4Q

2019

SVE Report

1920 W. Villa Maria, Ste. 205
Bryan, Texas 77807
970.516.8419
www.teamtimberwolf.com

January 31, 2020

Mr. Cory Smith, Environmental Specialist
New Mexico Oil Conservation Division – District 3
1000 Rio Brazos Road
Aztec, New Mexico 87410

Re: Status Report – 4th Quarter 2019
San Juan 28-7 Unit 183M
Rio Arriba County, New Mexico
OCD Incident No. NCS1901627746

Dear Mr. Smith:

On behalf of Hilcorp Energy Company (Hilcorp), Timberwolf Environmental, LLC (Timberwolf) presents this report to document remedial activities conducted during the fourth quarter of 2019 (4Q19) at the San Juan 28-7 Unit 183M (Site). Activities conducted during the 4Q19 consisted of the following:

- Construction and installation of a soil vapor extraction trailer
- Installation of a generator, SVE trailer, system startup, and operations
- Collection of an initial gas sample for laboratory analysis

Environmental Setting and Site Geology

The Site is situated on federal land managed by the Bureau of Land Management (BLM) in western Rio Arriba County, New Mexico (Figure 1). The area consists of sparse vegetative cover comprised primarily of scrub brush. Area terrain is comprised of plateaus divided by canyons. The primary canyon in the area is Carrizo Canyon, which drains to the northwest into the San Juan River, approximately 19 miles from the Site (Figures 2 and 3).

The Site is situated along the rimrock of an unnamed side canyon to Carrizo Canyon. Average elevation at the Site is approximately 6,523 feet (ft) above mean sea level. The closest surface water is a first order tributary of Carrizo Creek, situated 1,500 ft southeast of the Site and 330 ft lower in elevation.

According to the U.S. Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS), the Site soil consists of the Vessilla-Menefee-Orlie complex, 2 to 30 percent slopes. The surface horizon is comprised of a sandy loam, underlain by bedrock encountered between 15 to 19 inches below ground surface (bgs). Native salinity of the soil is nonsaline to very slightly saline (0.0 to 2.0 millimhos per centimeter (mmhos/cm)).

Site History

Corrosion near the base of the former oil tank resulted in the release of approximately 150 barrels (bbls) of oil and 7 bbls of produced water. All released fluid was contained by the berm. Standing fluid was recovered and the tank removed from service and disposed off-site. The initial investigation identified the area of the former tank battery as the primary area of concern (AOC).

Hilcorp constructed a new tank battery northeast of the original tank battery. Tanks and interconnective piping were removed from the original tank battery.

A soil investigation, conducted during March 2019, revealed the constituents of concern (COC) were: total BTEX (i.e., benzene, toluene, ethylbenzene, and xylene) and total petroleum hydrocarbons (TPH). Impacted soil was horizontally and vertically delineated; the vertical extent of impacted soil was approximately 27 ft bgs. Findings of the investigation are documented in Timberwolf's report entitled: *Site Characterization Report and Remedial Action Plan*, dated May 21, 2019.

SVE System Overview

To remediate impacted soil at the Site, Hilcorp installed and operates a soil vapor extraction (SVE) system. The SVE system is comprised 11 SVE wells, four vent wells, and a SVE trailer (Photo No. 1).

SVE Wells and Vents

SVE and vent wells at the Site include:

- 4 shallow SVE wells (i.e., SVE1 – SVE4)
- 7 deep SVE wells (i.e., SVE5 – SVE11)
- 4 deep SVE vents

Each vent or SVE wells was constructed of 2-inch polyvinyl chloride (PVC) screened and blank pipe. The four shallow SVE wells were completed in unconsolidated soil with screened intervals from 7 to 10 feet (ft) bgs. Seven deep SVE wells and four vents were completed within consolidated material with screened intervals from 15 ft to 25 ft bgs. Typical well construction diagrams for the shallow and deep SVE wells/vents are depicted in Figures 4 and 5, respectively.

Each well and vent were completed with silica sand pack in the each anulus to approximately 1 ft above the screened interval. A 3-ft bentonite seal was installed above the sand pack; each bentonite seal was hydrated with approximately 8 gallons of water. The remainder of the anulus was sealed with a cement-bentonite grout. SVE wells and vents were installed between 8/21/19 and 8/23/19.

SVE Trailer

The SVE trailer was constructed during October and November 2019 and is comprised of a regenerative blower, moisture separator and filter, sampling port, manifold with three legs, and 12 inlet ports comprised of 2-inch cam-lock fittings, gate valves, and vacuum gauges. Each leg accommodates four inlet ports and supports up to four SVE wells. SVE wells are connected to inlet ports with 2-inch PVC piping and vacuum hoses. System configuration is documented in Photo Nos. 2 – 5. The system is powered by an electrical generator which was installed at the Site from 12/13/20 through 12/17/19.

Each inlet port is equipped with a vacuum gauge capable of measuring the vacuum exerted on each SVE well and a gate valve to regulate vacuum and flow. Each leg is equipped with a flow meter and automated valve. The three legs converge into a 3-inch PVC trunk line to form the manifold. The trunk line is fitted with a sampling port and empties into a moisture separator. The moisture separator is equipped with a high-level shut-off and drain line to manage recovered water and condensate. Air exiting the moisture separator is filtered prior to entering a regenerative blower. Exhaust from the blower exits the trailer through a 2-inch steel pipe fitted with a rain cap.

The SVE trailer is equipped with a programmable automation panel to control valves for each manifold leg. The SVE system creates a treatment field of approximately 0.09 acres and treats soil to a depth of approximately 30 ft bgs for a total volume of approximately 4,365 cubic yards of soil. The SVE wells, presumed radius of influence of 16 ft, and leg configurations are shown in Figure 6.

SVE System Operations

The SVE system was fitted with three independent legs (i.e., Leg 1, Leg 2, and Leg 3). Legs 1 and 3 provide vacuum to the deep SVE wells; Leg 2 is piped to the shallow wells. The initial system startup was completed on 12/18/19. Upon startup, the automation valve for Leg 2 was non-responsive to electrical inputs; therefore, operation of Leg 2 (i.e., shallow wells) was temporarily abandoned until diagnostics and repairs could be made.

The automation panel was programmed to oscillate between Legs 1 and 3 every six hours for continuous 24-hr operations. Programmed runtimes are presented in Table 1 below.

Table 1. Programmed Runtimes and Leg Configurations

Leg	SVE Wells and Location	Scheduled Runtime
Leg 1	Deep Wells SVE6, SVE7, and SVE8 Eastern side of treatment zone	6 hours
Leg 3	Deep Wells SVE5, SVE9, SVE10, and SVE11 Central and Western side of treatment zone	6 hours
Leg 1	Deep Wells SVE6, SVE7, and SVE8 Eastern side of treatment zone	6 hours
Leg 3	Deep Wells SVE6, SVE7, and SVE8 Eastern side of treatment zone	6 hours

SVE – soil vapor extraction well

Water and condensate collected from the moisture separator is drained through a 1-inch PVC pipe and transferred to an open-top tank fitted with bird netting as shown in Photo No. 6. No water or condensate was recovered during the fourth quarter of 2019.

Runtime, flow rates, and percentage of runtime for 4Q19 are documented in Table 2 below. Note: runtimes were measured from generator hour meter beginning at system startup.

Table 2. System Runtime and Flow Rates – 4Q19

Measurement	Leg 1	Leg 2	Leg 3	Total
Runtime (hours)	161.25	1.75	161	324
Runtime (min)	9,675	105	9,660	9,823
CFM	10	10	25	--
Runtime Percentage	49.2%	0.5%	49.7%	99.4%

min – minutes CFM – cubic feet per minute

Collection and Analysis of Initial Gas Sample

After the SVE system setup was completed, and vacuum and flowrates documented, gas samples were collected from each leg using dedicated summa canisters. Each summa canister was prepared by the laboratory and received with a vacuum of at least 22 inches of mercury (e.g., 299 inches of water) and was equipped with a gauge to monitor canister vacuum.

The summa canister was connected to the sampling port after the leg had ran for a minimum of 30 minutes. The valve at the sampling port was opened to purge air within the tubing between the sampling port and summa canister. After purging, the summa canister valve was opened, and the vacuum gauge was monitored until vacuum in the canister became static. Each sample stabilized within 11 minutes. Upon stabilization, canister and sample port valves were closed prior to disconnection. This sample methodology was repeated for Legs 2 and 3.

Gas samples were shipped to Pace National in Mt. Juliet, Tennessee for chemical analysis of volatile organic compounds (VOCs) using EPA Method TO 15. Samples were shipped under proper chain-of-custody protocol. Laboratory report and chain-of-custody documents are attached. Constituents which exceeded laboratory detection limits are presented in Table 3; all constituent results are documented in the attached Table A-1.

Table 3. Initial Gas Analysis – 12/18/19

Volatile Organic Carbons (mg/m^3)	Leg 1	Leg 2 (Shallow Wells)	Leg 3
Acetone	46.3	55.6	7.46
Benzene	2,390	968	1,500
Cyclohexane	11,200	5,130	6,720
Ethanol	22.2	27.2	1.57
Ethylbenzene	78.0	95.8	65.5
4-Ethyltoluene	10.3	31.7	7.26
Heptane	6,130	2,530	3,180
N-Hexane	18,100	5,780	7,830
Iso-propylbenzene	5.16	12.5	3.95
2-Propanol	1,060	1,920	91.4
Tetrachloroethene	14.3	32.2	1.20
Toluene	3,920	2,780	2,720
1,2,4-Trimethylbenzene	4.46	14.3	2.74
1,3,5-Trimethylbenzene	5.99	19.8	3.83
Total Xylenes	650.5	1,101	503
TPH (GC/MS) Low Fraction	141,000	61,100	78,500

mg/m^3 – milligrams per cubic meter

Mass Removal

Timberwolf used the initial gas analysis, flow rates, and runtimes to calculate constituent mass removal. Since initial samples were collected on day 1 immediately following startup, a 50 percent correction factor was applied to laboratory concentrations with the assumption that the initial gas sample would bias the sample concentration high.

Mass removal of GRO and BTEX and associated recovered volume are presented in Table 4 below.

