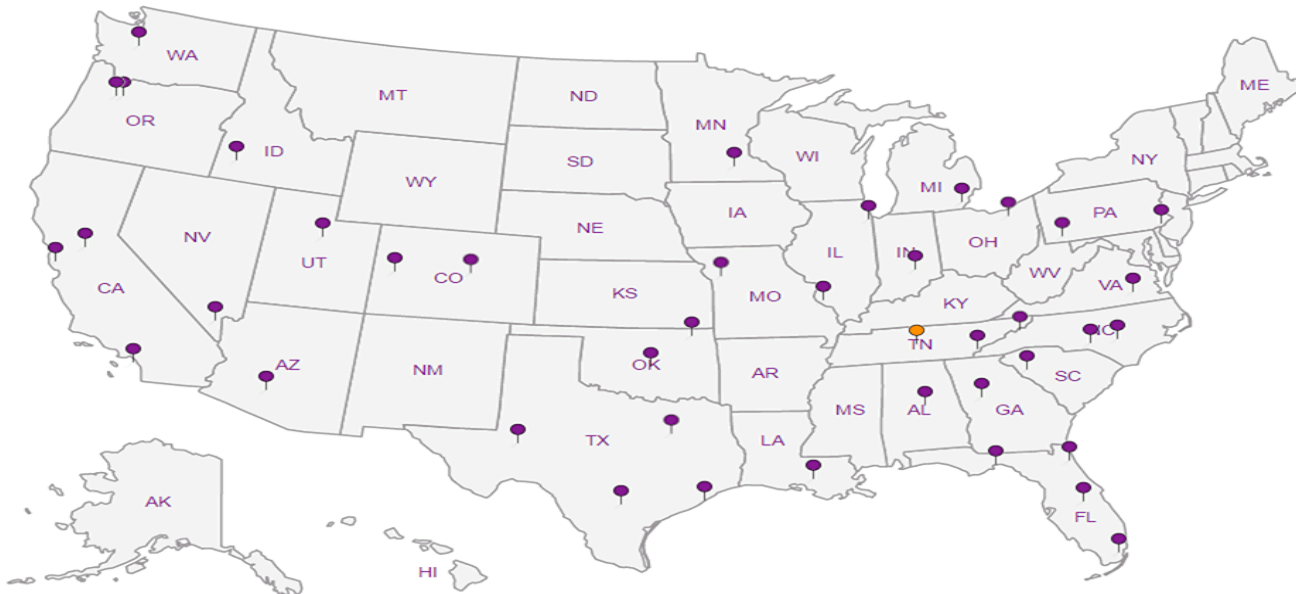
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn


5 Sr

6 Qc

7 Gl

8 Al

9 Sc

<b>UTC - Arcadis</b> 410 North 44th St. Suite 1000 Phoenix AZ 85008 Report to: <b>Thomas Vespalec</b>		Billing Information:		Accounts Payable 630 Plaza Drive, Suite 600 Highlands Ranch, CO 80129		Pres Chk	Analysis / Container / Preservative										Chain of Custody Page 1 of 1																																																																																																																																																																																																																													
		Project Description: <b>UPCO</b>		City/State Collected: <b>AZ</b>		Lab Project # <b>UTCARCA-UPCO11DCE</b>		**NITRATE** 125mlHDPE-NoPres 1,1-DCE-8260B 40mlAmb-HCl 1,4-Dioxane 8260B 40mlAmb-HCl Ammonia 250mlHDPE-H2SO4 Diss. Fe - LF 250mlHDPE-NoPres Perchlorate 125mlHDPE-NoPres RCRA8+Fe 250mlHDPE-HNO3 TOC 250ml/Amb-HCl TSS 1L-HDPE NoPres Total Phosphorous 250mlHDPE-H2SO4										12065 Lebanon Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-767-5859 Fax: 615-758-5859 																																																																																																																																																																																																																												
Phone: <b>480-535-7399</b>		Client Project # <b>03994018.0028</b>		P.O. #		Quote #												L# <b>L1136546</b> <b>1201</b>										Acctnum: <b>UTCARCA</b> Template: <b>T152379</b> Prelogin: <b>P716981</b> TSR: <b>526 - Chris McCord</b> PB:																																																																																																																																																																																																																		
Collected by (print): <b>MARK HAMMER</b>		Site/Facility ID # <b>UPCO</b>		Date Results Needed <b>STAT</b>		No. of Cntrs		Shipped Via: <b>FedEX Saver</b>																				Remarks      Sample # (lab only)																																																																																																																																																																																																																		
Collected by (signature): <i>Mark Hammer</i>		Rush? (Lab MUST Be Notified) <input type="checkbox"/> Same Day <input type="checkbox"/> Five Day <input type="checkbox"/> Next Day <input type="checkbox"/> 5 Day (Rad Only) <input type="checkbox"/> Two Day <input type="checkbox"/> 10 Day (Rad Only) <input type="checkbox"/> Three Day		Immediately		Packed on Ice N <input type="checkbox"/> Y <input checked="" type="checkbox"/>												<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample ID</th> <th>Comp/Grab</th> <th>Matrix *</th> <th>Depth</th> <th>Date</th> <th>Time</th> <th>No. of Cntrs</th> <th>**NITRATE** 125mlHDPE-NoPres</th> <th>1,1-DCE-8260B 40mlAmb-HCl</th> <th>1,4-Dioxane 8260B 40mlAmb-HCl</th> <th>Ammonia 250mlHDPE-H2SO4</th> <th>Diss. Fe - LF 250mlHDPE-NoPres</th> <th>Perchlorate 125mlHDPE-NoPres</th> <th>RCRA8+Fe 250mlHDPE-HNO3</th> <th>TOC 250ml/Amb-HCl</th> <th>TSS 1L-HDPE NoPres</th> <th>Total Phosphorous 250mlHDPE-H2SO4</th> <th>Remarks</th> <th>Sample # (lab only)</th> </tr> </thead> <tbody> <tr> <td>SP-702-090519</td> <td>6</td> <td>GW</td> <td>-</td> <td>9/5/19</td> <td>11:30</td> <td>5</td> <td></td> <td>X</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-01</td> </tr> <tr> <td>TRIP BLANK</td> <td>-</td> <td>GW</td> <td>-</td> <td>9/5/19</td> <td>-</td> <td>1</td> <td></td> <td>X</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>02</td> </tr> <tr><td> </td><td> </td><td>GW</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td>GW</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td>GW</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td>GW</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td>GW</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td>GW</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td>GW</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td>GW</td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>										Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250ml/Amb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)	SP-702-090519	6	GW	-	9/5/19	11:30	5		X	X			X							-01	TRIP BLANK	-	GW	-	9/5/19	-	1		X	X										02			GW																				GW																				GW																				GW																				GW																				GW																				GW																				GW									
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* Matrix: SS - Soil   AIR - Air   F - Filter GW - Groundwater   B - Bioassay WW - WasteWater DW - Drinking Water OT - Other _____		Remarks: <b>**NITRATE** has a 48hr hold time.</b>		pH _____ Temp _____		Flow _____ Other _____		Sample Receipt Checklist COC Seal Present/Intact: <input type="checkbox"/> NP <input checked="" type="checkbox"/> Y <input type="checkbox"/> N COC Signed/Accurate: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Bottles arrive intact: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Correct bottles used: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Sufficient volume sent: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N If Applicable VOA Zero Headspace: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Preservation Correct/Checked: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N <b>RAD SCREEN: &lt;0.5 mR/hr</b>																																																																																																																																																																																																																																						
Relinquished by: (Signature) <i>Mark Hammer</i>		Date: <b>9/5/19</b>		Time: <b>1222</b>		Received by: (Signature) <i>any...</i>		Trip Blank Received: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No HCl/ MeOH TBR		Tracking # <b>4794 8846 0147</b> Temp: <b>A30F °C</b> Bottles Received: <b>5</b> <b>4.5 ± 0.1 = 4.6</b>																																																																																																																																																																																																																																				
Relinquished by: (Signature) <i>any...</i>		Date: <b>9/5/19</b>		Time: <b>1800</b>		Received by: (Signature) <b>FedEx</b>		Temp: <b>A30F °C</b> Bottles Received: <b>5</b> <b>4.5 ± 0.1 = 4.6</b>		If preservation required by Login: Date/Time																																																																																																																																																																																																																																				
Relinquished by: (Signature) <i>any...</i>		Date: _____		Time: _____		Received for lab by: (signature) <i>any...</i>		Date: <b>9/5/19</b> Time: <b>0830</b>		Hold:		Condition: <b>NCF / OK</b>																																																																																																																																																																																																																																		

ESUAB



## UTC - Arcadis

Sample Delivery Group: L1138881  
Samples Received: 09/13/2019  
Project Number: 30002531.0000  
Description: UPCO

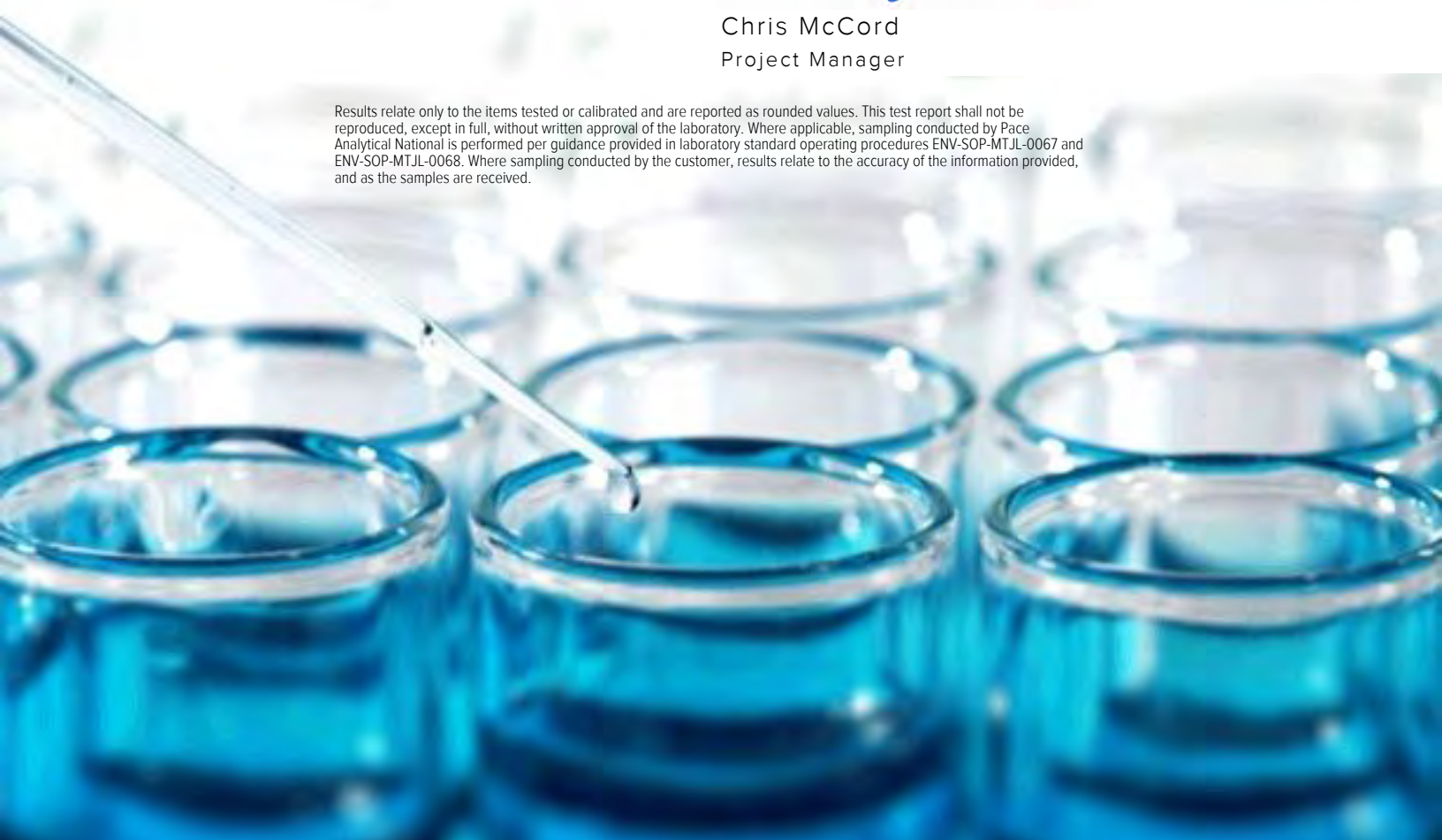
Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.







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# SAMPLE SUMMARY



## SP-201-091219 L1138881-01 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 12:40  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1345404	1	09/13/19 16:22	09/13/19 16:53	AEC	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1345170	1	09/13/19 22:57	09/13/19 22:57	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1345546	500	09/17/19 00:26	09/17/19 00:26	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1346973	1	09/14/19 08:37	09/17/19 10:30	SDL	Mt. Juliet, TN

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

## SP-301-091219 L1138881-02 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 12:50  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1345404	1	09/13/19 16:22	09/13/19 16:53	AEC	Mt. Juliet, TN
Wet Chemistry by Method 300.0	WG1345170	1	09/13/19 23:32	09/13/19 23:32	LDC	Mt. Juliet, TN
Wet Chemistry by Method 314.0 Mod	WG1345546	1	09/17/19 00:59	09/17/19 00:59	LBR	Mt. Juliet, TN
Wet Chemistry by Method 365.4	WG1346973	1	09/14/19 08:37	09/17/19 10:32	SDL	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1345498	1	09/14/19 08:59	09/14/19 08:59	VRP	Mt. Juliet, TN

## SP-701-091219 L1138881-03 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 12:35  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1345404	1	09/13/19 16:22	09/13/19 16:53	AEC	Mt. Juliet, TN

## SP-401-091219 L1138881-04 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 12:55  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1345404	1	09/13/19 16:22	09/13/19 16:53	AEC	Mt. Juliet, TN

## SP-211-091219 L1138881-05 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 13:05  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 D-2011	WG1345404	1	09/13/19 16:22	09/13/19 16:53	AEC	Mt. Juliet, TN

## MW-20-091219 L1138881-06 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 13:10  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1345546	5	09/17/19 03:08	09/17/19 03:08	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1346255	1	09/15/19 22:25	09/15/19 22:25	DWR	Mt. Juliet, TN

## T-801-091219 L1138881-07 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 13:15  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1346255	1	09/15/19 22:44	09/15/19 22:44	DWR	Mt. Juliet, TN

# SAMPLE SUMMARY



## T-802-091219 L1138881-08 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 13:17  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1346255	1	09/15/19 23:04	09/15/19 23:04	DWR	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

## T-803-091219 L1138881-09 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 13:20  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1346255	1	09/15/19 23:23	09/15/19 23:23	DWR	Mt. Juliet, TN

4 Cn

5 Sr

## EW-1-091219 L1138881-10 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 13:25  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1345546	1000	09/17/19 04:13	09/17/19 04:13	LBR	Mt. Juliet, TN

6 Qc

7 Gl

## EW-2-091219 L1138881-11 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 13:27  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1345546	1	09/17/19 04:46	09/17/19 04:46	LBR	Mt. Juliet, TN

8 Al

9 Sc

## IW-1-091219 L1138881-12 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 13:30  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1345546	2000	09/17/19 05:50	09/17/19 05:50	LBR	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	09/13/2019 16:53	<a href="#">WG1345404</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	4.06		0.100	1	09/13/2019 22:57	<a href="#">WG1345170</a>

<sup>3</sup> Ss

<sup>4</sup> Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	8.36		2.00	500	09/17/2019 00:26	<a href="#">WG1345546</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	ND		0.100	1	09/17/2019 10:30	<a href="#">WG1346973</a>

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	09/13/2019 16:53	<a href="#">WG1345404</a>

1 Cp

2 Tc

Wet Chemistry by Method 300.0

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Nitrate as (N)	ND		0.100	1	09/13/2019 23:32	<a href="#">WG1345170</a>

3 Ss

4 Cn

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	09/17/2019 00:59	<a href="#">WG1345546</a>

5 Sr

6 Qc

Wet Chemistry by Method 365.4

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Phosphorus, Total	0.223	<u>B1</u>	0.100	1	09/17/2019 10:32	<a href="#">WG1346973</a>

7 Gl

8 Al

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	6.23		1.00	1	09/14/2019 08:59	<a href="#">WG1345498</a>

9 Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		2.50	1	09/13/2019 16:53	<a href="#">WG1345404</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	2.50		2.50	1	09/13/2019 16:53	<a href="#">WG1345404</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Suspended Solids	ND		10.0	1	09/13/2019 16:53	<a href="#">WG1345404</a>

Sample Narrative:

L1138881-05 WG1345404: Reporting limit determined by filtrate volume.

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.338		0.0200	5	09/17/2019 03:08	<a href="#">WG1345546</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	0.0114		0.00300	1	09/15/2019 22:25	<a href="#">WG1346255</a>
(S) Toluene-d8	98.9		77.0-127		09/15/2019 22:25	<a href="#">WG1346255</a>

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/15/2019 22:44	<a href="#">WG1346255</a>
(S) Toluene-d8	98.9		77.0-127		09/15/2019 22:44	<a href="#">WG1346255</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/15/2019 23:04	<a href="#">WG1346255</a>
(S) Toluene-d8	98.9		77.0-127		09/15/2019 23:04	<a href="#">WG1346255</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/15/2019 23:23	<a href="#">WG1346255</a>
(S) Toluene-d8	98.4		77.0-127		09/15/2019 23:23	<a href="#">WG1346255</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	5.36		4.00	1000	09/17/2019 04:13	<a href="#">WG1345546</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0650		0.00400	1	09/17/2019 04:46	<a href="#">WG1345546</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	53.9		8.00	2000	09/17/2019 05:50	<a href="#">WG1345546</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Method Blank (MB)

(MB) R3450694-1 09/13/19 16:53

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Suspended Solids	U		0.350	2.50

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1138845-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1138845-01 09/13/19 16:53 • (DUP) R3450694-3 09/13/19 16:53

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	111	123	1	10.3	R8	5

L1138889-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1138889-01 09/13/19 16:53 • (DUP) R3450694-4 09/13/19 16:53

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Suspended Solids	10.6	12.6	1	17.2	R8	5

Laboratory Control Sample (LCS)

(LCS) R3450694-2 09/13/19 16:53

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Suspended Solids	773	812	105	85.0-115	



Method Blank (MB)

(MB) R3450634-1 09/13/19 09:20

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Nitrate	U		0.0227	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1138851-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1138851-03 09/13/19 14:26 • (DUP) R3450634-3 09/13/19 14:43

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	11.0	10.7	20	2.63		20

L1138881-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1138881-01 09/13/19 22:57 • (DUP) R3450634-7 09/13/19 23:14

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Nitrate	4.06	4.10	1	1.03		20

Laboratory Control Sample (LCS)

(LCS) R3450634-2 09/13/19 09:38

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Nitrate	8.00	8.34	104	90.0-110	

L1138861-06 Original Sample (OS) • Matrix Spike (MS)

(OS) L1138861-06 09/13/19 19:43 • (MS) R3450634-6 09/13/19 20:00

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Nitrate	5.00	ND	4.18	83.5	1	80.0-120	



Method Blank (MB)

(MB) R3451440-1 09/16/19 06:04

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

L1137274-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1137274-04 09/16/19 09:05 • (DUP) R3451440-3 09/16/19 09:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	U	0.000	1	0.000		15

L1138906-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1138906-01 09/17/19 06:23 • (DUP) R3451440-6 09/17/19 06:55

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.00114	1	0.000		15

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3451440-2 09/16/19 07:09

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00982	98.2	90.0-110	

L1138851-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1138851-06 09/16/19 22:17 • (MS) R3451440-4 09/16/19 22:49 • (MSD) R3451440-5 09/16/19 23:22

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	U	0.0109	0.0109	109	109	1	80.0-120			0.451	15



Method Blank (MB)

(MB) R3451416-1 09/17/19 10:07

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Phosphorus,Total	0.0455	E4	0.0350	0.100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1138834-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1138834-01 09/17/19 10:24 • (DUP) R3451416-5 09/17/19 10:25

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	4.62	4.90	1	5.88		20

L1139102-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1139102-01 09/17/19 10:33 • (DUP) R3451416-7 09/17/19 10:34

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Phosphorus,Total	1.41	1.53	1	8.16		20

Laboratory Control Sample (LCS)

(LCS) R3451416-2 09/17/19 10:09

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Phosphorus,Total	2.00	1.82	91.0	90.0-110	

L1138620-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1138620-02 09/17/19 10:18 • (MS) R3451416-3 09/17/19 10:19 • (MSD) R3451416-4 09/17/19 10:23

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits
Phosphorus,Total	2.50	0.764	3.16	3.11	95.8	93.8	1	90.0-110			1.59	20

L1138834-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1138834-02 09/17/19 10:26 • (MS) R3451416-6 09/17/19 10:28

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Phosphorus,Total	2.50	2.45	4.96	100	1	90.0-110	



Method Blank (MB)

(MB) R3450670-1 09/13/19 16:02

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TOC (Total Organic Carbon)	0.457	E4	0.102	1.00

L1138396-12 Original Sample (OS) • Duplicate (DUP)

(OS) L1138396-12 09/13/19 19:10 • (DUP) R3450670-3 09/13/19 19:30

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	2.56	2.42	1	5.67		20

Laboratory Control Sample (LCS)

(LCS) R3450670-2 09/13/19 16:43

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75.0	77.7	104	85.0-115	

L1138921-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1138921-01 09/14/19 09:20 • (MS) R3450670-4 09/14/19 10:58 • (MSD) R3450670-5 09/14/19 11:22

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TOC (Total Organic Carbon)	50.0	3.69	55.0	54.8	103	102	1	80.0-120			0.273	20

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Method Blank (MB)

(MB) R3451104-3 09/15/19 10:26

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	98.6			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3451104-1 09/15/19 09:27 • (LCSD) R3451104-2 09/15/19 09:47

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0517	0.0550	103	110	55.0-138			6.11	24
(S) Toluene-d8				98.2	98.4	77.0-127				

5 Sr

6 Qc

L1138369-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1138369-06 09/15/19 18:29 • (MS) R3451104-4 09/15/19 18:48 • (MSD) R3451104-5 09/15/19 19:08

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	U	0.0568	0.0524	114	105	1	13.0-160			8.03	31
(S) Toluene-d8					98.4	98.1		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

B1	Target analyte detected in method blank at or above the method reporting limit.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
R8	Sample RPD exceeded the method acceptance limit.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

