3RP-1038

2018

ANNUAL GROUND WATER MONITOR REPORT

2018 Annual Groundwater Monitoring Report

Mangum No. 1
S27, T29N, R11W
San Juan County, New Mexico
API# 30-045-07835
NMOCD# 3R-1038

Hilcorp Energy Company

OCD Received 1/22/19

Accepted For Record and Conditions
2/11/19

GHD | 6121 Indian School Rd NE Suite 200 Albuquerque NM 87110 USA

11146006| Report No 2 |January 2019

Smith, Cory, EMNRD

From: Smith, Cory, EMNRD
Sent: Monday, February 11, 2019 9:21 AM
To: Clara Cardoza
Cc: Griswold, Jim, EMNRD; Fields, Vanessa, EMNRD; 'whitney thomas (l1thomas@blm.gov)'; 'Jeff.Walker@ghd.com'
Subject: RE: 3R-1038 Mangum 1 2018 Annual GWM Rpt

Clara,

OCD has reviewed the 2018 Annual Ground Water Monitor Report received on January 22, 2019.

After review the OCD has accepted for record with the following conditions:

- HEC must fully delineate the ground water plum no later than the end of Q2 2019.
- OCD highly recommends the installation of a upgradient well outside the impacted zones.
- Once delineation is complete HEC must initiate some form of **active** remediation submit to the OCD a work plan for approval.

If you have any additional questions please let me know the report and these conditions of will be scanned to 3RP-1038.

Cory Smith
Environmental Specialist
Oil Conservation Division
Energy, Minerals, & Natural Resources
1000 Rio Brazos, Aztec, NM 87410
(505)334-6178 ext 115
cory.smith@state.nm.us

From: Jeff.Walker@ghd.com <Jeff.Walker@ghd.com>
Sent: Tuesday, January 22, 2019 1:32 PM
To: Smith, Cory, EMNRD <Cory.Smith@state.nm.us>
Cc: Clara Cardoza <ccardoza@hilcorp.com>
Subject: [EXT] 3R-1038 Mangum 1 2018 Annual GWM Rpt

Cory/Vanessa,

Please find attached the 2018 Annual Groundwater Monitoring report for the subject site, submitted on behalf of Hilcorp Energy. Please let Clara or me know if you have any questions regarding this document or the site.

Also, please acknowledge receipt for record keeping.

Thank you-Jeff

Jeffrey L. Walker
Sr. Project Manager

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1. Introduction

This Annual Groundwater Monitoring Report presents groundwater data collected during the 2018 reporting period by GHD Services, Inc. (GHD) conducted on behalf of Hilcorp Energy Company (Hilcorp) at the Mangum No. 1 natural gas well site (hereafter referred to as the "Site"). Hilcorp acquired the Site with the sale of San Juan Basin assets from ConocoPhillips in August 2017. The Site is located on federal land in Section 27, Township 29N, Range 11W of San Juan County, New Mexico. Geographical coordinates for the Site are 36.6965°North, 107.9840°West. The Site consists of a natural gas well and associated equipment. The Site Location Map and Site Plan are presented as Figure 1 and 2, respectively.

1.1 Site History

Site remediation was performed in February 2016 to address soil impacts from an historical release of produced water and condensate. An excavation with dimensions of approximately 100 feet (ft) by 40 ft, from 9 ft to 17 ft deep was completed. Approximately 1,400 cubic yards (cy) of impacted soils were hauled away for off-Site disposal at the Industrial Ecosystems, Inc. (IEI) landfarm in Aztec, New Mexico. Groundwater was encountered in the excavation at 16 ft below ground surface (bgs). Approximately 1 foot of groundwater saturated soil was removed from beneath the water table. The groundwater accumulation at the bottom of the excavation was evacuated using a vacuum truck. Groundwater was allowed to recharge overnight and was evacuated for three consecutive days. Approximately 275 barrels (bbls) of groundwater were removed and transported for off-Site disposal at IEI.

Subsequent to the vacuum truck removal from the excavation, a sample of the groundwater was obtained for laboratory analyses. The groundwater sample was analyzed for VOCs, dissolved metals including arsenic, barium, cadmium, calcium, chromium, iron, manganese, magnesium, sodium, and zinc, and for general chemistry analytes including chloride, potassium, nitrate, sulfate, fluoride, total alkalinity, bicarbonate, total hardness, pH, and specific conductivity. The groundwater sample indicated analytical results exceeding the applicable New Mexico Water Quality Control Commission (NMWQCC) groundwater quality standards for benzene, xylenes, dissolved manganese, and sulfate. The excavation was backfilled with segregated field screened soils (i.e., below 100 parts per million (ppm) on photo-ionization detector)) and clean, imported fill. A report summarizing the soil excavation and subsequent groundwater recovery and sampling activities was submitted April 7, 2016.

In May 2016, four groundwater monitoring wells were installed at the Site to assess the extent of impacts to groundwater. Following the installation and development of the new wells, groundwater samples have been collected on a quarterly basis, beginning June 2016.

2. Groundwater Monitoring

2.1 Groundwater Monitoring Methodology

GHD conducted groundwater monitoring at the Site March 13, June 25 and September 4, 2018 by GHD and on December 10, 2018 by Hilcorp. Depth to groundwater was gauged at monitoring wells MW-1, MW-2, MW-3 and MW-4 using an oil/water interface probe prior to sampling. A summary of historical depths to water and groundwater elevations can be found in Table 1. Groundwater potentiometric surface maps detailing groundwater elevations and groundwater flow direction using data collected during the reporting period are presented as Figures 3, 4, 5 and 6. Groundwater flow direction at the site varies seasonally from north-northeast to north-northwest.

Prior to sample collection, monitor wells MW-1, MW-2, MW-3 and MW-4 were purged of at least three casing volumes of water using a dedicated polyethylene bailer prior to sampling. Groundwater quality parameters including pH, temperature, oxidation reduction potential, total dissolved solids, and conductivity were collected using a calibrated YSI 556 Multi Parameter sonde and were recorded on GHD groundwater sampling field forms and are included in Table 2. Field parameters were not collected during the December monitoring event.

Groundwater samples were placed in laboratory prepared bottles, packed on ice and shipped under chain of custody documentation to Pace Analytical Laboratories. Groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8260, for dissolved manganese and iron by EPA Method 6010B, for sulfate by EPA Method 300.0 and for total dissolved solids (TDS) by SM 2540.

2.2 Analytical Results

Concentrations of benzene and xylenes were above the NMWQCC standard in groundwater from MW-3 and MW-4 for all four quarterly events in 2018 and for the June and December reporting periods in MW-2. Dissolved manganese concentrations were above the regulatory limit across all wells and dates in 2018. Sulfates concentrations were above the regulatory limit in monitor well MW-4 in March, June and September and in June at MW-3. TDS was in concentrations above the standard for this compound in all wells for all 4 quarters in 2018.

A summary of historical laboratory analytical results is presented as Table 3. Groundwater laboratory analytical reports are included as Appendix A.

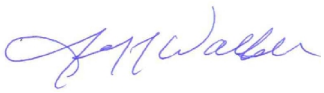
3. Conclusions and Recommendations

Based on analytical results from the groundwater samples collected from Site monitor wells to date, the following observations and recommendations are made:

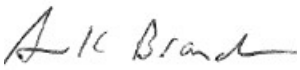
- Concentrations of BTEX constituents, dissolved manganese, sulfates and TDS occur in Site groundwater at levels above NMWQCC standards.
- Continuation of quarterly groundwater monitoring through 2019 is also recommended. The next quarterly groundwater monitoring event is scheduled for March 2019.

Respectfully Submitted,

GHD

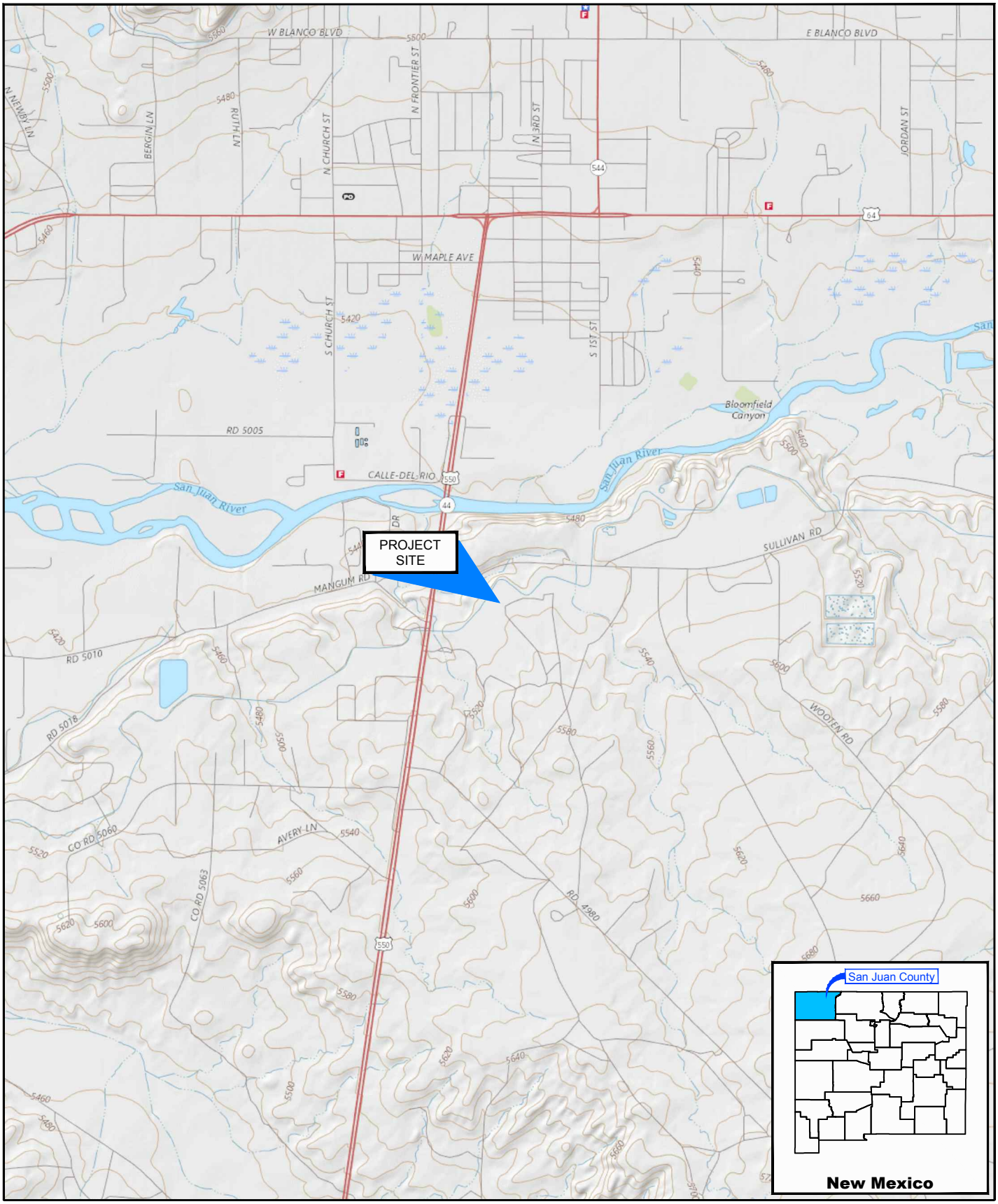


Jeff Walker
Senior Project Manager



Alan Brandon
Senior Project Manager

Figures



Source: USGS 7.5 Minute Quad "Bloomfield and Horn Canyon, New Mexico"

Lat/Long: 36.6955° North, 107.9840° West

0 1000 2000ft

Coordinate System:
NAD 1983 StatePlane-
New Mexico West (US Feet)

HILCORP ENERGY COMPANY
SAN JUAN COUNTY, NEW MEXICO
MANGUM No. 1

11146006-00

Jan 17, 2019

SITE LOCATION MAP

FIGURE 1

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1114----\11146006-Hilcorp-Mangum No.1\11146006-00\11146006-00(002)\11146006-00(002)GN-DL001.dwg

Source: Image © 2017 Google - Imagery Date: March 15, 2015

Lat/Long: 36.6955° North, 107.9840° West

0 20 60ft

Coordinate System:
NAD 1983 StatePlane-
New Mexico West (US Feet)

HILCORP ENERGY COMPANY
SAN JUAN COUNTY, NEW MEXICO
MANGUM No. 1

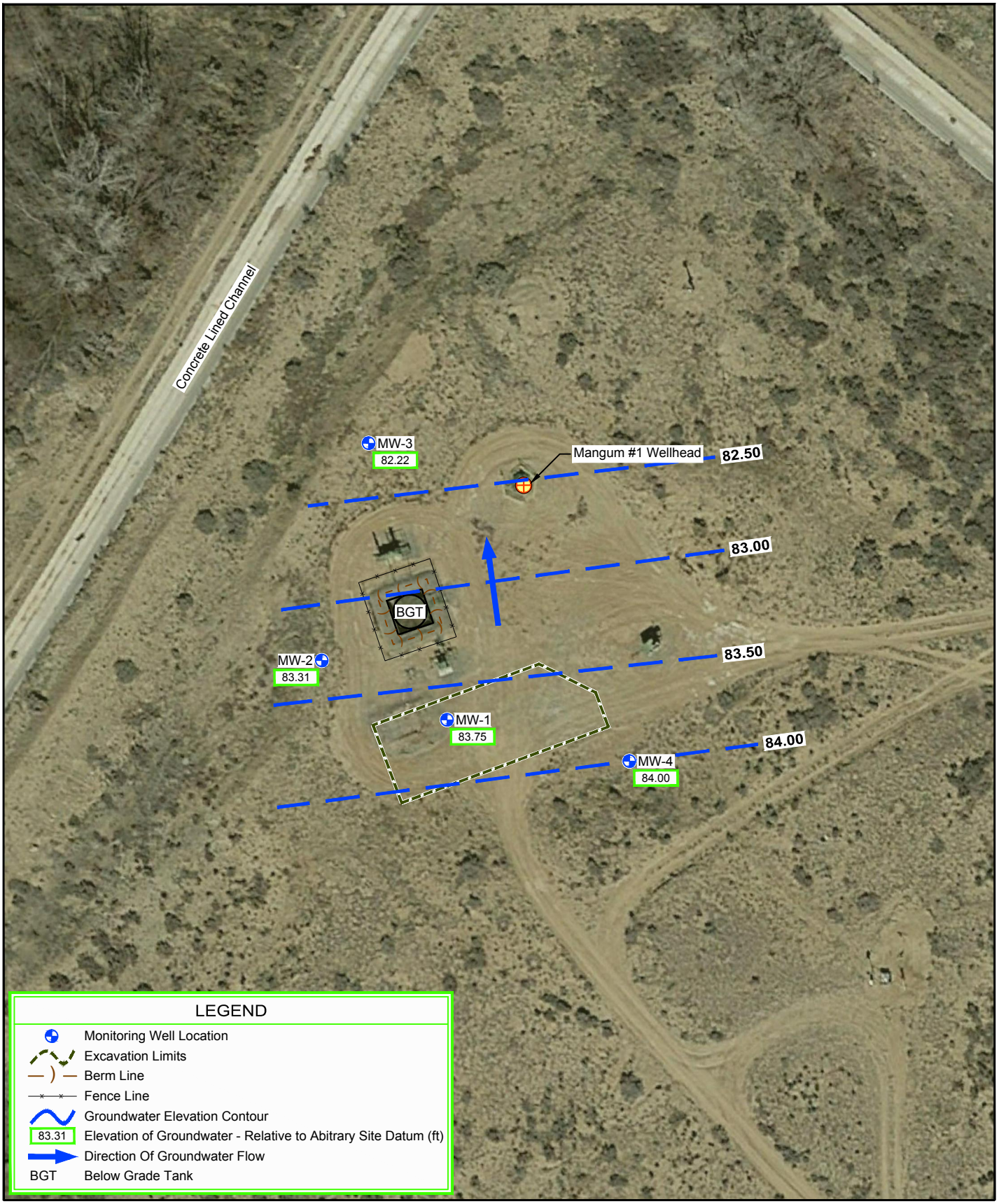
11146006-00

Jan 17, 2019

SITE PLAN

FIGURE 2

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1114----\11146006-Hilcorp-Mangum No.1\11146006-00\11146006-00(002)\11146006-00(002)GN-DL001.dwg