Table 4. Mass Removal and Associated Volume

Constituent	Mass Removal by Leg (kg)[1]			Total Mass Removed[2] (lbs)	Recovered Volume[3] (bbl)
	Leg 1	Leg 2	Leg 3		
GRO	193.2	0.91	268.4	1,017	3.77
Benzene	3.27	0.01	5.13	18.5	NC
Toluene	5.37	0.04	9.30	32.4	NC
Ethylbenzene	0.11	0.00	0.22	0.73	NC
Xylenes	0.89	0.02	1.94	6.27	NC

[1]Calculation = minutes ran * CFM * Concentration (mg/m^3) * 1 M3/35.3147 ft^3 * 50% Correction Factor * 1g/1000 mg * 1 kg/1000 g
[2]Calculation = [Leg 1 + Leg 2 + Leg 3] * 2.2 lbs/kg
[3]Calculation = lbs / 6.42 lb/gal / 42 gal/bbl
GRO = from TPH (GC/MS) Low Fraction
GRO – gasoline range organics
Assumptions: API Gravity = 52
kg – kilograms
lbs – pounds
bbl -barrel
NC – not calculated

Further Actions – First Quarter 2020

During 1Q20, Timberwolf plans to conduct the following activities at the Site:

- Diagnose and repair the automated valve for Leg 2 and place the Leg into service
- Install an hour meter which tracks runtime of the regenerative pump
- Install heat tape and insulation on the moisture separator to prevent icing
- Collect a gas sample for analysis of full EPA method 8260 constituent list plus carbon dioxide and oxygen
- Conduct regular Site inspections to include monitoring vents for vacuum to better determine the radius of influence exerted by the vacuum

If you have any questions regarding this report or need further assistance, please call us at 979-324-2139.

Sincerely,
Timberwolf Environmental, LLC

Preston Kocian
Senior Project Manager

Jim Foster
President

Attachments: Figures
Attached Table
Photographic Log
Laboratory Report and Chain-of-Custody Documents

Cc: Clara Cardoza, Hilcorp Energy Company

Figures

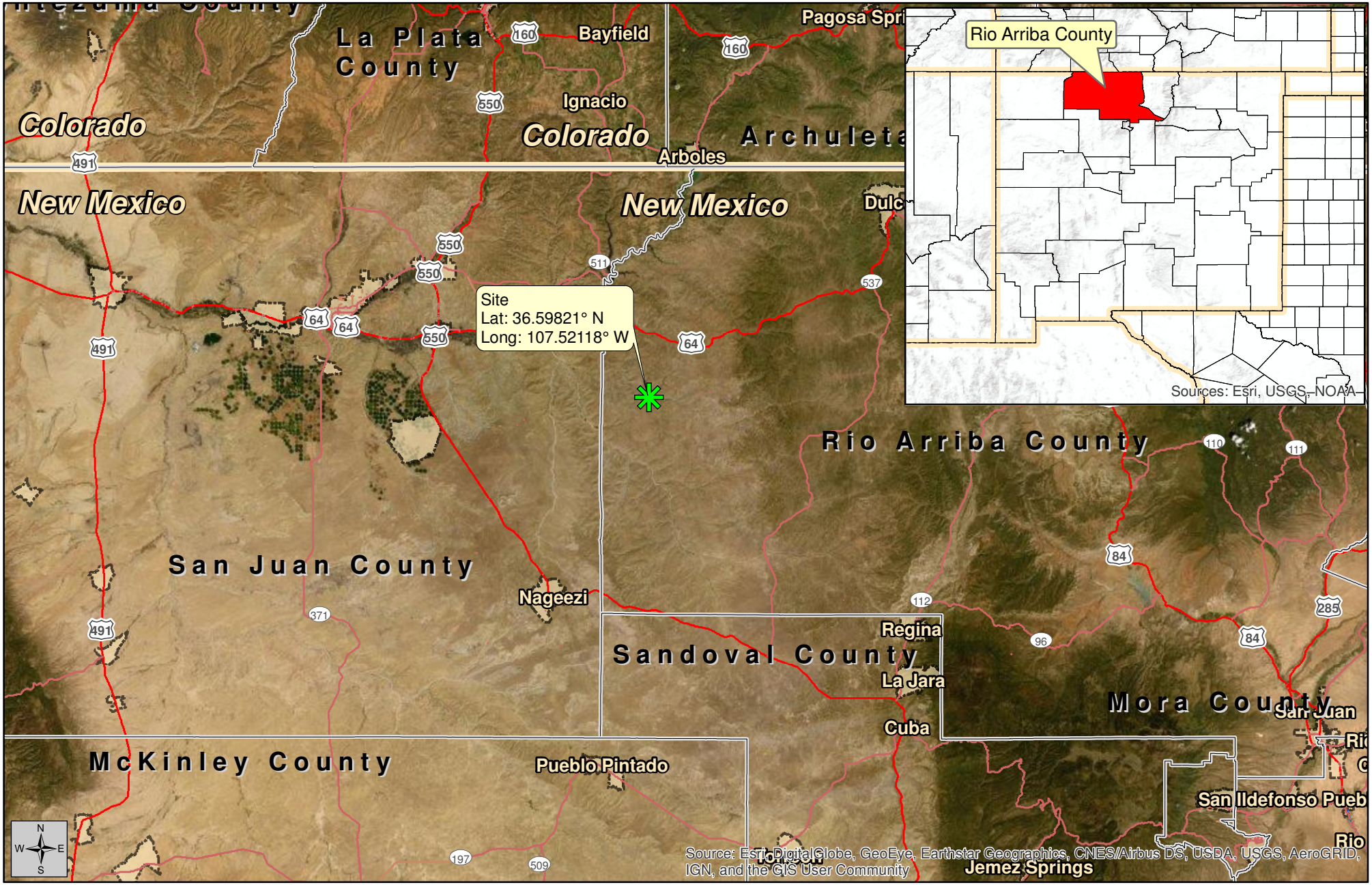


Figure 1 **Site Location Map**	**Status Report - 4th Quarter 2019**	**April 12, 2019**
TIMBERWOLF ENVIRONMENTAL	1:1,250,000 0 20 40 60 80 100 120 Miles **San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)** **Hilcorp Energy Company** **Rio Arriba County, New Mexico**	* Site
Created By: Russell Greer TE Project No.: HEC-190007	Datum: NAD83 Imagery Source: ESRI Vector Source: ESRI and TE	

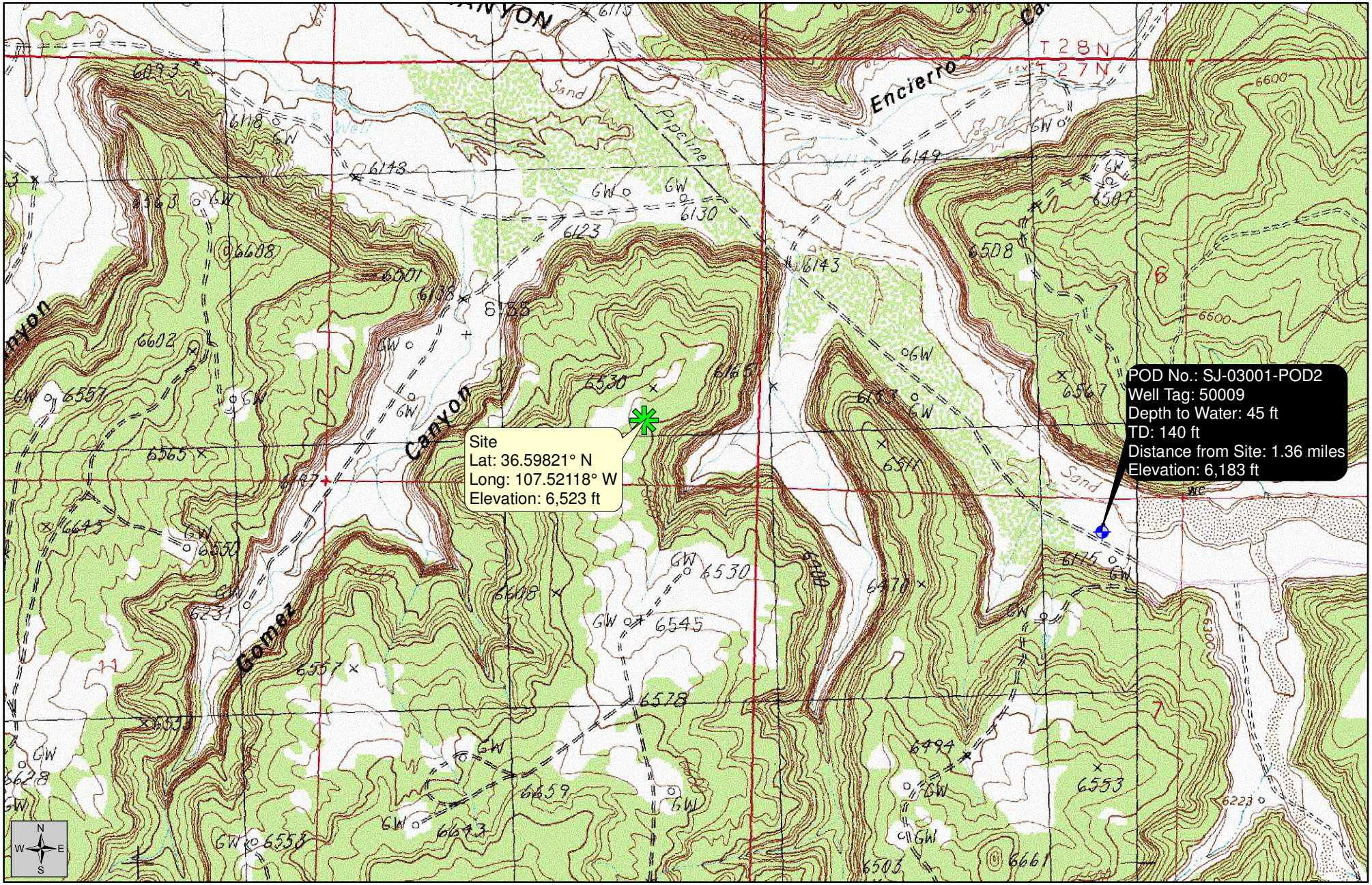


Figure 2
Topographic Map

Status Report - 4th Quarter 2019

April 12, 2019

1:24,000

0 0.5 1 1.5 2 2.5 Miles

San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

Created By:
Russell Greer
TE Project No.: HEC-190007

Datum: NAD83
Imagery Source: USGS
Quads: Gould Pass and Santos Peak
Vector Source: TE