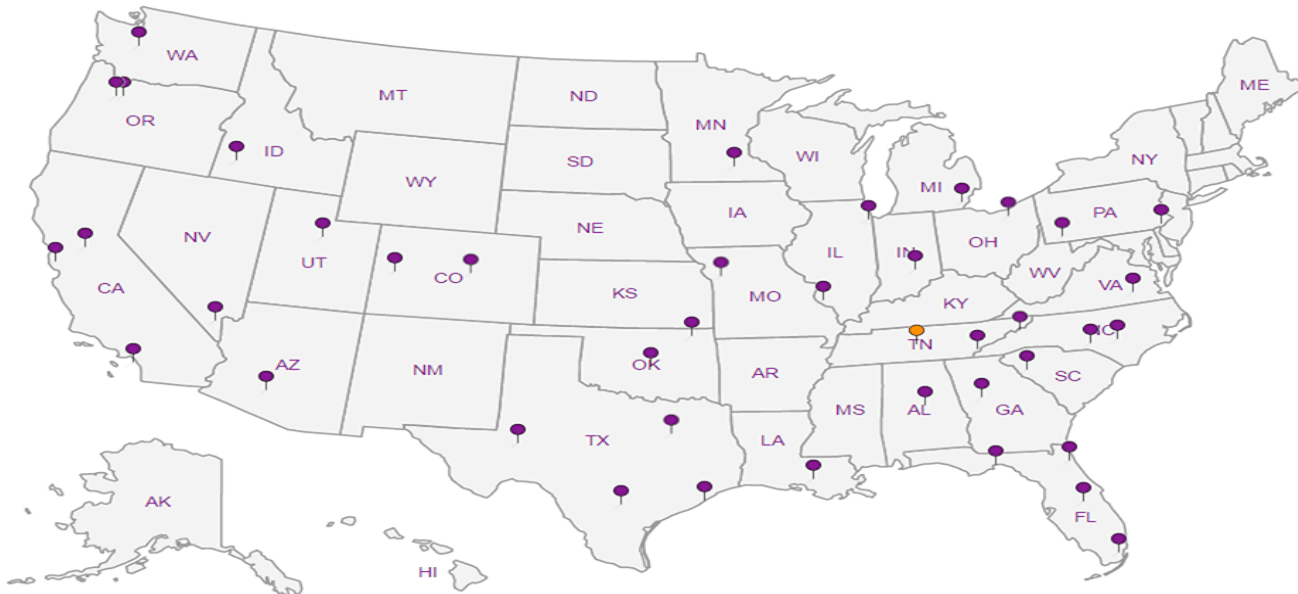
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008  
 Report to: **Thomas Vespalect**

Billing Information:  
**Accounts Payable**  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129  
 Email To: **thomas.vespalect@arcadis.com**

Chain of Custody Page 1 of 2  
  
 12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859

Project Description: **UPCO**  
 City/State Collected: **AZ**

Client Project # **03994018.0028**  
 Lab Project # **UTCARCA-UPCO11DCE**

Phone: **480-535-7399**  
 Fax:

Collected by (print): **MARK HAMMER**  
 Site/Facility ID #: **UPCO**

Collected by (signature): *Mark Hammer*  
 Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote # \_\_\_\_\_  
 Date Results Needed \_\_\_\_\_

Immediately Packed on Ice N  Y

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cnts	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40ml/Amb-HCl	1,4-Dioxane 8260B 40ml/Amb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250ml/Amb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-201-091219	G	GW	-	9/12/19	12:40	4	X					X			X	X		-01
SP-301-091219	G	GW	-	9/12/19	12:50	5	X					X		X	X	X		-02
SP-701-091219	G	GW		9/12/19	12:35	1									X			-03
SP-401-091219	G	GW		9/12/19	12:55	1									X			-04
SP-211-091219	G	GW		9/12/19	13:05	1									X			-05
MW-20-091219	G	GW		9/12/19	13:10	3		X			X							-06
T-801-091219	G	GW		9/12/19	13:15	2		X										-07
T-802-091219	G	GW		9/12/19	13:17	2		X										-08
T-803-091219	G	GW		9/12/19	13:20	2		X										-09
EW-1-091219	G	GW		9/12/19	13:25	1					X							-10

\* Matrix: SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  UPS  FedEx  Courier

Tracking # **Southwest**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

Relinquished by: (Signature) *Mark Hammer* Date: **9/12/19** Time: **1402**  
 Received by: (Signature) *anyar*

Relinquished by: (Signature) *anyar* Date: **9/12/19** Time: **800**  
 Received by: (Signature) *S...*

Relinquished by: (Signature) \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Received for lab by: (Signature) \_\_\_\_\_

Trip Blank Received: Yes (No)  HCL / MeOH TBR

Temp: **20.6/19.65** °C Bottles Received: **24**

Date: **9.13.19** Time: **0800** Hold: \_\_\_\_\_ Condition: **NCF / OK**

Sample Receipt Checklist  
 COC Seal Present/Intact:  NP Y N  
 COC Signed/Accurate:  Y N  
 Bottles arrive intact:  Y N  
 Correct bottles used:  Y N  
 Sufficient volume sent:  Y N  
 If Applicable  
 VOA Zero Headspace:  Y N  
 Preservation Correct/Checked:  Y N

**RAD SCREEN: <0.5 mR/hr**

If preservation required by Login: Date/Time

F.S. A7

**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

Collected by (print):  
**MARK HAMMER**

Site/Facility ID #  
**UPCO**

Collected by (signature):  
**Mark Hammer**

Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Immediately Packed on Ice N  Y

Billing Information:  
Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

City/State Collected:  
**AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #

Date Results Needed

Pres Chk

Analysis / Container / Preservative



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4
------------------------------	---------------------------	-------------------------------	-------------------------	--------------------------------	------------------------------	-------------------------	------------------	--------------------	-----------------------------------

L # **L113881**

Table #

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P716981**

TSR: **526 - Chris McCord**

PB:

Shipped Via: **FedEX Saver**

Remarks

Sample # (lab only)

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs
<b>EW-2-091219</b>	<b>6</b>	<b>GW</b>		<b>9/12/19</b>	<b>13:27</b>	<b>1</b>
<b>IW-1-091219</b>	<b>6</b>	<b>GW</b>		<b>9/12/19</b>	<b>13:30</b>	<b>1</b>
		<b>GW</b>				
		<b>GW</b>				
		<b>GW</b>				
		<b>GW</b>				
		<b>GW</b>				
		<b>GW</b>				
		<b>GW</b>				


\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist

COC Seal Present/Intact:  Y  N

COC Signed/Accurate:  Y  N

Bottles arrive intact:  Y  N

Correct bottles used:  Y  N

Sufficient volume sent:  Y  N

If Applicable

VOA Zero Headspace:  Y  N

Preservation Correct/Checked:  Y  N

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature)  
**Mark Hammer**

Date: **9/12/19**  
Time: **1402**

Received by: (Signature)  
**Samuel**

Trip Blank Received: Yes  No   
HCL / MeOH TBR

Relinquished by: (Signature)  
**Samuel**

Date: **9/12/19**  
Time: **1800**

Received by: (Signature)  
**Samuel**

Temp: **20.1 = 1.9°C** Bottles Received: **24**

If preservation required by Login: Date/Time

Relinquished by: (Signature)  
**Samuel**

Date: **9-13-19**  
Time: **0800**

Received for lab by: (Signature)  
**Samuel**

Date: **9-13-19** Time: **0800**

Hold: Condition: **NCF / OK**

September 20, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1138906  
Samples Received: 09/13/2019  
Project Number: 30002531.0000  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
<b>SP-701-091219 L1138906-01</b>	<b>5</b>	
<b>TRIP BLANK L1138906-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>6</sup>Qc</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>9</b>	
<b>Gl: Glossary of Terms</b>	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>12</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY



## SP-701-091219 L1138906-01 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 12:35  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1345546	1	09/17/19 06:23	09/17/19 06:23	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1347396	1	09/17/19 22:31	09/17/19 22:31	JCP	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1346714	1	09/16/19 19:06	09/16/19 19:06	JHH	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## TRIP BLANK L1138906-02 GW

Collected by: Mark Hammer  
 Collected date/time: 09/12/19 00:00  
 Received date/time: 09/13/19 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1347396	1	09/17/19 21:51	09/17/19 21:51	JCP	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1346714	1	09/16/19 16:48	09/16/19 16:48	JHH	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Perchlorate	ND		0.00400	1	09/17/2019 06:23	<a href="#">WG1345546</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
1,1-Dichloroethene	ND		0.00100	1	09/17/2019 22:31	<a href="#">WG1347396</a>
(S) Toluene-d8	103		80.0-120		09/17/2019 22:31	<a href="#">WG1347396</a>
(S) 4-Bromofluorobenzene	100		77.0-126		09/17/2019 22:31	<a href="#">WG1347396</a>
(S) 1,2-Dichloroethane-d4	92.7		70.0-130		09/17/2019 22:31	<a href="#">WG1347396</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
1,4-Dioxane	ND		0.00300	1	09/16/2019 19:06	<a href="#">WG1346714</a>
(S) Toluene-d8	99.1		77.0-127		09/16/2019 19:06	<a href="#">WG1346714</a>

6 Qc

7 Gl

8 Al

9 Sc



Collected date/time: 09/12/19 00:00

L1138906

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	09/17/2019 21:51	<a href="#">WG1347396</a>
(S) Toluene-d8	99.0		80.0-120		09/17/2019 21:51	<a href="#">WG1347396</a>
(S) 4-Bromofluorobenzene	99.3		77.0-126		09/17/2019 21:51	<a href="#">WG1347396</a>
(S) 1,2-Dichloroethane-d4	95.1		70.0-130		09/17/2019 21:51	<a href="#">WG1347396</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/16/2019 16:48	<a href="#">WG1346714</a>
(S) Toluene-d8	99.9		77.0-127		09/16/2019 16:48	<a href="#">WG1346714</a>





Method Blank (MB)

(MB) R3451440-1 09/16/19 06:04

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1137274-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1137274-04 09/16/19 09:05 • (DUP) R3451440-3 09/16/19 09:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	U	0.000	1	0.000		15

L1138906-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1138906-01 09/17/19 06:23 • (DUP) R3451440-6 09/17/19 06:55

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.00114	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3451440-2 09/16/19 07:09

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00982	98.2	90.0-110	

L1138851-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1138851-06 09/16/19 22:17 • (MS) R3451440-4 09/16/19 22:49 • (MSD) R3451440-5 09/16/19 23:22

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	U	0.0109	0.0109	109	109	1	80.0-120			0.451	15



Method Blank (MB)

(MB) R3452156-3 09/17/19 21:31

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	99.3			80.0-120
(S) 4-Bromofluorobenzene	98.0			77.0-126
(S) 1,2-Dichloroethane-d4	96.3			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3452156-1 09/17/19 20:25 • (LCSD) R3452156-2 09/17/19 20:45

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0263	0.0291	105	116	71.0-124			10.1	20
(S) Toluene-d8				99.0	93.7	80.0-120				
(S) 4-Bromofluorobenzene				99.6	91.9	77.0-126				
(S) 1,2-Dichloroethane-d4				106	108	70.0-130				

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3451349-3 09/16/19 11:23

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.4			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3451349-1 09/16/19 10:25 • (LCSD) R3451349-2 09/16/19 10:44

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0488	0.0454	97.7	90.8	55.0-138			7.26	24
(S) Toluene-d8				99.0	100	77.0-127				

5 Sr

6 Qc

L1138906-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1138906-01 09/16/19 19:06 • (MS) R3451349-4 09/16/19 19:25 • (MSD) R3451349-5 09/16/19 19:45

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	ND	0.0543	0.0549	109	110	1	13.0-160			0.990	31
(S) Toluene-d8					98.9	99.0		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Billing Information:  
Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: [thomas.vespalec@arcadis.com](mailto:thomas.vespalec@arcadis.com)

Project  
Description: **UPCO**

City/State  
Collected: **AZ**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
*MARK HAMMER*  
Collected by (signature):  
*Mark Hammer*

Site/Facility ID #  
**UPCO**  
Rush? (Lab MUST Be Notified)  
\_\_\_ Same Day \_\_\_ Five Day  
\_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
\_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
\_\_\_ Three Day

P.O. #  
Quote #  
Date Results Needed  
**STD TAT**

Immediately  
Packed on Ice N \_\_\_ Y **X**

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L # **L1138906**

**D095**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P716981**

TSR: **526 - Chris McCord**

PB:

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4
SP-701-091219	G	GW	-	9/12/19	12:35	5		X	X			X				
TRIP BLANK	-	GW	-	9/12/19	-	1		X	X							
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  
\_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier

Tracking # **SouthWest**

Sample Receipt Checklist  
COC Seal Present/Intact:  NP  Y  N  
COC Signed/Accurate:  Y  N  
Bottles arrive intact:  Y  N  
Correct bottles used:  Y  N  
Sufficient volume sent:  Y  N  
If Applicable  
VOA Zero Headspace:  Y  N  
Preservation Correct/Checked:  Y  N

Relinquished by: (Signature)  
*Mark Hammer*

Date: **9/12/19**  
Time: **1402**

Received by: (Signature)  
*Tanya*

Trip Blank Received:  Yes  No  
 HCL  MeOH  
 TBR

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature)  
*Tanya*

Date: **9/12/19**  
Time: **1800**

Received by: (Signature)  
*SL*

Temp: **2.0-1.9°C**  
Bottles Received: **5**

If preservation required by Login: Date/Time

Relinquished by: (Signature)  
*[Signature]*

Date: **9-13-19**  
Time: **0800**

Received for lab by: (Signature)  
*[Signature]*

Date: **9-13-19**  
Time: **0800**

Hold: \_\_\_\_\_ Condition: **NCF / DR**

*SSC*



## UTC - Arcadis

Sample Delivery Group: L1141421  
Samples Received: 09/20/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Jason Romer  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>5</b>	
<b>Sr: Sample Results</b>	<b>6</b>	<b>3</b> Ss
SP-201-091919 L1141421-01	6	
SP-301-091919 L1141421-02	7	<b>4</b> Cn
EW-1-091919 L1141421-03	8	<b>5</b> Sr
EW-2-091919 L1141421-04	9	
IW-1-091919 L1141421-05	10	<b>6</b> Qc
MW-20-091919 L1141421-06	11	
T-801-091919 L1141421-07	12	<b>7</b> Gl
T-802-091919 L1141421-08	13	<b>8</b> Al
T-803-091919 L1141421-09	14	
<b>Qc: Quality Control Summary</b>	<b>15</b>	<b>9</b> Sc
Wet Chemistry by Method 314.0 Mod	15	
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	16	
<b>Gl: Glossary of Terms</b>	<b>17</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>18</b>	
<b>Sc: Sample Chain of Custody</b>	<b>19</b>	



# SAMPLE SUMMARY



SP-201-091919 L1141421-01 GW Collected by Mark Hammer    Collected date/time 09/19/19 07:55    Received date/time 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1349539	500	09/21/19 08:00	09/21/19 08:00	LBR	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

SP-301-091919 L1141421-02 GW Collected by Mark Hammer    Collected date/time 09/19/19 08:00    Received date/time 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1349539	1	09/21/19 08:32	09/21/19 08:32	LBR	Mt. Juliet, TN

EW-1-091919 L1141421-03 GW Collected by Mark Hammer    Collected date/time 09/19/19 08:05    Received date/time 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1349539	1000	09/21/19 09:37	09/21/19 09:37	LBR	Mt. Juliet, TN

EW-2-091919 L1141421-04 GW Collected by Mark Hammer    Collected date/time 09/19/19 08:10    Received date/time 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1349539	1	09/21/19 10:09	09/21/19 10:09	LBR	Mt. Juliet, TN

IW-1-091919 L1141421-05 GW Collected by Mark Hammer    Collected date/time 09/19/19 08:15    Received date/time 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1349539	100	09/23/19 16:19	09/23/19 16:19	LBR	Mt. Juliet, TN

MW-20-091919 L1141421-06 GW Collected by Mark Hammer    Collected date/time 09/19/19 08:20    Received date/time 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1349539	5	09/21/19 13:24	09/21/19 13:24	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1352335	1	09/25/19 23:38	09/25/19 23:38	ADM	Mt. Juliet, TN

T-801-091919 L1141421-07 GW Collected by Mark Hammer    Collected date/time 09/19/19 08:30    Received date/time 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1352335	1	09/25/19 23:57	09/25/19 23:57	ADM	Mt. Juliet, TN

T-802-091919 L1141421-08 GW Collected by Mark Hammer    Collected date/time 09/19/19 08:35    Received date/time 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1352335	1	09/26/19 00:17	09/26/19 00:17	ADM	Mt. Juliet, TN

# SAMPLE SUMMARY



T-803-091919 L1141421-09 GW

Collected by: Mark Hammer  
Collected date/time: 09/19/19 08:40  
Received date/time: 09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1352335	1	09/26/19 00:36	09/26/19 00:36	ADM	Mt. Juliet, TN

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	8.21		2.00	500	09/21/2019 08:00	<a href="#">WG1349539</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	09/21/2019 08:32	<a href="#">WG1349539</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	52.1		4.00	1000	09/21/2019 09:37	<a href="#">WG1349539</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.0599		0.00400	1	09/21/2019 10:09	<a href="#">WG1349539</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	5.04		0.400	100	09/23/2019 16:19	<a href="#">WG1349539</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.343		0.0200	5	09/21/2019 13:24	<a href="#">WG1349539</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	0.0100		0.00300	1	09/25/2019 23:38	<a href="#">WG1352335</a>
(S) Toluene-d8	99.6		77.0-127		09/25/2019 23:38	<a href="#">WG1352335</a>

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/25/2019 23:57	<a href="#">WG1352335</a>
(S) Toluene-d8	99.1		77.0-127		09/25/2019 23:57	<a href="#">WG1352335</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/26/2019 00:17	<a href="#">WG1352335</a>
(S) Toluene-d8	99.7		77.0-127		09/26/2019 00:17	<a href="#">WG1352335</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/26/2019 00:36	<a href="#">WG1352335</a>
(S) Toluene-d8	99.5		77.0-127		09/26/2019 00:36	<a href="#">WG1352335</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3453861-1 09/21/19 06:21

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

L1141421-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1141421-02 09/21/19 08:32 • (DUP) R3453861-3 09/21/19 09:04

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

<sup>6</sup>Qc

Laboratory Control Sample (LCS)

(LCS) R3453861-2 09/21/19 07:26

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.0108	108	90.0-110	

<sup>7</sup>Gl

<sup>8</sup>Al

L1141421-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1141421-04 09/21/19 10:09 • (MS) R3453861-4 09/21/19 10:42 • (MSD) R3453861-5 09/21/19 11:14

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	0.0599	0.0703	0.0712	104	113	1	80.0-120			1.38	15

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3454663-3 09/25/19 20:02

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.5			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3454663-1 09/25/19 19:02 • (LCSD) R3454663-2 09/25/19 19:22

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0393	0.0480	78.6	96.0	55.0-138			19.9	24
(S) Toluene-d8				98.8	99.3	77.0-127				

5 Sr

6 Qc

L1142058-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1142058-02 09/26/19 02:15 • (MS) R3454663-4 09/26/19 02:34 • (MSD) R3454663-5 09/26/19 02:54

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	0.00386	0.0586	0.0606	110	113	1	13.0-160			3.31	31
(S) Toluene-d8					100	99.8		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

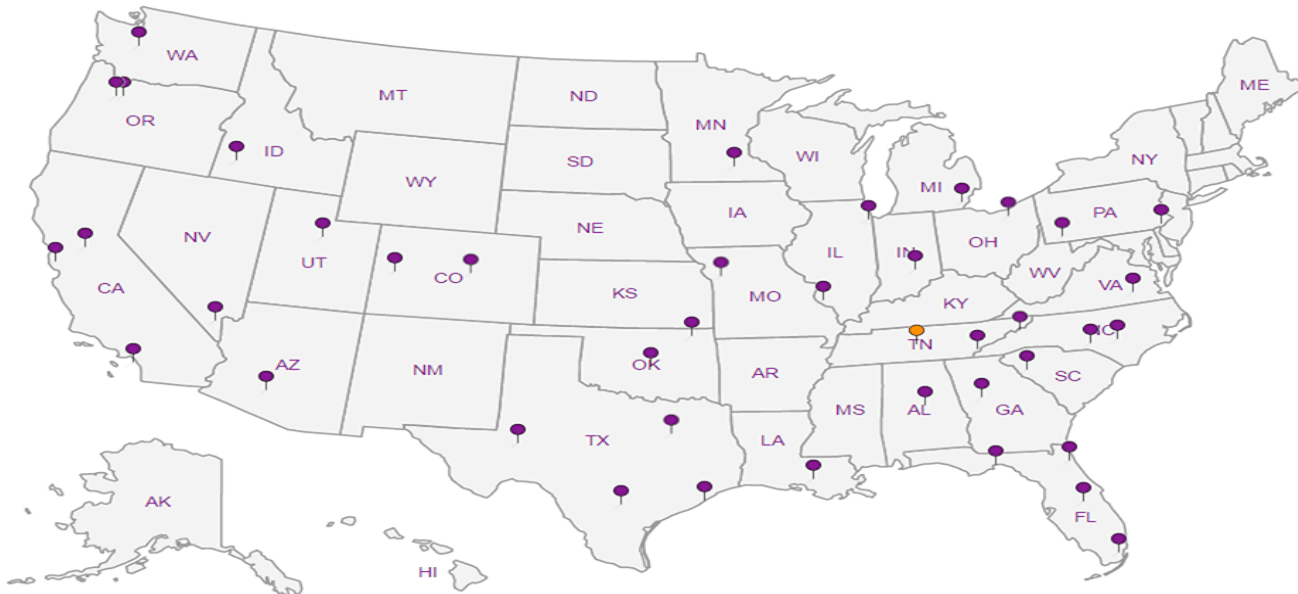
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

City/State  
Collected: **AZ**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**Mark Hammer**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*Mark Hammer*

Rush? (Lab MUST Be Notified)

Same Day Five Day  
Next Day 5 Day (Rad Only)  
 Two Day 10 Day (Rad Only)  
Three Day

Quote #

Date Results Needed

Immediately  
Packed on Ice N  Y

Fres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **414142**  
**A031**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P716981**

TSR: **526 - Chris McCord**

PB:

Shipped Via: **FedEx Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-82608 40mlAmb-HCl	1,4-Dioxane 82608 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)	
SP-201-091919	6	GW		9/19/19	07:55	1						X							-01
SP-301-091919		GW			08:00	1						X							-02
EW-1-091919		GW			08:05	1						X							-03
EW-2-091919		GW			08:10	1						X							-04
IW-1-091919		GW			08:15	2						X							-05
MW-20-091919		GW			08:20	3		X				X							-06
T-801-091919		GW			08:30	2		X											-07
T-802-091919		GW			08:35	2		X											-08
T-803-091919		GW			08:40	2		X											-09
		GW																	