Source: Image © 2017 Google - Imagery Date: March 15, 2015

Lat/Long: 36.6955° North, 107.9840° West

0 20 60ft

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HILCORP ENERGY COMPANY
SAN JUAN COUNTY, NEW MEXICO
MANGUM No. 1

MARCH 2018 GROUNDWATER ELEVATION CONTOUR MAP

11146006-00

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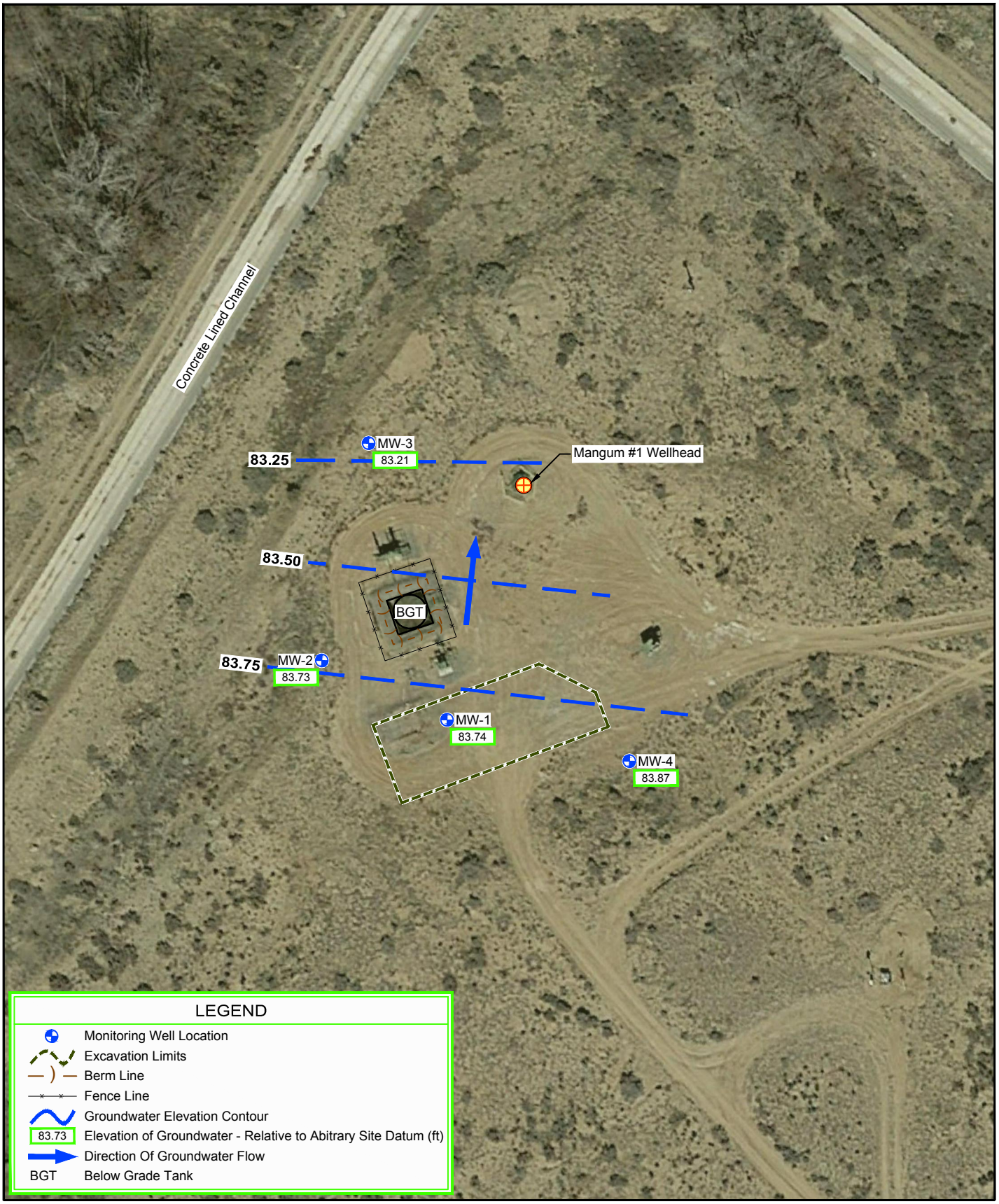
FIGURE 3

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1114----\11146006-Hilcorp-Mangum No.1\11146006-00\11146006-00(002)\11146006-00(002)GN-DL001.dwg



Source: Image © 2017 Google - Imagery Date: March 15, 2015

Lat/Long: 36.6955° North, 107.9840° West

0 20 60ft

Coordinate System:
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HILCORP ENERGY COMPANY
SAN JUAN COUNTY, NEW MEXICO
MANGUM No. 1

JUNE 2018 GROUNDWATER ELEVATION CONTOUR MAP

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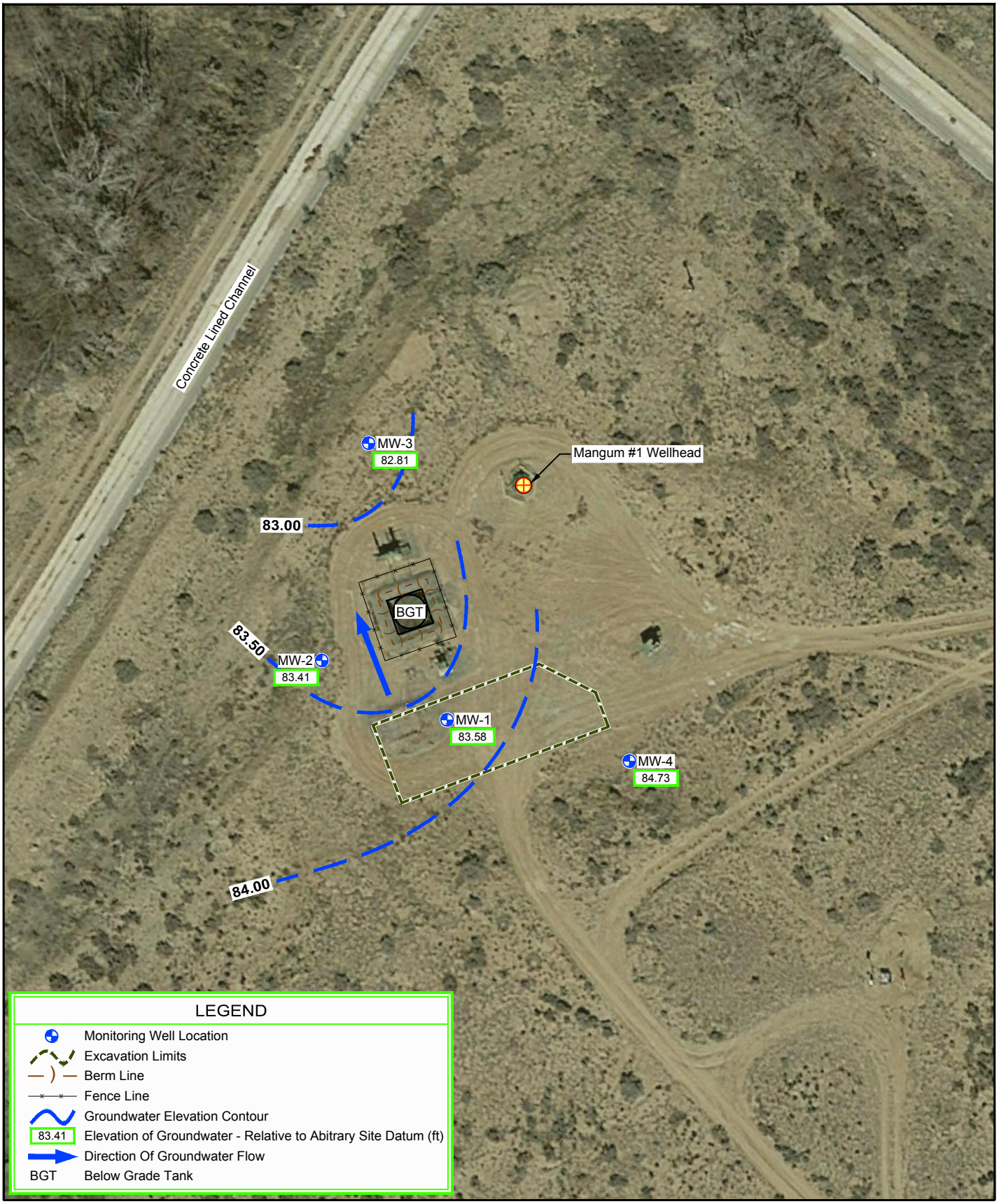
FIGURE 4

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1114----\11146006-Hilcorp-Mangum No.1\11146006-00\11146006-00(002)\11146006-00(002)GN-DL001.dwg



Source: Image © 2017 Google - Imagery Date: March 15, 2015

Lat/Long: 36.6955° North, 107.9840° West

0 20 60ft

Coordinate System:
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New Mexico West (US Feet)

HILCORP ENERGY COMPANY
SAN JUAN COUNTY, NEW MEXICO
MANGUM No. 1

11146006-00

Jan 17, 2019

SEPTEMBER 2018 GROUNDWATER ELEVATION CONTOUR MAP

FIGURE 5

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Source: Image © 2017 Google - Imagery Date: March 15, 2015

Lat/Long: 36.6955° North, 107.9840° West

0 20 60ft

Coordinate System:
NAD 1983 StatePlane-
New Mexico West (US Feet)

HILCORP ENERGY COMPANY
SAN JUAN COUNTY, NEW MEXICO
MANGUM No. 1

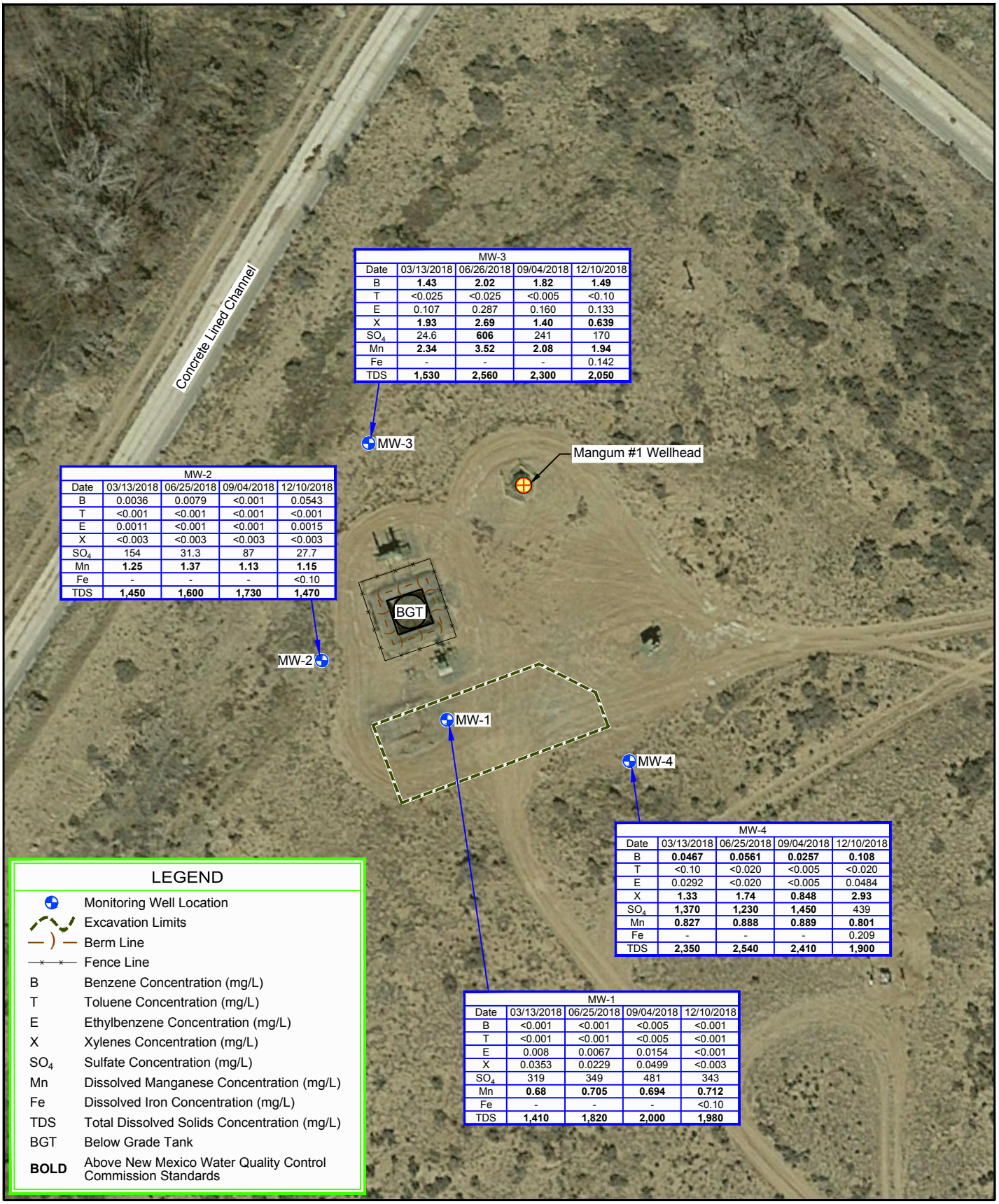
11146006-00

Jan 17, 2019

DECEMBER 2018 GROUNDWATER ELEVATION CONTOUR MAP

FIGURE 6

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1114----\11146006-Hilcorp-Mangum No.1\11146006-00\11146006-00(002)\11146006-00(002)GN-DL001.dwg