Site
Water Well

TIMBERWOLF ENVIRONMENTAL

Figure 3
Aerial Map

Status Report - 4th Quarter 2019

April 12, 2019

1:10,000

0 0.25 0.5 0.75 1 Miles

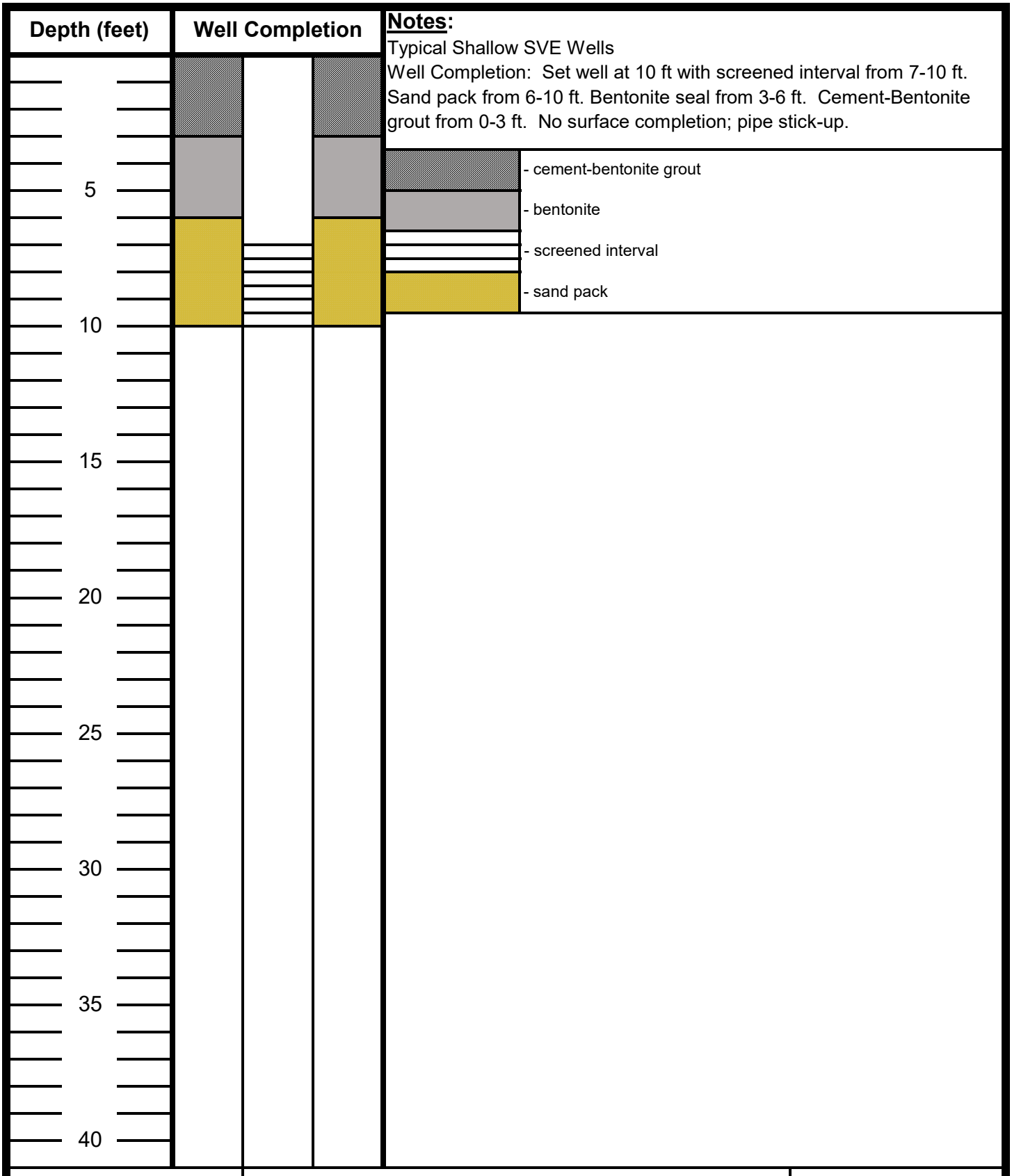
TIMBERWOLF ENVIRONMENTAL

San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

Created By:
Russell Greer
TE Project No.: HEC-190007

Datum: NAD83
Imagery Source: ESRI
Vector Source: TE

Site



Notes:

Typical Shallow SVE Wells

Well Completion: Set well at 10 ft with screened interval from 7-10 ft. Sand pack from 6-10 ft. Bentonite seal from 3-6 ft. Cement-Bentonite grout from 0-3 ft. No surface completion; pipe stick-up.

- cement-bentonite grout
- bentonite
- screened interval
- sand pack

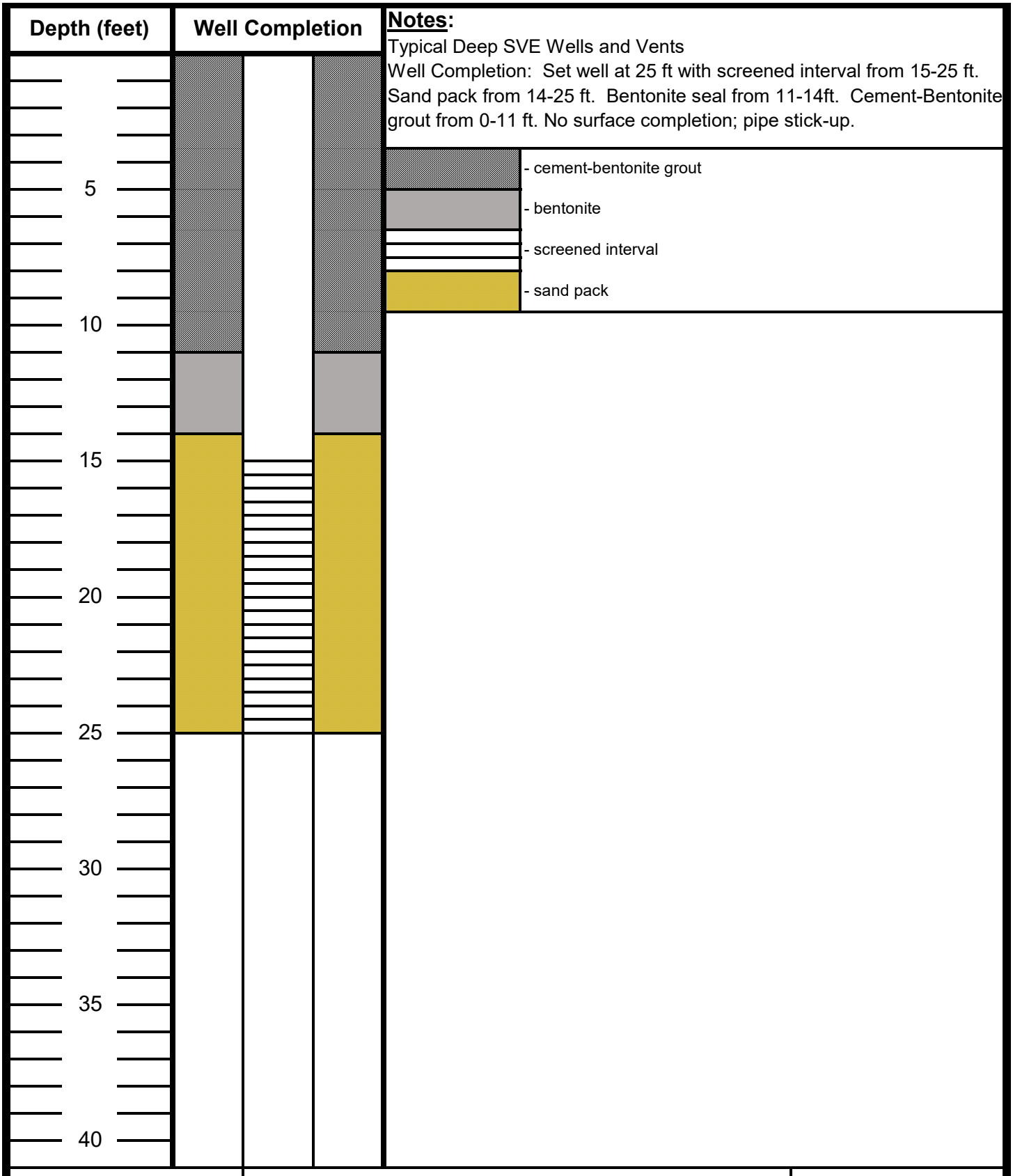
Figure 4
SVE Well Construction Diagram

TIMBERWOLF ENVIRONMENTAL

Status Report - 4th Quarter 2019
San Juan 28-7 Unit 183M
(OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

Date: 01/31/20

Drilling Method: Hollow Stem Auger



Notes:

Typical Deep SVE Wells and Vents

Well Completion: Set well at 25 ft with screened interval from 15-25 ft. Sand pack from 14-25 ft. Bentonite seal from 11-14ft. Cement-Bentonite grout from 0-11 ft. No surface completion; pipe stick-up.

- cement-bentonite grout
- bentonite
- screened interval
- sand pack

Figure 5
SVE Well Construction Diagram

TIMBERWOLF ENVIRONMENTAL

Status Report - 4th Quarter 2019
San Juan 28-7 Unit 183M
(OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