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist

COC Seal Present/Intact:  Y  N  
COC Signed/Accurate:  Y  N  
Bottles arrive intact:  Y  N  
Correct bottles used:  Y  N  
Sufficient volume sent:  Y  N  
If Applicable  
VOA Zero Headspace:  Y  N  
Preservation Correct/Checked:  Y  N

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: 9/19/19	Time: 10:16	Received by: (Signature) <i>amy arvin</i>	Trip Blank Received: Yes/No HCL / MeOH TBR
Relinquished by: (Signature) <i>amy arvin</i>	Date: 9/19/19	Time: 1800	Received by: (Signature) <i>SL</i>	Temp: _____ °C Bottles Received: <b>13</b>
Relinquished by: (Signature) <i>ISA</i>	Date:	Time:	Received for lab by: (Signature)	Date: _____ Time: _____ Hold: _____ Condition: NCF / <input checked="" type="checkbox"/> OK

ESL A7

September 26, 2019

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## UTC - Arcadis

Sample Delivery Group: L1141424  
Samples Received: 09/20/2019  
Project Number: 30002531.0000  
Description: UPCO

Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Jason Romer  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
<b>SP-701-091919 L1141424-01</b>	<b>5</b>	
<b>TRIP BLANK L1141424-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>6</sup>Qc</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>9</b>	
<b>Gl: Glossary of Terms</b>	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>12</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY



## SP-701-091919 L1141424-01 GW

Collected by  
Collected date/time  
Received date/time

09/19/19 07:40  
09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1350446	1	09/23/19 21:48	09/23/19 21:48	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1351212	1	09/25/19 08:21	09/25/19 08:21	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1352335	1	09/26/19 00:56	09/26/19 00:56	ADM	Mt. Juliet, TN

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

## TRIP BLANK L1141424-02 GW

Collected by  
Collected date/time  
Received date/time

09/19/19 00:00  
09/20/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1351212	1	09/25/19 00:27	09/25/19 00:27	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1352335	1	09/25/19 20:41	09/25/19 20:41	ADM	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Perchlorate	mg/l		mg/l		date / time	
	ND		0.00400	1	09/23/2019 21:48	<a href="#">WG1350446</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,1-Dichloroethene	mg/l		mg/l		date / time	
	ND		0.00100	1	09/25/2019 08:21	<a href="#">WG1351212</a>
(S) Toluene-d8	95.4		80.0-120		09/25/2019 08:21	<a href="#">WG1351212</a>
(S) 4-Bromofluorobenzene	95.7		77.0-126		09/25/2019 08:21	<a href="#">WG1351212</a>
(S) 1,2-Dichloroethane-d4	89.3		70.0-130		09/25/2019 08:21	<a href="#">WG1351212</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
1,4-Dioxane	mg/l		mg/l		date / time	
	ND		0.00300	1	09/26/2019 00:56	<a href="#">WG1352335</a>
(S) Toluene-d8	99.5		77.0-127		09/26/2019 00:56	<a href="#">WG1352335</a>

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	09/25/2019 00:27	<a href="#">WG1351212</a>
(S) Toluene-d8	97.6		80.0-120		09/25/2019 00:27	<a href="#">WG1351212</a>
(S) 4-Bromofluorobenzene	92.3		77.0-126		09/25/2019 00:27	<a href="#">WG1351212</a>
(S) 1,2-Dichloroethane-d4	88.7		70.0-130		09/25/2019 00:27	<a href="#">WG1351212</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/25/2019 20:41	<a href="#">WG1352335</a>
(S) Toluene-d8	98.9		77.0-127		09/25/2019 20:41	<a href="#">WG1352335</a>



Method Blank (MB)

(MB) R3454885-1 09/23/19 11:42

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

L1141312-12 Original Sample (OS) • Duplicate (DUP)

(OS) L1141312-12 09/23/19 20:43 • (DUP) R3454885-3 09/23/19 21:16

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Perchlorate	ND	0.000	1	0.000		15

7 Gl

8 Al

Laboratory Control Sample (LCS)

(LCS) R3454885-2 09/23/19 12:47

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.00952	95.2	90.0-110	

9 Sc





Method Blank (MB)

(MB) R3454918-3 09/25/19 00:04

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	97.4			80.0-120
(S) 4-Bromofluorobenzene	95.7			77.0-126
(S) 1,2-Dichloroethane-d4	88.0			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3454918-1 09/24/19 22:40 • (LCSD) R3454918-2 09/24/19 23:02

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0285	0.0299	114	119	71.0-124			4.67	20
(S) Toluene-d8				98.1	95.5	80.0-120				
(S) 4-Bromofluorobenzene				96.5	94.9	77.0-126				
(S) 1,2-Dichloroethane-d4				91.2	92.4	70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3454663-3 09/25/19 20:02

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.5			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3454663-1 09/25/19 19:02 • (LCSD) R3454663-2 09/25/19 19:22

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0393	0.0480	78.6	96.0	55.0-138			19.9	24
(S) Toluene-d8				98.8	99.3	77.0-127				

5 Sr

6 Qc

L1142058-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1142058-02 09/26/19 02:15 • (MS) R3454663-4 09/26/19 02:34 • (MSD) R3454663-5 09/26/19 02:54

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	0.00386	0.0586	0.0606	110	113	1	13.0-160			3.31	31
(S) Toluene-d8					100	99.8		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

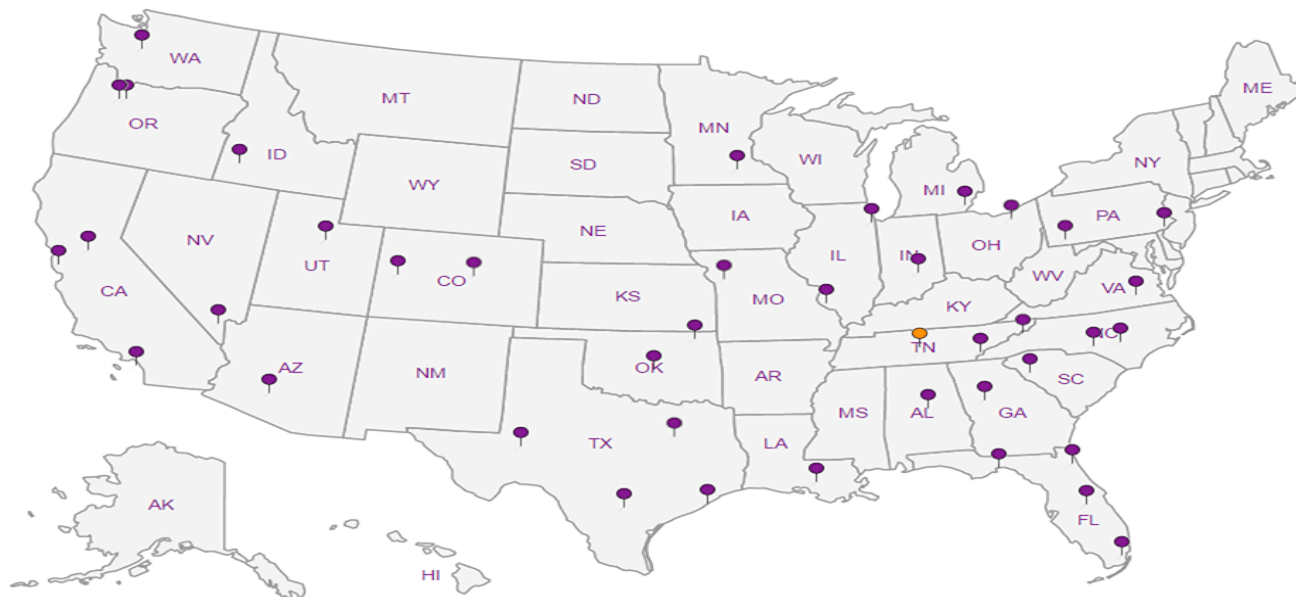
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Project  
Description: **UPCO**

Phone: **480-535-7399**

Fax: **MARK HAMMER**

Collected by (print):  
**Mark Hammer**

Collected by (signature):

Immediately Packed on Ice N  Y

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: **thomas.vespalec@arcadis.com**

City/State  
Collected: **AZ**

Client Project #  
**03994018.0028**

Site/Facility ID #

Rush? (Lab MUST Be Notified)

Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Lab Project #  
**UTCARCA-UPCO11DCE**

P.O. #

Quote #

Date Results Needed

**STAT**

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859

L# **C114/424**  
**A033**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P716981**

TSR: **526 - Chris McCord**

PB:

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
<b>SP-701-091919</b>	<b>G</b>	<b>GW</b>	<b>-</b>	<b>9/19/19</b>	<b>07:40</b>	<b>5</b>		<b>X</b>	<b>X</b>			<b>X</b>						
<b>TRIP BLANK</b>	<b>-</b>	<b>GW</b>	<b>-</b>	<b>9/19/19</b>	<b>-</b>	<b>1</b>		<b>X</b>	<b>X</b>									
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																
		<b>GW</b>																

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist  
COC Seal Present/Intact:  Y  N  
COC Signed/Accurate:  Y  N  
Bottles arrive intact:  Y  N  
Correct bottles used:  Y  N  
Sufficient volume sent:  Y  N  
If Applicable  
VOA Zero Headspace:  Y  N  
Preservation Correct/Checked:  Y  N

Relinquished by: (Signature) <b>Mark Hammer</b>	Date: <b>9/19/19</b>	Time: <b>1016</b>	Received by: (Signature) <b>amy...</b>	Trip Blank Received: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No FCL / MeoH TBR	Temp: _____ Bottles Received: <b>5</b>	If preservation required by Login: Date/Time <b>RAD SCREEN: &lt;0.5 mR/hr</b>
Relinquished by: (Signature) <b>amy...</b>	Date: <b>9/19/19</b>	Time: <b>1800</b>	Received by: (Signature) <b>SUA</b>	Date: _____ Time: _____	Date: _____ Time: _____	
Relinquished by: (Signature) <b>amy...</b>	Date: _____	Time: _____	Received for lab by: (Signature) <b>ISA</b>	Date: _____ Time: _____	Date: _____ Time: _____	

ES1A

09-20 8145

Condition:  
NCF / OK

October 02, 2019

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## UTC - Arcadis

Sample Delivery Group: L1142058  
Samples Received: 09/21/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:












Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





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# SAMPLE SUMMARY



## T-201-SLUDGE L1142058-01 GW

Collected by: Mark Hammer  
 Collected date/time: 09/20/19 09:00  
 Received date/time: 09/21/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1352658	1	09/24/19 15:34	09/24/19 15:34	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1354741	5	10/01/19 15:45	10/01/19 15:45	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1352335	1	09/26/19 01:55	09/26/19 01:55	ADM	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

## T-400-SLUDGE L1142058-02 GW

Collected by: Mark Hammer  
 Collected date/time: 09/20/19 09:15  
 Received date/time: 09/21/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1350446	1	09/24/19 06:59	09/24/19 06:59	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1353821	1	09/28/19 12:24	09/28/19 12:24	JCP	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1352335	1	09/26/19 02:15	09/26/19 02:15	ADM	Mt. Juliet, TN

4  
Cn

5  
Sr

6  
Qc

## T-201-SLUDGE L1142058-03 Waste

Collected by: Mark Hammer  
 Collected date/time: 09/20/19 09:00  
 Received date/time: 09/21/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Preparation by Method 1311	WG1353310	1	09/27/19 11:21	09/27/19 11:21	TM	Mt. Juliet, TN
Mercury by Method 7470A	WG1354377	1	09/29/19 15:38	09/30/19 08:12	TRB	Mt. Juliet, TN
Metals (ICP) by Method 6010C	WG1354232	1	09/29/19 08:52	09/29/19 13:20	JDG	Mt. Juliet, TN

7  
Gl

8  
Al

9  
Sc

## T-400-SLUDGE L1142058-04 Waste

Collected by: Mark Hammer  
 Collected date/time: 09/20/19 09:15  
 Received date/time: 09/21/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Preparation by Method 1311	WG1353310	1	09/27/19 11:21	09/27/19 11:21	TM	Mt. Juliet, TN
Mercury by Method 7470A	WG1354377	1	09/29/19 15:38	09/30/19 08:14	TRB	Mt. Juliet, TN
Metals (ICP) by Method 6010C	WG1354232	1	09/29/19 08:52	09/29/19 13:45	JDG	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

### Sample Delivery Group (SDG) Narrative

---

VOC pH outside of method requirement.

<u>Lab Sample ID</u>	<u>Project Sample ID</u>	<u>Method</u>
<a href="#">L1142058-01</a>	<a href="#">T-201-SLUDGE</a>	8260B



Collected date/time: 09/20/19 09:00

L1142058

Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Perchlorate	ND	M1	0.00400	1	09/24/2019 15:34	<a href="#">WG1352658</a>

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Acetone	0.569		0.250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Acrolein	ND		0.250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Acrylonitrile	ND		0.0500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Benzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Bromobenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Bromodichloromethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Bromoform	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Bromomethane	ND		0.0250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,3-Butadiene	ND		0.0100	5	10/01/2019 15:45	<a href="#">WG1354741</a>
n-Butylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
sec-Butylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
tert-Butylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Carbon tetrachloride	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Carbon disulfide	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Chlorobenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Chlorodibromomethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Chloroethane	ND		0.0250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Chloroform	ND		0.0250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Chloromethane	ND		0.0125	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Cyclohexane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
2-Chlorotoluene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
4-Chlorotoluene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2-Dibromo-3-Chloropropane	ND		0.0250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2-Dibromoethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Dibromomethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2-Dichlorobenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,3-Dichlorobenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,4-Dichlorobenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Dichlorodifluoromethane	ND		0.0250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,1-Dichloroethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2-Dichloroethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,1-Dichloroethene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
cis-1,2-Dichloroethene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
trans-1,2-Dichloroethene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2-Dichloropropane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,1-Dichloropropene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,3-Dichloropropane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
cis-1,3-Dichloropropene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
trans-1,3-Dichloropropene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
2,2-Dichloropropane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Dicyclopentadiene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Di-isopropyl ether	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Ethylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
4-Ethyltoluene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Hexachloro-1,3-butadiene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
n-Hexane	ND		0.0500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Isopropylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
p-Isopropyltoluene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
2-Butanone (MEK)	0.298		0.0500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Methyl Cyclohexane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Collected date/time: 09/20/19 09:00

L1142058

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Methylene Chloride	ND		0.0250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
4-Methyl-2-pentanone (MIBK)	ND		0.0500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Methyl tert-butyl ether	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Naphthalene	ND		0.0250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Propene	ND		0.0125	5	10/01/2019 15:45	<a href="#">WG1354741</a>
n-Propylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Styrene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,1,1,2-Tetrachloroethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,1,2,2-Tetrachloroethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,1,2-Trichlorotrifluoroethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Tetrachloroethene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Toluene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2,3-Trichlorobenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2,4-Trichlorobenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,1,1-Trichloroethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,1,2-Trichloroethane	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Trichloroethene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Trichlorofluoromethane	ND		0.0250	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2,3-Trichloropropane	ND		0.0125	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2,4-Trimethylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,2,3-Trimethylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
1,3,5-Trimethylbenzene	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Vinyl chloride	ND		0.00500	5	10/01/2019 15:45	<a href="#">WG1354741</a>
Xylenes, Total	ND		0.0150	5	10/01/2019 15:45	<a href="#">WG1354741</a>
(S) Toluene-d8	96.2		80.0-120		10/01/2019 15:45	<a href="#">WG1354741</a>
(S) 4-Bromofluorobenzene	88.9		77.0-126		10/01/2019 15:45	<a href="#">WG1354741</a>
(S) 1,2-Dichloroethane-d4	117		70.0-130		10/01/2019 15:45	<a href="#">WG1354741</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/26/2019 01:55	<a href="#">WG1352335</a>
(S) Toluene-d8	98.2		77.0-127		09/26/2019 01:55	<a href="#">WG1352335</a>



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Perchlorate	ND		0.00400	1	09/24/2019 06:59	<a href="#">WG1350446</a>

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Acetone	ND		0.0500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Acrolein	ND		0.0500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Acrylonitrile	ND		0.0100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Benzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Bromobenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Bromodichloromethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Bromoform	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Bromomethane	ND		0.00500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,3-Butadiene	ND		0.00200	1	09/28/2019 12:24	<a href="#">WG1353821</a>
n-Butylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
sec-Butylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
tert-Butylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Carbon tetrachloride	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Carbon disulfide	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Chlorobenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Chlorodibromomethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Chloroethane	ND		0.00500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Chloroform	ND		0.00500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Chloromethane	ND		0.00250	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Cyclohexane	ND	L1	0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
2-Chlorotoluene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
4-Chlorotoluene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2-Dibromo-3-Chloropropane	ND		0.00500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2-Dibromoethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Dibromomethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2-Dichlorobenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,3-Dichlorobenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,4-Dichlorobenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Dichlorodifluoromethane	ND		0.00500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,1-Dichloroethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2-Dichloroethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,1-Dichloroethene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
cis-1,2-Dichloroethene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
trans-1,2-Dichloroethene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2-Dichloropropane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,1-Dichloropropene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,3-Dichloropropane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
cis-1,3-Dichloropropene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
trans-1,3-Dichloropropene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
2,2-Dichloropropane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Dicyclopentadiene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Di-isopropyl ether	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Ethylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
4-Ethyltoluene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Hexachloro-1,3-butadiene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
n-Hexane	ND		0.0100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Isopropylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
p-Isopropyltoluene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
2-Butanone (MEK)	0.0292		0.0100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Methyl Cyclohexane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 09/20/19 09:15

L1142058

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Methylene Chloride	ND		0.00500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
4-Methyl-2-pentanone (MIBK)	ND		0.0100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Methyl tert-butyl ether	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Naphthalene	ND		0.00500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Propene	ND		0.00250	1	09/28/2019 12:24	<a href="#">WG1353821</a>
n-Propylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Styrene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,1,1,2-Tetrachloroethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,1,2,2-Tetrachloroethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,1,2-Trichlorotrifluoroethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Tetrachloroethene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Toluene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2,3-Trichlorobenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2,4-Trichlorobenzene	ND	<u>L1</u>	0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,1,1-Trichloroethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,1,2-Trichloroethane	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Trichloroethene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Trichlorofluoromethane	ND		0.00500	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2,3-Trichloropropane	ND		0.00250	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2,4-Trimethylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,2,3-Trimethylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
1,3,5-Trimethylbenzene	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Vinyl chloride	ND		0.00100	1	09/28/2019 12:24	<a href="#">WG1353821</a>
Xylenes, Total	ND		0.00300	1	09/28/2019 12:24	<a href="#">WG1353821</a>
(S) Toluene-d8	105		80.0-120		09/28/2019 12:24	<a href="#">WG1353821</a>
(S) 4-Bromofluorobenzene	104		77.0-126		09/28/2019 12:24	<a href="#">WG1353821</a>
(S) 1,2-Dichloroethane-d4	88.4		70.0-130		09/28/2019 12:24	<a href="#">WG1353821</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
1,4-Dioxane	0.00386		0.00300	1	09/26/2019 02:15	<a href="#">WG1352335</a>
(S) Toluene-d8	101		77.0-127		09/26/2019 02:15	<a href="#">WG1352335</a>



Preparation by Method 1311

Analyte	Result	Qualifier	Prep date / time	Batch
TCLP Extraction	-		9/27/2019 11:21:13 AM	WG1353310
Fluid	1		9/27/2019 11:21:13 AM	WG1353310
Initial pH	6.43		9/27/2019 11:21:13 AM	WG1353310
Final pH	4.92		9/27/2019 11:21:13 AM	WG1353310

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Limit	Dilution	Analysis date / time	Batch
Mercury	ND		0.0100	0.20	1	09/30/2019 08:12	<a href="#">WG1354377</a>

<sup>5</sup> Sr

<sup>6</sup> Qc

Metals (ICP) by Method 6010C

Analyte	Result	Qualifier	RDL	Limit	Dilution	Analysis date / time	Batch
Arsenic	ND		0.100	5	1	09/29/2019 13:20	<a href="#">WG1354232</a>
Barium	ND		0.100	100	1	09/29/2019 13:20	<a href="#">WG1354232</a>
Cadmium	ND		0.100	1	1	09/29/2019 13:20	<a href="#">WG1354232</a>
Chromium	ND		0.100	5	1	09/29/2019 13:20	<a href="#">WG1354232</a>
Lead	ND		0.100	5	1	09/29/2019 13:20	<a href="#">WG1354232</a>
Selenium	ND		0.100	1	1	09/29/2019 13:20	<a href="#">WG1354232</a>
Silver	ND		0.100	5	1	09/29/2019 13:20	<a href="#">WG1354232</a>

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Preparation by Method 1311

Analyte	Result	Qualifier	Prep date / time	Batch
TCLP Extraction	-		9/27/2019 11:21:13 AM	WG1353310
Fluid	1		9/27/2019 11:21:13 AM	WG1353310
Initial pH	6.9		9/27/2019 11:21:13 AM	WG1353310
Final pH	4.91		9/27/2019 11:21:13 AM	WG1353310

1 Cp

2 Tc

3 Ss

Mercury by Method 7470A

Analyte	Result mg/l	Qualifier	RDL mg/l	Limit mg/l	Dilution	Analysis date / time	Batch
Mercury	ND		0.0100	0.20	1	09/30/2019 08:14	<a href="#">WG1354377</a>

4 Cn

5 Sr

Metals (ICP) by Method 6010C

Analyte	Result mg/l	Qualifier	RDL mg/l	Limit mg/l	Dilution	Analysis date / time	Batch
Arsenic	ND		0.100	5	1	09/29/2019 13:45	<a href="#">WG1354232</a>
Barium	ND		0.100	100	1	09/29/2019 13:45	<a href="#">WG1354232</a>
Cadmium	ND		0.100	1	1	09/29/2019 13:45	<a href="#">WG1354232</a>
Chromium	0.115	<u>B1</u>	0.100	5	1	09/29/2019 13:45	<a href="#">WG1354232</a>
Lead	ND		0.100	5	1	09/29/2019 13:45	<a href="#">WG1354232</a>
Selenium	ND		0.100	1	1	09/29/2019 13:45	<a href="#">WG1354232</a>
Silver	ND		0.100	5	1	09/29/2019 13:45	<a href="#">WG1354232</a>

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3454885-1 09/23/19 11:42

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1141312-12 Original Sample (OS) • Duplicate (DUP)

(OS) L1141312-12 09/23/19 20:43 • (DUP) R3454885-3 09/23/19 21:16

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

L1142058-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1142058-02 09/24/19 06:59 • (DUP) R3454885-4 09/24/19 08:06

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3454885-2 09/23/19 12:47

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00952	95.2	90.0-110	





Method Blank (MB)