MW-3				
Date	03/13/2018	06/26/2018	09/04/2018	12/10/2018
B	**1.43**	**2.02**	**1.82**	**1.49**
T	<0.025	<0.025	<0.005	<0.10
E	0.107	0.287	0.160	0.133
X	**1.93**	**2.69**	**1.40**	**0.639**
SO_4	24.6	**606**	241	170
Mn	**2.34**	**3.52**	**2.08**	**1.94**
Fe	-	-	-	0.142
TDS	**1,530**	**2,560**	**2,300**	**2,050**

MW-2				
Date	03/13/2018	06/25/2018	09/04/2018	12/10/2018
B	0.0036	0.0079	<0.001	0.0543
T	<0.001	<0.001	<0.001	<0.001
E	0.0011	<0.001	<0.001	0.0015
X	<0.003	<0.003	<0.003	<0.003
SO_4	154	31.3	87	27.7
Mn	**1.25**	**1.37**	**1.13**	**1.15**
Fe	-	-	-	<0.10
TDS	**1,450**	**1,600**	**1,730**	**1,470**

MW-4				
Date	03/13/2018	06/25/2018	09/04/2018	12/10/2018
B	**0.0467**	**0.0561**	**0.0257**	**0.108**
T	<0.10	<0.020	<0.005	<0.020
E	0.0292	<0.020	<0.005	0.0484
X	**1.33**	**1.74**	**0.848**	**2.93**
SO_4	**1,370**	**1,230**	**1,450**	439
Mn	**0.827**	**0.888**	**0.889**	**0.801**
Fe	-	-	-	0.209
TDS	**2,350**	**2,540**	**2,410**	**1,900**

MW-1				
Date	03/13/2018	06/25/2018	09/04/2018	12/10/2018
B	<0.001	<0.001	<0.005	<0.001
T	<0.001	<0.001	<0.005	<0.001
E	0.008	0.0067	0.0154	<0.001
X	0.0353	0.0229	0.0499	<0.003
SO_4	319	349	481	343
Mn	**0.68**	**0.705**	**0.694**	**0.712**
Fe	-	-	-	<0.10
TDS	**1,410**	**1,820**	**2,000**	**1,980**

LEGEND

- Monitoring Well Location
- Excavation Limits
- Berm Line
- Fence Line
- B — Benzene Concentration (mg/L)
- T — Toluene Concentration (mg/L)
- E — Ethylbenzene Concentration (mg/L)
- X — Xylenes Concentration (mg/L)
- SO_4 — Sulfate Concentration (mg/L)
- Mn — Dissolved Manganese Concentration (mg/L)
- Fe — Dissolved Iron Concentration (mg/L)
- TDS — Total Dissolved Solids Concentration (mg/L)
- BGT — Below Grade Tank
- **BOLD** — Above New Mexico Water Quality Control Commission Standards

Source: Image © 2017 Google - Imagery Date: March 15, 2015

Lat/Long: 36.6955° North, 107.9840° West

0 20 60ft

Coordinate System:
NAD 1983 StatePlane-
New Mexico West (US Feet)

HILCORP ENERGY COMPANY
SAN JUAN COUNTY, NEW MEXICO
MANGUM No. 1

2018 CONTAMINANT CONCENTRATION MAP

11146006-00

Jan 21, 2019

FIGURE 7

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Tables

Table 1

Groundwater Elevations
Hilcorp Energy Company
Mangum No.1
San Juan County, New Mexico

Well ID	Top of Casing (feet)	Date of Measurement	Depth to Water (feet)	Groundwater Elevation (feet)
MW-1	98.97	6/8/2016	15.12	83.85
		9/12/2016	14.75	84.22
		11/29/2016	15.06	83.91
		3/6/2017	14.91	84.06
		6/12/2017	14.96	84.01
		10/26/2017	15.00	83.97
		12/4/2017	15.08	83.89
		3/13/2018	15.22	83.75
		6/25/2018	15.23	83.74
		9/4/2018	15.39	83.58
		12/ /2018	15.12	83.85
MW-2	101.05	6/8/2016	17.49	83.56
		9/12/2016	17.28	84.07
		11/29/2016	17.62	83.43
		3/6/2017	17.49	83.56
		6/12/2017	17.40	83.65
		10/26/2017	17.49	83.56
		12/4/2017	17.57	83.48
		3/13/2018	17.74	83.31
		6/25/2018	17.32	83.73
		9/5/2018	17.64	83.41
		12/ /2018	17.58	83.47

Table 1

Groundwater Elevations
Hilcorp Energy Company
Mangum No.1
San Juan County, New Mexico

Well ID	Top of Casing (feet)	Date of Measurement	Depth to Water (feet)	Groundwater Elevation (feet)
MW-3	101.35	6/8/2016	18.47	82.88
		9/12/2016	18.41	82.94
		11/29/2016	18.84	82.51
		3/6/2017	19.01	82.34
		6/12/2017	18.32	83.03
		10/26/2017	18.50	82.85
		12/4/2017	18.87	82.48
		3/13/2018	19.13	82.22
		6/25/2018	18.14	83.21
		9/5/2018	18.54	82.81
		12/ /2018	18.71	82.64
MW-4	103.76	6/8/2016	19.72	84.04
		9/12/2016	19.43	84.33
		11/29/2016	19.62	84.14
		3/6/2017	19.50	84.26
		6/21/2017	19.76	84.00
		10/26/2017	19.59	84.17
		12/4/2017	19.62	84.14
		3/13/2018	19.76	84.00
		6/25/2018	19.89	83.87
		9/4/2018	19.03	84.73
		12/ /2018	19.69	84.07

Table 2

Field Parameters
Hilcorp Energy Company
Mangum No.1
San Juan County, New Mexico

Well ID	Date	Temp˚C	pH	TDS (mg/L)	SC (µS/cm)	DO (mg/L)	ORP (mV)	Volume (gal)
MW-1	11/29/2016	16.54	7.42	--	2.607	1.52	-155.3	--
	3/6/2017	13.37	7.37	1.993	3057	1.48	-262.6	2
	6/12/2017	14.35	7.14	1.82	2800	0.89	-197.6	2
	10/26/2017	18	7.19	--	2600	1.85	-156	2.25
	12/4/2017	15.47	7.07	1.787	2748	1.3	-209.9	2
	3/13/2018	19.94	7.31	--	2502	-0.02	-203.58	1.7
	6/25/2018	15.81	7.22	--	2109.5	0.51	-198.3	1.75
MW-2	11/29/2016	16.04	7.2	--	2.299	2.21	-109.3	--
	3/6/2017	12.74	7.15	1.744	2683	2.05	-171.7	1.5
	6/12/2017	13.5	6.95	1.558	2396	1.61	-155.8	1.5
	10/26/2017	18.7	7.01	--	2264	1.74	-92.8	1.5
	12/4/2017	15.41	7	1.517	2333	1.11	-178	1.5
	3/13/2018	14.67	7.21	--	2334	-0.08	-180.73	1.3
	6/25/2018	17.63	6.62	--	1905.7	0.94	-187.2	1.75
MW-3	11/29/2016	15.01	7.09	--	3.091	2.52	-91	--
	3/6/2017	12.74	7.05	2.193	3376	4.17	-151.6	1
	6/12/2017	15.4	7.18	2.189	3360	6.7	-136	0.5
	10/26/2017	17.71	7.06	--	2653	1.8	-177.4	1.25
	12/4/2017	14.19	7.04	1.838	2835	3.05	-153.5	0.25
	3/13/2018	14.84	7.18	--	2641	0.17	-167.03	1.6
	6/25/2018	No parameters due to low volume						
MW-4	6/23/2016	15.1	7.29	--	2.95	1.04	-148.5	1.5
	11/29/2016	16.01	7.4	--	2.396	1.59	-127.5	--
	3/6/2017	13.01	7.39	2.337	3608	2.01	-237.2	2
	6/21/2017	14.49	7.08	1.917	2955	1.36	-188.7	1.25
	10/26/2017	17.37	7.29	--	2830	1.74	-193.2	1.75
	12/4/2017	15.26	3.33	2.055	3161	0.66	-244.2	1.5
	3/13/2018	15.08	7.41	--	3437	-0.07	-214.88	1.5
	6/25/2018	15.85	7.33	--	2580	0.97	-224.9	1.75

Notes:

TDS = total dissolved solids
SC = Soil Conductivity
DO = dissolved oxygen
ORP = oxidation-reduction potential
-- Not Measured

°C = degrees Centigrade
mg/L = milligrams per liter
µS/cm = micro Siemens per centimeter
mV = millivolts
gal = gallons

Table 3

Groundwater Laboratory Analytical Results Summary
Hilcorp Energy Company
Mangum No.1
San Juan County, New Mexico

Well ID	Sample ID	Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (Total) (mg/L)	Sulfate (mg/L)	Manganese (Dissolved) (mg/L)	Iron (Dissolved) (mg/L)	Total Dissolved Solids (mg/L)
NMWQCC Groundwater Quality Standards			**0.005***	**1.0***	**0.70***	**0.62**	**600**	**0.2**	**1.0**	**1000**
MW-1	WT-11102646-060816-JWMW1	6/8/2016	**0.0388**	<0.020	0.358	**4.01**	**1170**	**1.69**	--	**2590**
	GW-11102646-091216-CM-MW-1	9/12/2016	**0.0111**	< 0.001	0.0946	0.382	577	**0.925**	--	--
	GW-11102646-112916-CN-MW-1	11/29/2016	**0.0132**	< 0.001	0.119	0.445	240	**0.99**	--	--
	GW-11102646-030617-CN-MW-1	3/6/2017	0.0041	< 0.001	0.0481	0.167	387	**0.876**	--	**1920**
	GW-11102646-061217-CN-MW-1	6/12/2017	0.002	< 0.001	0.0265	0.12	312	**0.8**	--	**1830**
	GW-11146006-102617-CM-MW-1	10/26/2017	< 0.001	< 0.001	0.0081	0.0307	424	**0.71**	0.256	**1940**
	GW-11145006-120417-SP-MW-1	12/4/2017	<0.005	< 0.005	0.021	0.0814	321	**0.674**	--	**1710**
	GW-11146006-031318-CN-MW-1	3/13/2018	< 0.001	< 0.001	0.008	0.0353	319	**0.68**		**1410**
	GW-11146006-062518-CN-MW-1	6/25/2018	< 0.001	< 0.001	0.0067	0.0229	349	**0.705**	--	**1820**
	GW-11146006-090418-JP-MW-1	9/4/2018	<0.005	<0.005	0.0154	0.0499	481	**0.694**	--	**2000**
	MW-1	12/10/2018	<0.001	<0.001	<0.001	<0.003	343	**0.712**	<0.10	**1980**
MW-2	WT-11102646-060816-JW-MW-2	6/8/2016	**0.103**	< 0.001	0.0072	0.0448	3.0	**1.06**	--	**1580**
	GW-11102646-091216-CM-MW-2	9/12/2016	**0.0647**	< 0.001	0.0021	0.0032	2.8	**1.73**	--	--
	GW-11102646-112916-CN-MW-2	11/29/2016	**0.0257**	< 0.001	0.0021	< 0.003	2.6	**1.41**	--	--
	GW-11102646-030617-CN-MW-2	3/6/2017	**0.0347**	< 0.001	0.0022	< 0.003	7.9	**1.45**	--	**1510**
	GW-11102646-061217-CN-MW-2	6/12/2017	0.009	< 0.001	0.0011	< 0.003	3.1	**1.39**	--	**1550**
	GW-11146006-102617-CM-MW-2	10/26/2017	0.0013	< 0.001	< 0.001	< 0.003	4.5	**1.26**	**5.1**	**1560**
	GW-11145006-120417-SP-MW-2	12/4/2017	0.0039	< 0.001	0.0011	< 0.003	14.3	**1.23**	--	**1470**
	GW-11146006-031318-CN-MW-2	3/13/2018	0.0036	< 0.001	0.0011	< 0.003	154	**1.25**	--	**1450**
	GW-11146006-062518-CN-MW-2	6/25/2018	**0.0079**	< 0.001	< 0.001	< 0.003	31.3	**1.37**	--	**1600**
	GW-11146006-090418-JP-MW-2	9/4/2018	< 0.001	< 0.001	< 0.001	< 0.003	87	**1.13**	--	**1730**
	MW-2	12/10/2018	**0.0543**	< 0.001	0.0015	< 0.003	27.7	**1.15**	<0.1	**1470**

Table 3

Groundwater Laboratory Analytical Results Summary
Hilcorp Energy Company
Mangum No.1
San Juan County, New Mexico