Date: 01/31/20

Drilling Method: Hollow Stem Auger

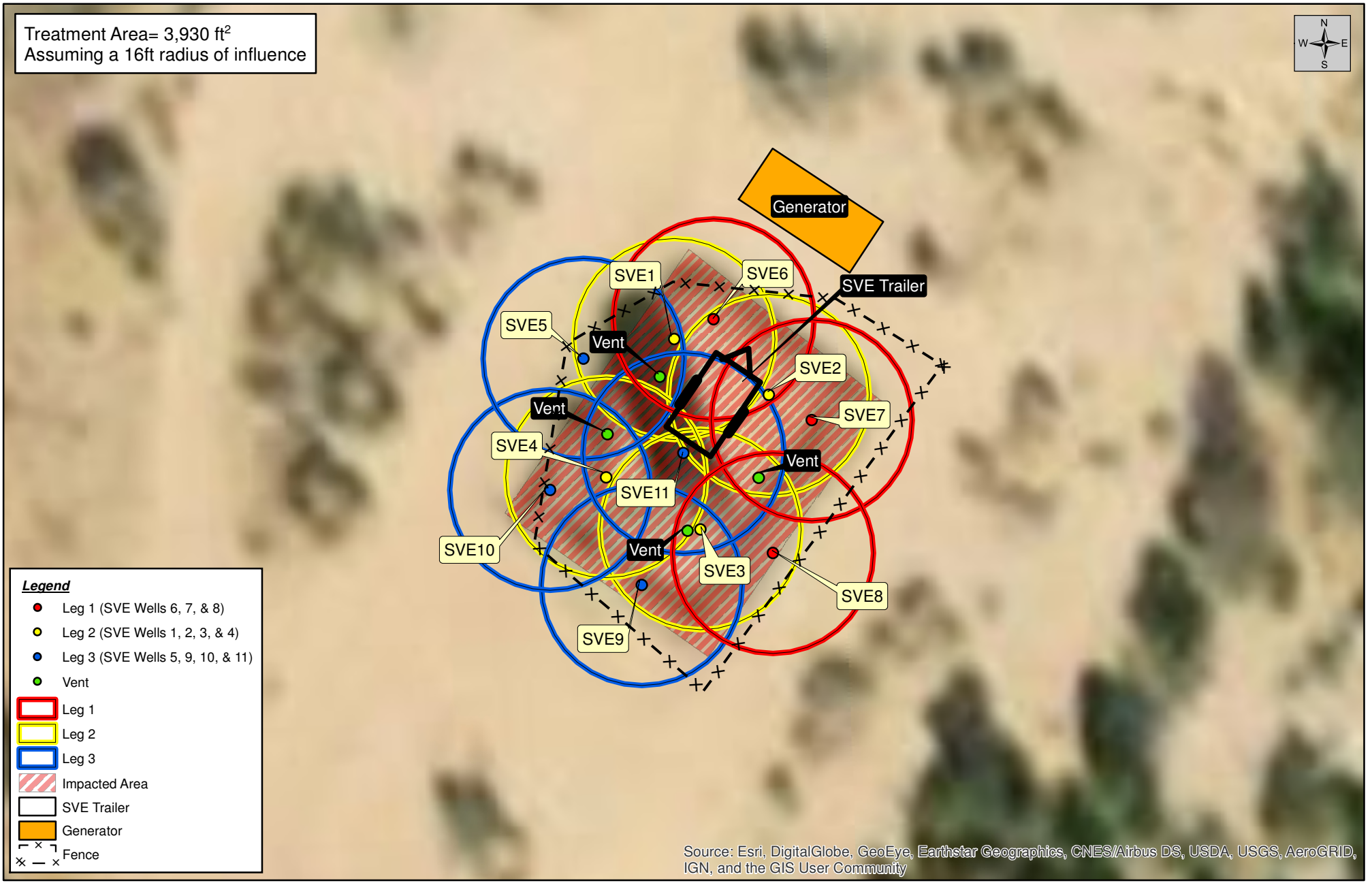


Figure 6
SVE Overview

Status Report - 4th Quarter 2019

January 31, 2020

1:250

0 40 80 120 Feet

San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

TIMBERWOLF ENVIRONMENTAL

Created By:
Kevin Cole
TE Project No.: HEC-190007

Datum: NAD83
Imagery Source: ESRI
Vector Source: TE

Attached Table

Table A-1. Gas Analytical Results
Status Report - 4th Quarter 2019
San Juan 28-7 Unit 183 M
Rio Arriba County, New Mexico

Volatiles (mg/m^3)	Leg 1	Leg 2 (Shallow Wells)	Leg 3
Acetone	46.3	55.6	7.46
Allyl Chloride	<2.50	<5.01	<0.501
Benzene	2,390	968	1,500
Benzyl Chloride	<4.16	<8.31	<0.831
Bromodichlormethane	<5.37	<10.7	<1.07
Bromoform	<24.8	<49.7	<4.97
Bromomethane	<3.11	<6.21	<0.621
1,3-Butadiene	<17.7	<35.4	<3.54
Carbon Disulfide	<2.49	<4.98	<0.498
Carbon Tetrachloride	<5.04	<10.1	<1.01
Chlorobenzene	<3.70	<7.39	<0.739
Chloroethane	<2.11	<4.22	<0.422
Chloroform	<3.89	<7.79	<0.779
Chloromethane	<1.65	<3.30	<0.330
2- Chlorotoluene	<4.12	<8.25	<0.825
Cyclohexane	11,200	5,130	6,720
Chlorodibromomethane	<6.81	<13.6	<1.36
1,2-Dibromoethane	<6.15	<12.3	<1.23
1,2-Dichlorobenzene	<4.81	<9.62	<0.962
1,3-Dichlorobenzene	<4.81	<9.62	<0.962
1,4-Dichlorobenzene	<4.81	<9.62	<0.962
1,2-Dichloroethane	<3.24	<6.48	<0.648
1,1-Dichloroethane	<3.21	<6.41	<0.641
1,1-Dichloroethane	<3.17	<6.34	<0.634
Cis-1,2-Dichloroethane	<3.17	<6.34	<0.634
Trans-1,2-Dichloroethane	<3.17	<6.34	<0.634
1,2-Dichloropropane	<3.70	<7.39	<0.739
Cis-1,3-Dichloropropane	<3.63	<7.26	<0.726
Trans-1,3-Dichloropropane	<3.63	<7.26	<0.726
1,4-Dioxane	<2.88	<5.77	<0.577
Ethanol	22.2	27.2	1.57
Ethylbenzene	78	95.8	65.5
4-Ethyltoluene	10.3	31.7	7.26
Trichlorofluoromethane	<4.50	<8.99	<0.899
Dichlorodifluoromethane	<3.96	<7.91	<0.791
1,1,2-Trichlorotrifluoroethane	<6.13	<12.3	<1.23
1,2-Dichlorotetrefluoroethane	<5.60	<11.2	<1.12
Heptane	6,130	2,530	3,180
Hexachloro-1,3-Butadiene	<26.9	<53.8	<5.38

Table A-1. Gas Analytical Results
Status Report - 4th Quarter 2019
San Juan 28-7 Unit 183 M
Rio Arriba County, New Mexico

Volatiles (mg/m^3)	Leg 1	Leg 2 (Shallow Wells)	Leg 3
N-Hexane	18,100	5,780	7,830
Isopropylbenzene	5.16	12.5	3.95
Methylene Chloride	<2.78	<5.56	<0.556
Methyl Butyl Ketone	<20.4	<40.9	<4.09
2-Butanone (MEK)	<14.7	<29.5	<2.95
4-Methyl-2-Pentanone (MIBK)	<20.5	<40.9	<4.09
Methyl Methacrylate	<3.28	<6.55	<0.655
Methyl Tert-butyl Ether	<2.88	<5.77	<0.577
Naphthalene	<13.2	<26.4	<2.64
2-Propanol	1,060	1,920	91.4
Propene	<2.76	<5.51	<0.551
Styrene	<3.40	<6.81	<0.681
1,1,2,2-Tetrachloroethane	<5.50	<11.0	<1.10
Tetrachloroethene	14.3	32.2	1.2
Tetrahydrofuran	<2.36	<4.72	<0.472
Toluene	3,920	2,780	2,720
1,2,4-Trichlorobenzene	<18.7	<37.3	<3.73
1,1,1-Trichloroethane	<4.35	<8.70	<0.870
1,1,2-Trichloroethane	<4.35	<8.70	<0.870
Trichloroethane	<4.29	<8.57	<0.857
1,2,4-Trimethylbenzene	4.46	14.3	2.74
1,3,5-Trimethylbenzene	5.99	19.8	3.83
2,2,4-Trimethylpentane	<3.74	<7.47	<0.747
Vinyl Chloride	<2.04	<4.09	<0.409
Vinyl Bromide	<3.50	<7.00	<0.700
Vinyl Acetate	<2.82	<5.63	<0.563
Total Xylenes	650.5	1,101	503
TPH (GC/MS) low fraction	141,000	61,100	78,500

mg/m^3 - milligrams per cubic meter

Photographic Log

691 CR 233, Suit B-4
Durango, CO 81301
(970) 516-8419
www.teamtimberwolf.com

PHOTOGRAPHIC LOG

Project No.:	HEC-190007	**Client:**	Hilcorp Energy Company
Project Name:	San Juan 28-7 Unit 183M	**Site Location:**	Rio Arriba County, New Mexico
Task Description:	Status Report – 4th Quarter 2019	**Date:**	October-December, 2019

Photo No.:
1

Direction:
South

Comments:
View of SVE trailer and wells.

Note: Locations of vents and shallow wells.

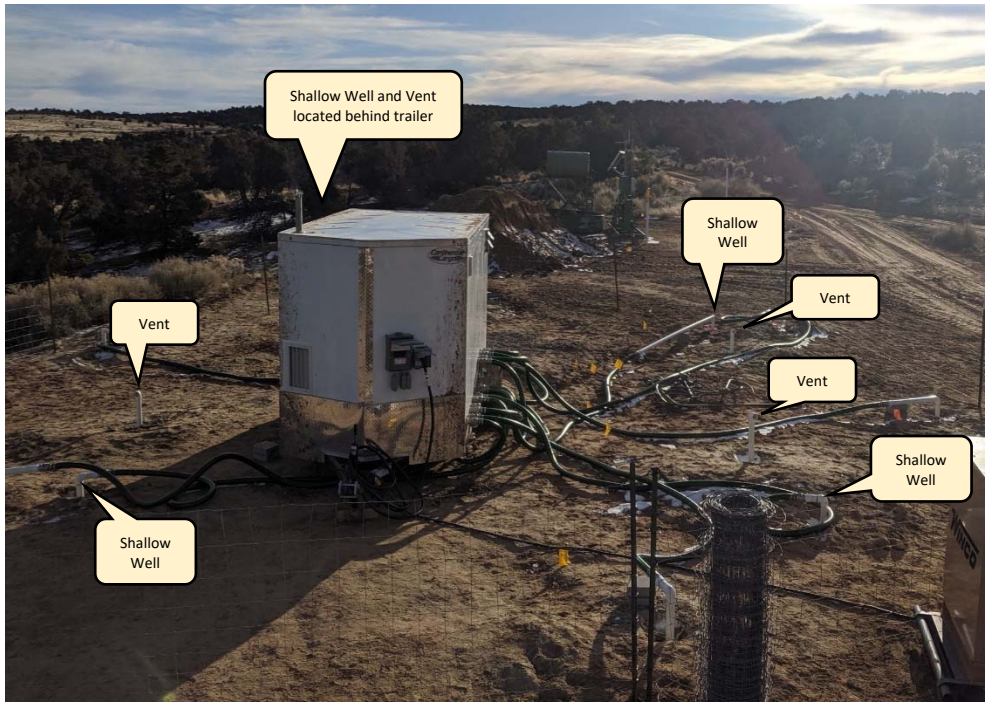


Photo No.:
2

Direction:
N/A

Comments:
View of all 3 manifolds.

Note:
Bottom to top: vacuum gauge, gate valve, flow meter, automated valve which terminates into 3-inch PVC trunk line.

691 CR 233, Suit B-4
Durango, CO 81301
(970) 516-8419
www.teamtimberwolf.com

PHOTOGRAPHIC LOG

Project No.:	HEC-190007	**Client:**	Hilcorp Energy Company
Project Name:	San Juan 28-7 Unit 183M	**Site Location:**	Rio Arriba County, New Mexico
Task Description:	Status Report – 4th Quarter 2019	**Date:**	October-December, 2019

Photo No.: 3

Direction: N/A

Comments: View of moisture separator, filter, and regenerative pump.

.