(MB) R3454886-2 09/23/19 18:31

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

Laboratory Control Sample (LCS)

(LCS) R3454886-1 09/23/19 12:47

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00952	95.2	90.0-110	

L1141533-03 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141533-03 09/23/19 23:25 • (MS) R3454886-3 09/23/19 23:58

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.00330	0.0156	123	1	80.0-120	M1

Sample Narrative:

OS: Conductivity>MCT

L1141533-04 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141533-04 09/24/19 00:30 • (MS) R3454886-4 09/24/19 01:03

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.00647	0.0158	93.7	1	80.0-120	

Sample Narrative:

OS: Conductivity>MCT

L1141533-05 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141533-05 09/24/19 01:35 • (MS) R3454886-5 09/24/19 02:07

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Perchlorate	0.0100	0.00622	0.0160	98.2	1	80.0-120	

Sample Narrative:

OS: Conductivity>MCT



L1141533-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1141533-06 09/24/19 02:40 • (MS) R3454886-6 09/24/19 03:12 • (MSD) R3454886-7 09/24/19 03:45

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits
Perchlorate	0.0100	0.00764	0.0180	0.0161	103	85.0	1	80.0-120			10.7	15

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1141533-07 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141533-07 09/24/19 04:17 • (MS) R3454886-8 09/24/19 05:54

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	0.0200	0.0300	99.5	1	80.0-120	

L1141533-13 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141533-13 09/24/19 08:58 • (MS) R3454886-9 09/24/19 16:06

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	0.0160	0.0257	97.0	1	80.0-120	

Sample Narrative:

OS: Conductivity>MCT

L1141999-11 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141999-11 09/24/19 09:33 • (MS) R3454886-10 09/24/19 16:38

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	U	0.00967	96.7	1	80.0-120	

L1141999-12 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141999-12 09/24/19 10:06 • (MS) R3454886-11 09/24/19 17:11

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	0.00140	0.0128	114	1	80.0-120	



L1141999-13 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141999-13 09/24/19 10:38 • (MS) R3454886-12 09/24/19 17:43

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	0.0182	0.0262	79.8	1	80.0-120	M2

Sample Narrative:

OS: Conductivity>MCT

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1141999-14 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141999-14 09/24/19 11:10 • (MS) R3454886-13 09/24/19 18:16

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	U	0.00987	98.7	1	80.0-120	

Sample Narrative:

OS: Conductivity>MCT

L1141999-15 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141999-15 09/24/19 11:43 • (MS) R3454886-14 09/24/19 18:48

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	0.00348	0.0147	112	1	80.0-120	

L1141999-16 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141999-16 09/24/19 14:27 • (MS) R3454886-15 09/24/19 19:21

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	0.00502	0.0160	110	1	80.0-120	

L1141999-17 Original Sample (OS) • Matrix Spike (MS)

(OS) L1141999-17 09/24/19 15:01 • (MS) R3454886-16 09/24/19 20:58

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	U	0.0102	102	1	80.0-120	



[L1142058-01](#)

L1142058-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1142058-01 09/24/19 15:34 • (MS) R3454886-17 09/24/19 21:30

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>
Perchlorate	0.0100	ND	0.0132	132	1	80.0-120	M1

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3455891-1 09/30/19 07:57

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Mercury	U		0.00330	0.0100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3455891-2 09/30/19 07:59 • (LCSD) R3455891-3 09/30/19 08:01

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Mercury	0.0300	0.0294	0.0277	98.0	92.2	80.0-120			6.04	20

L1142682-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1142682-01 09/30/19 08:03 • (MS) R3455891-4 09/30/19 08:08 • (MSD) R3455891-5 09/30/19 08:10

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Mercury	0.0300	ND	0.0311	0.0310	104	103	1	75.0-125			0.151	20



Method Blank (MB)

(MB) R3455769-1 09/29/19 13:11

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Arsenic	0.0515	E4	0.0330	0.100
Barium	U		0.0330	0.100
Cadmium	U		0.0330	0.100
Chromium	0.0370	E4	0.0330	0.100
Lead	U		0.0330	0.100
Selenium	U		0.0330	0.100
Silver	U		0.0330	0.100



Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3455769-2 09/29/19 13:14 • (LCSD) R3455769-3 09/29/19 13:17

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Arsenic	10.0	10.0	10.1	100	101	80.0-120			1.13	20
Barium	10.0	10.2	10.3	102	103	80.0-120			1.23	20
Cadmium	10.0	9.99	10.1	99.9	101	80.0-120			1.09	20
Chromium	10.0	9.79	9.96	97.9	99.6	80.0-120			1.73	20
Lead	10.0	9.94	10.1	99.4	101	80.0-120			1.41	20
Selenium	10.0	10.3	10.4	103	104	80.0-120			0.367	20
Silver	2.00	1.91	1.94	95.5	97.2	80.0-120			1.72	20



L1142058-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1142058-03 09/29/19 13:20 • (MS) R3455769-5 09/29/19 13:25 • (MSD) R3455769-6 09/29/19 13:28

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Arsenic	10.0	ND	10.0	10.2	99.9	101	1	75.0-125			1.32	20
Barium	10.0	ND	10.3	10.4	102	103	1	75.0-125			0.736	20
Cadmium	10.0	ND	9.99	10.1	99.9	101	1	75.0-125			0.762	20
Chromium	10.0	ND	9.80	9.92	97.4	98.6	1	75.0-125			1.20	20
Lead	10.0	ND	10.0	10.1	100	101	1	75.0-125			0.732	20
Selenium	10.0	ND	10.2	10.3	102	103	1	75.0-125			0.895	20
Silver	2.00	ND	1.91	1.93	95.3	96.6	1	75.0-125			1.42	20



L1142682-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1142682-01 09/29/19 13:31 • (MS) R3455769-7 09/29/19 13:33 • (MSD) R3455769-8 09/29/19 13:36

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Arsenic	10.0	ND	10.0	9.95	99.7	99.1	1	75.0-125			0.608	20
Barium	10.0	ND	10.5	10.5	104	104	1	75.0-125			0.0380	20
Cadmium	10.0	ND	10.1	10.1	101	101	1	75.0-125			0.0887	20
Chromium	10.0	ND	9.86	9.88	98.0	98.2	1	75.0-125			0.138	20
Lead	10.0	ND	9.90	9.95	99.0	99.5	1	75.0-125			0.431	20
Selenium	10.0	ND	10.3	10.3	103	103	1	75.0-125			0.112	20
Silver	2.00	ND	1.94	1.94	97.2	96.8	1	75.0-125			0.320	20

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3455987-3 09/28/19 04:16

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Acetone	U		0.0100	0.0500
Acrolein	U		0.00887	0.0500
Acrylonitrile	U		0.00187	0.0100
Benzene	U		0.000331	0.00100
Bromobenzene	U		0.000352	0.00100
Bromodichloromethane	U		0.000380	0.00100
Bromoform	U		0.000469	0.00100
Bromomethane	U		0.000866	0.00500
1,3-Butadiene	U		0.000330	0.00200
n-Butylbenzene	U		0.000361	0.00100
sec-Butylbenzene	U		0.000365	0.00100
tert-Butylbenzene	U		0.000399	0.00100
Carbon disulfide	U		0.000275	0.00100
Carbon tetrachloride	U		0.000379	0.00100
Chlorobenzene	U		0.000348	0.00100
Chlorodibromomethane	U		0.000327	0.00100
Chloroethane	U		0.000453	0.00500
Chloroform	U		0.000324	0.00500
Chloromethane	U		0.000276	0.00250
Cyclohexane	U		0.000390	0.00100
2-Chlorotoluene	U		0.000375	0.00100
4-Chlorotoluene	U		0.000351	0.00100
1,2-Dibromo-3-Chloropropane	U		0.00133	0.00500
1,2-Dibromoethane	U		0.000381	0.00100
Dibromomethane	U		0.000346	0.00100
1,2-Dichlorobenzene	U		0.000349	0.00100
1,3-Dichlorobenzene	U		0.000220	0.00100
1,4-Dichlorobenzene	U		0.000274	0.00100
Dichlorodifluoromethane	U		0.000551	0.00500
1,1-Dichloroethane	U		0.000259	0.00100
1,2-Dichloroethane	U		0.000361	0.00100
1,1-Dichloroethene	U		0.000398	0.00100
cis-1,2-Dichloroethene	U		0.000260	0.00100
trans-1,2-Dichloroethene	U		0.000396	0.00100
1,2-Dichloropropane	U		0.000306	0.00100
1,1-Dichloropropene	U		0.000352	0.00100
1,3-Dichloropropane	U		0.000366	0.00100
cis-1,3-Dichloropropene	U		0.000418	0.00100
trans-1,3-Dichloropropene	U		0.000419	0.00100
2,2-Dichloropropane	U		0.000321	0.00100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Method Blank (MB)

(MB) R3455987-3 09/28/19 04:16

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Dicyclopentadiene	U		0.000219	0.00100
Di-isopropyl ether	U		0.000320	0.00100
Ethylbenzene	U		0.000384	0.00100
4-Ethyltoluene	U		0.000172	0.00100
Hexachloro-1,3-butadiene	0.000665	E4	0.000256	0.00100
n-Hexane	U		0.000736	0.0100
Isopropylbenzene	U		0.000326	0.00100
p-Isopropyltoluene	U		0.000350	0.00100
2-Butanone (MEK)	U		0.00393	0.0100
Methyl Cyclohexane	U		0.000380	0.00100
Methylene Chloride	U		0.00100	0.00500
4-Methyl-2-pentanone (MIBK)	U		0.00214	0.0100
Methyl tert-butyl ether	U		0.000367	0.00100
Naphthalene	U		0.00100	0.00500
Propene	U		0.000975	0.00250
n-Propylbenzene	U		0.000349	0.00100
Styrene	U		0.000307	0.00100
1,1,1,2-Tetrachloroethane	U		0.000385	0.00100
1,1,2,2-Tetrachloroethane	U		0.000130	0.00100
Tetrachloroethene	U		0.000372	0.00100
Toluene	U		0.000412	0.00100
1,1,2-Trichlorotrifluoroethane	U		0.000303	0.00100
1,2,3-Trichlorobenzene	U		0.000230	0.00100
1,2,4-Trichlorobenzene	U		0.000355	0.00100
1,1,1-Trichloroethane	U		0.000319	0.00100
1,1,2-Trichloroethane	U		0.000383	0.00100
Trichloroethene	U		0.000398	0.00100
Trichlorofluoromethane	U		0.00120	0.00500
1,2,3-Trichloropropane	U		0.000807	0.00250
1,2,3-Trimethylbenzene	U		0.000321	0.00100
1,2,4-Trimethylbenzene	U		0.000373	0.00100
1,3,5-Trimethylbenzene	U		0.000387	0.00100
Vinyl chloride	U		0.000259	0.00100
Xylenes, Total	U		0.00106	0.00300
(S) Toluene-d8	104			80.0-120
(S) 4-Bromofluorobenzene	105			77.0-126
(S) 1,2-Dichloroethane-d4	87.8			70.0-130

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3455987-1 09/28/19 03:14 • (LCSD) R3455987-2 09/28/19 03:34

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	0.125	0.152	0.149	122	119	19.0-160			2.33	27
Acrolein	0.125	0.140	0.145	112	116	10.0-160			3.18	26
Acrylonitrile	0.125	0.137	0.133	110	106	55.0-149			3.03	20
Benzene	0.0250	0.0270	0.0259	108	103	70.0-123			4.16	20
Bromobenzene	0.0250	0.0251	0.0239	101	95.8	73.0-121			4.88	20
Bromodichloromethane	0.0250	0.0256	0.0243	102	97.2	75.0-120			5.27	20
Bromoform	0.0250	0.0267	0.0269	107	107	68.0-132			0.487	20
Bromomethane	0.0250	0.0223	0.0217	89.1	86.6	10.0-160			2.83	25
1,3-Butadiene	0.0250	0.0305	0.0293	122	117	45.0-147			4.00	20
n-Butylbenzene	0.0250	0.0287	0.0276	115	110	73.0-125			3.76	20
sec-Butylbenzene	0.0250	0.0280	0.0266	112	106	75.0-125			5.01	20
tert-Butylbenzene	0.0250	0.0270	0.0258	108	103	76.0-124			4.55	20
Carbon disulfide	0.0250	0.0263	0.0254	105	101	61.0-128			3.64	20
Carbon tetrachloride	0.0250	0.0291	0.0276	117	111	68.0-126			5.29	20
Chlorobenzene	0.0250	0.0275	0.0266	110	106	80.0-121			3.38	20
Chlorodibromomethane	0.0250	0.0270	0.0268	108	107	77.0-125			0.836	20
Chloroethane	0.0250	0.0228	0.0213	91.2	85.3	47.0-150			6.65	20
Chloroform	0.0250	0.0250	0.0240	99.9	96.1	73.0-120			3.87	20
Chloromethane	0.0250	0.0187	0.0175	74.7	70.0	41.0-142			6.55	20
Cyclohexane	0.0250	0.0360	0.0346	144	138	71.0-124	<u>L1</u>	<u>L1</u>	4.04	20
2-Chlorotoluene	0.0250	0.0259	0.0247	104	98.6	76.0-123			5.10	20
4-Chlorotoluene	0.0250	0.0262	0.0249	105	99.8	75.0-122			4.78	20
1,2-Dibromo-3-Chloropropane	0.0250	0.0271	0.0264	108	106	58.0-134			2.39	20
1,2-Dibromoethane	0.0250	0.0258	0.0252	103	101	80.0-122			2.27	20
Dibromomethane	0.0250	0.0268	0.0258	107	103	80.0-120			3.73	20
1,2-Dichlorobenzene	0.0250	0.0285	0.0275	114	110	79.0-121			3.55	20
1,3-Dichlorobenzene	0.0250	0.0274	0.0264	109	106	79.0-120			3.55	20
1,4-Dichlorobenzene	0.0250	0.0270	0.0261	108	105	79.0-120			3.31	20
Dichlorodifluoromethane	0.0250	0.0186	0.0182	74.2	72.6	51.0-149			2.15	20
1,1-Dichloroethane	0.0250	0.0273	0.0265	109	106	70.0-126			2.72	20
1,2-Dichloroethane	0.0250	0.0253	0.0245	101	98.2	70.0-128			3.09	20
1,1-Dichloroethene	0.0250	0.0290	0.0276	116	110	71.0-124			5.09	20
cis-1,2-Dichloroethene	0.0250	0.0279	0.0271	112	108	73.0-120			2.97	20
trans-1,2-Dichloroethene	0.0250	0.0281	0.0273	113	109	73.0-120			2.99	20
1,2-Dichloropropane	0.0250	0.0290	0.0277	116	111	77.0-125			4.44	20
1,1-Dichloropropene	0.0250	0.0281	0.0273	112	109	74.0-126			2.71	20
1,3-Dichloropropane	0.0250	0.0260	0.0256	104	103	80.0-120			1.49	20
cis-1,3-Dichloropropene	0.0250	0.0265	0.0251	106	100	80.0-123			5.63	20
trans-1,3-Dichloropropene	0.0250	0.0250	0.0244	100	97.6	78.0-124			2.60	20
2,2-Dichloropropane	0.0250	0.0252	0.0238	101	95.0	58.0-130			6.05	20

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3455987-1 09/28/19 03:14 • (LCSD) R3455987-2 09/28/19 03:34

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	<u>LCS Qualifier</u>	<u>LCSD Qualifier</u>	RPD %	RPD Limits %
Dicyclopentadiene	0.0250	0.0263	0.0250	105	100	74.0-126			4.78	20
Di-isopropyl ether	0.0250	0.0277	0.0264	111	105	58.0-138			5.02	20
Ethylbenzene	0.0250	0.0281	0.0271	112	109	79.0-123			3.56	20
4-Ethyltoluene	0.0250	0.0272	0.0257	109	103	74.0-127			5.60	20
Hexachloro-1,3-butadiene	0.0250	0.0321	0.0333	128	133	54.0-138			3.86	20
n-Hexane	0.0250	0.0299	0.0287	120	115	57.0-133			4.05	20
Isopropylbenzene	0.0250	0.0280	0.0275	112	110	76.0-127			1.93	20
p-Isopropyltoluene	0.0250	0.0280	0.0268	112	107	76.0-125			4.49	20
2-Butanone (MEK)	0.125	0.133	0.126	106	101	44.0-160			5.31	20
Methyl Cyclohexane	0.0250	0.0308	0.0291	123	116	68.0-126			5.60	20
Methylene Chloride	0.0250	0.0275	0.0268	110	107	67.0-120			2.78	20
4-Methyl-2-pentanone (MIBK)	0.125	0.121	0.118	96.8	94.8	68.0-142			2.08	20
Methyl tert-butyl ether	0.0250	0.0238	0.0229	95.1	91.4	68.0-125			3.97	20
Naphthalene	0.0250	0.0304	0.0298	122	119	54.0-135			2.13	20
Propene	0.0250	0.0218	0.0211	87.2	84.5	10.0-160			3.06	20
n-Propylbenzene	0.0250	0.0269	0.0256	108	102	77.0-124			5.16	20
Styrene	0.0250	0.0281	0.0275	112	110	73.0-130			2.01	20
1,1,1,2-Tetrachloroethane	0.0250	0.0274	0.0266	110	107	75.0-125			2.88	20
1,1,2,2-Tetrachloroethane	0.0250	0.0258	0.0247	103	98.8	65.0-130			4.22	20
Tetrachloroethene	0.0250	0.0269	0.0266	107	106	72.0-132			1.09	20
Toluene	0.0250	0.0267	0.0264	107	105	79.0-120			1.28	20
1,1,2-Trichlorotrifluoroethane	0.0250	0.0303	0.0297	121	119	69.0-132			2.07	20
1,2,3-Trichlorobenzene	0.0250	0.0329	0.0335	132	134	50.0-138			1.75	20
1,2,4-Trichlorobenzene	0.0250	0.0344	0.0341	138	137	57.0-137	<u>L1</u>		0.742	20
1,1,1-Trichloroethane	0.0250	0.0276	0.0260	110	104	73.0-124			6.07	20
1,1,2-Trichloroethane	0.0250	0.0269	0.0264	108	105	80.0-120			2.09	20
Trichloroethene	0.0250	0.0286	0.0275	115	110	78.0-124			3.99	20
Trichlorofluoromethane	0.0250	0.0268	0.0260	107	104	59.0-147			3.13	20
1,2,3-Trichloropropane	0.0250	0.0259	0.0245	104	98.0	73.0-130			5.65	20
1,2,3-Trimethylbenzene	0.0250	0.0264	0.0251	106	100	77.0-120			5.19	20
1,2,4-Trimethylbenzene	0.0250	0.0269	0.0259	108	103	76.0-121			4.00	20
1,3,5-Trimethylbenzene	0.0250	0.0270	0.0255	108	102	76.0-122			5.64	20
Vinyl chloride	0.0250	0.0244	0.0239	97.7	95.8	67.0-131			2.02	20
Xylenes, Total	0.0750	0.0850	0.0834	113	111	79.0-123			1.90	20
(S) Toluene-d8				101	101	80.0-120				
(S) 4-Bromofluorobenzene				99.3	102	77.0-126				
(S) 1,2-Dichloroethane-d4				95.3	95.3	70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3456573-4 10/01/19 14:18

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Acetone	U		0.0100	0.0500
Acrolein	U		0.00887	0.0500
Acrylonitrile	U		0.00187	0.0100
Benzene	U		0.000331	0.00100
Bromobenzene	U		0.000352	0.00100
Bromodichloromethane	U		0.000380	0.00100
Bromoform	U		0.000469	0.00100
Bromomethane	U		0.000866	0.00500
1,3-Butadiene	U		0.000330	0.00200
n-Butylbenzene	U		0.000361	0.00100
sec-Butylbenzene	U		0.000365	0.00100
tert-Butylbenzene	U		0.000399	0.00100
Carbon disulfide	U		0.000275	0.00100
Carbon tetrachloride	U		0.000379	0.00100
Chlorobenzene	U		0.000348	0.00100
Chlorodibromomethane	U		0.000327	0.00100
Chloroethane	U		0.000453	0.00500
Chloroform	U		0.000324	0.00500
Chloromethane	U		0.000276	0.00250
Cyclohexane	U		0.000390	0.00100
2-Chlorotoluene	U		0.000375	0.00100
4-Chlorotoluene	U		0.000351	0.00100
1,2-Dibromo-3-Chloropropane	U		0.00133	0.00500
1,2-Dibromoethane	U		0.000381	0.00100
Dibromomethane	U		0.000346	0.00100
1,2-Dichlorobenzene	U		0.000349	0.00100
1,3-Dichlorobenzene	U		0.000220	0.00100
1,4-Dichlorobenzene	U		0.000274	0.00100
Dichlorodifluoromethane	U		0.000551	0.00500
1,1-Dichloroethane	U		0.000259	0.00100
1,2-Dichloroethane	U		0.000361	0.00100
1,1-Dichloroethene	U		0.000398	0.00100
cis-1,2-Dichloroethene	U		0.000260	0.00100
trans-1,2-Dichloroethene	U		0.000396	0.00100
1,2-Dichloropropane	U		0.000306	0.00100
1,1-Dichloropropene	U		0.000352	0.00100
1,3-Dichloropropane	U		0.000366	0.00100
cis-1,3-Dichloropropene	U		0.000418	0.00100
trans-1,3-Dichloropropene	U		0.000419	0.00100
2,2-Dichloropropane	U		0.000321	0.00100

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3456573-4 10/01/19 14:18

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Dicyclopentadiene	U		0.000219	0.00100
Di-isopropyl ether	U		0.000320	0.00100
Ethylbenzene	U		0.000384	0.00100
4-Ethyltoluene	U		0.000172	0.00100
Hexachloro-1,3-butadiene	U		0.000256	0.00100
n-Hexane	U		0.000736	0.0100
Isopropylbenzene	U		0.000326	0.00100
p-Isopropyltoluene	U		0.000350	0.00100
2-Butanone (MEK)	U		0.00393	0.0100
Methyl Cyclohexane	U		0.000380	0.00100
Methylene Chloride	U		0.00100	0.00500
4-Methyl-2-pentanone (MIBK)	U		0.00214	0.0100
Methyl tert-butyl ether	U		0.000367	0.00100
Naphthalene	U		0.00100	0.00500
Propene	U		0.000975	0.00250
n-Propylbenzene	U		0.000349	0.00100
Styrene	U		0.000307	0.00100
1,1,1,2-Tetrachloroethane	U		0.000385	0.00100
1,1,2,2-Tetrachloroethane	U		0.000130	0.00100
Tetrachloroethene	U		0.000372	0.00100
Toluene	U		0.000412	0.00100
1,1,2-Trichlorotrifluoroethane	U		0.000303	0.00100
1,2,3-Trichlorobenzene	U		0.000230	0.00100
1,2,4-Trichlorobenzene	U		0.000355	0.00100
1,1,1-Trichloroethane	U		0.000319	0.00100
1,1,2-Trichloroethane	U		0.000383	0.00100
Trichloroethene	U		0.000398	0.00100
Trichlorofluoromethane	U		0.00120	0.00500
1,2,3-Trichloropropane	U		0.000807	0.00250
1,2,3-Trimethylbenzene	U		0.000321	0.00100
1,2,4-Trimethylbenzene	U		0.000373	0.00100
1,3,5-Trimethylbenzene	U		0.000387	0.00100
Vinyl chloride	U		0.000259	0.00100
Xylenes, Total	U		0.00106	0.00300
(S) Toluene-d8	97.3			80.0-120
(S) 4-Bromofluorobenzene	89.5			77.0-126
(S) 1,2-Dichloroethane-d4	117			70.0-130