Well ID	Sample ID	Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (Total) (mg/L)	Sulfate (mg/L)	Manganese (Dissolved) (mg/L)	Iron (Dissolved) (mg/L)	Total Dissolved Solids (mg/L)
NMWQCC Groundwater Quality Standards			**0.005***	**1.0***	**0.70***	**0.62**	**600**	**0.2**	**1.0**	**1000**
MW-3	WT-11102646-060816-JW-MW-3	6/8/2016	**2.95**	< 0.020	**0.813**	**7.78**	110	**2.65**	--	**2190**
	GW-11102646-091216-CM-MW-3	9/12/2016	**2.27**	< 0.001	0.44	**2.49**	112	**3.62**	--	--
	GW-11102646-091216-CN-MW-3	11/29/2016	**2.97**	< 0.001	**0.845**	**5.44**	22.5	**3.12**	--	--
	GW-11102646-030617-CN-MW-3	3/6/2017	**1.89**	< 0.02	0.259	**3.06**	14.7	**2.52**	--	**1880**
	GW-11102646-061217-CN-MW-3	6/12/2017	**1.68**	< 0.02	0.329	**1.93**	372	**3.09**	--	**2280**
	GW-11146006-102617-CM-MW-3	10/26/2017	**1.88**	< 0.001	0.417	**2.91**	65.6	**2.15**	**3.58**	**2000**
	GW-11145006-120417-SP-MW-3	12/4/2017	**2.00**	< 0.025	0.346	**2.43**	35.5	**2.36**	--	**1750**
	GW-11146006-031318-CN	3/13/2018	**1.43**	< 0.025	0.107	**1.93**	24.6	**2.34**	**--**	**1530**
	GW-11146006-062618-CN-MW-3	6/26/2018	**2.02**	< 0.025	0.287	**2.69**	**606**	**3.52**	--	**2560**
	GW-11146006-090518-JP-MW-3	9/5/2018	**1.82**	<0.005	0.160	**1.40**	241	**2.08**	--	**2300**
	MW-3	12/10/2018	**1.49**	<0.10	0.133	**0.639**	170	**1.94**	0.142	**2050**
MW-4	GW-11102646-062316-SP-MW-4	6/23/2016	**0.118**	< 0.001	0.186	**1.06**	**838**	**0.983**	--	--
	GW-11102646-091216-CM-MW-4	9/12/2016	**0.0742**	< 0.001	0.114	**0.803**	**735**	**1.32**	--	--
	GW-11102646-112916-CN-MW-4	11/29/2016	**0.0853**	< 0.001	0.0929	**0.967**	382	**1.26**	--	--
	GW-11102646-030617-CN-MW-4	3/6/2017	**0.0886**	< 0.02	0.0804	**1.23**	**814**	**1.22**	--	**2260**
	GW-11102646-061217-CN-MW-4	6/12/2017	**0.1**	< 0.005	0.0747	**1.44**	**738**	**1.01**	--	**2140**
	GW-11146006-102617-CM-MW-4	10/26/2017	**0.0462**	< 0.001	0.0226	**0.849**	**1120**	**0.73**	0.507	**2370**
	GW-11145006-120417-SP-MW-4	12/4/2017	**0.0632**	<0 .020	0.0386	**1.45**	**993**	**0.893**	--	**2150**
	GW-11145006-120417-SP-DUP	12/4/2017	**0.064**	<0.020	0.0421	**1.7**	**--**	**--**	--	**--**
	GW-11146006-031318-CN-MW-4	3/13/2018	**0.0467**	<0.10	0.0292	**1.33**	**1370**	**0.827**	--	**2350**
	GW-11146006-062518-CN-MW-4	6/25/2018	**0.0561**	<0.020	<0.020	**1.74**	**1230**	**0.888**	--	**2540**
	GW-11146006-090418-JP-MW-4	9/4/2018	**0.0257**	< 0.005	< 0.005	**0.848**	**1450**	**0.889**	--	**2410**
	MW-4	12/10/2018	**0.108**	<0.020	0.0484	**2.93**	439	**0.801**	0.209	**1900**

Notes:

NMWQCC = New Mexico Water Quality Control Commission
mg/L = milligrams per liter (parts per million)
< 0.001 = Below Laboratory Detection Limit of 0.001 mg/L, etc
-- = Not Analyzed
* standard revised 12/2018

Appendix A
Groundwater Laboratory Analytical Report

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

March 28, 2018

Jeff Walker
GHD Services
6121 indian School Rd
Ste 200
Albuquerque, NM 87110

RE: Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Dear Jeff Walker:
Enclosed are the analytical results for sample(s) received by the laboratory on March 17, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Colleen Clyne

Colleen Clyne
colleen.clyne@pacelabs.com
1(913)563-1406
Project Manager

Enclosures

cc: Angela Bown, GHD Services
Christine Mathews, GHD Services

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CERTIFICATIONS

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
WY STR Certification #: 2456.01
Arkansas Certification #: 17-016-0
Illinois Certification #: 200030
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070

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SAMPLE SUMMARY

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60266194001	**GW-11146006-031318-CN-MW-1**	Water	03/13/18 14:15	03/17/18 08:05
60266194002	**GW-11146006-031318-CN-MW-2**	Water	03/13/18 14:00	03/17/18 08:05
60266194003	**GW-11146006-031318-CN-MW-3**	Water	03/14/18 07:55	03/17/18 08:05
60266194004	**GW-11146006-031318-CN-MW-4**	Water	03/13/18 14:10	03/17/18 08:05
60266194005	**TRIP BLANK**	Water	03/13/18 14:00	03/17/18 08:05

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SAMPLE ANALYTE COUNT

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60266194001	**GW-11146006-031318-CN-MW-1**	EPA 6010	JGP	1	PASI-K
		EPA 8260	JTK	8	PASI-K
		SM 2540C	OL	1	PASI-K
		EPA 300.0	AGO	1	PASI-K
60266194002	**GW-11146006-031318-CN-MW-2**	EPA 6010	JGP	1	PASI-K
		EPA 8260	JTK	8	PASI-K
		SM 2540C	OL	1	PASI-K
		EPA 300.0	AGO	1	PASI-K
60266194003	**GW-11146006-031318-CN-MW-3**	EPA 6010	JGP	1	PASI-K
		EPA 8260	JTK	8	PASI-K
		SM 2540C	OL	1	PASI-K
		EPA 300.0	AGO	1	PASI-K
60266194004	**GW-11146006-031318-CN-MW-4**	EPA 6010	JGP	1	PASI-K
		EPA 8260	JTK	8	PASI-K
		SM 2540C	OL	1	PASI-K
		EPA 300.0	AGO	1	PASI-K
60266194005	**TRIP BLANK**	EPA 8260	JTK	8	PASI-K

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ANALYTICAL RESULTS

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Sample: GW-11146006-031318-CN-MW-1 **Lab ID: 60266194001** Collected: 03/13/18 14:15 Received: 03/17/18 08:05 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**680**	ug/L	5.0	1	03/21/18 11:30	03/22/18 13:29	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	ND	ug/L	1.0	1		03/21/18 02:17	71-43-2	
Ethylbenzene	**8.0**	ug/L	1.0	1		03/21/18 02:17	100-41-4	
Toluene	ND	ug/L	1.0	1		03/21/18 02:17	108-88-3	
Xylene (Total)	**35.3**	ug/L	3.0	1		03/21/18 02:17	1330-20-7	
Surrogates								
Toluene-d8 (S)	103	%	80-115	1		03/21/18 02:17	2037-26-5	
4-Bromofluorobenzene (S)	100	%	80-119	1		03/21/18 02:17	460-00-4	
1,2-Dichloroethane-d4 (S)	91	%	80-117	1		03/21/18 02:17	17060-07-0	
Preservation pH	**1.0**		1.0	1		03/21/18 02:17		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1410**	mg/L	5.0	1		03/20/18 13:25		D6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**319**	mg/L	20.0	20		03/26/18 16:43	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Sample: GW-11146006-031318-CN-MW-2 **Lab ID: 60266194002** Collected: 03/13/18 14:00 Received: 03/17/18 08:05 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**1250**	ug/L	5.0	1	03/21/18 11:30	03/22/18 13:32	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	**33.6**	ug/L	1.0	1		03/21/18 02:32	71-43-2	
Ethylbenzene	ND	ug/L	1.0	1		03/21/18 02:32	100-41-4	
Toluene	ND	ug/L	1.0	1		03/21/18 02:32	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		03/21/18 02:32	1330-20-7	
Surrogates								
Toluene-d8 (S)	102	%	80-115	1		03/21/18 02:32	2037-26-5	
4-Bromofluorobenzene (S)	102	%	80-119	1		03/21/18 02:32	460-00-4	
1,2-Dichloroethane-d4 (S)	92	%	80-117	1		03/21/18 02:32	17060-07-0	
Preservation pH	**1.0**		1.0	1		03/21/18 02:32		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1450**	mg/L	5.0	1		03/20/18 13:25		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**154**	mg/L	10.0	10		03/22/18 23:26	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Sample: GW-11146006-031318-CN-MW-3 **Lab ID: 60266194003** Collected: 03/14/18 07:55 Received: 03/17/18 08:05 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**2340**	ug/L	5.0	1	03/21/18 11:30	03/22/18 13:35	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	**1430**	ug/L	25.0	25		03/21/18 02:47	71-43-2	
Ethylbenzene	**107**	ug/L	25.0	25		03/21/18 02:47	100-41-4	
Toluene	ND	ug/L	25.0	25		03/21/18 02:47	108-88-3	
Xylene (Total)	**1930**	ug/L	75.0	25		03/21/18 02:47	1330-20-7	
Surrogates								
Toluene-d8 (S)	102	%	80-115	25		03/21/18 02:47	2037-26-5	
4-Bromofluorobenzene (S)	102	%	80-119	25		03/21/18 02:47	460-00-4	
1,2-Dichloroethane-d4 (S)	91	%	80-117	25		03/21/18 02:47	17060-07-0	
Preservation pH	**1.0**		1.0	25		03/21/18 02:47		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1530**	mg/L	5.0	1		03/20/18 13:26		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**24.6**	mg/L	10.0	10		03/22/18 23:39	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Sample: GW-11146006-031318-CN-MW-4 **Lab ID: 60266194004** Collected: 03/13/18 14:10 Received: 03/17/18 08:05 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**827**	ug/L	5.0	1	03/21/18 11:30	03/22/18 13:37	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	**46.7**	ug/L	10.0	10		03/21/18 03:03	71-43-2	
Ethylbenzene	**29.2**	ug/L	10.0	10		03/21/18 03:03	100-41-4	
Toluene	ND	ug/L	10.0	10		03/21/18 03:03	108-88-3	
Xylene (Total)	**1330**	ug/L	30.0	10		03/21/18 03:03	1330-20-7	
Surrogates								
Toluene-d8 (S)	109	%	80-115	10		03/21/18 03:03	2037-26-5	
4-Bromofluorobenzene (S)	100	%	80-119	10		03/21/18 03:03	460-00-4	
1,2-Dichloroethane-d4 (S)	89	%	80-117	10		03/21/18 03:03	17060-07-0	
Preservation pH	**1.0**		1.0	10		03/21/18 03:03		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**2350**	mg/L	5.0	1		03/20/18 13:26		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**1370**	mg/L	200	200		03/26/18 16:56	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Sample: TRIP BLANK **Lab ID: 60266194005** Collected: 03/13/18 14:00 Received: 03/17/18 08:05 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	ND	ug/L	1.0	1		03/21/18 03:18	71-43-2	
Ethylbenzene	ND	ug/L	1.0	1		03/21/18 03:18	100-41-4	
Toluene	ND	ug/L	1.0	1		03/21/18 03:18	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		03/21/18 03:18	1330-20-7	
Surrogates								
Toluene-d8 (S)	102	%	80-115	1		03/21/18 03:18	2037-26-5	
4-Bromofluorobenzene (S)	101	%	80-119	1		03/21/18 03:18	460-00-4	
1,2-Dichloroethane-d4 (S)	92	%	80-117	1		03/21/18 03:18	17060-07-0	
Preservation pH	**1.0**		1.0	1		03/21/18 03:18		

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QUALITY CONTROL DATA

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

QC Batch: 518527 Analysis Method: EPA 6010
QC Batch Method: EPA 3010 Analysis Description: 6010 MET Dissolved
Associated Lab Samples: 60266194001, 60266194002, 60266194003, 60266194004

METHOD BLANK: 2122445 Matrix: Water
Associated Lab Samples: 60266194001, 60266194002, 60266194003, 60266194004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Manganese, Dissolved	ug/L	ND	5.0	03/22/18 13:04	

LABORATORY CONTROL SAMPLE: 2122446

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Manganese, Dissolved	ug/L	1000	1010	101	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2122447 2122448

Parameter	Units	60265784002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Manganese, Dissolved	ug/L	83.7	1000	1000	1080	1100	100	101	75-125	2	20	

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QUALITY CONTROL DATA

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

QC Batch: 518443 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV UST-WATER
Associated Lab Samples: 60266194001, 60266194002, 60266194003, 60266194004, 60266194005

METHOD BLANK: 2122059 Matrix: Water
Associated Lab Samples: 60266194001, 60266194002, 60266194003, 60266194004, 60266194005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	03/21/18 01:01	
Ethylbenzene	ug/L	ND	1.0	03/21/18 01:01	
Toluene	ug/L	ND	1.0	03/21/18 01:01	
Xylene (Total)	ug/L	ND	3.0	03/21/18 01:01	
1,2-Dichloroethane-d4 (S)	%	91	80-117	03/21/18 01:01	
4-Bromofluorobenzene (S)	%	101	80-119	03/21/18 01:01	
Toluene-d8 (S)	%	103	80-115	03/21/18 01:01	

LABORATORY CONTROL SAMPLE: 2122060

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	20	18.6	93	81-118	
Ethylbenzene	ug/L	20	20.3	102	80-118	
Toluene	ug/L	20	20.1	101	82-118	
Xylene (Total)	ug/L	60	60.6	101	81-120	
1,2-Dichloroethane-d4 (S)	%			90	80-117	
4-Bromofluorobenzene (S)	%			100	80-119	
Toluene-d8 (S)	%			103	80-115	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

QC Batch: 518321 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60266194001, 60266194002, 60266194003, 60266194004

METHOD BLANK: 2121722 Matrix: Water
Associated Lab Samples: 60266194001, 60266194002, 60266194003, 60266194004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	ND	5.0	03/20/18 13:24	

LABORATORY CONTROL SAMPLE: 2121723

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	969	97	80-120	

SAMPLE DUPLICATE: 2121724

Parameter	Units	60266194001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	1410	1740	21	10	D6

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

QC Batch: 518791 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60266194002, 60266194003

METHOD BLANK: 2123326 Matrix: Water
Associated Lab Samples: 60266194002, 60266194003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	03/22/18 20:28	

LABORATORY CONTROL SAMPLE: 2123327

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	4.8	96	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2123328 2123329

Parameter	Units	60265723001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	0.40J	5	5	5.4	5.5	99	103	80-120	3	15	

MATRIX SPIKE SAMPLE: 2123330

Parameter	Units	60265733003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	243	100	326	83	80-120	