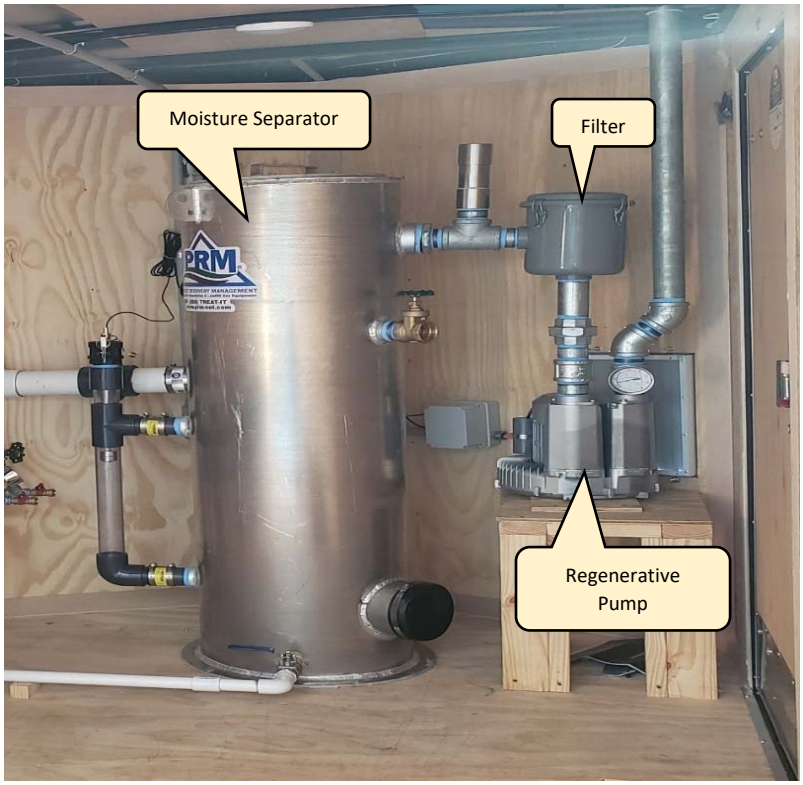


Photo No.: 4

Direction: N/A

Comments: View of trunk line, moisture separator, and gas sample port.

691 CR 233, Suit B-4
Durango, CO 81301
(970) 516-8419
www.teamtimberwolf.com

PHOTOGRAPHIC LOG

Project No.:	HEC-190007	**Client:**	Hilcorp Energy Company
Project Name:	San Juan 28-7 Unit 183M	**Site Location:**	Rio Arriba County, New Mexico
Task Description:	Status Report – 4th Quarter 2019	**Date:**	October-December, 2019

Photo No.:
5

Direction:
N/A

Comments:
View of moisture separator high level shut-off and drain.

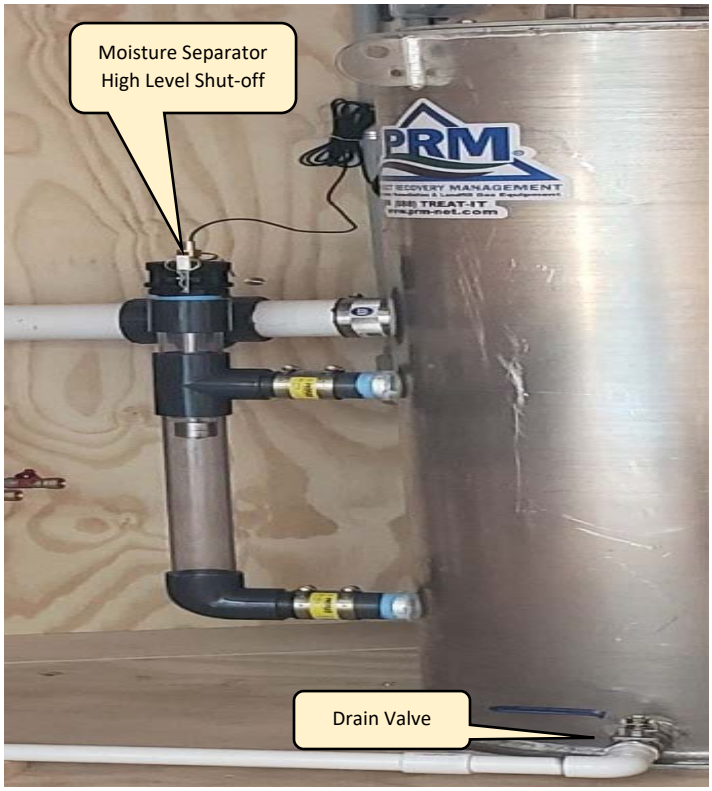


Photo No.:
6

Direction:
N/A

Comments:
View of open-top water/condensate storage tank fitted with bird netting.

Laboratory Report and Chain-of-Custody Documents

Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

February 03, 2020

Timberwolf Environmental, LLC

Sample Delivery Group:	L1172940
Samples Received:	12/20/2019
Project Number:	190007
Description:	HEC-190007

Report To: Jim Foster
1920 W Villa Maria, Ste 205
Bryan, TX 77807

Entire Report Reviewed By:

Olivia Studebaker
Project Manager

TABLE OF CONTENTS

LEG 2 (SHALLOW WELL) L1172940-01 Air

Collected by: Michael Morse
Collected date/time: 12/18/19 16:15
Received date/time: 12/20/19 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (MS) by Method TO-15	WG1402728	8000	12/27/19 01:41	12/27/19 01:41	MBF	Mt. Juliet, TN
Volatile Organic Compounds (MS) by Method TO-15	WG1403246	40000	12/27/19 22:03	12/27/19 22:03	CAW	Mt. Juliet, TN

LEG 1 L1172940-02 Air

Collected by: Michael Morse
Collected date/time: 12/18/19 16:30
Received date/time: 12/20/19 09:30

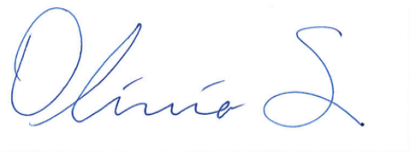
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (MS) by Method TO-15	WG1402728	4000	12/27/19 02:17	12/27/19 02:17	MBF	Mt. Juliet, TN
Volatile Organic Compounds (MS) by Method TO-15	WG1403246	100000	12/27/19 22:48	12/27/19 22:48	CAW	Mt. Juliet, TN

LEG 3 L1172940-03 Air

Collected by: Michael Morse
Collected date/time: 12/18/19 16:45
Received date/time: 12/20/19 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (MS) by Method TO-15	WG1402728	800	12/27/19 02:53	12/27/19 02:53	MBF	Mt. Juliet, TN
Volatile Organic Compounds (MS) by Method TO-15	WG1403246	40000	12/27/19 23:35	12/27/19 23:35	CAW	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.



Olivia Studebaker
Project Manager

Report Revision History

Version 1: 12/30/19 17:20

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	10000	23800	23400	55600		8000	WG1402728
Allyl chloride	107-05-1	76.53	1600	5010	ND	ND		8000	WG1402728
Benzene	71-43-2	78.10	1600	5110	303000	968000		8000	WG1402728
Benzyl Chloride	100-44-7	127	1600	8310	ND	ND		8000	WG1402728
Bromodichloromethane	75-27-4	164	1600	10700	ND	ND		8000	WG1402728
Bromoform	75-25-2	253	4800	49700	ND	ND		8000	WG1402728
Bromomethane	74-83-9	94.90	1600	6210	ND	ND		8000	WG1402728
1,3-Butadiene	106-99-0	54.10	16000	35400	ND	ND		8000	WG1402728
Carbon disulfide	75-15-0	76.10	1600	4980	ND	ND		8000	WG1402728
Carbon tetrachloride	56-23-5	154	1600	10100	ND	ND		8000	WG1402728
Chlorobenzene	108-90-7	113	1600	7390	ND	ND		8000	WG1402728
Chloroethane	75-00-3	64.50	1600	4220	ND	ND		8000	WG1402728
Chloroform	67-66-3	119	1600	7790	ND	ND		8000	WG1402728
Chloromethane	74-87-3	50.50	1600	3300	ND	ND		8000	WG1402728
2-Chlorotoluene	95-49-8	126	1600	8250	ND	ND		8000	WG1402728
Cyclohexane	110-82-7	84.20	8000	27600	1490000	5130000		40000	WG1403246
Dibromochloromethane	124-48-1	208	1600	13600	ND	ND		8000	WG1402728
1,2-Dibromoethane	106-93-4	188	1600	12300	ND	ND		8000	WG1402728
1,2-Dichlorobenzene	95-50-1	147	1600	9620	ND	ND		8000	WG1402728
1,3-Dichlorobenzene	541-73-1	147	1600	9620	ND	ND		8000	WG1402728
1,4-Dichlorobenzene	106-46-7	147	1600	9620	ND	ND		8000	WG1402728
1,2-Dichloroethane	107-06-2	99	1600	6480	ND	ND		8000	WG1402728
1,1-Dichloroethane	75-34-3	98	1600	6410	ND	ND		8000	WG1402728
1,1-Dichloroethene	75-35-4	96.90	1600	6340	ND	ND		8000	WG1402728
cis-1,2-Dichloroethene	156-59-2	96.90	1600	6340	ND	ND		8000	WG1402728
trans-1,2-Dichloroethene	156-60-5	96.90	1600	6340	ND	ND		8000	WG1402728
1,2-Dichloropropane	78-87-5	113	1600	7390	ND	ND		8000	WG1402728
cis-1,3-Dichloropropene	10061-01-5	111	1600	7260	ND	ND		8000	WG1402728
trans-1,3-Dichloropropene	10061-02-6	111	1600	7260	ND	ND		8000	WG1402728
1,4-Dioxane	123-91-1	88.10	1600	5770	ND	ND		8000	WG1402728
Ethanol	64-17-5	46.10	5040	9500	14400	27200		8000	WG1402728
Ethylbenzene	100-41-4	106	1600	6940	22100	95800		8000	WG1402728
4-Ethyltoluene	622-96-8	120	1600	7850	6460	31700		8000	WG1402728
Trichlorofluoromethane	75-69-4	137.40	1600	8990	ND	ND		8000	WG1402728
Dichlorodifluoromethane	75-71-8	120.92	1600	7910	ND	ND		8000	WG1402728
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	1600	12300	ND	ND		8000	WG1402728
1,2-Dichlorotetrafluoroethane	76-14-2	171	1600	11200	ND	ND		8000	WG1402728
Heptane	142-82-5	100	8000	32700	618000	2530000		40000	WG1403246
Hexachloro-1,3-butadiene	87-68-3	261	5040	53800	ND	ND		8000	WG1402728
n-Hexane	110-54-3	86.20	8000	28200	1640000	5780000		40000	WG1403246
Isopropylbenzene	98-82-8	120.20	1600	7870	2550	12500		8000	WG1402728
Methylene Chloride	75-09-2	84.90	1600	5560	ND	ND		8000	WG1402728
Methyl Butyl Ketone	591-78-6	100	10000	40900	ND	ND		8000	WG1402728
2-Butanone (MEK)	78-93-3	72.10	10000	29500	ND	ND		8000	WG1402728
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	10000	40900	ND	ND		8000	WG1402728
Methyl methacrylate	80-62-6	100.12	1600	6550	ND	ND		8000	WG1402728
MTBE	1634-04-4	88.10	1600	5770	ND	ND		8000	WG1402728
Naphthalene	91-20-3	128	5040	26400	ND	ND		8000	WG1402728
2-Propanol	67-63-0	60.10	10000	24600	780000	1920000		8000	WG1402728
Propene	115-07-1	42.10	3200	5510	ND	ND		8000	WG1402728
Styrene	100-42-5	104	1600	6810	ND	ND		8000	WG1402728
1,1,2,2-Tetrachloroethane	79-34-5	168	1600	11000	ND	ND		8000	WG1402728
Tetrachloroethylene	127-18-4	166	1600	10900	4750	32200		8000	WG1402728
Tetrahydrofuran	109-99-9	72.10	1600	4720	ND	ND		8000	WG1402728
Toluene	108-88-3	92.10	1600	6030	737000	2780000		8000	WG1402728
1,2,4-Trichlorobenzene	120-82-1	181	5040	37300	ND	ND		8000	WG1402728