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3456573-1 10/01/19 12:04 • (LCSD) R3456573-2 10/01/19 12:26

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	0.125	0.136	0.138	109	110	19.0-160			0.850	27
Acrolein	0.125	0.183	0.185	147	148	10.0-160			0.731	26
Acrylonitrile	0.125	0.143	0.148	114	118	55.0-149			3.26	20
Benzene	0.0250	0.0251	0.0248	100	99.2	70.0-123			1.14	20
Bromobenzene	0.0250	0.0252	0.0250	101	100	73.0-121			0.517	20
Bromodichloromethane	0.0250	0.0278	0.0278	111	111	75.0-120			0.119	20
Bromoform	0.0250	0.0245	0.0246	98.1	98.5	68.0-132			0.490	20
Bromomethane	0.0250	0.0259	0.0282	104	113	10.0-160			8.46	25
1,3-Butadiene	0.0250	0.0301	0.0313	120	125	45.0-147			3.87	20
n-Butylbenzene	0.0250	0.0237	0.0243	94.8	97.3	73.0-125			2.60	20
sec-Butylbenzene	0.0250	0.0233	0.0242	93.3	96.7	75.0-125			3.59	20
tert-Butylbenzene	0.0250	0.0237	0.0242	95.0	96.6	76.0-124			1.71	20
Carbon disulfide	0.0250	0.0281	0.0260	112	104	61.0-128			7.77	20
Carbon tetrachloride	0.0250	0.0250	0.0245	99.9	97.8	68.0-126			2.05	20
Chlorobenzene	0.0250	0.0240	0.0251	95.8	100	80.0-121			4.70	20
Chlorodibromomethane	0.0250	0.0242	0.0252	96.9	101	77.0-125			3.78	20
Chloroethane	0.0250	0.0267	0.0280	107	112	47.0-150			4.65	20
Chloroform	0.0250	0.0267	0.0265	107	106	73.0-120			0.970	20
Chloromethane	0.0250	0.0277	0.0276	111	110	41.0-142			0.305	20
Cyclohexane	0.0250	0.0259	0.0266	103	106	71.0-124			2.77	20
2-Chlorotoluene	0.0250	0.0243	0.0261	97.3	105	76.0-123			7.25	20
4-Chlorotoluene	0.0250	0.0256	0.0255	102	102	75.0-122			0.509	20
1,2-Dibromo-3-Chloropropane	0.0250	0.0210	0.0212	84.2	84.8	58.0-134			0.720	20
1,2-Dibromoethane	0.0250	0.0255	0.0269	102	108	80.0-122			5.62	20
Dibromomethane	0.0250	0.0272	0.0271	109	108	80.0-120			0.417	20
1,2-Dichlorobenzene	0.0250	0.0246	0.0248	98.3	99.1	79.0-121			0.810	20
1,3-Dichlorobenzene	0.0250	0.0244	0.0243	97.8	97.2	79.0-120			0.649	20
1,4-Dichlorobenzene	0.0250	0.0254	0.0251	102	101	79.0-120			0.971	20
Dichlorodifluoromethane	0.0250	0.0314	0.0323	126	129	51.0-149			2.66	20
1,1-Dichloroethane	0.0250	0.0277	0.0274	111	109	70.0-126			1.18	20
1,2-Dichloroethane	0.0250	0.0297	0.0286	119	114	70.0-128			3.84	20
1,1-Dichloroethene	0.0250	0.0265	0.0264	106	106	71.0-124			0.391	20
cis-1,2-Dichloroethene	0.0250	0.0250	0.0244	99.8	97.6	73.0-120			2.20	20
trans-1,2-Dichloroethene	0.0250	0.0261	0.0252	104	101	73.0-120			3.25	20
1,2-Dichloropropane	0.0250	0.0271	0.0264	108	106	77.0-125			2.55	20
1,1-Dichloropropene	0.0250	0.0273	0.0265	109	106	74.0-126			2.94	20
1,3-Dichloropropane	0.0250	0.0273	0.0276	109	110	80.0-120			1.14	20
cis-1,3-Dichloropropene	0.0250	0.0269	0.0263	108	105	80.0-123			2.04	20
trans-1,3-Dichloropropene	0.0250	0.0274	0.0275	110	110	78.0-124			0.327	20
2,2-Dichloropropane	0.0250	0.0298	0.0288	119	115	58.0-130			3.44	20

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3456573-1 10/01/19 12:04 • (LCSD) R3456573-2 10/01/19 12:26

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Dicyclopentadiene	0.0250	0.0243	0.0246	97.3	98.6	74.0-126			1.35	20
Di-isopropyl ether	0.0250	0.0289	0.0283	116	113	58.0-138			2.08	20
Ethylbenzene	0.0250	0.0239	0.0244	95.5	97.7	79.0-123			2.18	20
4-Ethyltoluene	0.0250	0.0242	0.0242	96.6	96.8	74.0-127			0.120	20
Hexachloro-1,3-butadiene	0.0250	0.0223	0.0216	89.3	86.2	54.0-138			3.47	20
n-Hexane	0.0250	0.0299	0.0304	120	122	57.0-133			1.55	20
Isopropylbenzene	0.0250	0.0240	0.0250	95.9	100	76.0-127			4.30	20
p-Isopropyltoluene	0.0250	0.0234	0.0240	93.6	96.0	76.0-125			2.54	20
2-Butanone (MEK)	0.125	0.160	0.157	128	126	44.0-160			1.75	20
Methyl Cyclohexane	0.0250	0.0245	0.0247	98.2	98.9	68.0-126			0.718	20
Methylene Chloride	0.0250	0.0265	0.0257	106	103	67.0-120			3.32	20
4-Methyl-2-pentanone (MIBK)	0.125	0.154	0.153	123	122	68.0-142			0.589	20
Methyl tert-butyl ether	0.0250	0.0304	0.0295	121	118	68.0-125			2.92	20
Naphthalene	0.0250	0.0209	0.0214	83.7	85.5	54.0-135			2.16	20
Propene	0.0250	0.0250	0.0261	100	104	10.0-160			4.19	20
n-Propylbenzene	0.0250	0.0247	0.0255	98.7	102	77.0-124			3.10	20
Styrene	0.0250	0.0242	0.0248	96.9	99.1	73.0-130			2.29	20
1,1,1,2-Tetrachloroethane	0.0250	0.0255	0.0248	102	99.4	75.0-125			2.78	20
1,1,2,2-Tetrachloroethane	0.0250	0.0274	0.0266	109	107	65.0-130			2.71	20
Tetrachloroethene	0.0250	0.0259	0.0257	103	103	72.0-132			0.729	20
Toluene	0.0250	0.0244	0.0242	97.8	96.6	79.0-120			1.19	20
1,1,2-Trichlorotrifluoroethane	0.0250	0.0254	0.0244	101	97.5	69.0-132			4.02	20
1,2,3-Trichlorobenzene	0.0250	0.0236	0.0238	94.3	95.3	50.0-138			1.07	20
1,2,4-Trichlorobenzene	0.0250	0.0219	0.0222	87.8	88.9	57.0-137			1.24	20
1,1,1-Trichloroethane	0.0250	0.0290	0.0283	116	113	73.0-124			2.42	20
1,1,2-Trichloroethane	0.0250	0.0250	0.0258	100	103	80.0-120			3.05	20
Trichloroethene	0.0250	0.0245	0.0243	97.8	97.3	78.0-124			0.593	20
Trichlorofluoromethane	0.0250	0.0305	0.0311	122	124	59.0-147			1.87	20
1,2,3-Trichloropropane	0.0250	0.0272	0.0268	109	107	73.0-130			1.42	20
1,2,3-Trimethylbenzene	0.0250	0.0237	0.0231	94.6	92.6	77.0-120			2.17	20
1,2,4-Trimethylbenzene	0.0250	0.0243	0.0245	97.3	97.9	76.0-121			0.715	20
1,3,5-Trimethylbenzene	0.0250	0.0234	0.0242	93.7	96.8	76.0-122			3.25	20
Vinyl chloride	0.0250	0.0263	0.0279	105	112	67.0-131			5.97	20
Xylenes, Total	0.0750	0.0699	0.0706	93.2	94.1	79.0-123			0.996	20
(S) Toluene-d8				95.6	97.2	80.0-120				
(S) 4-Bromofluorobenzene				92.4	93.8	77.0-126				
(S) 1,2-Dichloroethane-d4				117	128	70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3454663-3 09/25/19 20:02

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	99.5			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3454663-1 09/25/19 19:02 • (LCSD) R3454663-2 09/25/19 19:22

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0393	0.0480	78.6	96.0	55.0-138			19.9	24
(S) Toluene-d8				98.8	99.3	77.0-127				

5 Sr

6 Qc

L1142058-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1142058-02 09/26/19 02:15 • (MS) R3454663-4 09/26/19 02:34 • (MSD) R3454663-5 09/26/19 02:54

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	0.00386	0.0586	0.0606	110	113	1	13.0-160			3.31	31
(S) Toluene-d8					100	99.8		77.0-127				

7 Gl

8 Al

9 Sc





Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

B1	Target analyte detected in method blank at or above the method reporting limit.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
L1	The associated blank spike recovery was above laboratory acceptance limits.
M1	Matrix spike recovery was high, the method control sample recovery was acceptable.
M2	Matrix spike recovery was low, the method control sample recovery was acceptable.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

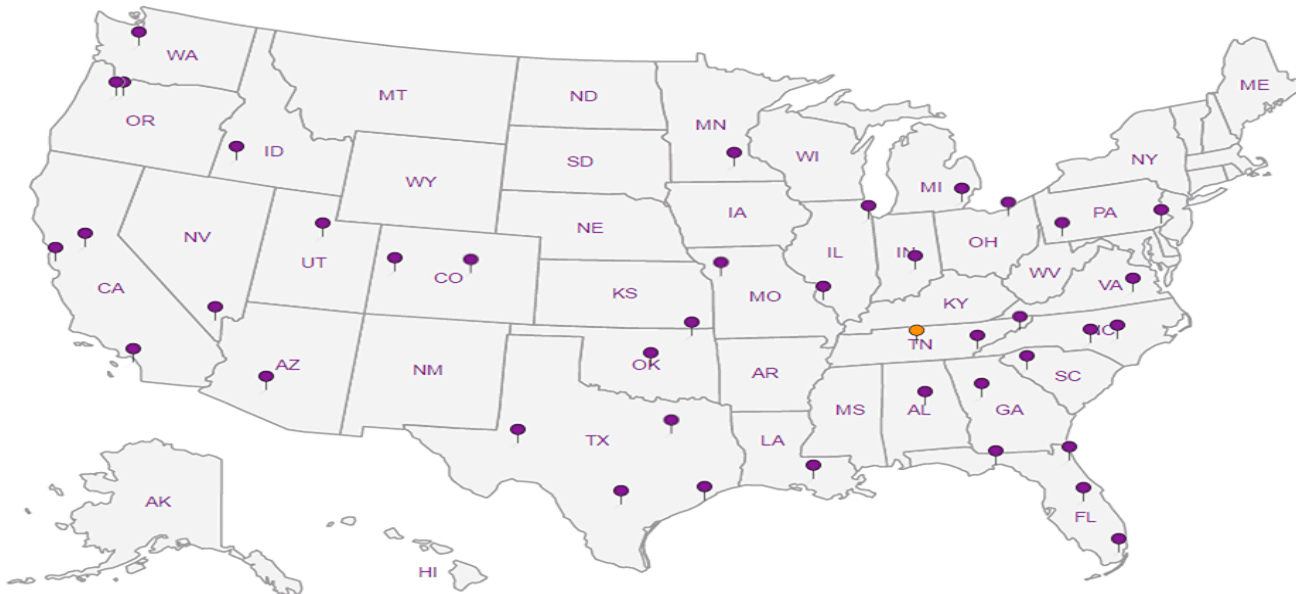
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



## UTC - Arcadis

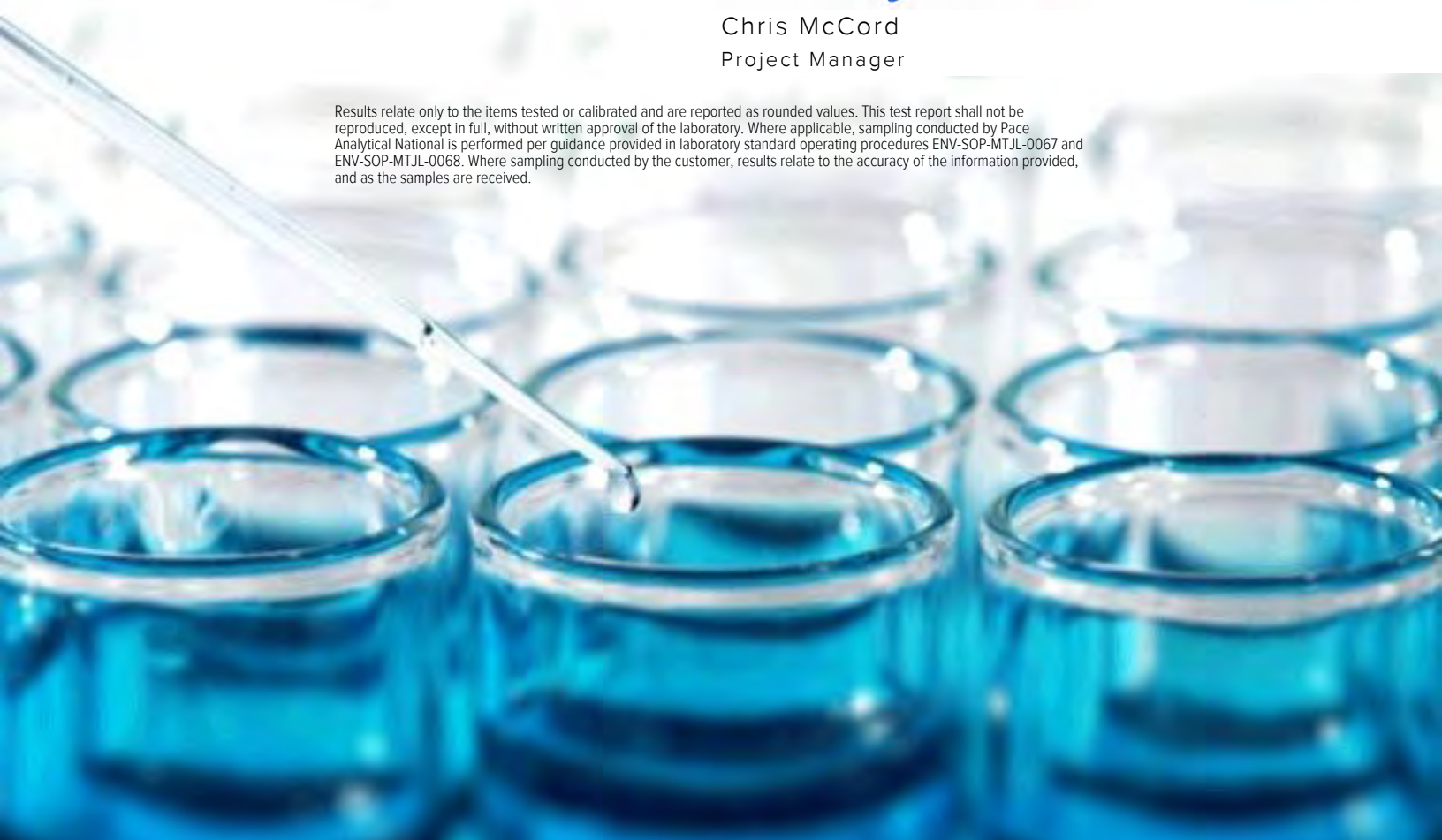
Sample Delivery Group: L1143756  
Samples Received: 09/27/2019  
Project Number: 30002531.0000  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
<b>SP-701-092619 L1143756-01</b>	<b>5</b>	
<b>TRIP BLANK L1143756-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>6</sup>Qc</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>9</b>	
<b>Gl: Glossary of Terms</b>	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>12</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY



## SP-701-092619 L1143756-01 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 08:40  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1353418	1	09/30/19 17:09	09/30/19 17:09	MCG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1355734	1	10/02/19 04:29	10/02/19 04:29	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1353345	1	09/27/19 17:29	09/27/19 17:29	BMB	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## TRIP BLANK L1143756-02 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 00:00  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1355734	1	10/02/19 01:38	10/02/19 01:38	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1353345	1	09/27/19 13:14	09/27/19 13:14	BMB	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Perchlorate	ND	R5	0.00400	1	09/30/2019 17:09	<a href="#">WG1353418</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
1,1-Dichloroethene	ND		0.00100	1	10/02/2019 04:29	<a href="#">WG1355734</a>
(S) Toluene-d8	108		80.0-120		10/02/2019 04:29	<a href="#">WG1355734</a>
(S) 4-Bromofluorobenzene	104		77.0-126		10/02/2019 04:29	<a href="#">WG1355734</a>
(S) 1,2-Dichloroethane-d4	102		70.0-130		10/02/2019 04:29	<a href="#">WG1355734</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
1,4-Dioxane	ND		0.00300	1	09/27/2019 17:29	<a href="#">WG1353345</a>
(S) Toluene-d8	100		77.0-127		09/27/2019 17:29	<a href="#">WG1353345</a>

6 Qc

7 Gl

8 Al

9 Sc





Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	10/02/2019 01:38	<a href="#">WG1355734</a>
(S) Toluene-d8	105		80.0-120		10/02/2019 01:38	<a href="#">WG1355734</a>
(S) 4-Bromofluorobenzene	104		77.0-126		10/02/2019 01:38	<a href="#">WG1355734</a>
(S) 1,2-Dichloroethane-d4	95.3		70.0-130		10/02/2019 01:38	<a href="#">WG1355734</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/27/2019 13:14	<a href="#">WG1353345</a>
(S) Toluene-d8	100		77.0-127		09/27/2019 13:14	<a href="#">WG1353345</a>



Method Blank (MB)

(MB) R3456338-1 09/27/19 14:05

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1143347-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1143347-01 09/27/19 19:46 • (DUP) R3456338-3 09/27/19 20:12

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Perchlorate	U	0.000	1	0.000		15

L1143616-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1143616-02 09/28/19 01:23 • (DUP) R3456338-4 09/28/19 01:49

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Perchlorate	U	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3456338-2 09/27/19 14:57

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0101	101	90.0-110	

L1143756-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1143756-01 09/30/19 17:09 • (MS) R3456338-5 09/30/19 17:35 • (MSD) R3456338-6 09/30/19 18:01

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	ND	0.00849	0.0100	84.9	100	1	80.0-120		R5	16.3	15



Method Blank (MB)

(MB) R3456733-3 10/02/19 00:13

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	105			80.0-120
(S) 4-Bromofluorobenzene	104			77.0-126
(S) 1,2-Dichloroethane-d4	99.7			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3456733-1 10/01/19 23:17 • (LCSD) R3456733-2 10/01/19 23:36

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0238	0.0250	95.2	100	71.0-124			4.92	20
(S) Toluene-d8				104	104	80.0-120				
(S) 4-Bromofluorobenzene				102	103	77.0-126				
(S) 1,2-Dichloroethane-d4				109	108	70.0-130				

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3456200-3 09/27/19 11:17

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	101			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3456200-1 09/27/19 10:19 • (LCSD) R3456200-2 09/27/19 10:38

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0535	0.0532	107	106	55.0-138			0.720	24
(S) Toluene-d8				101	101	77.0-127				

5 Sr

6 Qc

L1143575-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1143575-07 09/27/19 17:10 • (MS) R3456200-4 09/27/19 18:08 • (MSD) R3456200-5 09/27/19 18:28

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.100	0.0965	0.201	0.186	104	89.4	1	13.0-160			7.59	31
(S) Toluene-d8					99.3	99.3		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

R5	MS/MSD RPD exceeded the laboratory acceptance limit. Recovery met acceptance criteria.
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Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

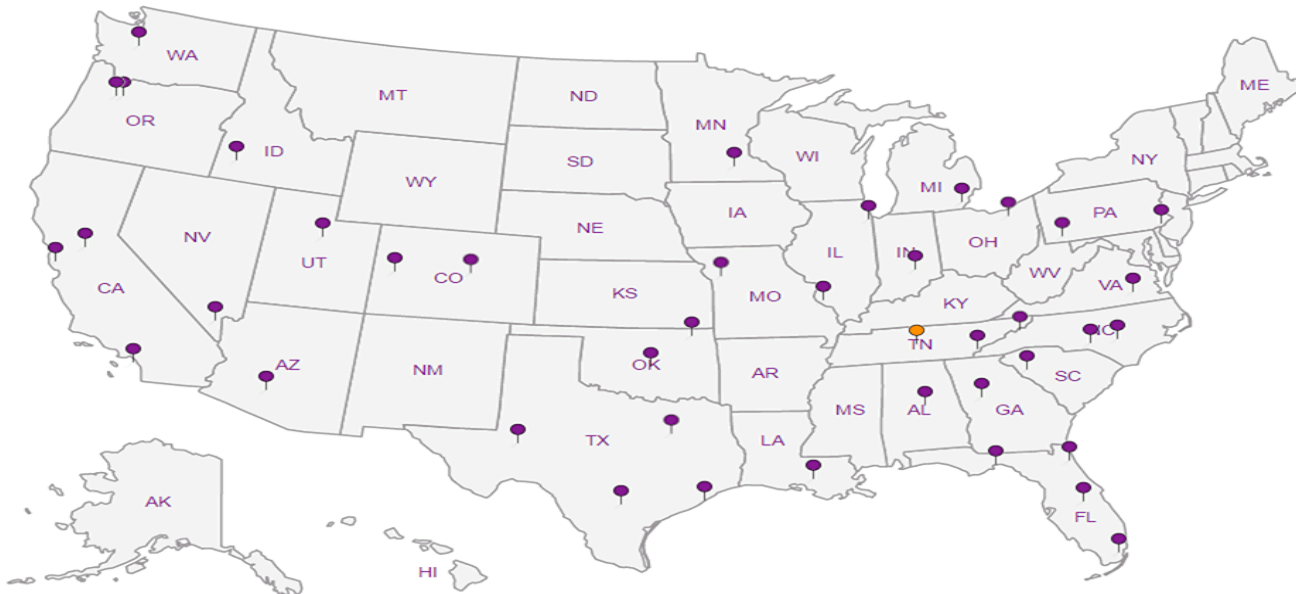
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Report to:  
**Thomas Vespalec**