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QUALITY CONTROL DATA

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

QC Batch: 519081 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60266194001, 60266194004

METHOD BLANK: 2125183 Matrix: Water
Associated Lab Samples: 60266194001, 60266194004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	03/26/18 13:36	

LABORATORY CONTROL SAMPLE: 2125184

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	5.1	103	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2125185 2125186

Parameter	Units	2072651019 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	194	100	100	304	303	109	109	80-120	0	15	

MATRIX SPIKE SAMPLE: 2125187

Parameter	Units	60266194004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	1370	1000	2520	115	80-120	

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QUALIFIERS

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K Pace Analytical Services - Kansas City

BATCH QUALIFIERS

Batch: 518443

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

D6 The precision between the sample and sample duplicate exceeded laboratory control limits.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 11146006 MAGNUM NO 1
Pace Project No.: 60266194

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60266194001	**GW-11146006-031318-CN-MW-1**	EPA 3010	518527	EPA 6010	518583
60266194002	**GW-11146006-031318-CN-MW-2**	EPA 3010	518527	EPA 6010	518583
60266194003	**GW-11146006-031318-CN-MW-3**	EPA 3010	518527	EPA 6010	518583
60266194004	**GW-11146006-031318-CN-MW-4**	EPA 3010	518527	EPA 6010	518583
60266194001	**GW-11146006-031318-CN-MW-1**	EPA 8260	518443		
60266194002	**GW-11146006-031318-CN-MW-2**	EPA 8260	518443		
60266194003	**GW-11146006-031318-CN-MW-3**	EPA 8260	518443		
60266194004	**GW-11146006-031318-CN-MW-4**	EPA 8260	518443		
60266194005	**TRIP BLANK**	EPA 8260	518443		
60266194001	**GW-11146006-031318-CN-MW-1**	SM 2540C	518321		
60266194002	**GW-11146006-031318-CN-MW-2**	SM 2540C	518321		
60266194003	**GW-11146006-031318-CN-MW-3**	SM 2540C	518321		
60266194004	**GW-11146006-031318-CN-MW-4**	SM 2540C	518321		
60266194001	**GW-11146006-031318-CN-MW-1**	EPA 300.0	519081		
60266194002	**GW-11146006-031318-CN-MW-2**	EPA 300.0	518791		
60266194003	**GW-11146006-031318-CN-MW-3**	EPA 300.0	518791		
60266194004	**GW-11146006-031318-CN-MW-4**	EPA 300.0	519081		

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Sample Condition Upon Receipt

WO# : 60266194

60266194

Client Name: CHD NM

Courier: FedEx ☒ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☐ Other ☐

Tracking #: 7801 1642 0336 Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☒ No ☐ Seals intact: Yes ☒ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☐ Other ☐

Thermometer Used: 266 **Type of Ice:** (Wet) Blue None

CH

Cooler Temperature (°C): **As-read** 3.1 **Corr. Factor** +0.2 **Corrected** 3.3

Date and initials of person examining contents:

Temperature should be above freezing to 6°C

Chain of Custody present:	☒Yes ☐No ☐N/A	
Chain of Custody relinquished:	☒Yes ☐No ☐N/A	
Samples arrived within holding time:	☒Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☐Yes ☒No ☐N/A	
Rush Turn Around Time requested:	☐Yes ☒No ☐N/A	
Sufficient volume:	☒Yes ☐No ☐N/A	
Correct containers used:	☒Yes ☐No ☐N/A	
Pace containers used:	☒Yes ☐No ☐N/A	
Containers intact:	☒Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☒N/A	
Filtered volume received for dissolved tests?	☒Yes ☐No ☐N/A	
Sample labels match COC: Date / time / ID / analyses	☒Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☒No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: (VOA) Micro, O&G, KS TPH, OK-DRO)	☒Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☒Yes ☐No ☐N/A	
Headspace in VOA vials (>6mm):	☐Yes ☒No ☐N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☒N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☒N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: Colleen Clyne Date: 03/20/2018

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Pace Analytical

Page : 1 Of 1

Section A
Required Client Information:
Company: GHD Services, New Mexico
Address: 6121 indian School Rd
Albuquerque, NM 87110
Email: jeff.walker@ghd.com
Phone: 505-884-0672 Fax:
Requested Due Date:

Section B
Required Project Information:
Report To: Jeff Walker
Copy To:
Purchase Order #:
Project Name: 11146006 Mangum No 1
Project #:

Section C
Invoice Information:
Attention:
Company Name:
Address:
Pace Quote:
Pace Project Manager: alice.spiller@pacelabs.com,
Pace Profile #: 10540 line 1

Regulatory Agency:
State / Location: NM

MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Other OT; Tissue TS

SAMPLE ID — One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

Requested Analysis Filtered (Y/N)

60266194

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	8260 BTEX	Total Dissolved Solids	300.0 Sulfate	Dissolved Mn-field filtered	Residual Chlorine (Y/N)	
1	GW-11146006-031318-CN-MW-1	WT	G	3-13-18	1415	—	—	3				↓	↓						↓	↓	↓	↓		BP2U BP3F (3)DG9H 001
2	GW-11146006-031318-CN-MW-2	↓	↓	↓	1400	—		↓				↓	↓						↓	↓	↓	↓		↓ 002
3	GW-11146006-031418-CN-MW-3	↓	↓	↓		3-14-18	0755	↓				↓	↓						↓	↓	↓	↓		↓ 003
4	GW-11146006-031318-CN-MW-4	↓	↓	↓	1410	—		↓				↓	↓						↓	↓	↓	↓		↓ 004
5																								(2) DG9H TB 005
6																								
7																								
8																								
9																								
10																								
11																								
12																								

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	J Walker / GHD	3-16-18	0941	[signature]	3/17	0905	3.3	Y	Y	Y

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Charles Neligh
SIGNATURE of SAMPLER: [signature]
DATE Signed: 03-14-18

Pace Analytical Services, LLC
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July 16, 2018

Jeff Walker
GHD Services
6121 indian School Rd
Ste 200
Albuquerque, NM 87110

RE: Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Dear Jeff Walker:
Enclosed are the analytical results for sample(s) received by the laboratory on June 29, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jamie Church
jamie.church@pacelabs.com
314-838-7223
Project Manager

Enclosures

cc: Angela Bown, GHD Services
Christine Mathews, GHD Services

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CERTIFICATIONS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Certification Number: 10090
WY STR Certification #: 2456.01
Arkansas Certification #: 17-016-0
Illinois Certification #: 200030
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070
Missouri Certification Number: 10090

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SAMPLE SUMMARY

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60273826001	**GW-11146006-062518-CN-MW-1**	Water	06/25/18 15:00	06/29/18 09:00
60273826002	**GW-11146006-062518-CN-MW-2**	Water	06/25/18 14:45	06/29/18 09:00
60273826003	**GW-11146006-062618-CN-MW-3**	Water	06/26/18 19:15	06/29/18 09:00
60273826004	**GW-11146006-062518-CN-MW-4**	Water	06/25/18 15:15	06/29/18 09:00

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SAMPLE ANALYTE COUNT

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60273826001	**GW-11146006-062518-CN-MW-1**	EPA 6010	TDS	1	PASI-K
		EPA 8260	PGH	8	PASI-K
		SM 2540C	JDA	1	PASI-K
		EPA 300.0	WNM	1	PASI-K
60273826002	**GW-11146006-062518-CN-MW-2**	EPA 6010	TDS	1	PASI-K
		EPA 8260	PGH	8	PASI-K
		SM 2540C	JDA	1	PASI-K
		EPA 300.0	WNM	1	PASI-K
60273826003	**GW-11146006-062618-CN-MW-3**	EPA 6010	TDS	1	PASI-K
		EPA 8260	PGH	8	PASI-K
		SM 2540C	JDA	1	PASI-K
		EPA 300.0	WNM	1	PASI-K
60273826004	**GW-11146006-062518-CN-MW-4**	EPA 6010	TDS	1	PASI-K
		EPA 8260	PGH	8	PASI-K
		SM 2540C	JDA	1	PASI-K
		EPA 300.0	WNM	1	PASI-K

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Sample: GW-11146006-062518-CN-MW-1 **Lab ID: 60273826001** Collected: 06/25/18 15:00 Received: 06/29/18 09:00 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**705**	ug/L	5.0	1	07/03/18 10:15	07/13/18 20:16	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	ND	ug/L	5.0	5		07/06/18 12:42	71-43-2	
Ethylbenzene	**6.7**	ug/L	5.0	5		07/06/18 12:42	100-41-4	
Toluene	ND	ug/L	5.0	5		07/06/18 12:42	108-88-3	
Xylene (Total)	**22.9**	ug/L	15.0	5		07/06/18 12:42	1330-20-7	
Surrogates								
Toluene-d8 (S)	99	%	80-115	5		07/06/18 12:42	2037-26-5	D3
4-Bromofluorobenzene (S)	99	%	80-119	5		07/06/18 12:42	460-00-4	
1,2-Dichloroethane-d4 (S)	81	%	80-117	5		07/06/18 12:42	17060-07-0	
Preservation pH	**1.0**		1.0	5		07/06/18 12:42		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1820**	mg/L	5.0	1		07/02/18 17:40		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**349**	mg/L	50.0	50		07/10/18 12:27	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Sample: GW-11146006-062518-CN-MW-2 **Lab ID: 60273826002** Collected: 06/25/18 14:45 Received: 06/29/18 09:00 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**1370**	ug/L	5.0	1	07/03/18 10:15	07/13/18 20:18	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	**7.9**	ug/L	5.0	5		07/06/18 12:57	71-43-2	
Ethylbenzene	ND	ug/L	5.0	5		07/06/18 12:57	100-41-4	
Toluene	ND	ug/L	5.0	5		07/06/18 12:57	108-88-3	
Xylene (Total)	ND	ug/L	15.0	5		07/06/18 12:57	1330-20-7	
Surrogates								
Toluene-d8 (S)	98	%	80-115	5		07/06/18 12:57	2037-26-5	D3
4-Bromofluorobenzene (S)	97	%	80-119	5		07/06/18 12:57	460-00-4	
1,2-Dichloroethane-d4 (S)	80	%	80-117	5		07/06/18 12:57	17060-07-0	
Preservation pH	**1.0**		1.0	5		07/06/18 12:57		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1600**	mg/L	5.0	1		07/02/18 17:40		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**31.3**	mg/L	2.0	2		07/10/18 12:42	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Sample: GW-11146006-062618-CN-MW-3 **Lab ID: 60273826003** Collected: 06/26/18 19:15 Received: 06/29/18 09:00 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**3520**	ug/L	5.0	1	07/03/18 10:15	07/13/18 20:20	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	**2020**	ug/L	25.0	25		07/09/18 19:10	71-43-2	
Ethylbenzene	**287**	ug/L	25.0	25		07/09/18 19:10	100-41-4	
Toluene	ND	ug/L	25.0	25		07/09/18 19:10	108-88-3	
Xylene (Total)	**2690**	ug/L	75.0	25		07/09/18 19:10	1330-20-7	
Surrogates								
Toluene-d8 (S)	99	%	80-115	25		07/09/18 19:10	2037-26-5	
4-Bromofluorobenzene (S)	94	%	80-119	25		07/09/18 19:10	460-00-4	
1,2-Dichloroethane-d4 (S)	81	%	80-117	25		07/09/18 19:10	17060-07-0	
Preservation pH	**1.0**		1.0	25		07/09/18 19:10		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**2560**	mg/L	5.0	1		07/02/18 17:40		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**606**	mg/L	50.0	50		07/10/18 13:27	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Sample: GW-11146006-062518-CN-MW-4 **Lab ID: 60273826004** Collected: 06/25/18 15:15 Received: 06/29/18 09:00 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**888**	ug/L	5.0	1	07/03/18 10:15	07/13/18 20:23	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	**56.1**	ug/L	20.0	20		07/06/18 13:12	71-43-2	
Ethylbenzene	ND	ug/L	20.0	20		07/06/18 13:12	100-41-4	
Toluene	ND	ug/L	20.0	20		07/06/18 13:12	108-88-3	
Xylene (Total)	**1740**	ug/L	60.0	20		07/06/18 13:12	1330-20-7	
Surrogates								
Toluene-d8 (S)	102	%	80-115	20		07/06/18 13:12	2037-26-5	D3
4-Bromofluorobenzene (S)	98	%	80-119	20		07/06/18 13:12	460-00-4	
1,2-Dichloroethane-d4 (S)	78	%	80-117	20		07/06/18 13:12	17060-07-0	S0,S8
Preservation pH	**1.0**		1.0	20		07/06/18 13:12		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**2540**	mg/L	5.0	1		07/02/18 17:40		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**1230**	mg/L	200	200		07/11/18 10:06	14808-79-8	M1

REPORT OF LABORATORY ANALYSIS

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Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

QC Batch: 532692 Analysis Method: EPA 6010
QC Batch Method: EPA 3010 Analysis Description: 6010 MET Dissolved
Associated Lab Samples: 60273826001, 60273826002, 60273826003, 60273826004

METHOD BLANK: 2181855 Matrix: Water
Associated Lab Samples: 60273826001, 60273826002, 60273826003, 60273826004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Manganese, Dissolved	ug/L	ND	5.0	07/13/18 20:08	

LABORATORY CONTROL SAMPLE: 2181856

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Manganese, Dissolved	ug/L	1000	1040	104	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2181857 2181858

Parameter	Units	60273713001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Manganese, Dissolved	ug/L	570	1000	1000	1630	1640	106	107	75-125	1	20	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

QC Batch: 533124 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV UST-WATER
Associated Lab Samples: 60273826001, 60273826002, 60273826004

METHOD BLANK: 2183516 Matrix: Water
Associated Lab Samples: 60273826001, 60273826002, 60273826004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	07/06/18 11:56	
Ethylbenzene	ug/L	ND	1.0	07/06/18 11:56	
Toluene	ug/L	ND	1.0	07/06/18 11:56	
Xylene (Total)	ug/L	ND	3.0	07/06/18 11:56	
1,2-Dichloroethane-d4 (S)	%	88	80-117	07/06/18 11:56	
4-Bromofluorobenzene (S)	%	98	80-119	07/06/18 11:56	
Toluene-d8 (S)	%	98	80-115	07/06/18 11:56	