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	1600	8700	ND	ND		8000	WG1402728
1,1,2-Trichloroethane	79-00-5	133	1600	8700	ND	ND		8000	WG1402728
Trichloroethylene	79-01-6	131	1600	8570	ND	ND		8000	WG1402728
1,2,4-Trimethylbenzene	95-63-6	120	1600	7850	2910	14300		8000	WG1402728
1,3,5-Trimethylbenzene	108-67-8	120	1600	7850	4040	19800		8000	WG1402728
2,2,4-Trimethylpentane	540-84-1	114.22	1600	7470	ND	ND		8000	WG1402728
Vinyl chloride	75-01-4	62.50	1600	4090	ND	ND		8000	WG1402728
Vinyl Bromide	593-60-2	106.95	1600	7000	ND	ND		8000	WG1402728
Vinyl acetate	108-05-4	86.10	1600	5630	ND	ND		8000	WG1402728
m&p-Xylene	1330-20-7	106	3200	13900	216000	936000		8000	WG1402728
o-Xylene	95-47-6	106	1600	6940	38000	165000		8000	WG1402728
TPH (GC/MS) Low Fraction	8006-61-9	101	1600000	6610000	14800000	61100000		8000	WG1402728
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*105*				WG1402728
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*95.0*				WG1403246

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	5000	11900	19500	46300		4000	WG1402728
Allyl chloride	107-05-1	76.53	800	2500	ND	ND		4000	WG1402728
Benzene	71-43-2	78.10	20000	63900	747000	2390000		100000	WG1403246
Benzyl Chloride	100-44-7	127	800	4160	ND	ND		4000	WG1402728
Bromodichloromethane	75-27-4	164	800	5370	ND	ND		4000	WG1402728
Bromoform	75-25-2	253	2400	24800	ND	ND		4000	WG1402728
Bromomethane	74-83-9	94.90	800	3110	ND	ND		4000	WG1402728
1,3-Butadiene	106-99-0	54.10	8000	17700	ND	ND		4000	WG1402728
Carbon disulfide	75-15-0	76.10	800	2490	ND	ND		4000	WG1402728
Carbon tetrachloride	56-23-5	154	800	5040	ND	ND		4000	WG1402728
Chlorobenzene	108-90-7	113	800	3700	ND	ND		4000	WG1402728
Chloroethane	75-00-3	64.50	800	2110	ND	ND		4000	WG1402728
Chloroform	67-66-3	119	800	3890	ND	ND		4000	WG1402728
Chloromethane	74-87-3	50.50	800	1650	ND	ND		4000	WG1402728
2-Chlorotoluene	95-49-8	126	800	4120	ND	ND		4000	WG1402728
Cyclohexane	110-82-7	84.20	20000	68900	3250000	11200000		100000	WG1403246
Dibromochloromethane	124-48-1	208	800	6810	ND	ND		4000	WG1402728
1,2-Dibromoethane	106-93-4	188	800	6150	ND	ND		4000	WG1402728
1,2-Dichlorobenzene	95-50-1	147	800	4810	ND	ND		4000	WG1402728
1,3-Dichlorobenzene	541-73-1	147	800	4810	ND	ND		4000	WG1402728
1,4-Dichlorobenzene	106-46-7	147	800	4810	ND	ND		4000	WG1402728
1,2-Dichloroethane	107-06-2	99	800	3240	ND	ND		4000	WG1402728
1,1-Dichloroethane	75-34-3	98	800	3210	ND	ND		4000	WG1402728
1,1-Dichloroethene	75-35-4	96.90	800	3170	ND	ND		4000	WG1402728
cis-1,2-Dichloroethene	156-59-2	96.90	800	3170	ND	ND		4000	WG1402728
trans-1,2-Dichloroethene	156-60-5	96.90	800	3170	ND	ND		4000	WG1402728
1,2-Dichloropropane	78-87-5	113	800	3700	ND	ND		4000	WG1402728
cis-1,3-Dichloropropene	10061-01-5	111	800	3630	ND	ND		4000	WG1402728
trans-1,3-Dichloropropene	10061-02-6	111	800	3630	ND	ND		4000	WG1402728
1,4-Dioxane	123-91-1	88.10	800	2880	ND	ND		4000	WG1402728
Ethanol	64-17-5	46.10	2520	4750	11800	22200		4000	WG1402728
Ethylbenzene	100-41-4	106	800	3470	18000	78000		4000	WG1402728
4-Ethyltoluene	622-96-8	120	800	3930	2090	10300		4000	WG1402728
Trichlorofluoromethane	75-69-4	137.40	800	4500	ND	ND		4000	WG1402728
Dichlorodifluoromethane	75-71-8	120.92	800	3960	ND	ND		4000	WG1402728
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	800	6130	ND	ND		4000	WG1402728
1,2-Dichlorotetrafluoroethane	76-14-2	171	800	5600	ND	ND		4000	WG1402728
Heptane	142-82-5	100	20000	81800	1500000	6130000		100000	WG1403246
Hexachloro-1,3-butadiene	87-68-3	261	2520	26900	ND	ND		4000	WG1402728
n-Hexane	110-54-3	86.20	20000	70500	5140000	18100000		100000	WG1403246
Isopropylbenzene	98-82-8	120.20	800	3930	1050	5160		4000	WG1402728
Methylene Chloride	75-09-2	84.90	800	2780	ND	ND		4000	WG1402728
Methyl Butyl Ketone	591-78-6	100	5000	20400	ND	ND		4000	WG1402728
2-Butanone (MEK)	78-93-3	72.10	5000	14700	ND	ND		4000	WG1402728
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	5000	20500	ND	ND		4000	WG1402728
Methyl methacrylate	80-62-6	100.12	800	3280	ND	ND		4000	WG1402728
MTBE	1634-04-4	88.10	800	2880	ND	ND		4000	WG1402728
Naphthalene	91-20-3	128	2520	13200	ND	ND		4000	WG1402728
2-Propanol	67-63-0	60.10	5000	12300	432000	1060000	E	4000	WG1402728
Propene	115-07-1	42.10	1600	2760	ND	ND		4000	WG1402728
Styrene	100-42-5	104	800	3400	ND	ND		4000	WG1402728
1,1,2,2-Tetrachloroethane	79-34-5	168	800	5500	ND	ND		4000	WG1402728
Tetrachloroethylene	127-18-4	166	800	5430	2110	14300		4000	WG1402728
Tetrahydrofuran	109-99-9	72.10	800	2360	ND	ND		4000	WG1402728
Toluene	108-88-3	92.10	20000	75300	1040000	3920000		100000	WG1403246
1,2,4-Trichlorobenzene	120-82-1	181	2520	18700	ND	ND		4000	WG1402728

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	800	4350	ND	ND		4000	WG1402728
1,1,2-Trichloroethane	79-00-5	133	800	4350	ND	ND		4000	WG1402728
Trichloroethylene	79-01-6	131	800	4290	ND	ND		4000	WG1402728
1,2,4-Trimethylbenzene	95-63-6	120	800	3930	908	4460		4000	WG1402728
1,3,5-Trimethylbenzene	108-67-8	120	800	3930	1220	5990		4000	WG1402728
2,2,4-Trimethylpentane	540-84-1	114.22	800	3740	ND	ND		4000	WG1402728
Vinyl chloride	75-01-4	62.50	800	2040	ND	ND		4000	WG1402728
Vinyl Bromide	593-60-2	106.95	800	3500	ND	ND		4000	WG1402728
Vinyl acetate	108-05-4	86.10	800	2820	ND	ND		4000	WG1402728
m&p-Xylene	1330-20-7	106	1600	6940	132000	572000		4000	WG1402728
o-Xylene	95-47-6	106	800	3470	18100	78500		4000	WG1402728
TPH (GC/MS) Low Fraction	8006-61-9	101	20000000	82600000	34200000	141000000		100000	WG1403246
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*101*				WG1402728
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*99.4*				WG1403246