Billing Information:  
 Accounts Payable  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Email To: thomas.vespalec@arcadis.com

Chain of Custody Page 1 of 1

**Pace Analytical**  
 National Center for Testing & Innovation

12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



Project Description: **UPCO**

City/State Collected: **AZ**

Client Project #: **03994018.0028**

Lab Project #: **UTCARCA-UPCO11DCE**

Collected by (print): **MARK HAMMER**

Site/Facility ID #: **UPCO**

Collected by (signature): *Mark Hammer*

Rush? (Lab MUST Be Notified)  
 \_\_\_ Same Day \_\_\_ Five Day  
 \_\_\_ Next Day \_\_\_ 5 Day (Rad Only)  
 \_\_\_ Two Day \_\_\_ 10 Day (Rad Only)  
 \_\_\_ Three Day

Quote #

Date Results Needed: **STD TAT**

Immediately Packed on Ice N \_\_\_ Y **X**

Analysis / Container / Preservative

**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4
------------------------------	---------------------------	-------------------------------	-------------------------	--------------------------------	------------------------------	-------------------------	------------------	--------------------	-----------------------------------

Remarks: **UPCO**

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-701-092619	G	GW	-	9/26/19	08:40	5		X	X			X						01
TRIP BLANK	-	GW	-	9/26/19	-	1		X	X									02
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix: SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via: \_\_\_ UPS \_\_\_ FedEx \_\_\_ Courier \_\_\_\_\_

Tracking # \_\_\_\_\_

Sample Receipt Checklist

COC Seal Present/Intact: \_\_\_ NP  Y \_\_\_ N

COC Signed/Accurate:  Y \_\_\_ N

Bottles arrive intact:  Y \_\_\_ N

Correct bottles used:  Y \_\_\_ N

Sufficient volume sent:  Y \_\_\_ N

If Applicable

VOA Zero Headspace:  Y \_\_\_ N

Preservation Correct/Checked: \_\_\_ Y \_\_\_ N

Relinquished by: (Signature) *Mark Hammer* Date: 9/26/19 Time: 0940

Received by: (Signature) *Tanya...* Trip Blank Received: Yes (No) HCL/MeoH TBR

Relinquished by: (Signature) *Tanya...* Date: 9/26/19 Time: 1800

Received by: (Signature) *Sh...* Temp: 3.1 ± 0 = 3.1 ± 0.6 °C Bottles Received: 6

Relinquished by: (Signature) *Delwonte P...* Date: 9/27/19 Time: 8:45

Received for lab by: (Signature) *Delwonte P...* Date: 9/27/19 Time: 8:45

Hold: \_\_\_\_\_ Condition: NCF /  OK

RAD SCREEN: <0.5 mR/hr

If preservation required by Login: Date/Time

ESSI AB



## UTC - Arcadis

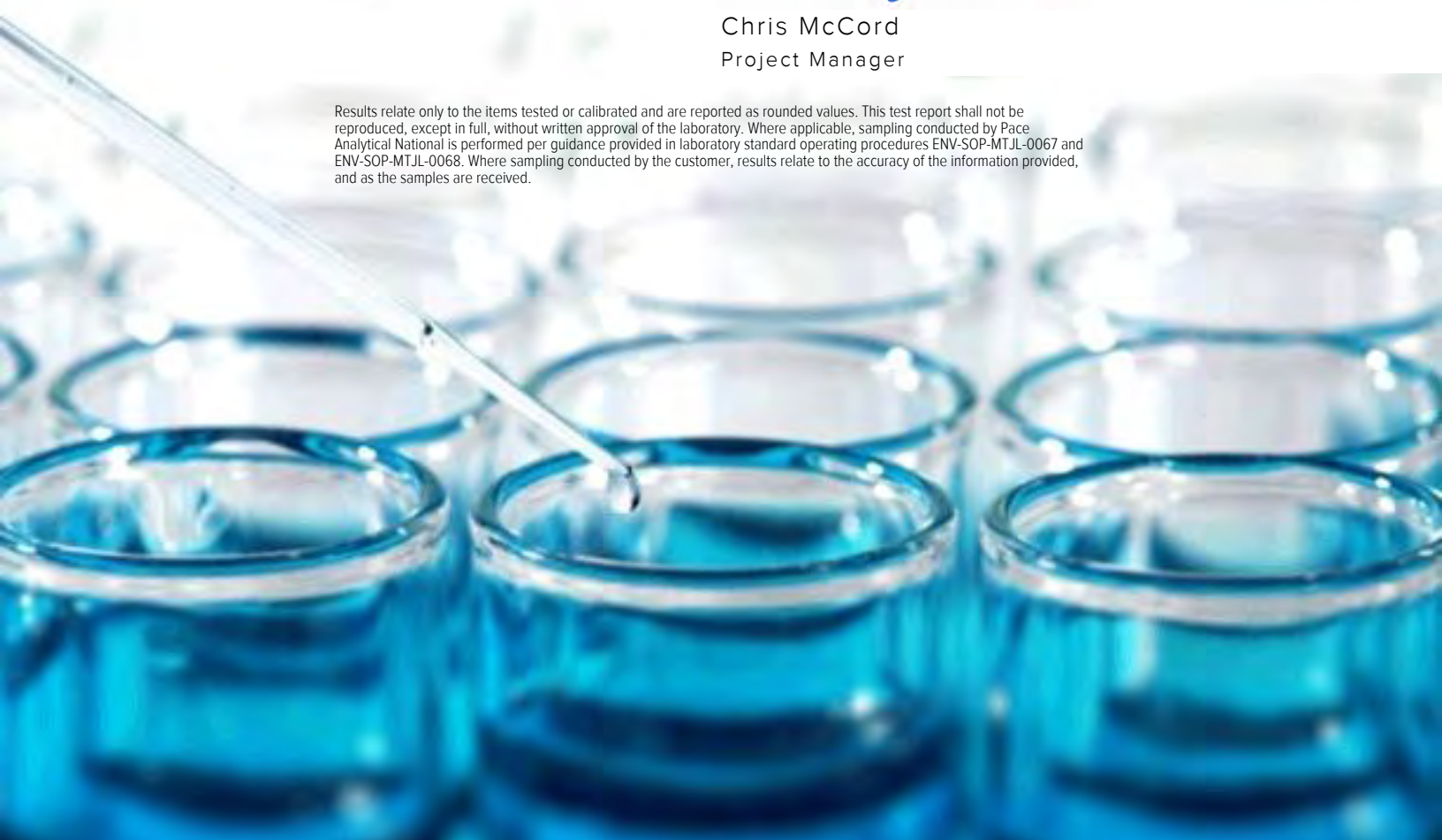
Sample Delivery Group: L1143758  
Samples Received: 09/27/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.







<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>5</b>	
<b>Sr: Sample Results</b>	<b>6</b>	<b>3</b> Ss
SP-301-092619 L1143758-01	<b>6</b>	
MW-20-092619 L1143758-02	<b>7</b>	<b>4</b> Cn
T-801-092619 L1143758-03	<b>8</b>	<b>5</b> Sr
T-802-092619 L1143758-04	<b>9</b>	
T-803-092619 L1143758-05	<b>10</b>	<b>6</b> Qc
T-601-092619 L1143758-06	<b>11</b>	
T-602-092619 L1143758-07	<b>12</b>	<b>7</b> Gl
T-603-092619 L1143758-08	<b>13</b>	<b>8</b> Al
T-604-092619 L1143758-09	<b>14</b>	
<b>Qc: Quality Control Summary</b>	<b>15</b>	<b>9</b> Sc
Wet Chemistry by Method 314.0 Mod	<b>15</b>	
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	<b>16</b>	
<b>Gl: Glossary of Terms</b>	<b>17</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>18</b>	
<b>Sc: Sample Chain of Custody</b>	<b>19</b>	

# SAMPLE SUMMARY



## SP-301-092619 L1143758-01 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 07:40  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1351879	1	10/01/19 05:41	10/01/19 05:41	MCG	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

## MW-20-092619 L1143758-02 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 08:50  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1351879	5	10/01/19 06:45	10/01/19 06:45	MCG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1353345	1	09/27/19 13:34	09/27/19 13:34	BMB	Mt. Juliet, TN

4 Cn

5 Sr

6 Qc

## T-801-092619 L1143758-03 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 09:00  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1353345	1	09/27/19 13:53	09/27/19 13:53	BMB	Mt. Juliet, TN

7 Gl

8 Al

## T-802-092619 L1143758-04 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 09:05  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1353345	1	09/27/19 14:13	09/27/19 14:13	BMB	Mt. Juliet, TN

9 Sc

## T-803-092619 L1143758-05 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 09:10  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1353345	1	09/27/19 14:32	09/27/19 14:32	BMB	Mt. Juliet, TN

## T-601-092619 L1143758-06 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 09:20  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1351879	1	10/01/19 07:18	10/01/19 07:18	MCG	Mt. Juliet, TN

## T-602-092619 L1143758-07 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 09:23  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1351879	1	10/01/19 07:50	10/01/19 07:50	MCG	Mt. Juliet, TN

## T-603-092619 L1143758-08 GW

Collected by: Mark Hammer  
 Collected date/time: 09/26/19 09:25  
 Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1351879	1	10/01/19 08:55	10/01/19 08:55	MCG	Mt. Juliet, TN

# SAMPLE SUMMARY



T-604-092619 L1143758-09 GW

Collected by: Mark Hammer  
Collected date/time: 09/26/19 09:28  
Received date/time: 09/27/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1351879	1	10/01/19 10:32	10/01/19 10:32	MCG	Mt. Juliet, TN

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/01/2019 05:41	<a href="#">WG1351879</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	0.336		0.0200	5	10/01/2019 06:45	<a href="#">WG1351879</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	0.0107		0.00300	1	09/27/2019 13:34	<a href="#">WG1353345</a>
(S) Toluene-d8	101		77.0-127		09/27/2019 13:34	<a href="#">WG1353345</a>

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/27/2019 13:53	<a href="#">WG1353345</a>
(S) Toluene-d8	100		77.0-127		09/27/2019 13:53	<a href="#">WG1353345</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/27/2019 14:13	<a href="#">WG1353345</a>
(S) Toluene-d8	100		77.0-127		09/27/2019 14:13	<a href="#">WG1353345</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	09/27/2019 14:32	<a href="#">WG1353345</a>
(S) Toluene-d8	101		77.0-127		09/27/2019 14:32	<a href="#">WG1353345</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/01/2019 07:18	<a href="#">WG1351879</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/01/2019 07:50	<a href="#">WG1351879</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/01/2019 08:55	<a href="#">WG1351879</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/01/2019 10:32	<a href="#">WG1351879</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3456465-1 09/30/19 11:42

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

L1143758-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1143758-07 10/01/19 07:50 • (DUP) R3456465-4 10/01/19 08:23

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Perchlorate	ND	0.000	1	0.000		15

<sup>4</sup>Cn

<sup>5</sup>Sr

Laboratory Control Sample (LCS)

(LCS) R3456465-2 09/30/19 12:46

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0106	106	90.0-110	

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



Method Blank (MB)

(MB) R3456200-3 09/27/19 11:17

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	101			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3456200-1 09/27/19 10:19 • (LCSD) R3456200-2 09/27/19 10:38

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
1,4-Dioxane	0.0500	0.0535	0.0532	107	106	55.0-138			0.720	24
(S) Toluene-d8				101	101	77.0-127				

5 Sr

6 Qc

L1143575-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1143575-07 09/27/19 17:10 • (MS) R3456200-4 09/27/19 18:08 • (MSD) R3456200-5 09/27/19 18:28

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
1,4-Dioxane	0.100	0.0965	0.201	0.186	104	89.4	1	13.0-160			7.59	31
(S) Toluene-d8					99.3	99.3		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.





Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

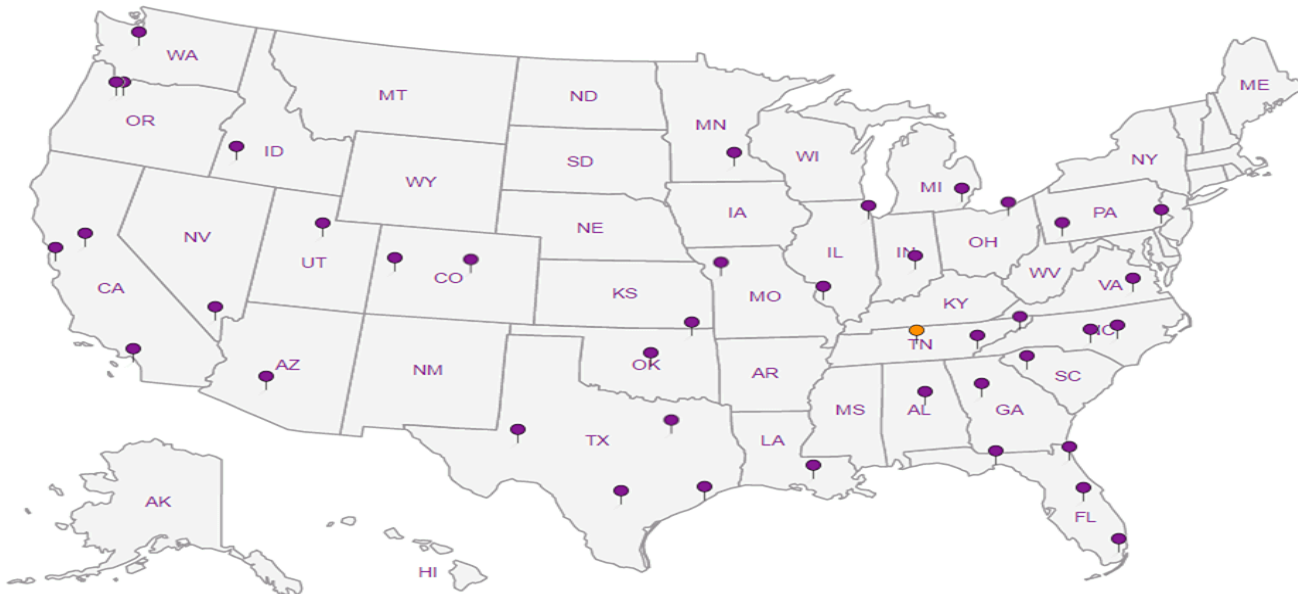
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008

Billing Information:  
 Accounts Payable  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129

Report to:  
**Thomas Vespalec**

Email To: thomas.vespalec@arcadis.com

Project Description: **UPCO**

City/State Collected: **AZ**

Phone: **480-535-7399** Client Project # **03994018.0028** Lab Project # **UTCARCA-UPCO11DCE**

Collected by (print): **Mark Hammer** Site/Facility ID # **UPCO** P.O. #


Collected by (signature): *Mark Hammer* **Rush?** (Lab MUST Be Notified)

Immediately Packed on Ice N  Y   Same Day  Five Day  Next Day  5 Day (Rad Only)  Two Day  10 Day (Rad Only)  Three Day

Date Results Needed

No. of Cntrs

12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859



Sample ID

Comp/Grab

Matrix \*

Depth

Date

Time

Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-301-092619	G	GW		9/26/19	07:40	1						X						01
MW-20-092619		GW			08:50	3		X				X						02
T-801-092619		GW			09:08	2		X										03
T-802-092619		GW			09:05	2		X										04
T-803-092619		GW			09:10	2		X										05
T-601-092619		GW			09:20	1						X						06
T-602-092619		GW			09:23	1						X						07
T-603-092619		GW			09:25	1						X						08
T-604-092619		GW			09:28	1						X						09

L # **1143798**

**J096**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P716981**

TSR: **526 - Chris McCord**

PB:

Shipped Via: **FedEX Saver**

\* Matrix: SS - Soil AIR - Air F - Filter GW - Groundwater B - Bioassay WW - WasteWater DW - Drinking Water OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  UPS  FedEx  Courier

Tracking #

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Trip Blank Received: Yes / No

HCL / MeOH TBR

Sample Receipt Checklist

COC Seal Present/Intact:  NP  Y  N

COC Signed/Accurate:  Y  N

Bottles arrive intact:  Y  N

Correct bottles used:  Y  N

Sufficient volume sent:  Y  N

If Applicable

VOA Zero Headspace:  Y  N

Preservation Correct/Checked:  Y  N

Relinquished by: (Signature) *Mark Hammer* Date: **9/26/19** Time: **0940** Received by: (Signature) *Janyar* Trip Blank Received: Yes / No

Relinquished by: (Signature) *Janyar* Date: **9/26/19** Time: **1800** Received by: (Signature) *Delvonte Pinkston* Temp: **3.1±0.3°C** Bottles Received: **14** If preservation required by Login: Date/Time

Relinquished by: (Signature) Date: Time: Received for lab by: (Signature) Date: **9/27/19** Time: **8:45** Hold: Condition: **NCF / PK**

ESUB

## UTC - Arcadis

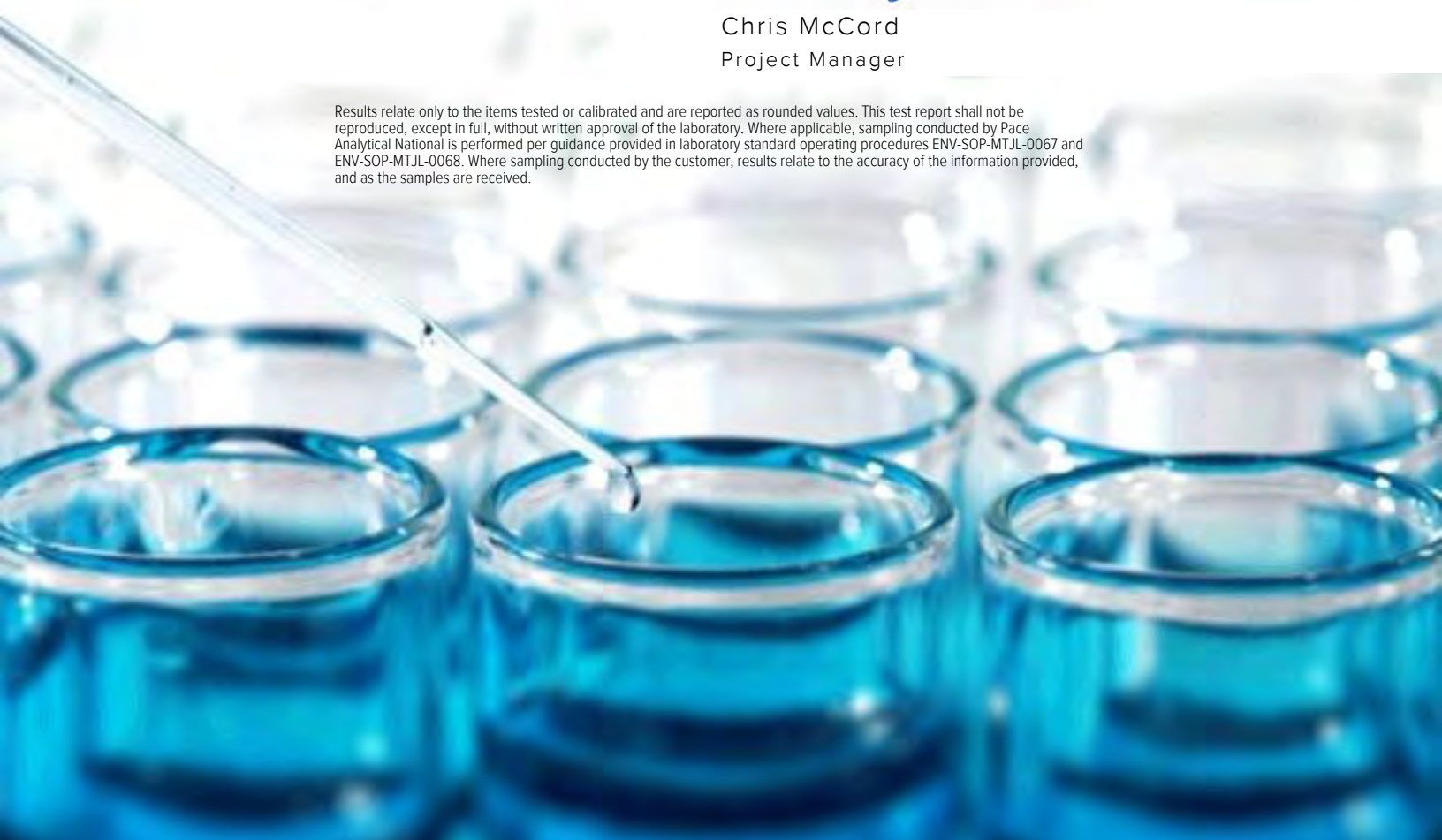
Sample Delivery Group: L1146242  
Samples Received: 10/04/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
<b>SP-201-100319 L1146242-01</b>	<b>5</b>	
<b>SP-301-100319 L1146242-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>6</sup>Qc</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Gl: Glossary of Terms</b>	<b>8</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>9</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>10</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY



SP-201-100319 L1146242-01 GW

Collected by: Mark Hammer  
 Collected date/time: 10/03/19 10:15  
 Received date/time: 10/04/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1358571	500	10/08/19 08:51	10/08/19 08:51	LBR	Mt. Juliet, TN

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

SP-301-100319 L1146242-02 GW

Collected by: Mark Hammer  
 Collected date/time: 10/03/19 10:20  
 Received date/time: 10/04/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1358571	1	10/08/19 09:18	10/08/19 09:18	LBR	Mt. Juliet, TN

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	9.17		2.00	500	10/08/2019 08:51	<a href="#">WG1358571</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/08/2019 09:18	<a href="#">WG1358571</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Method Blank (MB)

(MB) R3458832-1 10/07/19 17:22

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

Laboratory Control Sample (LCS)

(LCS) R3458832-2 10/07/19 18:29

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00975	97.5	90.0-110	

<sup>6</sup> Qc

L1146242-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1146242-02 10/07/19 21:11 • (MS) R3458832-3 10/07/19 22:48 • (MSD) R3458832-4 10/07/19 23:21

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	ND	0.0107	0.0107	107	107	1	80.0-120			0.0328	15

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



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RPD	Relative Percent Difference.
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Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
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Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: [thomas.vespalec@arcadis.com](mailto:thomas.vespalec@arcadis.com)