LABORATORY CONTROL SAMPLE: 2183517

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	20	20.2	101	81-118	
Ethylbenzene	ug/L	20	22.2	111	80-118	
Toluene	ug/L	20	21.4	107	82-118	
Xylene (Total)	ug/L	60	65.1	109	81-120	
1,2-Dichloroethane-d4 (S)	%			97	80-117	
4-Bromofluorobenzene (S)	%			96	80-119	
Toluene-d8 (S)	%			101	80-115	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

QC Batch: 533385 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV UST-WATER
Associated Lab Samples: 60273826003

METHOD BLANK: 2184753 Matrix: Water
Associated Lab Samples: 60273826003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	07/09/18 17:24	
Ethylbenzene	ug/L	ND	1.0	07/09/18 17:24	
Toluene	ug/L	ND	1.0	07/09/18 17:24	
Xylene (Total)	ug/L	ND	3.0	07/09/18 17:24	
1,2-Dichloroethane-d4 (S)	%	86	80-117	07/09/18 17:24	
4-Bromofluorobenzene (S)	%	97	80-119	07/09/18 17:24	
Toluene-d8 (S)	%	98	80-115	07/09/18 17:24	

LABORATORY CONTROL SAMPLE: 2184754

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	20	19.7	98	81-118	
Ethylbenzene	ug/L	20	22.0	110	80-118	
Toluene	ug/L	20	20.6	103	82-118	
Xylene (Total)	ug/L	60	65.1	108	81-120	
1,2-Dichloroethane-d4 (S)	%			98	80-117	
4-Bromofluorobenzene (S)	%			92	80-119	
Toluene-d8 (S)	%			101	80-115	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

QC Batch: 532621 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60273826001, 60273826002, 60273826003, 60273826004

METHOD BLANK: 2181595 Matrix: Water
Associated Lab Samples: 60273826001, 60273826002, 60273826003, 60273826004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	ND	5.0	07/02/18 17:40	

LABORATORY CONTROL SAMPLE: 2181596

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	1000	100	80-120	

SAMPLE DUPLICATE: 2181597

Parameter	Units	60273826001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	1820	1820	0	10	

SAMPLE DUPLICATE: 2181598

Parameter	Units	60273651001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	963	961	0	10	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

QC Batch: 533632 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60273826001, 60273826002, 60273826003

METHOD BLANK: 2185387 Matrix: Water
Associated Lab Samples: 60273826001, 60273826002, 60273826003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	07/10/18 09:45	

LABORATORY CONTROL SAMPLE: 2185388

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	4.8	97	90-110	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

QC Batch: 533816 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60273826004

METHOD BLANK: 2186127 Matrix: Water
Associated Lab Samples: 60273826004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	07/11/18 09:38	

LABORATORY CONTROL SAMPLE: 2186128

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	4.8	96	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2186129 2186130

Parameter	Units	60273826004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	1230	1000	1000	2040	2290	81	105	90-110	11	15	M1

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QUALIFIERS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

BATCH QUALIFIERS

Batch: 533124

[M5]	A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 533385

[M5]	A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

D3	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
S0	Surrogate recovery outside laboratory control limits.
S8	Surrogate recovery outside laboratory control limits due to matrix interferences (confirmed by similar results from sample re-extraction and/or re-analysis)

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 11146006 MANGUM NO 1
Pace Project No.: 60273826

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60273826001	**GW-11146006-062518-CN-MW-1**	EPA 3010	532692	EPA 6010	532752
60273826002	**GW-11146006-062518-CN-MW-2**	EPA 3010	532692	EPA 6010	532752
60273826003	**GW-11146006-062618-CN-MW-3**	EPA 3010	532692	EPA 6010	532752
60273826004	**GW-11146006-062518-CN-MW-4**	EPA 3010	532692	EPA 6010	532752
60273826001	**GW-11146006-062518-CN-MW-1**	EPA 8260	533124		
60273826002	**GW-11146006-062518-CN-MW-2**	EPA 8260	533124		
60273826003	**GW-11146006-062618-CN-MW-3**	EPA 8260	533385		
60273826004	**GW-11146006-062518-CN-MW-4**	EPA 8260	533124		
60273826001	**GW-11146006-062518-CN-MW-1**	SM 2540C	532621		
60273826002	**GW-11146006-062518-CN-MW-2**	SM 2540C	532621		
60273826003	**GW-11146006-062618-CN-MW-3**	SM 2540C	532621		
60273826004	**GW-11146006-062518-CN-MW-4**	SM 2540C	532621		
60273826001	**GW-11146006-062518-CN-MW-1**	EPA 300.0	533632		
60273826002	**GW-11146006-062518-CN-MW-2**	EPA 300.0	533632		
60273826003	**GW-11146006-062618-CN-MW-3**	EPA 300.0	533632		
60273826004	**GW-11146006-062518-CN-MW-4**	EPA 300.0	533816		

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Sample Condition Upon Receipt

WO# : 60273826

60273826

Client Name: GHD Services NM

Courier: FedEx ☑ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☐ Other ☐

Tracking #: 7816 3632 7818 Pace Shipping Label Used? Yes ☐ No ☑

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☑ Foam ☐ None ☐ Other ☐

Thermometer Used: T-296 **Type of Ice:** Wet Blue None

JLS

Cooler Temperature (°C): **As-read** 2.6 **Corr. Factor** +1.3 **Corrected** 3.9

Date and initials of person examining contents 6/29/18 JLS

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☐Yes ☑No ☐N/A	
Rush Turn Around Time requested:	☐Yes ☑No ☐N/A	
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	☑Yes ☐No ☐N/A	
Pace containers used:	☑Yes ☐No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☑No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☑Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☑Yes ☐No ☐N/A	
Headspace in VOA vials (>6mm):	☐Yes ☑No ☐N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☑N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: Jann Chuck 7/2/18 Date: _____

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A — Required Client Information:

Company:	GHD Services, New Mexico
Address:	6121 indian School Rd
	Albuquerque, NM 87110
Email:	jeff.walker@ghd.com
Phone:	505-884-0672 Fax:
Requested Due Date:	Standard TAT

Section B — Required Project Information:

Report To:	Jeff Walker
Copy To:	
Purchase Order #:	
Project Name:	11146006 Mangum No 1
Project #:	

Section C — Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote:	
Pace Project Manager:	alice.spiller@pacelabs.com,
Pace Profile #:	10540 line 1

Regulatory Agency
State / Location
NM

SAMPLE ID — One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

Requested Analysis Filtered (Y/N): Dissolved Mn-field filtered — Y

6027386

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	8260 BTEX	Total Dissolved Solids	300.0 Sulfate	Dissolved Mn-field filtered		Residual Chlorine (Y/N)	
1	GW-11146006-062518-CN-MW-1	WT		6/25/18	1500				5	1		1	3						X	X	X	X	BPIU, BP3F, 3	DG9H	001
2	GW-11146006-062518-CN-MW-2	WT		6/25/18	1445				5	1		1	3						X	X	X	X	↓	↓	002
3	GW-11146006-062618-CN-MW-3	WT		6/26/18	915				5	1		1	3						X	X	X	X	↓	↓	003
4	GW-11146006-062618-CN-MW-4	WT		6/25/18	1515				5	1		1	3						X	X	X	X	↓	↓	004
5																							2	DG9H (CTB)	005
6																									
7																									
8																									
9																									
10																									
11																									
12																									

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	[signature] / GHD	6/28/18	1600	E Brockett / Pace	6/29	0900	3.9	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Christine Mathews

SIGNATURE of SAMPLER: [signature]

DATE Signed: 6/28/18

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

September 18, 2018

Jeff Walker
GHD Services
6121 indian School Rd
Ste 200
Albuquerque, NM 87110

RE: Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Dear Jeff Walker:
Enclosed are the analytical results for sample(s) received by the laboratory on September 08, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jamie Church
jamie.church@pacelabs.com
314-838-7223
Project Manager

Enclosures

cc: Angela Bown, GHD Services
Christine Mathews, GHD Services

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CERTIFICATIONS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Certification Number: 10090
Arkansas Drinking Water
WY STR Certification #: 2456.01
Arkansas Certification #: 18-016-0
Arkansas Drinking Water
Illinois Certification #: 004455
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070
Missouri Certification Number: 10090

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SAMPLE SUMMARY

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60280031001	**GW-11146006-090418-JP-MW-1**	Water	09/04/18 16:20	09/08/18 08:30
60280031002	**GW-11146006-090418-JP-MW-2**	Water	09/04/18 16:40	09/08/18 08:30
60280031003	**GW-11146006-090518-JP-MW-3**	Water	09/05/18 07:41	09/08/18 08:30
60280031004	**GW-11146006-090418-JP-MW-4**	Water	09/04/18 16:00	09/08/18 08:30
60280031005	**TRIP BLANK**	Water	09/04/18 08:00	09/08/18 11:12

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SAMPLE ANALYTE COUNT

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60280031001	**GW-11146006-090418-JP-MW-1**	EPA 6010	OL	1	PASI-K
		EPA 8260	JKL	8	PASI-K
		SM 2540C	LDF	1	PASI-K
		EPA 300.0	WNM	1	PASI-K
60280031002	**GW-11146006-090418-JP-MW-2**	EPA 6010	OL	1	PASI-K
		EPA 8260	JKL	8	PASI-K
		SM 2540C	LDF	1	PASI-K
		EPA 300.0	WNM	1	PASI-K
60280031003	**GW-11146006-090518-JP-MW-3**	EPA 6010	OL	1	PASI-K
		EPA 8260	EAG, JKL	8	PASI-K
		SM 2540C	JDA	1	PASI-K
		EPA 300.0	WNM	1	PASI-K
60280031004	**GW-11146006-090418-JP-MW-4**	EPA 6010	OL	1	PASI-K
		EPA 8260	JKL	8	PASI-K
		SM 2540C	LDF	1	PASI-K
		EPA 300.0	WNM	1	PASI-K
60280031005	**TRIP BLANK**	EPA 8260	JKL	8	PASI-K

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Sample: GW-11146006-090418-JP-MW-1 **Lab ID: 60280031001** Collected: 09/04/18 16:20 Received: 09/08/18 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**694**	ug/L	5.0	1	09/11/18 10:15	09/11/18 16:44	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	ND	ug/L	5.0	5		09/14/18 09:21	71-43-2	
Ethylbenzene	**15.4**	ug/L	5.0	5		09/14/18 09:21	100-41-4	
Toluene	ND	ug/L	5.0	5		09/14/18 09:21	108-88-3	
Xylene (Total)	**49.9**	ug/L	15.0	5		09/14/18 09:21	1330-20-7	
Surrogates								
Toluene-d8 (S)	105	%	80-115	5		09/14/18 09:21	2037-26-5	D3
4-Bromofluorobenzene (S)	106	%	80-119	5		09/14/18 09:21	460-00-4	
1,2-Dichloroethane-d4 (S)	100	%	80-117	5		09/14/18 09:21	17060-07-0	
Preservation pH	**1.0**		1.0	5		09/14/18 09:21		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**2000**	mg/L	5.0	1		09/10/18 21:24		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**481**	mg/L	50.0	50		09/17/18 15:18	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Sample: GW-11146006-090418-JP-MW-2 **Lab ID: 60280031002** Collected: 09/04/18 16:40 Received: 09/08/18 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**1130**	ug/L	5.0	1	09/11/18 10:15	09/11/18 16:51	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	ND	ug/L	1.0	1		09/14/18 09:36	71-43-2	
Ethylbenzene	ND	ug/L	1.0	1		09/14/18 09:36	100-41-4	
Toluene	ND	ug/L	1.0	1		09/14/18 09:36	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		09/14/18 09:36	1330-20-7	
Surrogates								
Toluene-d8 (S)	104	%	80-115	1		09/14/18 09:36	2037-26-5	
4-Bromofluorobenzene (S)	102	%	80-119	1		09/14/18 09:36	460-00-4	
1,2-Dichloroethane-d4 (S)	101	%	80-117	1		09/14/18 09:36	17060-07-0	
Preservation pH	**1.0**		1.0	1		09/14/18 09:36		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1730**	mg/L	5.0	1		09/10/18 21:24		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**87.0**	mg/L	10.0	10		09/11/18 19:52	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Sample: GW-11146006-090518-JP-MW-3 **Lab ID: 60280031003** Collected: 09/05/18 07:41 Received: 09/08/18 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**2080**	ug/L	5.0	1	09/11/18 10:15	09/11/18 17:06	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	**1820**	ug/L	25.0	25		09/17/18 21:06	71-43-2	
Ethylbenzene	**160**	ug/L	5.0	5		09/14/18 09:52	100-41-4	
Toluene	ND	ug/L	5.0	5		09/14/18 09:52	108-88-3	
Xylene (Total)	**1400**	ug/L	15.0	5		09/14/18 09:52	1330-20-7	
Surrogates								
Toluene-d8 (S)	104	%	80-115	5		09/14/18 09:52	2037-26-5	
4-Bromofluorobenzene (S)	107	%	80-119	5		09/14/18 09:52	460-00-4	
1,2-Dichloroethane-d4 (S)	102	%	80-117	5		09/14/18 09:52	17060-07-0	
Preservation pH	**1.0**		1.0	5		09/14/18 09:52		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**2300**	mg/L	5.0	1		09/12/18 14:37		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**241**	mg/L	20.0	20		09/13/18 17:30	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Sample: GW-11146006-090418-JP-MW-4 **Lab ID: 60280031004** Collected: 09/04/18 16:00 Received: 09/08/18 08:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Manganese, Dissolved	**889**	ug/L	5.0	1	09/11/18 10:15	09/11/18 17:09	7439-96-5	
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	**25.7**	ug/L	5.0	5		09/14/18 10:07	71-43-2	
Ethylbenzene	ND	ug/L	5.0	5		09/14/18 10:07	100-41-4	
Toluene	ND	ug/L	5.0	5		09/14/18 10:07	108-88-3	
Xylene (Total)	**848**	ug/L	15.0	5		09/14/18 10:07	1330-20-7	
Surrogates								
Toluene-d8 (S)	106	%	80-115	5		09/14/18 10:07	2037-26-5	
4-Bromofluorobenzene (S)	105	%	80-119	5		09/14/18 10:07	460-00-4	
1,2-Dichloroethane-d4 (S)	100	%	80-117	5		09/14/18 10:07	17060-07-0	
Preservation pH	**1.0**		1.0	5		09/14/18 10:07		
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**2410**	mg/L	5.0	1		09/10/18 21:24		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Sulfate	**1450**	mg/L	100	100		09/13/18 17:44	14808-79-8	