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1000	2380	3140	7460		800	WG1402728
Allyl chloride	107-05-1	76.53	160	501	ND	ND		800	WG1402728
Benzene	71-43-2	78.10	8000	25600	470000	1500000		40000	WG1403246
Benzyl Chloride	100-44-7	127	160	831	ND	ND		800	WG1402728
Bromodichloromethane	75-27-4	164	160	1070	ND	ND		800	WG1402728
Bromoform	75-25-2	253	480	4970	ND	ND		800	WG1402728
Bromomethane	74-83-9	94.90	160	621	ND	ND		800	WG1402728
1,3-Butadiene	106-99-0	54.10	1600	3540	ND	ND		800	WG1402728
Carbon disulfide	75-15-0	76.10	160	498	ND	ND		800	WG1402728
Carbon tetrachloride	56-23-5	154	160	1010	ND	ND		800	WG1402728
Chlorobenzene	108-90-7	113	160	739	ND	ND		800	WG1402728
Chloroethane	75-00-3	64.50	160	422	ND	ND		800	WG1402728
Chloroform	67-66-3	119	160	779	ND	ND		800	WG1402728
Chloromethane	74-87-3	50.50	160	330	ND	ND		800	WG1402728
2-Chlorotoluene	95-49-8	126	160	825	ND	ND		800	WG1402728
Cyclohexane	110-82-7	84.20	8000	27600	1950000	6720000		40000	WG1403246
Dibromochloromethane	124-48-1	208	160	1360	ND	ND		800	WG1402728
1,2-Dibromoethane	106-93-4	188	160	1230	ND	ND		800	WG1402728
1,2-Dichlorobenzene	95-50-1	147	160	962	ND	ND		800	WG1402728
1,3-Dichlorobenzene	541-73-1	147	160	962	ND	ND		800	WG1402728
1,4-Dichlorobenzene	106-46-7	147	160	962	ND	ND		800	WG1402728
1,2-Dichloroethane	107-06-2	99	160	648	ND	ND		800	WG1402728
1,1-Dichloroethane	75-34-3	98	160	641	ND	ND		800	WG1402728
1,1-Dichloroethene	75-35-4	96.90	160	634	ND	ND		800	WG1402728
cis-1,2-Dichloroethene	156-59-2	96.90	160	634	ND	ND		800	WG1402728
trans-1,2-Dichloroethene	156-60-5	96.90	160	634	ND	ND		800	WG1402728
1,2-Dichloropropane	78-87-5	113	160	739	ND	ND		800	WG1402728
cis-1,3-Dichloropropene	10061-01-5	111	160	726	ND	ND		800	WG1402728
trans-1,3-Dichloropropene	10061-02-6	111	160	726	ND	ND		800	WG1402728
1,4-Dioxane	123-91-1	88.10	160	577	ND	ND		800	WG1402728
Ethanol	64-17-5	46.10	504	950	834	1570		800	WG1402728
Ethylbenzene	100-41-4	106	160	694	15100	65500		800	WG1402728
4-Ethyltoluene	622-96-8	120	160	785	1480	7260		800	WG1402728
Trichlorofluoromethane	75-69-4	137.40	160	899	ND	ND		800	WG1402728
Dichlorodifluoromethane	75-71-8	120.92	160	791	ND	ND		800	WG1402728
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	160	1230	ND	ND		800	WG1402728
1,2-Dichlorotetrafluoroethane	76-14-2	171	160	1120	ND	ND		800	WG1402728
Heptane	142-82-5	100	8000	32700	778000	3180000		40000	WG1403246
Hexachloro-1,3-butadiene	87-68-3	261	504	5380	ND	ND		800	WG1402728
n-Hexane	110-54-3	86.20	8000	28200	2220000	7830000		40000	WG1403246
Isopropylbenzene	98-82-8	120.20	160	787	804	3950		800	WG1402728
Methylene Chloride	75-09-2	84.90	160	556	ND	ND		800	WG1402728
Methyl Butyl Ketone	591-78-6	100	1000	4090	ND	ND		800	WG1402728
2-Butanone (MEK)	78-93-3	72.10	1000	2950	ND	ND		800	WG1402728
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1000	4090	ND	ND		800	WG1402728
Methyl methacrylate	80-62-6	100.12	160	655	ND	ND		800	WG1402728
MTBE	1634-04-4	88.10	160	577	ND	ND		800	WG1402728
Naphthalene	91-20-3	128	504	2640	ND	ND		800	WG1402728
2-Propanol	67-63-0	60.10	1000	2460	37200	91400		800	WG1402728
Propene	115-07-1	42.10	320	551	ND	ND		800	WG1402728
Styrene	100-42-5	104	160	681	ND	ND		800	WG1402728
1,1,2,2-Tetrachloroethane	79-34-5	168	160	1100	ND	ND		800	WG1402728
Tetrachloroethylene	127-18-4	166	160	1090	177	1200		800	WG1402728
Tetrahydrofuran	109-99-9	72.10	160	472	ND	ND		800	WG1402728
Toluene	108-88-3	92.10	8000	30100	721000	2720000		40000	WG1403246
1,2,4-Trichlorobenzene	120-82-1	181	504	3730	ND	ND		800	WG1402728

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	160	870	ND	ND		800	WG1402728
1,1,2-Trichloroethane	79-00-5	133	160	870	ND	ND		800	WG1402728
Trichloroethylene	79-01-6	131	160	857	ND	ND		800	WG1402728
1,2,4-Trimethylbenzene	95-63-6	120	160	785	558	2740		800	WG1402728
1,3,5-Trimethylbenzene	108-67-8	120	160	785	781	3830		800	WG1402728
2,2,4-Trimethylpentane	540-84-1	114.22	160	747	ND	ND		800	WG1402728
Vinyl chloride	75-01-4	62.50	160	409	ND	ND		800	WG1402728
Vinyl Bromide	593-60-2	106.95	160	700	ND	ND		800	WG1402728
Vinyl acetate	108-05-4	86.10	160	563	ND	ND		800	WG1402728
m&p-Xylene	1330-20-7	106	320	1390	116000	503000		800	WG1402728
o-Xylene	95-47-6	106	160	694	15000	65000		800	WG1402728
TPH (GC/MS) Low Fraction	8006-61-9	101	8000000	33000000	19000000	78500000		40000	WG1403246
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*107*				WG1402728
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*95.3*				WG1403246

Method Blank (MB)

(MB) R3486360-2 12/26/19 22:44

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Acetone	U		0.0569	1.25
Allyl Chloride	U		0.0546	0.200
Benzene	U		0.0460	0.200
Benzyl Chloride	U		0.0598	0.200
Bromodichloromethane	U		0.0436	0.200
Bromoform	U		0.0786	0.600
Bromomethane	U		0.0609	0.200
1,3-Butadiene	U		0.0563	2.00
Carbon disulfide	U		0.0544	0.200
Carbon tetrachloride	U		0.0585	0.200
Chlorobenzene	U		0.0601	0.200
Chloroethane	U		0.0489	0.200
Chloroform	U		0.0574	0.200
Chloromethane	U		0.0544	0.200
2-Chlorotoluene	U		0.0605	0.200
Dibromochloromethane	U		0.0494	0.200
1,2-Dibromoethane	U		0.0185	0.200
1,2-Dichlorobenzene	U		0.0603	0.200
1,3-Dichlorobenzene	U		0.0597	0.200
1,4-Dichlorobenzene	U		0.0557	0.200
1,2-Dichloroethane	U		0.0616	0.200
1,1-Dichloroethane	U		0.0514	0.200
1,1-Dichloroethene	U		0.0490	0.200
cis-1,2-Dichloroethene	U		0.0389	0.200
trans-1,2-Dichloroethene	U		0.0464	0.200
1,2-Dichloropropane	U		0.0599	0.200
cis-1,3-Dichloropropene	U		0.0588	0.200
trans-1,3-Dichloropropene	U		0.0435	0.200
1,4-Dioxane	U		0.0554	0.200
Ethylbenzene	U		0.0506	0.200
4-Ethyltoluene	U		0.0666	0.200
Trichlorofluoromethane	U		0.0673	0.200
Dichlorodifluoromethane	U		0.0601	0.200
1,1,2-Trichlorotrifluoroethane	U		0.0687	0.200
1,2-Dichlorotetrafluoroethane	U		0.0458	0.200
Hexachloro-1,3-butadiene	U		0.0656	0.630
Isopropylbenzene	U		0.0563	0.200
Methylene Chloride	U		0.0465	0.200
Methyl Butyl Ketone	U		0.0682	1.25
2-Butanone (MEK)	U		0.0493	1.25

Method Blank (MB)

(MB) R3486360-2 12/26/19 22:44

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
4-Methyl-2-pentanone (MIBK)	U		0.0650	1.25
Methyl Methacrylate	U		0.0773	0.200
MTBE	U		0.0505	0.200
Naphthalene	U		0.154	0.630
2-Propanol	U		0.0882	1.25
Propene	0.185	J	0.0932	0.400
Styrene	U		0.0465	0.200
1,1,2,2-Tetrachloroethane	U		0.0576	0.200
Tetrachloroethylene	U		0.0497	0.200
Tetrahydrofuran	U		0.0508	0.200
Toluene	U		0.0499	0.200
1,2,4-Trichlorobenzene	U		0.148	0.630
1,1,1-Trichloroethane	U		0.0665	0.200
1,1,2-Trichloroethane	U		0.0287	0.200
Trichloroethylene	U		0.0545	0.200
1,2,4-Trimethylbenzene	U		0.0483	0.200
1,3,5-Trimethylbenzene	U		0.0631	0.200
2,2,4-Trimethylpentane	U		0.0456	0.200
Vinyl chloride	U		0.0457	0.200
Vinyl Bromide	U		0.0727	0.200
Vinyl acetate	U		0.0639	0.200
m&p-Xylene	U		0.0946	0.400
o-Xylene	U		0.0633	0.200
Ethanol	U		0.0832	0.630
TPH (GC/MS) Low Fraction	10.3	J	6.91	200
(S) 1,4-Bromofluorobenzene	*93.7*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3486360-1 12/26/19 21:30 • (LCSD) R3486360-3 12/27/19 09:16

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Ethanol	3.75	3.57	3.52	95.2	93.9	55.0-148			1.41	25
Propene	3.75	3.51	3.60	93.6	96.0	64.0-144			2.53	25
Dichlorodifluoromethane	3.75	3.78	4.16	101	111	64.0-139			9.57	25
1,2-Dichlorotetrafluoroethane	3.75	3.76	4.13	100	110	70.0-130			9.38	25
Chloromethane	3.75	3.85	4.08	103	109	70.0-130			5.80	25
Vinyl chloride	3.75	3.80	3.92	101	105	70.0-130			3.11	25
1,3-Butadiene	3.75	3.65	3.61	97.3	96.3	70.0-130			1.10	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3486360-1 12/26/19 21:30 • (LCSD) R3486360-3 12/27/19 09:16

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Bromomethane	3.75	3.53	3.90	94.1	104	70.0-130			9.96	25
Chloroethane	3.75	3.70	3.90	98.7	104	70.0-130			5.26	25
Trichlorofluoromethane	3.75	3.67	3.98	97.9	106	70.0-130			8.10	25
1,1,2-Trichlorotrifluoroethane	3.75	3.80	4.08	101	109	70.0-130			7.11	25
1,1-Dichloroethene	3.75	3.75	3.98	100	106	70.0-130			5.95	25
1,1-Dichloroethane	3.75	3.76	4.01	100	107	70.0-130			6.44	25
Acetone	3.75	3.64	3.67	97.1	97.9	70.0-130			0.821	25
2-Propanol	3.75	3.72	3.79	99.2	101	70.0-139			1.86	25
Carbon disulfide	3.75	3.67	3.98	97.9	106	70.0-130			8.10	25
Methylene Chloride	3.75	3.68	4.01	98.1	107	70.0-130			8.58	25
MTBE	3.75	3.69	3.78	98.4	101	70.0-130			2.41	25
trans-1,2-Dichloroethene	3.75	3.80	4.02	101	107	70.0-130			5.63	25
Vinyl acetate	3.75	3.92	4.01	105	107	70.0-130			2.27	25
Methyl Ethyl Ketone	3.75	3.93	3.94	105	105	70.0-130			0.254	25
cis-1,2-Dichloroethene	3.75	3.79	3.93	101	105	70.0-130			3.63	25
Chloroform	3.75	3.83	4.01	102	107	70.0-130			4.59	25
1,1,1-Trichloroethane	3.75	3.78	3.93	101	105	70.0-130			3.89	25
Carbon tetrachloride	3.75	3.76	3.92	100	105	70.0-130			4.17	25
Benzene	3.75	3.80	4.00	101	107	70.0-130			5.13	25
1,2-Dichloroethane	3.75	3.78	3.97	101	106	70.0-130			4.90	25
Trichloroethylene	3.75	3.84	3.83	102	102	70.0-130			0.261	25
1,2-Dichloropropane	3.75	3.80	3.84	101	102	70.0-130			1.05	25
1,4-Dioxane	3.75	3.87	3.86	103	103	70.0-140			0.259	25
Bromodichloromethane	3.75	3.79	3.93	101	105	70.0-130			3.63	25
cis-1,3-Dichloropropene	3.75	3.78	3.83	101	102	70.0-130			1.31	25
4-Methyl-2-pentanone (MIBK)	3.75	3.69	3.82	98.4	102	70.0-139			3.46	25
Toluene	3.75	3.85	4.01	103	107	70.0-130			4.07	25
trans-1,3-Dichloropropene	3.75	3.74	3.82	99.7	102	70.0-130			2.12	25
1,1,2-Trichloroethane	3.75	3.81	3.90	102	104	70.0-130			2.33	25
Tetrachloroethylene	3.75	3.78	4.20	101	112	70.0-130			10.5	25
Methyl Butyl Ketone	3.75	3.71	3.81	98.9	102	70.0-149			2.66	25
Dibromochloromethane	3.75	3.88	3.94	103	105	70.0-130			1.53	25
1,2-Dibromoethane	3.75	3.80	3.89	101	104	70.0-130			2.34	25
Chlorobenzene	3.75	3.90	4.05	104	108	70.0-130			3.77	25
Ethylbenzene	3.75	3.90	4.01	104	107	70.0-130			2.78	25
m&p-Xylene	7.50	7.73	7.86	103	105	70.0-130			1.67	25
o-Xylene	3.75	3.82	3.90	102	104	70.0-130			2.07	25
Styrene	3.75	3.96	3.98	106	106	70.0-130			0.504	25
Bromoform	3.75	4.04	4.13	108	110	70.0-130			2.20	25
1,1,2,2-Tetrachloroethane	3.75	3.86	3.92	103	105	70.0-130			1.54	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3486360-1 12/26/19 21:30 • (LCSD) R3486360-3 12/27/19 09:16