Project  
Description: **UPCO**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

City/State  
Collected: **AZ**  
Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**MARK HAMMER**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*Mark Hammer*

**Rush?** (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #  
Date Results Needed

Immediately  
Packed on Ice N  Y

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **L1146242**

**A027**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P716981**

TSR: **526 - Chris McCord**

PB:

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)	
SP-201-100319	G	GW	-	10/3/19	10:15	1						X							-01
SP-301-100319	G	GW	-	10/3/19	10:20	1						X							-02
		GW																	
		GW																	
		GW																	
		GW																	
		GW																	
		GW																	
		GW																	

\* Matrix:  
 SS - Soil AIR - Air F - Filter  
 GW - Groundwater B - Bioassay  
 WW - WasteWater  
 DW - Drinking Water  
 OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
 UPS  FedEx  Courier

Tracking #

pH \_\_\_\_\_ Temp \_\_\_\_\_

Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist

COC Seal Present/Intact:  NP  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N

If Applicable

VOA Zero Headspace:  Y  N  
 Preservation Correct/Checked:  Y  N

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature)  
*Mark Hammer*

Date: **10/3/19**  
Time: **1409**

Received by: (Signature)  
*amy...*

Trip Blank Received: Yes/No  
HCL/MeOH  
TBR

Relinquished by: (Signature)  
*amy...*

Date: **10/3/19**  
Time: **1800**

Received by: (Signature)  
*sw...*

Temp: **15.2°C**  
Bottles Received: **2**  
**1.0-1.15**

If preservation required by Login: Date/Time

Relinquished by: (Signature)  
*isa...*

Date: **10-04**  
Time: **8130**

Received for lab by: (Signature)

Date: **10-04**  
Time: **8130**

Hold: **8130**  
Condition: **NCF / OK**

## UTC - Arcadis

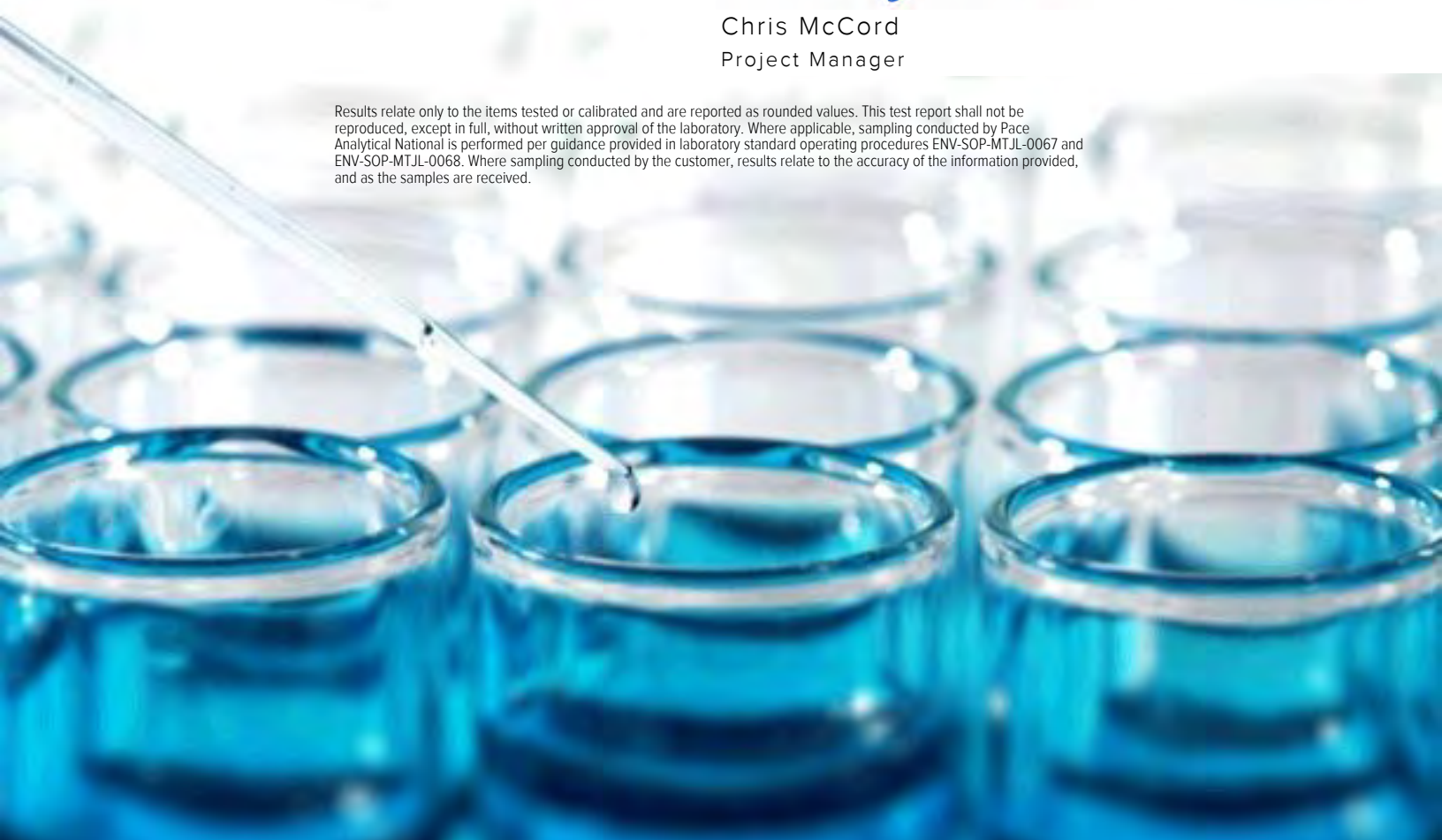
Sample Delivery Group: L1146243  
Samples Received: 10/04/2019  
Project Number: 03994018.0028  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>2</sup>Tc</b>
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>3</sup>Ss</b>
<b>SP-701-100319 L1146243-01</b>	<b>5</b>	
<b>TRIP BLANK L1146243-02</b>	<b>6</b>	<b><sup>4</sup>Cn</b>
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>5</sup>Sr</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	<b><sup>6</sup>Qc</b>
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>10</b>	
<b>Gl: Glossary of Terms</b>	<b>11</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>12</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>13</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY

## SP-701-100319 L1146243-01 GW

Collected by: Mark Hammer  
 Collected date/time: 10/03/19 08:40  
 Received date/time: 10/04/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1359367	1	10/09/19 02:28	10/09/19 02:28	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1362384	1	10/13/19 19:56	10/13/19 19:56	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1358993	1	10/08/19 15:21	10/08/19 15:21	ACG	Mt. Juliet, TN

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## TRIP BLANK L1146243-02 GW

Collected by: Mark Hammer  
 Collected date/time: 10/03/19 00:00  
 Received date/time: 10/04/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1362173	1	10/12/19 22:29	10/12/19 22:29	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1358993	1	10/08/19 12:25	10/08/19 12:25	ACG	Mt. Juliet, TN





All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/09/2019 02:28	<a href="#">WG1359367</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	10/13/2019 19:56	<a href="#">WG1362384</a>
(S) Toluene-d8	115		80.0-120		10/13/2019 19:56	<a href="#">WG1362384</a>
(S) 4-Bromofluorobenzene	113		77.0-126		10/13/2019 19:56	<a href="#">WG1362384</a>
(S) 1,2-Dichloroethane-d4	97.2		70.0-130		10/13/2019 19:56	<a href="#">WG1362384</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	10/08/2019 15:21	<a href="#">WG1358993</a>
(S) Toluene-d8	100		77.0-127		10/08/2019 15:21	<a href="#">WG1358993</a>

6 Qc

7 Gl

8 Al

9 Sc



Collected date/time: 10/03/19 00:00

L1146243

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	10/12/2019 22:29	<a href="#">WG1362173</a>
(S) Toluene-d8	112		80.0-120		10/12/2019 22:29	<a href="#">WG1362173</a>
(S) 4-Bromofluorobenzene	110		77.0-126		10/12/2019 22:29	<a href="#">WG1362173</a>
(S) 1,2-Dichloroethane-d4	78.8		70.0-130		10/12/2019 22:29	<a href="#">WG1362173</a>

1 Cp

2 Tc

3 Ss

4 Cn

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	10/08/2019 12:25	<a href="#">WG1358993</a>
(S) Toluene-d8	98.3		77.0-127		10/08/2019 12:25	<a href="#">WG1358993</a>

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3459572-1 10/08/19 17:49

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

Laboratory Control Sample (LCS)

(LCS) R3459572-2 10/08/19 18:54

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Perchlorate	0.0100	0.0104	104	90.0-110	

<sup>6</sup> Qc

L1146243-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1146243-01 10/09/19 02:28 • (MS) R3459572-3 10/09/19 04:05 • (MSD) R3459572-4 10/09/19 04:38

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Perchlorate	0.0100	ND	0.00877	0.00935	87.7	93.5	1	80.0-120			6.48	15

<sup>7</sup> Gl

<sup>8</sup> Al

L1146249-05 Original Sample (OS) • Matrix Spike (MS)

(OS) L1146249-05 10/09/19 07:20 • (MS) R3459572-5 10/09/19 13:49

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Perchlorate	0.0100	U	0.0107	107	1	80.0-120	

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3460895-3 10/12/19 22:08

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	111			80.0-120
(S) 4-Bromofluorobenzene	109			77.0-126
(S) 1,2-Dichloroethane-d4	78.6			70.0-130

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3460895-1 10/12/19 21:06 • (LCSD) R3460895-2 10/12/19 21:27

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0279	0.0280	112	112	71.0-124			0.358	20
(S) Toluene-d8				107	109	80.0-120				
(S) 4-Bromofluorobenzene				110	110	77.0-126				
(S) 1,2-Dichloroethane-d4				87.6	89.1	70.0-130				

6 Qc

7 Gl

8 Al

L1146249-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1146249-04 10/12/19 23:31 • (MS) R3460895-4 10/13/19 05:03 • (MSD) R3460895-5 10/13/19 05:24

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.00500	0.000549	0.0105	0.00745	199	138	1	11.0-160	M1	R5	34.0	29
(S) Toluene-d8					108	109		80.0-120				
(S) 4-Bromofluorobenzene					110	111		77.0-126				
(S) 1,2-Dichloroethane-d4					81.0	74.6		70.0-130				

9 Sc



Method Blank (MB)

(MB) R3460849-4 10/13/19 14:31

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	113			80.0-120
(S) 4-Bromofluorobenzene	108			77.0-126
(S) 1,2-Dichloroethane-d4	105			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3460849-1 10/13/19 12:54 • (LCSD) R3460849-2 10/13/19 13:18

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0254	0.0279	102	112	71.0-124			9.38	20
(S) Toluene-d8				107	109	80.0-120				
(S) 4-Bromofluorobenzene				107	112	77.0-126				
(S) 1,2-Dichloroethane-d4				97.5	102	70.0-130				

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Method Blank (MB)

(MB) R3458901-3 10/08/19 11:09

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	98.7			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3458901-1 10/08/19 10:09 • (LCSD) R3458901-2 10/08/19 10:29

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
1,4-Dioxane	0.0500	0.0369	0.0402	73.8	80.4	55.0-138			8.56	24
(S) Toluene-d8				98.8	98.5	77.0-127				

5 Sr

6 Qc

L1147005-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1147005-01 10/08/19 19:13 • (MS) R3458901-4 10/08/19 19:53 • (MSD) R3458901-5 10/08/19 20:13

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
1,4-Dioxane	0.0500	0.00196	0.0439	0.0432	83.9	82.5	1	13.0-160			1.61	31
(S) Toluene-d8					98.5	98.5		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
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Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

M1	Matrix spike recovery was high, the method control sample recovery was acceptable.
R5	MS/MSD RPD exceeded the laboratory acceptance limit. Recovery met acceptance criteria.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

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 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
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Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

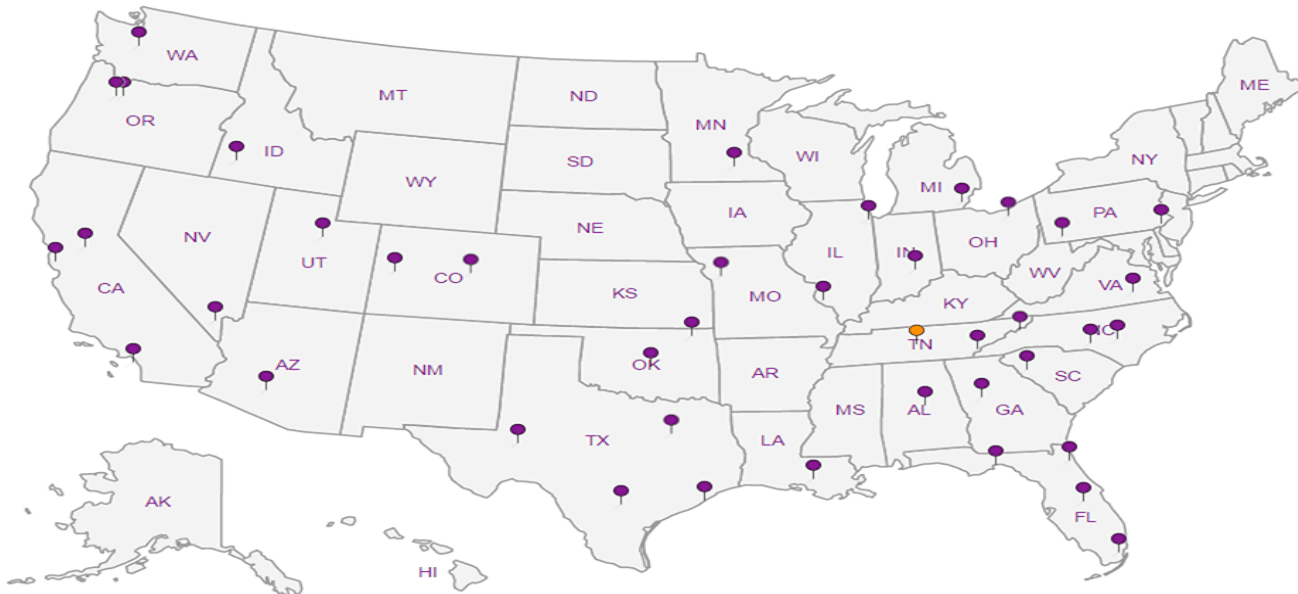
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A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

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1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



**UTC - Arcadis**  
 410 North 44th St.  
 Suite 1000  
 Phoenix AZ 85008  
 Report to:  
**Thomas Vespalec**

Billing Information:  
**Accounts Payable**  
 630 Plaza Drive, Suite 600  
 Highlands Ranch, CO 80129  
 Email To: [thomas.vespalec@arcadis.com](mailto:thomas.vespalec@arcadis.com)

Chain of Custody Page 1 of 1

**Face Analytical**  
 National Center for Testing & Innovation

12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859

Project Description: **UPCO** City/State Collected: **AZ**

Phone: **480-535-7399** Client Project #: **03994018.0028** Lab Project #: **UTCARCA-UPCO11DCE**

Collected by (print): **MARK HAMMER** Site/Facility ID #: **UPCO** P.O. #

Collected by (signature): *Mark Hammer* **Rush?** (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Immediately Packed on Ice N  Y  **Quote #**  
**STD TAT**

No. of Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40ml/Amb-HCl	1,4-Dioxane 8260B 40ml/Amb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250ml/Amb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
SP-701-100319	6	GW	-	10/3/19	08:40	5		X	X			X						- 01
TRIP BLANK	-	GW	-	10/3/19		1		X	X									- 02
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																
		GW																

\* Matrix: SS - Soil AIR - Air F - Filter GW - Groundwater B - Bioassay WW - WasteWater DW - Drinking Water OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  UPS  FedEx  Courier  Tracking #

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

**Sample Receipt Checklist**  
 COC Seal Present/Intact:  NP  Y  N  
 COC Signed/Accurate:  Y  N  
 Bottles arrive intact:  Y  N  
 Correct bottles used:  Y  N  
 Sufficient volume sent:  Y  N  
 If Applicable  
 VOA Zero Headspace:  Y  N  
 Preservation Correct/Checked:  Y  N

Relinquished by: (Signature) *Mark Hammer* Date: **10/3/19** Time: **1409** Received by: (Signature) *amg...* Trip Blank Received:  Yes  No  
 HCL / MeoH TBR

Relinquished by: (Signature) *amg...* Date: **10/3/19** Time: **1800** Received by: (Signature) *SWA* Temp: **15.8°C** Bottles Received: **5** If preservation required by Login: Date/Time  
**1.0-1.5**

Relinquished by: (Signature) *ISA...* Date: **10-04** Time: **8130** Received for lab by: (Signature) *ISA...* Hold: Condition: **NCF / OK**

ESY 17

## UTC - Arcadis

Sample Delivery Group: L1149254  
Samples Received: 10/11/2019  
Project Number: 30002531.0000  
Description: UPCO

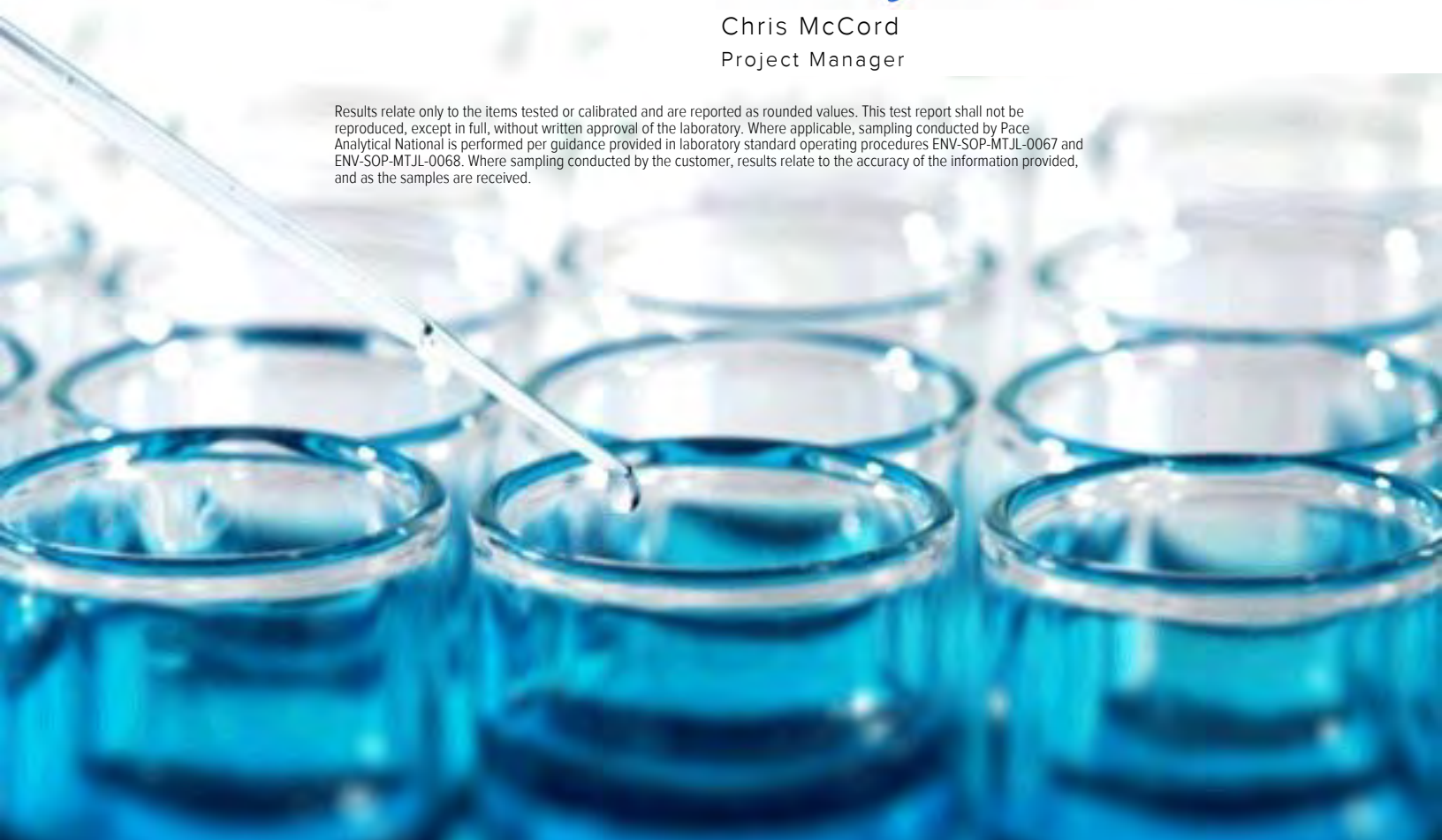
Report To: Thomas Vespalec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b>2</b> Tc
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b>3</b> Ss
SP-201-101019 L1149254-01	<b>5</b>	
SP-301-101019 L1149254-02	<b>6</b>	<b>4</b> Cn
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b>5</b> Sr
Wet Chemistry by Method 314.0 Mod	<b>7</b>	
Wet Chemistry by Method 9060A	<b>8</b>	<b>6</b> Qc
<b>Gl: Glossary of Terms</b>	<b>9</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>10</b>	<b>7</b> Gl
<b>Sc: Sample Chain of Custody</b>	<b>11</b>	<b>8</b> Al
		<b>9</b> Sc

# SAMPLE SUMMARY



## SP-201-101019 L1149254-01 GW

Collected by: Mark Hammer  
 Collected date/time: 10/10/19 07:40  
 Received date/time: 10/11/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1362528	500	10/14/19 17:50	10/14/19 17:50	LBR	Mt. Juliet, TN

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

## SP-301-101019 L1149254-02 GW

Collected by: Mark Hammer  
 Collected date/time: 10/10/19 07:50  
 Received date/time: 10/11/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1362528	1	10/14/19 19:27	10/14/19 19:27	LBR	Mt. Juliet, TN
Wet Chemistry by Method 9060A	WG1363059	1	10/16/19 14:26	10/16/19 14:26	VRP	Mt. Juliet, TN

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	7.23		2.00	500	10/14/2019 17:50	<a href="#">WG1362528</a>

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/14/2019 19:27	<a href="#">WG1362528</a>

1 Cp

2 Tc

Wet Chemistry by Method 9060A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	1.08	<u>B1</u>	1.00	1	10/16/2019 14:26	<a href="#">WG1363059</a>

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3461436-1 10/14/19 13:34

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

L1149254-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1149254-02 10/14/19 19:27 • (DUP) R3461436-3 10/14/19 21:04

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

<sup>6</sup> Qc

Laboratory Control Sample (LCS)

(LCS) R3461436-2 10/14/19 14:39

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00962	96.2	90.0-110	

<sup>7</sup> Gl

<sup>8</sup> Al

L1149256-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1149256-01 10/14/19 21:36 • (MS) R3461436-4 10/14/19 22:09 • (MSD) R3461436-5 10/14/19 22:41

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	ND	0.00934	0.00944	93.4	94.4	1	80.0-120			1.09	15

<sup>9</sup> Sc





Method Blank (MB)

(MB) R3461678-1 10/15/19 17:22

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TOC (Total Organic Carbon)	0.450	E4	0.102	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1148968-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1148968-03 10/15/19 20:34 • (DUP) R3461678-3 10/15/19 20:56

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	68.0	67.6	1	0.649		20

L1149254-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1149254-02 10/16/19 14:26 • (DUP) R3461678-9 10/16/19 14:46

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
TOC (Total Organic Carbon)	1.08	1.01	1	6.77		20

Laboratory Control Sample (LCS)

(LCS) R3461678-2 10/15/19 18:02

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TOC (Total Organic Carbon)	75.0	69.7	92.9	85.0-115	

L1148968-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1148968-06 10/15/19 23:37 • (MS) R3461678-4 10/16/19 00:05 • (MSD) R3461678-5 10/16/19 00:33

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	8.20	56.9	55.7	97.4	95.1	1	80.0-120			2.09	20

L1149342-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1149342-04 10/16/19 04:34 • (MS) R3461678-7 10/16/19 04:59 • (MSD) R3461678-8 10/16/19 05:20

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TOC (Total Organic Carbon)	50.0	ND	47.7	48.7	94.1	96.1	1	80.0-120			2.07	20



## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

### Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
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Qualifier	Description
-----------	-------------

B1	Target analyte detected in method blank at or above the method reporting limit.
E4	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.