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ANALYTICAL RESULTS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Sample: TRIP BLANK **Lab ID: 60280031005** Collected: 09/04/18 08:00 Received: 09/08/18 11:12 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV UST, Water	Analytical Method: EPA 8260							
Benzene	ND	ug/L	1.0	1		09/14/18 10:23	71-43-2	
Ethylbenzene	ND	ug/L	1.0	1		09/14/18 10:23	100-41-4	
Toluene	ND	ug/L	1.0	1		09/14/18 10:23	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		09/14/18 10:23	1330-20-7	
Surrogates								
Toluene-d8 (S)	103	%	80-115	1		09/14/18 10:23	2037-26-5	
4-Bromofluorobenzene (S)	110	%	80-119	1		09/14/18 10:23	460-00-4	
1,2-Dichloroethane-d4 (S)	100	%	80-117	1		09/14/18 10:23	17060-07-0	
Preservation pH	**1.0**		1.0	1		09/14/18 10:23		

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

QC Batch: 543870 Analysis Method: EPA 6010
QC Batch Method: EPA 3010 Analysis Description: 6010 MET Dissolved
Associated Lab Samples: 60280031001, 60280031002, 60280031003, 60280031004

METHOD BLANK: 2228607 Matrix: Water
Associated Lab Samples: 60280031001, 60280031002, 60280031003, 60280031004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Manganese, Dissolved	ug/L	ND	5.0	09/11/18 16:18	

LABORATORY CONTROL SAMPLE: 2228608

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Manganese, Dissolved	ug/L	1000	998	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2228609 2228610

Parameter	Units	60279617001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Manganese, Dissolved	ug/L	240	1000	1000	1190	1210	95	97	75-125	2	20	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

QC Batch: 544539 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV UST-WATER
Associated Lab Samples: 60280031001, 60280031002, 60280031003, 60280031004, 60280031005

METHOD BLANK: 2230961 Matrix: Water
Associated Lab Samples: 60280031001, 60280031002, 60280031003, 60280031004, 60280031005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	09/14/18 05:13	
Ethylbenzene	ug/L	ND	1.0	09/14/18 05:13	
Toluene	ug/L	ND	1.0	09/14/18 05:13	
Xylene (Total)	ug/L	ND	3.0	09/14/18 05:13	
1,2-Dichloroethane-d4 (S)	%	98	80-117	09/14/18 05:13	
4-Bromofluorobenzene (S)	%	110	80-119	09/14/18 05:13	
Toluene-d8 (S)	%	104	80-115	09/14/18 05:13	

LABORATORY CONTROL SAMPLE: 2230962

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	20	20.2	101	81-118	
Ethylbenzene	ug/L	20	20.7	103	80-118	
Toluene	ug/L	20	22.3	112	82-118	
Xylene (Total)	ug/L	60	59.0	98	81-120	
1,2-Dichloroethane-d4 (S)	%			101	80-117	
4-Bromofluorobenzene (S)	%			104	80-119	
Toluene-d8 (S)	%			104	80-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2230963 2230964

Parameter	Units	60279836006 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Benzene	ug/L	ND	20	20	17.8	30.6	89	153	62-138	53	34	M1,R1
Ethylbenzene	ug/L	ND	20	20	18.9	33.1	94	165	60-140	55	32	M1,R1
Toluene	ug/L	ND	20	20	19.4	33.7	97	169	65-135	54	32	M1,R1
Xylene (Total)	ug/L	ND	60	60	54.9	95.8	92	160	69-133	54	31	MS,RS
1,2-Dichloroethane-d4 (S)	%						102	103	80-117			
4-Bromofluorobenzene (S)	%						106	104	80-119			
Toluene-d8 (S)	%						103	104	80-115			
Preservation pH		11.0			11.0	11.0				0	0	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

QC Batch: 544934
QC Batch Method: EPA 8260
Analysis Method: EPA 8260
Analysis Description: 8260 MSV UST-WATER
Associated Lab Samples: 60280031003

METHOD BLANK: 2233104 Matrix: Water
Associated Lab Samples: 60280031003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	09/17/18 17:08	
1,2-Dichloroethane-d4 (S)	%	99	80-117	09/17/18 17:08	
4-Bromofluorobenzene (S)	%	101	80-119	09/17/18 17:08	
Toluene-d8 (S)	%	101	80-115	09/17/18 17:08	

LABORATORY CONTROL SAMPLE: 2233105

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	20	18.6	93	81-118	
1,2-Dichloroethane-d4 (S)	%			99	80-117	
4-Bromofluorobenzene (S)	%			100	80-119	
Toluene-d8 (S)	%			100	80-115	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

QC Batch: 543785 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60280031001, 60280031002, 60280031004

METHOD BLANK: 2228384 Matrix: Water
Associated Lab Samples: 60280031001, 60280031002, 60280031004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	ND	5.0	09/10/18 21:24	

LABORATORY CONTROL SAMPLE: 2228385

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	988	99	80-120	

SAMPLE DUPLICATE: 2228386

Parameter	Units	60279537001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	332	328	1	10	

SAMPLE DUPLICATE: 2228387

Parameter	Units	60279670006 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	27900	31200	11	10	D6

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

QC Batch: 544091 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60280031003

METHOD BLANK: 2229368 Matrix: Water
Associated Lab Samples: 60280031003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	ND	5.0	09/12/18 14:37	

LABORATORY CONTROL SAMPLE: 2229369

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	1010	101	80-120	

SAMPLE DUPLICATE: 2229370

Parameter	Units	60279828005 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	888	895	1	10	

SAMPLE DUPLICATE: 2229371

Parameter	Units	60279996001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	8780	8580	2	10	

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

QC Batch: 543974
QC Batch Method: EPA 300.0
Analysis Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60280031002

METHOD BLANK: 2228958 Matrix: Water
Associated Lab Samples: 60280031002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	09/11/18 14:15	

LABORATORY CONTROL SAMPLE: 2228959

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	4.9	99	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2228960 2228961

Parameter	Units	60277317001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	1220			1770	1770				0	15	H1

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

QC Batch: 544408 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60280031003, 60280031004

METHOD BLANK: 2230504 Matrix: Water
Associated Lab Samples: 60280031003, 60280031004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	09/13/18 14:46	

LABORATORY CONTROL SAMPLE: 2230505

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	5.2	103	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2230506 2230507

Parameter	Units	60279789001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	2640	1000	1000	3830	3800	119	116	90-110	1	15	M1

MATRIX SPIKE SAMPLE: 2230508

Parameter	Units	60280078004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	1400	500	2010	123	90-110	E,M1

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QUALITY CONTROL DATA

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

QC Batch: 544903 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60280031001

METHOD BLANK: 2233029 Matrix: Water
Associated Lab Samples: 60280031001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	09/17/18 13:56	

LABORATORY CONTROL SAMPLE: 2233030

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	5.1	102	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2233031 2233032

Parameter	Units	60279770001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	ND	50000	50000	67300	64100	120	114	90-110	5	15	M1

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QUALIFIERS

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

BATCH QUALIFIERS

Batch: 544934

[M5]	A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

D3	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
D6	The precision between the sample and sample duplicate exceeded laboratory control limits.
E	Analyte concentration exceeded the calibration range. The reported result is estimated.
H1	Analysis conducted outside the EPA method holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
MS	Analyte recovery in the matrix spike was outside QC limits for one or more of the constituent analytes used in the calculated result.
R1	RPD value was outside control limits.
RS	The RPD value in one of the constituent analytes was outside the control limits.

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Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 11146006 MANGUM NO 1
Pace Project No.: 60280031

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60280031001	**GW-11146006-090418-JP-MW-1**	EPA 3010	543870	EPA 6010	543906
60280031002	**GW-11146006-090418-JP-MW-2**	EPA 3010	543870	EPA 6010	543906
60280031003	**GW-11146006-090518-JP-MW-3**	EPA 3010	543870	EPA 6010	543906
60280031004	**GW-11146006-090418-JP-MW-4**	EPA 3010	543870	EPA 6010	543906
60280031001	**GW-11146006-090418-JP-MW-1**	EPA 8260	544539		
60280031002	**GW-11146006-090418-JP-MW-2**	EPA 8260	544539		
60280031003	**GW-11146006-090518-JP-MW-3**	EPA 8260	544539		
60280031003	**GW-11146006-090518-JP-MW-3**	EPA 8260	544934		
60280031004	**GW-11146006-090418-JP-MW-4**	EPA 8260	544539		
60280031005	**TRIP BLANK**	EPA 8260	544539		
60280031001	**GW-11146006-090418-JP-MW-1**	SM 2540C	543785		
60280031002	**GW-11146006-090418-JP-MW-2**	SM 2540C	543785		
60280031003	**GW-11146006-090518-JP-MW-3**	SM 2540C	544091		
60280031004	**GW-11146006-090418-JP-MW-4**	SM 2540C	543785		
60280031001	**GW-11146006-090418-JP-MW-1**	EPA 300.0	544903		
60280031002	**GW-11146006-090418-JP-MW-2**	EPA 300.0	543974		
60280031003	**GW-11146006-090518-JP-MW-3**	EPA 300.0	544408		
60280031004	**GW-11146006-090418-JP-MW-4**	EPA 300.0	544408		

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Jamie

WO# : 60280031

60280031

Pace Analytical®
www.pacelabs.com

Sample Condition Upon Receipt

Client Name: GHD

Courier: FedEx ☑ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☐ Other ☐

Tracking #: 7826 8003 8772 Pace Shipping Label Used? Yes ☐ No ☑

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☑ Foam ☐ None ☐ Other ☑

Thermometer Used: T298 **Type of Ice:** (Wet) Blue None

Cooler Temperature (°C): As-read 2.4 **Corr. Factor** 0.0 **Corrected** 2.4

Date and initials of person examining contents: DG 9-8-18

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☐Yes ☑No ☐N/A	
Rush Turn Around Time requested:	☐Yes ☑No ☐N/A	
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	☑Yes ☐No ☐N/A	
Pace containers used:	☑Yes ☐No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☑No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☑Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added. Sample # 3 collected @ 0741
Cyanide water sample checks: Lead acetate strip turns dark? (Record only) Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No / ☐Yes ☐No	
Trip Blank present:	☑Yes ☐No ☐N/A	
Headspace in VOA vials (>6mm):	☐Yes ☑No ☐N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☑N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: Date/Time:

Comments/ Resolution:

Project Manager Review: Jami Church Date: 9/10/18

Pace Analytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A — Required Client Information:

Company:	GHD Services, New Mexico
Address:	6121 indian School Rd
	Albuquerque, NM 87110
Email:	jeff.walker@ghd.com
Phone:	505-884-0672 Fax:
Requested Due Date:	

Section B — Required Project Information:

Report To:	Jeff Walker
Copy To:	
Purchase Order #:	
Project Name:	11146006 Mangum No 1
Project #:	

Section C — Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote:	
Pace Project Manager:	alice.spiller@pacelabs.com,
Pace Profile #:	10540 line 1

Regulatory Agency	
State / Location	NM

SAMPLE ID — One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	8260 BTEX	Total Dissolved Solids	300.0 Sulfate	Dissolved Mn-field filtered	Residual Chlorine (Y/N)	60280031
1	GW-11146006-090418-JP-MW-1		G	9-4-18	1620				6										✓	✓	✓	✓	BP1U, BP3N, DG9H/(3)	001
2	GW-11146006-090418-JP-MW-2		↓	9-4-18	1640				6										✓	✓	✓	✓	↓	002
3	GW-11146006-090518-JP-MW-3		↓	9-5-18					6										✓	✓	✓	✓	↓	003
4	GW-11146006-090418-JP-MW-4		↓	9-4-18	1600				6										✓	✓	✓	✓	↓	004
5																							DG9H(2)(TB)	005
6																								
7																								
8																								
9																								
10																								
11																								
12																								

F SDG 9-8-18

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	[signature]	9/7/18	1300	[signature] PACE	9-8-18	0830	2.4	Y	Y	Y

SAMPLE CONDITIONS

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Josh Pigg / Charles Nelch

SIGNATURE of SAMPLER: [signature] DATE Signed: 9-7-18

Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

December 21, 2018

HilCorp-Farmington, NM

Sample Delivery Group:	L1052315
Samples Received:	12/12/2018
Project Number:	
Description:	Mangum 1
Site:	MANGUM #1
Report To:	Kurt Hoekstra and Jennifer Deal 382 Road 3100 Aztec, NM 87401

Entire Report Reviewed By: Daphne R Richards

Daphne Richards
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.

TABLE OF CONTENTS

MW1 L1052315-01 GW

Collected by	Collected date/time	Received date/time
Kurt	12/10/18 11:40	12/12/18 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Gravimetric Analysis by Method 2540 C-2011	WG1210427	1	12/15/18 09:13	12/15/18 11:07	AJS
Wet Chemistry by Method 9056A	WG1213182	10	12/21/18 12:00	12/21/18 12:00	ELN
Metals (ICP) by Method 6010B	WG1210107	1	12/14/18 00:00	12/14/18 16:30	TRB
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1210727	1	12/16/18 14:23	12/16/18 14:23	JAH

MW2 L1052315-02 GW

Collected by	Collected date/time	Received date/time
Kurt	12/10/18 13:35	12/12/18 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Gravimetric Analysis by Method 2540 C-2011	WG1210427	1	12/15/18 09:13	12/15/18 11:07	AJS
Wet Chemistry by Method 9056A	WG1213182	1	12/21/18 05:18	12/21/18 05:18	ELN
Metals (ICP) by Method 6010B	WG1210107	1	12/14/18 00:00	12/14/18 16:33	TRB
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1212787	1	12/19/18 01:16	12/19/18 01:16	JHH

MW3 L1052315-03 GW

Collected by	Collected date/time	Received date/time
Kurt	12/10/18 15:00	12/12/18 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Gravimetric Analysis by Method 2540 C-2011	WG1210427	1	12/15/18 09:13	12/15/18 11:07	AJS
Wet Chemistry by Method 9056A	WG1213182	5	12/21/18 12:15	12/21/18 12:15	ELN
Metals (ICP) by Method 6010B	WG1210107	1	12/14/18 00:00	12/14/18 16:35	TRB
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1210727	100	12/16/18 15:03	12/16/18 15:03	JAH

MW4 L1052315-04 GW

Collected by	Collected date/time	Received date/time
Kurt	12/10/18 10:30	12/12/18 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Gravimetric Analysis by Method 2540 C-2011	WG1210427	1	12/15/18 09:13	12/15/18 11:07	AJS
Wet Chemistry by Method 9056A	WG1213182	10	12/21/18 12:30	12/21/18 12:30	ELN
Metals (ICP) by Method 6010B	WG1210107	1	12/14/18 00:00	12/14/18 16:44	TRB
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1212787	20	12/19/18 01:56	12/19/18 01:56	JHH

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.