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
4-Ethyltoluene	3.75	3.90	4.01	104	107	70.0-130			2.78	25
1,3,5-Trimethylbenzene	3.75	3.89	3.90	104	104	70.0-130			0.257	25
1,2,4-Trimethylbenzene	3.75	3.92	3.99	105	106	70.0-130			1.77	25
1,3-Dichlorobenzene	3.75	3.91	4.02	104	107	70.0-130			2.77	25
1,4-Dichlorobenzene	3.75	3.94	4.06	105	108	70.0-130			3.00	25
Benzyl Chloride	3.75	3.83	3.78	102	101	70.0-152			1.31	25
1,2-Dichlorobenzene	3.75	3.89	4.05	104	108	70.0-130			4.03	25
1,2,4-Trichlorobenzene	3.75	3.88	3.97	103	106	70.0-160			2.29	25
Hexachloro-1,3-butadiene	3.75	3.66	3.89	97.6	104	70.0-151			6.09	25
Naphthalene	3.75	3.85	4.03	103	107	70.0-159			4.57	25
TPH (GC/MS) Low Fraction	203	196	204	96.6	100	70.0-130			4.00	25
Allyl Chloride	3.75	3.75	3.96	100	106	70.0-130			5.45	25
2-Chlorotoluene	3.75	3.86	3.99	103	106	70.0-130			3.31	25
Methyl Methacrylate	3.75	3.77	3.94	101	105	70.0-130			4.41	25
Tetrahydrofuran	3.75	3.82	3.84	102	102	70.0-137			0.522	25
2,2,4-Trimethylpentane	3.75	3.95	4.08	105	109	70.0-130			3.24	25
Vinyl Bromide	3.75	3.59	4.00	95.7	107	70.0-130			10.8	25
Isopropylbenzene	3.75	3.89	3.95	104	105	70.0-130			1.53	25
(S) 1,4-Bromofluorobenzene				*100*	*98.3*	*60.0-140*				

Method Blank (MB)

(MB) R3486411-3 12/27/19 11:03

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Benzene	U		0.0460	0.200
Cyclohexane	U		0.0534	0.200
Heptane	U		0.0626	0.200
n-Hexane	U		0.0457	0.200
Toluene	U		0.0499	0.200
TPH (GC/MS) Low Fraction	22.4	J	6.91	200
(S) 1,4-Bromofluorobenzene	*99.4*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3486411-1 12/27/19 09:43 • (LCSD) R3486411-2 12/27/19 10:21

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
n-Hexane	3.75	4.00	3.71	107	98.9	70.0-130			7.52	25
Cyclohexane	3.75	3.98	3.79	106	101	70.0-130			4.89	25
Benzene	3.75	3.84	3.66	102	97.6	70.0-130			4.80	25
Heptane	3.75	4.21	4.08	112	109	70.0-130			3.14	25
Toluene	3.75	3.83	3.61	102	96.3	70.0-130			5.91	25
TPH (GC/MS) Low Fraction	203	210	207	103	102	70.0-130			1.44	25
(S) 1,4-Bromofluorobenzene				*100*	*103*	*60.0-140*				

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 Method Quantitation Limit.
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 Sample Detection Limit.
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.

Qualifier	Description
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
J	The identification of the analyte is acceptable; the reported value is an estimate.

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 [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	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	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas [5]	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

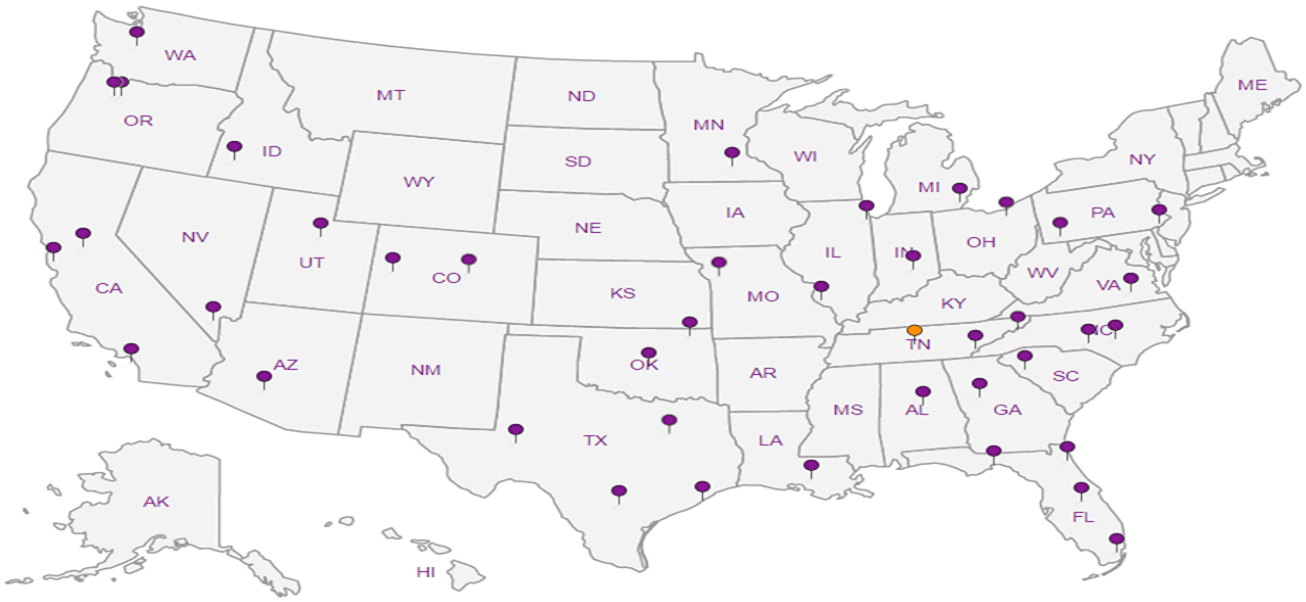
Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] 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.



Timberwolf Environmental, LLC

1920 W Villa Maria, Ste 205
Bryan, TX 77807

Billing Information:
Accounts Payable
1920 W Villa Maria, Ste 205
Bryan, TX 77807
Jim@teamtimberwolf.com

Report to: Jim Foster

Email To: russell@teamtimberwolf.com; preston@teamtimberwolf.com;

Project Description: HEC-190007

City/State Collected: NM

Please Circle: PT MT CT ET

Phone: 361-772-8706
Fax:

Client Project # ~~190006~~ 190007

Lab Project # TIMENVBTX-~~190055~~ 190007

Collected by (print): Michael Morse

Site/Facility ID #

P.O. #

Collected by (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

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	TO-15 Summa									Remarks	Sample # (lab only)
Leg 1 (Shallow well)		Air	N/A	12-18-19	1615	1	X										-01
Leg 2		Air	N/A	12-18-19	1630	1	X										-02
Leg 3		Air	N/A	12-1819	1645	1	X										-03
		~~Air~~				~~1~~	~~X~~										

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

SDG # L1172940

Tabl D058

Acctnum: TIMENVBTX
Template: T159109
Prelogin: P740835
PM: 823 - Olivia Studebaker
PB: CSL 11/22/19
Shipped Via: FedEX Ground

* 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 # 1145 2239 8050

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: ✓Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
	12-19-19	10:50	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Trip Blank Received: Yes (No) HCL / MeoH TBR

Temp: Amb °C Bottles Received: 3

Date: 12-20 Time: 0930

If preservation required by Login: Date/Time

Hold:

Condition: NCF / (OK)

Timberwolf Environmental, LLC

1920 W Villa Maria, Ste 205
Bryan, TX 77807

Billing Information:
Accounts Payable
1920 W Villa Maria, Ste 205
Bryan, TX 77807
Jim@teamtimberwolf.com

Report to: Jim Foster

Email To: russell@teamtimberwolf.com; preston@teamtimberwolf.com;

Project Description: HEC-190007

City/State Collected: NM

Please Circle: PT (MT) CT ET

Phone: 361-772-8706
Fax:

Client Project # ~~190006~~ 190007

Lab Project # TIMENVBTX-~~260055~~ 190007

Collected by (print): Michael Morse

Collected by (signature):

Immediately Packed on Ice N ✓ Y ___

Site/Facility ID #

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

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	TO-15 Summa	Remarks	Sample # (lab only)
~~Leg 1~~ Leg 2 (shallow well)	M.M. 2-3-20	Air	N/A	12-18-19	1615	1	X		-01
~~Leg 2~~ Leg 1	M.M. 2-3-20	Air	N/A	12-18-19	1630	1	X		-02
Leg 3		Air	N/A	12-1819	1645	1	X		-03
		~~Air~~				~~1~~	~~X~~		

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

SDG # L1172940

Tabl D058

Acctnum: TIMENVBTX
Template: T159109
Prelogin: P740835
PM: 823 - Olivia Studebaker
PB: CSL 11/22/19
Shipped Via: FedEX Ground

* 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 # 1145 2239 8050

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: ✓Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes (No) HCL / MeoH TBR
	12-19-19	10:50		
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: Amb °C Bottles Received: 3
				If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 12-20 Time: 0930
				Hold:

Condition: NCF / (OK)