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Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

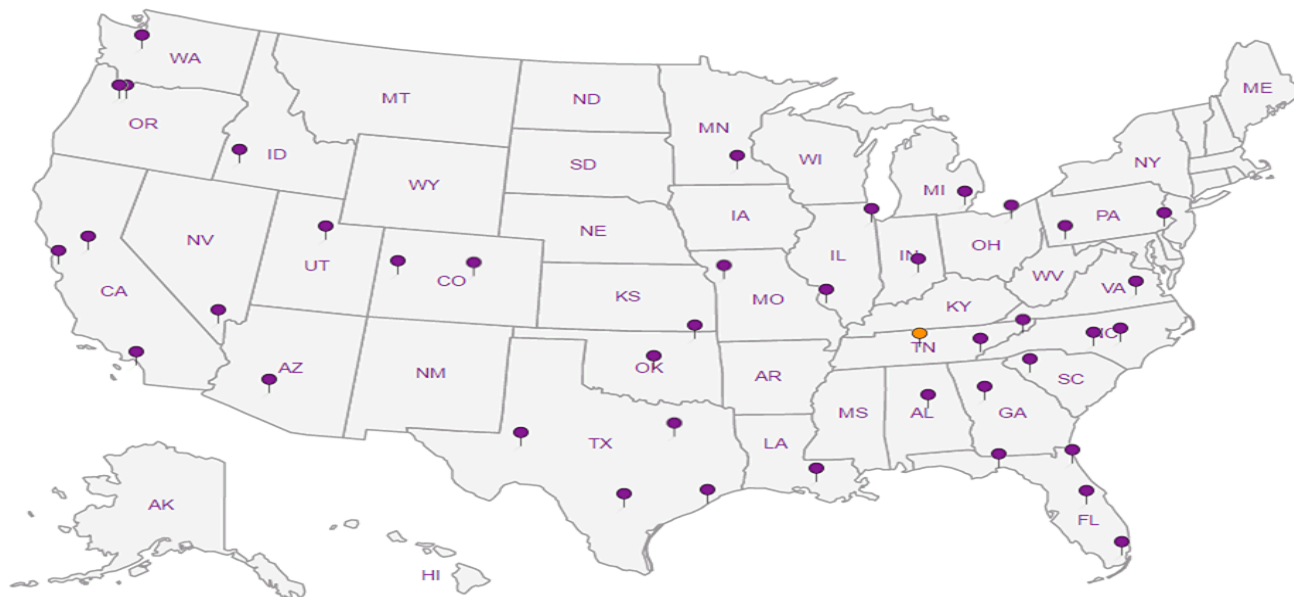
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EPA-Crypto	TN00003		

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1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000

Phoenix AZ 85008

Report to:  
Thomas Vespalec

Billing Information:  
Accounts Payable  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: thomas.vespalec@arcadis.com

Project  
Description: **UPCO**

Phone: 480-535-7399  
Fax:

Client Project #  
**03994018.0028**

City/State  
Collected: **AZ**  
Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**MARK HAMMER**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*Mark Hammer*

Rush? (Lab MUST Be Notified)

Quote #

Immediately  
Packed on Ice N  Y

Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Date Results Needed

**STD TAT**

Pres  
Chk

Analysis / Container / Preservative

Chain of Custody Page **L** of **L**



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **L1149254**  
**C231**

Acctnum: **UTCARCA**

Template: **T152379**

Prelogin: **P716981**

TSR: **526 - Chris McCord**

PB:

Shipped Via: **FedEX Saver**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**NITRATE** 125mlHDPE-NoPres	1,1-DCE-8260B 40mlAmb-HCl	1,4-Dioxane 8260B 40mlAmb-HCl	Ammonia 250mlHDPE-H2SO4	Diss. Fe - LF 250mlHDPE-NoPres	Perchlorate 125mlHDPE-NoPres	RCRA8+Fe 250mlHDPE-HNO3	TOC 250mlAmb-HCl	TSS 1L-HDPE NoPres	Total Phosphorous 250mlHDPE-H2SO4	Remarks	Sample # (lab only)	
SP-201-101019	X6	GW	-	10/10/19	07:40	1						X							-01
SP-301-101019	6	GW	-	10/10/19	07:50	2						X		X					02
		GW																	
		GW																	
		GW																	
		GW																	
		GW																	
		GW																	
		GW																	

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist  
COC Seal Present/Intact:  NP  Y  N  
COC Signed/Accurate:  Y  N  
Bottles arrive intact:  Y  N  
Correct bottles used:  Y  N  
Sufficient volume sent:  Y  N  
If Applicable  
VOA Zero Headspace:  Y  N  
Preservation Correct/Checked:  Y  N

Samples returned via:  
 UPS  FedEx  Courier

Tracking # **Southwest**

**RAD SCREEN: <0.5 mR/hr**

Relinquished by: (Signature)  
*Mark Hammer*  
Date: **10/10/19**  
Relinquished by: (Signature)  
*amy...*  
Date: **10/10/19**  
Relinquished by: (Signature)  
*Adel...*  
Date: \_\_\_\_\_

Date: **10/10/19**  
Time: **1410**  
Date: **10/10/19**  
Time: **1800**  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Received by: (Signature)  
*amy...*  
Received by: (Signature)  
*Sub...*  
Received for lab by: (Signature)  
*Adel...*

Trip Blank Received: Yes/No  
**0** HCL/MeOH  
TBR  
Temp: **12.2°C**  
Date: **2-2-19**  
Bottles Received: **3**  
Date: **10/11/19**  
Time: **8:30**

If preservation required by Login: Date/Time  
Hold:  
Condition:  
NCF /  OK



## UTC - Arcadis

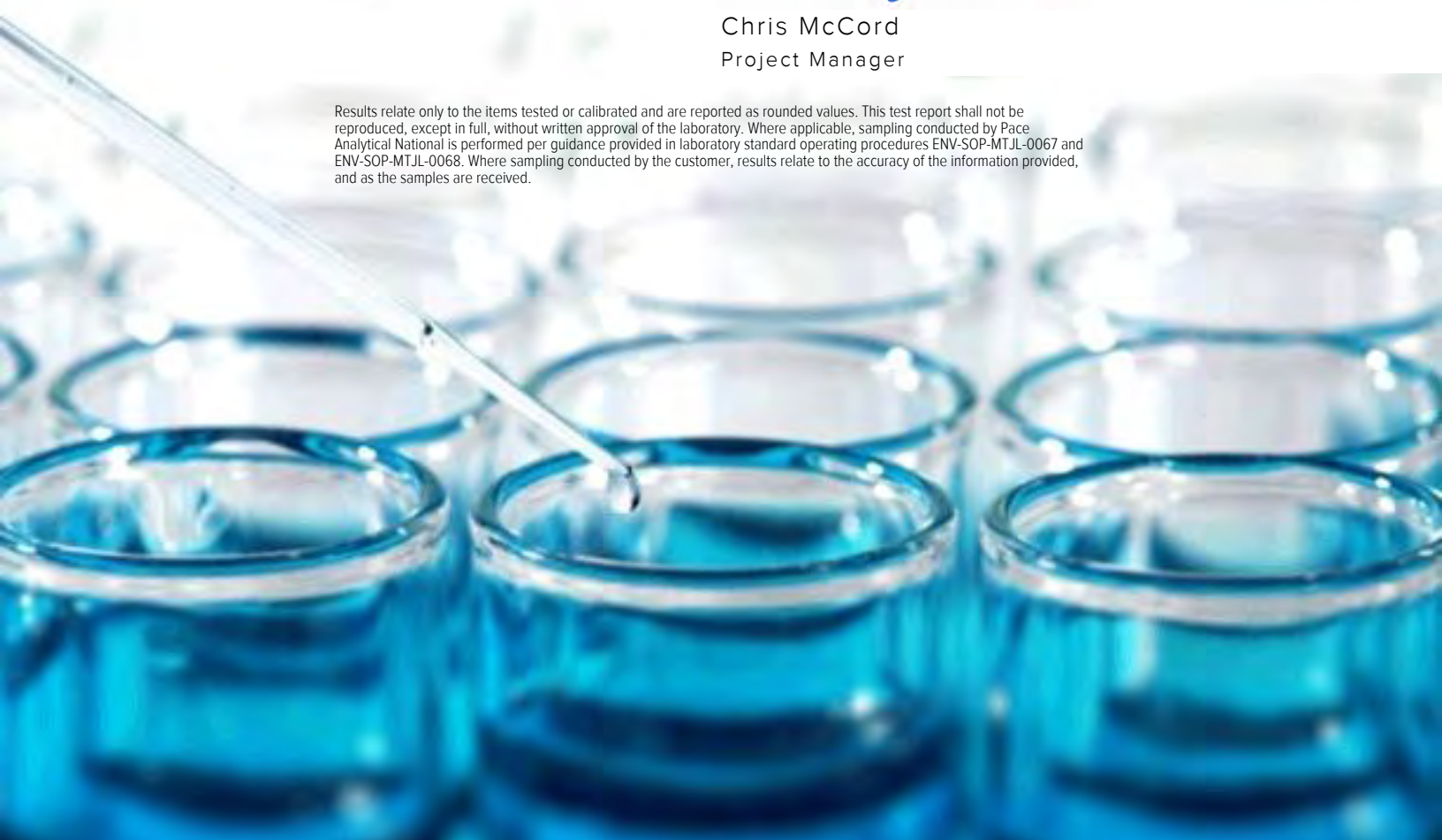
Sample Delivery Group: L1149256  
Samples Received: 10/11/2019  
Project Number: 30002531.0000  
Description: UPCO  
Site: UPCO  
Report To: Thomas Vespaec  
410 North 44th St.  
Suite 1000  
Phoenix, AZ 85008

Entire Report Reviewed By:



Chris McCord  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.





<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>5</sup>Sr</b>
<b>SP-701-101019 L1149256-01</b>	<b>5</b>	
<b>TRIP BLANK L1149256-02</b>	<b>6</b>	
<b>Qc: Quality Control Summary</b>	<b>7</b>	<b><sup>6</sup>Qc</b>
<b>Wet Chemistry by Method 314.0 Mod</b>	<b>7</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B</b>	<b>8</b>	
<b>Volatile Organic Compounds (GC/MS) by Method 8260B-SIM</b>	<b>9</b>	
<b>Gl: Glossary of Terms</b>	<b>10</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>11</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>12</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY

## SP-701-101019 L1149256-01 GW

Collected by: Mark Hammer  
 Collected date/time: 10/10/19 07:30  
 Received date/time: 10/11/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 314.0 Mod	WG1362528	1	10/14/19 21:36	10/14/19 21:36	LBR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1365981	1	10/19/19 21:14	10/19/19 21:14	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1363097	1	10/15/19 15:42	10/15/19 15:42	JHH	Mt. Juliet, TN

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

## TRIP BLANK L1149256-02 GW

Collected by: Mark Hammer  
 Collected date/time: 10/10/19 00:00  
 Received date/time: 10/11/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1365981	1	10/19/19 18:43	10/19/19 18:43	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B-SIM	WG1363097	1	10/15/19 12:06	10/15/19 12:06	JHH	Mt. Juliet, TN



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris McCord  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc





Wet Chemistry by Method 314.0 Mod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Perchlorate	ND		0.00400	1	10/14/2019 21:36	<a href="#">WG1362528</a>

1 Cp

2 Tc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	10/19/2019 21:14	<a href="#">WG1365981</a>
(S) Toluene-d8	107		80.0-120		10/19/2019 21:14	<a href="#">WG1365981</a>
(S) 4-Bromofluorobenzene	99.2		77.0-126		10/19/2019 21:14	<a href="#">WG1365981</a>
(S) 1,2-Dichloroethane-d4	88.3		70.0-130		10/19/2019 21:14	<a href="#">WG1365981</a>

3 Ss

4 Cn

5 Sr

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	10/15/2019 15:42	<a href="#">WG1363097</a>
(S) Toluene-d8	100		77.0-127		10/15/2019 15:42	<a href="#">WG1363097</a>

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,1-Dichloroethene	ND		0.00100	1	10/19/2019 18:43	<a href="#">WG1365981</a>
(S) Toluene-d8	106		80.0-120		10/19/2019 18:43	<a href="#">WG1365981</a>
(S) 4-Bromofluorobenzene	97.9		77.0-126		10/19/2019 18:43	<a href="#">WG1365981</a>
(S) 1,2-Dichloroethane-d4	94.8		70.0-130		10/19/2019 18:43	<a href="#">WG1365981</a>

1 Cp

2 Tc

3 Ss

4 Cn

Volatile Organic Compounds (GC/MS) by Method 8260B-SIM

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.00300	1	10/15/2019 12:06	<a href="#">WG1363097</a>
(S) Toluene-d8	101		77.0-127		10/15/2019 12:06	<a href="#">WG1363097</a>

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3461436-1 10/14/19 13:34

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Perchlorate	U		0.000300	0.00400

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

L1149254-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1149254-02 10/14/19 19:27 • (DUP) R3461436-3 10/14/19 21:04

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Perchlorate	ND	0.000	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3461436-2 10/14/19 14:39

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Perchlorate	0.0100	0.00962	96.2	90.0-110	

L1149256-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1149256-01 10/14/19 21:36 • (MS) R3461436-4 10/14/19 22:09 • (MSD) R3461436-5 10/14/19 22:41

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Perchlorate	0.0100	ND	0.00934	0.00944	93.4	94.4	1	80.0-120			1.09	15



Method Blank (MB)

(MB) R3462948-2 10/19/19 18:05

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1,1-Dichloroethene	U		0.000398	0.00100
(S) Toluene-d8	107			80.0-120
(S) 4-Bromofluorobenzene	100			77.0-126
(S) 1,2-Dichloroethane-d4	99.5			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3462948-1 10/19/19 16:30 • (LCSD) R3462948-3 10/20/19 01:01

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethene	0.0250	0.0267	0.0256	107	102	71.0-124			4.21	20
(S) Toluene-d8				105	105	80.0-120				
(S) 4-Bromofluorobenzene				101	101	77.0-126				
(S) 1,2-Dichloroethane-d4				106	101	70.0-130				

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Method Blank (MB)

(MB) R3461273-3 10/15/19 11:47

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
1,4-Dioxane	U		0.000597	0.00300
(S) Toluene-d8	100			77.0-127

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3461273-1 10/15/19 10:48 • (LCSD) R3461273-2 10/15/19 11:07

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
1,4-Dioxane	0.0500	0.0446	0.0466	89.2	93.2	55.0-138			4.39	24
(S) Toluene-d8				100	99.6	77.0-127				

5 Sr

6 Qc

L1149256-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1149256-01 10/15/19 15:42 • (MS) R3461273-4 10/15/19 16:01 • (MSD) R3461273-5 10/15/19 16:21

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
1,4-Dioxane	0.0500	ND	0.0528	0.0447	106	89.4	1	13.0-160			16.6	31
(S) Toluene-d8					100	99.5		77.0-127				

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

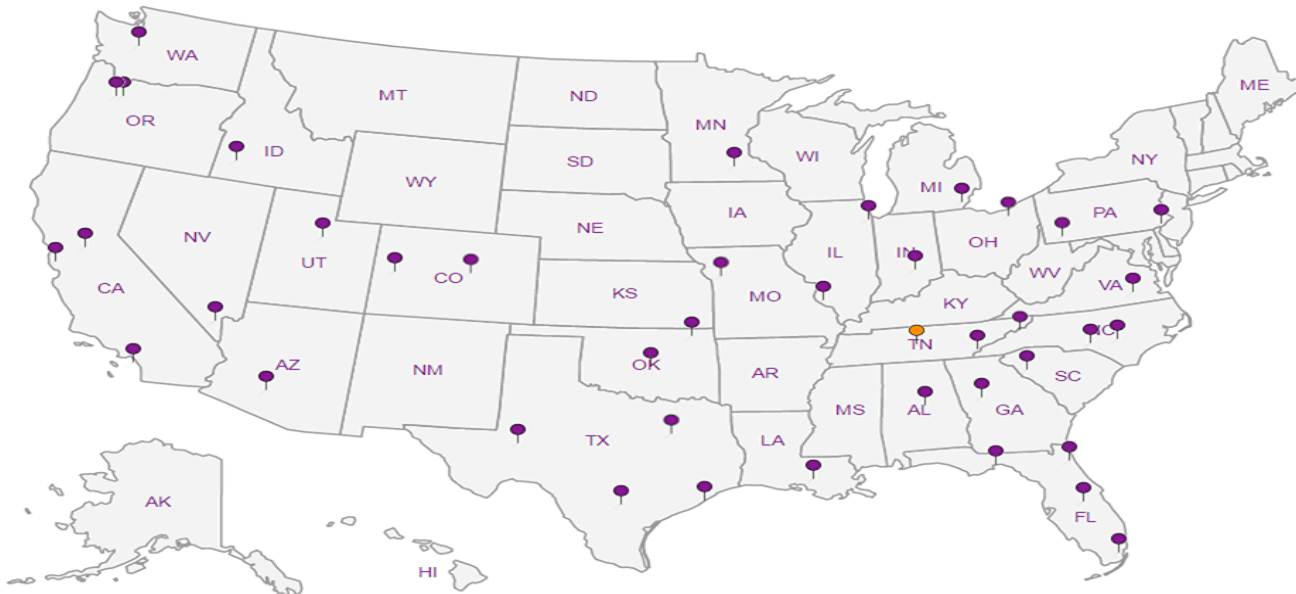
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

**UTC - Arcadis**

410 North 44th St.  
Suite 1000  
Phoenix AZ 85008

Report to:  
**Thomas Vespalec**

Billing Information:  
**Accounts Payable**  
630 Plaza Drive, Suite 600  
Highlands Ranch, CO 80129

Email To: [thomas.vespalec@arcadis.com](mailto:thomas.vespalec@arcadis.com)

Project  
Description: **UPCO**

City/State  
Collected: **AZ**

Phone: **480-535-7399**  
Fax:

Client Project #  
**03994018.0028**

Lab Project #  
**UTCARCA-UPCO11DCE**

Collected by (print):  
**MARK HAMMER**

Site/Facility ID #  
**UPCO**

P.O. #

Collected by (signature):  
*Mark Hammer*

Rush? (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Quote #

Immediately  
Packed on Ice N  Y

Date Results Needed  
**STA TAT**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Pres Chk	Analysis / Container / Preservative
SP-701-101019	G	GW	-	10/10/19	07:30	5		**NITRATE** 125mlHDPE-NoPres
TRIP BLANK	-	GW	-	10/10/19	-	1		1,1-DCE-8260B 40ml/Amb-HCl
		GW						1,4-Dioxane 8260B 40ml/Amb-HCl
		GW						Ammonia 250mlHDPE-H2SO4
		GW						Diss. Fe - LF 250mlHDPE-NoPres
		GW						Perchlorate 125mlHDPE-NoPres
		GW						RCRA8+Fe 250mlHDPE-HNO3
		GW						TOC 250ml/Amb-HCl
		GW						TSS 1L-HDPE NoPres
		GW						Total Phosphorous 250mlHDPE-H2SO4



12065 Lebanon Rd  
Mount Juliet, TN 37122  
Phone: 615-758-5858  
Phone: 800-767-5859  
Fax: 615-758-5859



L# **L1149256**  
**C230**

Acctnum: **UTCARCA**  
Template: **T152379**  
Prelogin: **P716981**  
TSR: **526 - Chris McCord**  
PB:

Shipped Via: **FedEX Saver**

Remarks	Sample # (lab only)
	-01
	02

\* Matrix:  
SS - Soil AIR - Air F - Filter  
GW - Groundwater B - Bioassay  
WW - WasteWater  
DW - Drinking Water  
OT - Other

Remarks: **\*\*NITRATE\*\* has a 48hr hold time.**

Samples returned via:  
 UPS  FedEx  Courier

Tracking # **Southwest**

pH \_\_\_\_\_ Temp \_\_\_\_\_  
Flow \_\_\_\_\_ Other \_\_\_\_\_

Sample Receipt Checklist

COC Seal Present/Intact:	NP	<input checked="" type="checkbox"/>	Y	<input type="checkbox"/>	N
COC Signed/Accurate:		<input checked="" type="checkbox"/>			N
Bottles arrive intact:		<input checked="" type="checkbox"/>			N
Correct bottles used:		<input checked="" type="checkbox"/>			N
Sufficient volume sent:		<input checked="" type="checkbox"/>			N
If Applicable					
VOA Zero Headspace:		<input checked="" type="checkbox"/>			N
Preservation Correct/Checked:		<input checked="" type="checkbox"/>			N

Relinquished by: (Signature) <i>Mark Hammer</i>	Date: 10/10/19	Time: 1410	Received by: (Signature) <i>amy...</i>	Trip Blank Received: Yes/No HCL/ MeOH TBR	Temp: <b>12.2°C</b>	Bottles Received: <b>5</b>	If preservation required by Login: Date/Time
Relinquished by: (Signature) <i>amy...</i>	Date: 10/10/19	Time: 1800	Received by: (Signature) <i>sw...</i>	Date: 10/11/19	Time: 8:45	Hold:	Condition: NCF / <input checked="" type="checkbox"/>

ESUB