Daphne R Richards

Daphne Richards
Project Manager

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	1980		50.0	1	12/15/2018 11:07	WG1210427

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Sulfate	343		50.0	10	12/21/2018 12:00	WG1213182

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Iron,Dissolved	ND		0.100	1	12/14/2018 16:30	WG1210107
Manganese,Dissolved	0.712		0.0100	1	12/14/2018 16:30	WG1210107

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Benzene	ND		0.00100	1	12/16/2018 14:23	WG1210727
Toluene	ND		0.00100	1	12/16/2018 14:23	WG1210727
Ethylbenzene	ND		0.00100	1	12/16/2018 14:23	WG1210727
Total Xylenes	ND		0.00300	1	12/16/2018 14:23	WG1210727
(S) Toluene-d8	*114*		*80.0-120*		*12/16/2018 14:23*	WG1210727
(S) Dibromofluoromethane	*86.5*		*75.0-120*		*12/16/2018 14:23*	WG1210727
(S) a,a,a-Trifluorotoluene	*98.5*		*80.0-120*		*12/16/2018 14:23*	WG1210727
(S) 4-Bromofluorobenzene	*105*		*77.0-126*		*12/16/2018 14:23*	WG1210727

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	1470		25.0	1	12/15/2018 11:07	WG1210427

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Sulfate	27.7		5.00	1	12/21/2018 05:18	WG1213182

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Iron,Dissolved	ND		0.100	1	12/14/2018 16:33	WG1210107
Manganese,Dissolved	1.15		0.0100	1	12/14/2018 16:33	WG1210107

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Benzene	0.0543		0.00100	1	12/19/2018 01:16	WG1212787
Toluene	ND		0.00100	1	12/19/2018 01:16	WG1212787
Ethylbenzene	0.00154		0.00100	1	12/19/2018 01:16	WG1212787
Total Xylenes	ND		0.00300	1	12/19/2018 01:16	WG1212787
(S) Toluene-d8	*101*		*80.0-120*		*12/19/2018 01:16*	WG1212787
(S) Dibromofluoromethane	*102*		*75.0-120*		*12/19/2018 01:16*	WG1212787
(S) a,a,a-Trifluorotoluene	*102*		*80.0-120*		*12/19/2018 01:16*	WG1212787
(S) 4-Bromofluorobenzene	*123*		*77.0-126*		*12/19/2018 01:16*	WG1212787

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	2050		50.0	1	12/15/2018 11:07	WG1210427

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Sulfate	170		25.0	5	12/21/2018 12:15	WG1213182

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Iron,Dissolved	0.142		0.100	1	12/14/2018 16:35	WG1210107
Manganese,Dissolved	1.94		0.0100	1	12/14/2018 16:35	WG1210107

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Benzene	1.49		0.100	100	12/16/2018 15:03	WG1210727
Toluene	ND		0.100	100	12/16/2018 15:03	WG1210727
Ethylbenzene	0.133		0.100	100	12/16/2018 15:03	WG1210727
Total Xylenes	0.639		0.300	100	12/16/2018 15:03	WG1210727
(S) Toluene-d8	*105*		*80.0-120*		*12/16/2018 15:03*	WG1210727
(S) Dibromofluoromethane	*87.8*		*75.0-120*		*12/16/2018 15:03*	WG1210727
(S) a,a,a-Trifluorotoluene	*102*		*80.0-120*		*12/16/2018 15:03*	WG1210727
(S) 4-Bromofluorobenzene	*97.5*		*77.0-126*		*12/16/2018 15:03*	WG1210727

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	1900		50.0	1	12/15/2018 11:07	WG1210427

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Sulfate	439		50.0	10	12/21/2018 12:30	WG1213182

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Iron,Dissolved	0.209		0.100	1	12/14/2018 16:44	WG1210107
Manganese,Dissolved	0.801		0.0100	1	12/14/2018 16:44	WG1210107

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Benzene	0.108		0.0200	20	12/19/2018 01:56	WG1212787
Toluene	ND		0.0200	20	12/19/2018 01:56	WG1212787
Ethylbenzene	0.0484		0.0200	20	12/19/2018 01:56	WG1212787
Total Xylenes	2.93		0.0600	20	12/19/2018 01:56	WG1212787
(S) Toluene-d8	*105*		*80.0-120*		*12/19/2018 01:56*	WG1212787
(S) Dibromofluoromethane	*101*		*75.0-120*		*12/19/2018 01:56*	WG1212787
(S) a,a,a-Trifluorotoluene	*99.4*		*80.0-120*		*12/19/2018 01:56*	WG1212787
(S) 4-Bromofluorobenzene	*99.2*		*77.0-126*		*12/19/2018 01:56*	WG1212787

Method Blank (MB)

(MB) R3368632-1 12/15/18 11:07

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Dissolved Solids	U		2.82	10.0

L1052367-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1052367-04 12/15/18 11:07 • (DUP) R3368632-3 12/15/18 11:07

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Dissolved Solids	6680	6720	1	0.597		5

Laboratory Control Sample (LCS)

(LCS) R3368632-2 12/15/18 11:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Dissolved Solids	8800	8680	98.6	85.0-115	

Method Blank (MB)

(MB) R3370465-1 12/21/18 02:28

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Sulfate	U		0.0774	5.00

L1052314-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1052314-02 12/21/18 03:15 • (DUP) R3370465-3 12/21/18 03:30

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Sulfate	45.4	45.4	1	0.0958		15

L1052388-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1052388-01 12/21/18 09:09 • (DUP) R3370465-6 12/21/18 09:24

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Sulfate	11.1	11.0	1	0.224		15

Laboratory Control Sample (LCS)

(LCS) R3370465-2 12/21/18 02:44

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Sulfate	40.0	40.3	101	80.0-120	

L1052314-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1052314-02 12/21/18 03:15 • (MS) R3370465-4 12/21/18 03:45 • (MSD) R3370465-5 12/21/18 04:01

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 %
Sulfate	50.0	45.4	96.5	96.0	102	101	1	80.0-120			0.518	15

L1052388-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1052388-01 12/21/18 09:09 • (MS) R3370465-7 12/21/18 09:40

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Sulfate	50.0	11.1	62.1	102	1	80.0-120	

Method Blank (MB)

(MB) R3368433-1 12/14/18 15:38

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Iron,Dissolved	U		0.0141	0.100
Manganese,Dissolved	U		0.00120	0.0100

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

(LCS) R3368433-2 12/14/18 15:40 • (LCSD) R3368433-3 12/14/18 15:43

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 %
Iron,Dissolved	10.0	9.75	9.72	97.5	97.2	80.0-120			0.325	20
Manganese,Dissolved	1.00	0.966	0.951	96.6	95.1	80.0-120			1.60	20

L1051760-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1051760-01 12/14/18 15:46 • (MS) R3368433-5 12/14/18 15:51 • (MSD) R3368433-6 12/14/18 15:53

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 %
Iron,Dissolved	10.0	ND	9.73	9.83	97.3	98.3	1	75.0-125			1.03	20
Manganese,Dissolved	1.00	ND	0.958	0.968	95.8	96.8	1	75.0-125			0.950	20

Method Blank (MB)

(MB) R3369293-3 12/16/18 11:05

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Benzene	U		0.000331	0.00100
Ethylbenzene	U		0.000384	0.00100
Toluene	U		0.000412	0.00100
Xylenes, Total	U		0.00106	0.00300
(S) Toluene-d8	*110*			*80.0-120*
(S) Dibromofluoromethane	*85.7*			*75.0-120*
(S) a,a,a-Trifluorotoluene	*102*			*80.0-120*
(S) 4-Bromofluorobenzene	*98.6*			*77.0-126*

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

(LCS) R3369293-1 12/16/18 09:46 • (LCSD) R3369293-2 12/16/18 10:26

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 %
Benzene	0.0250	0.0211	0.0204	84.4	81.5	70.0-123			3.53	20
Ethylbenzene	0.0250	0.0269	0.0267	108	107	79.0-123			0.947	20
Toluene	0.0250	0.0252	0.0253	101	101	79.0-120			0.379	20
Xylenes, Total	0.0750	0.0818	0.0813	109	108	79.0-123			0.613	20
(S) Toluene-d8				*104*	*106*	*80.0-120*				
(S) Dibromofluoromethane				*84.7*	*84.1*	*75.0-120*				
(S) a,a,a-Trifluorotoluene				*103*	*103*	*80.0-120*				
(S) 4-Bromofluorobenzene				*93.3*	*93.5*	*77.0-126*				

Method Blank (MB)

(MB) R3369546-3 12/19/18 00:56

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Benzene	U		0.000331	0.00100
Ethylbenzene	U		0.000384	0.00100
Toluene	U		0.000412	0.00100
Xylenes, Total	U		0.00106	0.00300
(S) Toluene-d8	*106*			*80.0-120*
(S) Dibromofluoromethane	*103*			*75.0-120*
(S) a,a,a-Trifluorotoluene	*99.9*			*80.0-120*
(S) 4-Bromofluorobenzene	*97.3*			*77.0-126*

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

(LCS) R3369546-1 12/18/18 23:36 • (LCSD) R3369546-2 12/18/18 23:56

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 %
Benzene	0.0250	0.0258	0.0260	103	104	70.0-123			0.444	20
Ethylbenzene	0.0250	0.0268	0.0268	107	107	79.0-123			0.182	20
Toluene	0.0250	0.0253	0.0253	101	101	79.0-120			0.173	20
Xylenes, Total	0.0750	0.0808	0.0818	108	109	79.0-123			1.23	20
(S) Toluene-d8				*101*	*102*	*80.0-120*				
(S) Dibromofluoromethane				*102*	*101*	*75.0-120*				
(S) a,a,a-Trifluorotoluene				*101*	*102*	*80.0-120*				
(S) 4-Bromofluorobenzene				*100*	*102*	*77.0-126*				

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

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 [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	T 104704245-17-14
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

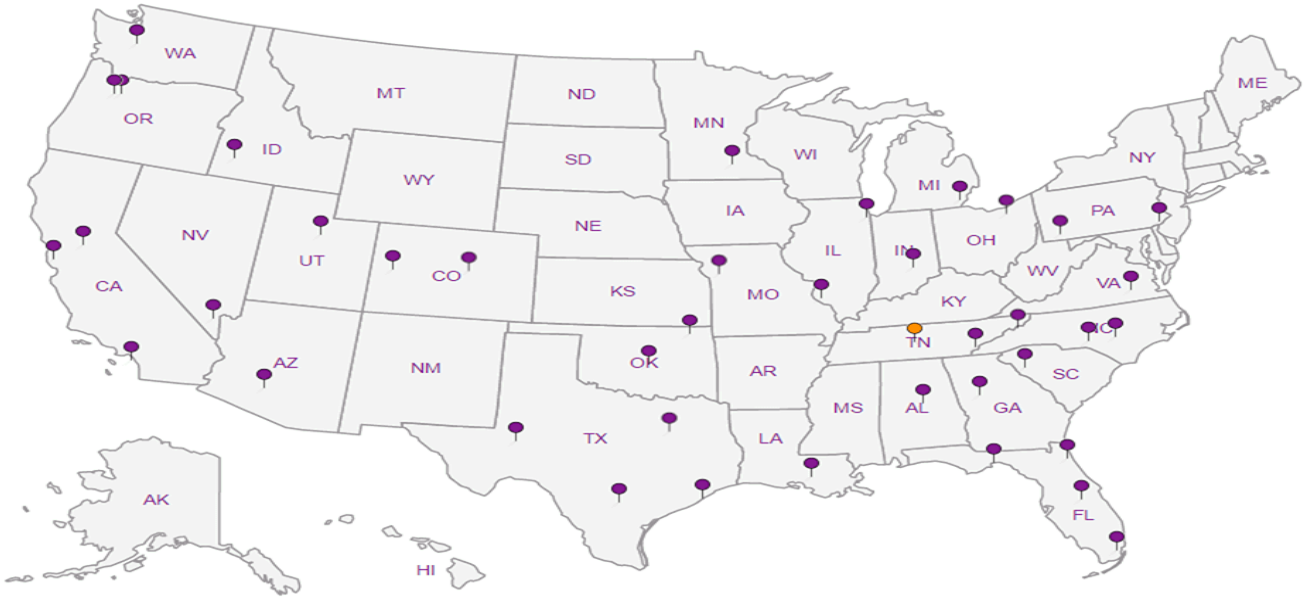
Third Party Federal Accreditations

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.



HilCorp-Farmington, NM

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Aztec, NM 87401

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Houston, TX 77208

Pres Chk

Report to: Kurt Hoekstra

Email To: khoekstra@hilcorp.com
CCARDOZA@hilcorp.com

Project Description:

City/State Collected:

Phone: 505-486-9543
Fax:

Client Project #

Lab Project # HILCORANM-HOEKSTRA

Collected by (print): Kurt

Site/Facility ID # MANCOS #1

P.O. #

Collected by (signature): Kurt Hoekstra
Immediately Packed on Ice N ___ Y ___

Rush? (Lab MUST Be Notified)
___ Same Day X Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace Analytical® National Center for Testing & Innovation

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L# L105 2315

B096

Account: HILCORANM
Template: T142959
Prelogin: P680913
TSR: 288 - Daphne Richards
PB: 11-14-18
Shipped Via: FedEX Ground

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Diss. Mn and Fe 250mlHDPE-NoPres NOT FIELD FILTERED	SULFATE, TDS 250mlHDPE-NoPres	V8260BTEX 40mlAmb-HCl	Remarks	Sample # (lab only)
MW1		GW	15.12	12-10	11:40	5	X	X	X		-01
MW2		GW	17.58	12-10	1:35	5	X	X	X		-02
MW3		GW	18.71	12-10	3:00	5	X	X	X		-03
[redacted]		GW				5	X	X	X		
MW4		GW	19.69	12-10	10:30	5	X	X	X		-04

* 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 # 4529 3005 1611

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)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR
Kurt Hoekstra	12-11-18	6:50 am		
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: 0.1 °C 2.1 2.2 Bottles Received: 20
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) ED	Date: 12/12/18 Time: 0830

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK