

REVIEWED

By Mike Buchanan at 10:01 am, May 24, 2024



ENSOLUM

March 29, 2023

New Mexico Oil Conservation Division

New Mexico Energy, Minerals, and Natural Resources Department
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Re: 2022 Annual Groundwater Monitoring Report

Mangum #1
San Juan County, New Mexico
NMOCD Incident Number: NCS1602631162
NMOCD Administrative Order: 3R-1038

To Whom it May Concern:

Ensolum, LLC (Ensolum), on behalf of Hilcorp Energy Company (Hilcorp), presents this 2022 Annual Groundwater Monitoring Report to the New Mexico Oil Conservation Division (NMOCD). This report documents quarterly groundwater monitoring activities conducted at the Mangum #1 natural gas production well (Site) in 2022. The Site is located approximately 1-mile south of the City of Bloomfield, New Mexico and is situated on surface BTEX. Continue to assess MW-3 for dissolved Mn.

SITE BACKGROUND

In April of 2015, ConocoPhillips Company (well owner/operator at that time) conducted a Site assessment as part of internal due diligence activities. Seven potholes were advanced to depths of approximately 7.5 feet to 8 feet below ground surface (bgs) using a backhoe. Soil within the potholes was field screened for volatile aromatic hydrocarbons using a photoionization detector (PID) and total-petroleum hydrocarbon (TPH) field test kits. Several soil samples were collected and submitted for laboratory analysis of TPH, with one soil sample result indicating a TPH concentration of 3,180 milligrams per kilogram (mg/kg). The location of this sample coincided with a former aboveground tank used and removed by a previous well owner/operator.

Following the Site assessment, ConocoPhillips Company excavated impacted soil in February 2016. The final excavation measured approximately 100 feet by 38 feet laterally by 9 feet to 17 feet vertically. Approximately 1,400 cubic yards of impacted soil were transported for off-site disposal at Industrial Ecosystems, Inc in Aztec, New Mexico. Groundwater was encountered in the bottom of the excavation at a depth of 16 feet bgs. A total of 1 foot of groundwater-saturated soil was removed from the excavation in the deepest extents. Approximately 275 barrels (bbl) of impacted groundwater was then removed from the bottom of the excavation and transported for off-site disposal to Industrial Ecosystems, Inc. Five-point composite soil samples were collected from the sidewalls and shallow floor area (area excavated to 9 feet). In total, five sidewall samples and one floor sample were collected to confirm the removal of impacted soil. All soil analytical results were below the Site closure standards for TPH, chloride, and benzene, toluene, ethylbenzene, and total xylenes (BTEX). The NMOCD approved backfill of the excavation via email communications on February 22, 2016.

Review of the 2022 Annual Groundwater Monitoring Report for Mangum #1: Content Satisfactory

1. Proceed to install upgradient monitoring well as proposed at (MW-8) location and upload permit obtained from OSE if applicable.

2. Sample upgradient well for background concentrations of TDS,

sulfate, manganese as recommended.

3. Continue quarterly sampling events for site wells as prescribed for

North MW-3 for dissolved Mn.

4. Submit 2023 Annual Report if not already submitted.

5. Submit the 2024 Annual Groundwater Report by April 1, 2025.

Four groundwater monitoring wells (MW-1 through MW-4) were subsequently installed in May 2016 to assess and monitor groundwater conditions at the Site (Figure 2). Based on initial analysis, the following contaminants of concern (COCs) were identified for groundwater at the Site: benzene, xylenes, dissolved iron, dissolved manganese, sulfate, and total dissolved solids (TDS). Quarterly sampling has been performed since June 2016 from wells MW-1 through MW-4.

GHD Services, Inc. (GHD) prepared the *2018 Annual Groundwater Monitoring Report* (dated January 2019) summarizing groundwater sampling activities performed in 2018. Based on their review of the report, the NMOCD required Hilcorp (the current owner and operator of the Site) to “fully delineate the groundwater plume” at the Site. In response, Hilcorp/GHD installed three new groundwater monitoring wells (MW-5, MW-6, and MW-7) in locations downgradient of the release in June 2019 (Figure 2). The installation of one additional well (MW-8) was attempted in an upgradient location (Figure 2) but encountered shallow refusal in two separate locations and was finally abandoned. During drilling activities, soils were field screened for volatile aromatic hydrocarbons using a PID. Field screening results from well MW-6 did not indicate petroleum hydrocarbon impacts, therefore soil samples were not collected for laboratory analysis. Two soil samples were collected from well MW-5 at 17 feet and 21 feet bgs during drilling. TPH was detected at 17 feet bgs at a concentration of 99 mg/kg. TPH was not detected above laboratory reporting limits in the soil sample collected at 21 feet bgs. BTEX concentrations in soil were not detected in either sample from well MW-5. One soil sample collected from well MW-7 at 26 feet bgs had a TPH concentration of 74 mg/kg; BTEX was not detected in this soil sample.

The newly installed wells were incorporated into the quarterly sampling program starting in the third quarter of 2019. Results from the 2019, 2020, and 2021 quarterly sampling indicated BTEX constituents, dissolved manganese, sulfate, and/or TDS were present in the Site groundwater at concentrations above New Mexico Water Quality Control Commission (NMWQCC) standards.

SITE GROUNDWATER CLEANUP STANDARDS

The NMOCD requires groundwater-quality standards be met as presented by the NMWQCC and listed in Title 20, Chapter 6, Part 2, Section 3103 (20.6.2.3103) of the New Mexico Administrative Code (NMAC). The following standards are presented for the COCs at the Site in milligrams per liter (mg/L).

- Benzene: 0.005 mg/L
- Toluene: 1.0 mg/L
- Ethylbenzene: 0.70 mg/L
- Total Xylenes: 0.62 mg/L
- Dissolved Iron: 1.0 mg/L
- Dissolved Manganese: 0.20 mg/L
- Sulfate: 600 mg/L
- Total Dissolved Solids: 1,000 mg/L

GROUNDWATER SAMPLING ACTIVITIES AND RESULTS

Groundwater-level measurements and samples were collected in January, June, September, and December 2022 from wells MW-1 through MW-7. Static groundwater-level monitoring included recording depth-to-groundwater measurements of each monitoring well using a Keck oil/water interface probe. The interface probe was decontaminated with Alconox™ soap and rinsed with

distilled water prior to each measurement to prevent cross-contamination. Groundwater elevations measured in monitoring wells during the 2022 sampling events are presented in Table 1 and were used to develop groundwater potentiometric surface maps (Figures 3 through 6). The inferred groundwater flow direction is to the north.

GROUNDWATER SAMPLING

Groundwater from each monitoring well was purged and sampled using a disposable bailer. Purging was accomplished by removing stagnant groundwater from the monitoring well prior to collecting a sample. Field measurements of groundwater quality parameters, including temperature, pH, and electrical conductivity, were collected during the purging process, and are presented in Table 2.

Following well purging, groundwater samples were placed directly into laboratory-provided containers and labeled with the date and time of collection, well designation, project name, sample collector's name, and parameters to be analyzed. Samples were immediately sealed with zero headspace and packed on ice to preserve samples. Samples were submitted to Hall Environmental Analysis Laboratory (Hall) in Albuquerque, New Mexico, for analysis of BTEX by United States Environmental Protection Agency (EPA) Method 8260B, dissolved manganese and iron (sampled only in June 2022) by EPA Method 200.7, sulfate by EPA Method 300.0, and TDS by Method SM2540C MOD. Proper chain-of-custody procedures were followed documenting the date and time sampled, sample number, type of sample, sample collector's name, preservative used, analyses required, and sample collector's signature.

GROUNDWATER ANALYTICAL RESULTS

Benzene was detected in groundwater during one or more quarters at concentrations above the NMWQCC standard in wells MW-2, MW-3, MW-4, and MW-6. Ethylbenzene, toluene, and total xylenes were not detected above the NMWQCC standards in any of the wells during 2022 sampling events.

Dissolved manganese and TDS were detected at concentrations above the NMWQCC standards in all wells during one or more quarterly sampling events in 2022. Sulfate was detected at concentrations above the NMWQCC standard during one or more 2022 quarterly sampling events in wells MW-1, MW-3, MW-4, MW-5, and MW-7. Lastly, dissolved iron was detected in wells MW-3 and MW-6 above the NMWQCC standard during the second quarter 2022 sampling event. Dissolved iron was not detected above the NMWQCC standards in any other wells or sampling events in 2022. A summary of analytical results are presented in Table 3 and depicted on Figure 7, with complete laboratory analytical reports attached as Appendix A.

CONCLUSIONS AND RECOMMENDATIONS

Based on the groundwater analytical data collected since 2016, groundwater conditions have improved over time, with BTEX concentrations decreasing in all wells between 2016 and 2022. Based on historical data, natural attenuation through biodegradation processes is occurring in all wells and active remediation is not currently recommended at the Site. In all wells except MW-3, dissolved manganese, sulfate, and TDS concentrations have largely remained consistent since they were first analyzed in 2016. Additionally, dissolved manganese and TDS concentrations have consistently exceeded the NMWQCC standards since initial sampling efforts began in 2016. Although concentrations of manganese, sulfate, and TDS could be elevated as a byproduct of petroleum degradation, these constituents are often naturally occurring at elevated concentrations in areas with shallow, perched groundwater.

Dissolved iron was detected above NMWQCC standards in wells MW-3 and MW-6 during the second quarter 2022 sampling event. Based on historical data collected from these wells, the dissolved iron results collected during this event are anomalous and are likely not representative of actual groundwater conditions. Additionally, dissolved iron and TDS have significantly increased in concentration between 2020 and 2022, with no significant corresponding changes in groundwater elevations and/or other COC concentrations in this or other wells at the Site.

Based on current and historical data gathered at the Site, Ensolum/Hilcorp recommend the following actions:

- Install an upgradient groundwater monitoring well in the location previously attempted in 2019 (location MW-8). This well would be used to assess upgradient groundwater conditions and background concentrations of dissolved manganese, sulfate, and TDS. The continued sampling of these constituents will be reassessed once background samples have been collected and analyzed.
- Continue quarterly monitoring of all Site wells for BTEX constituents. BTEX concentrations have continuously decreased since 2016 and it is anticipated that they will continue to attenuate to below NMWQCC standards.
- Continue to assess groundwater in well MW-3 in 2023 to monitor dissolved manganese and TDS concentrations over time.

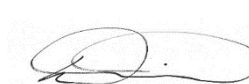
Ensolum appreciates the opportunity to provide these environmental services to Hilcorp. Please contact either of the undersigned with any questions.

Sincerely,

Ensolum, LLC



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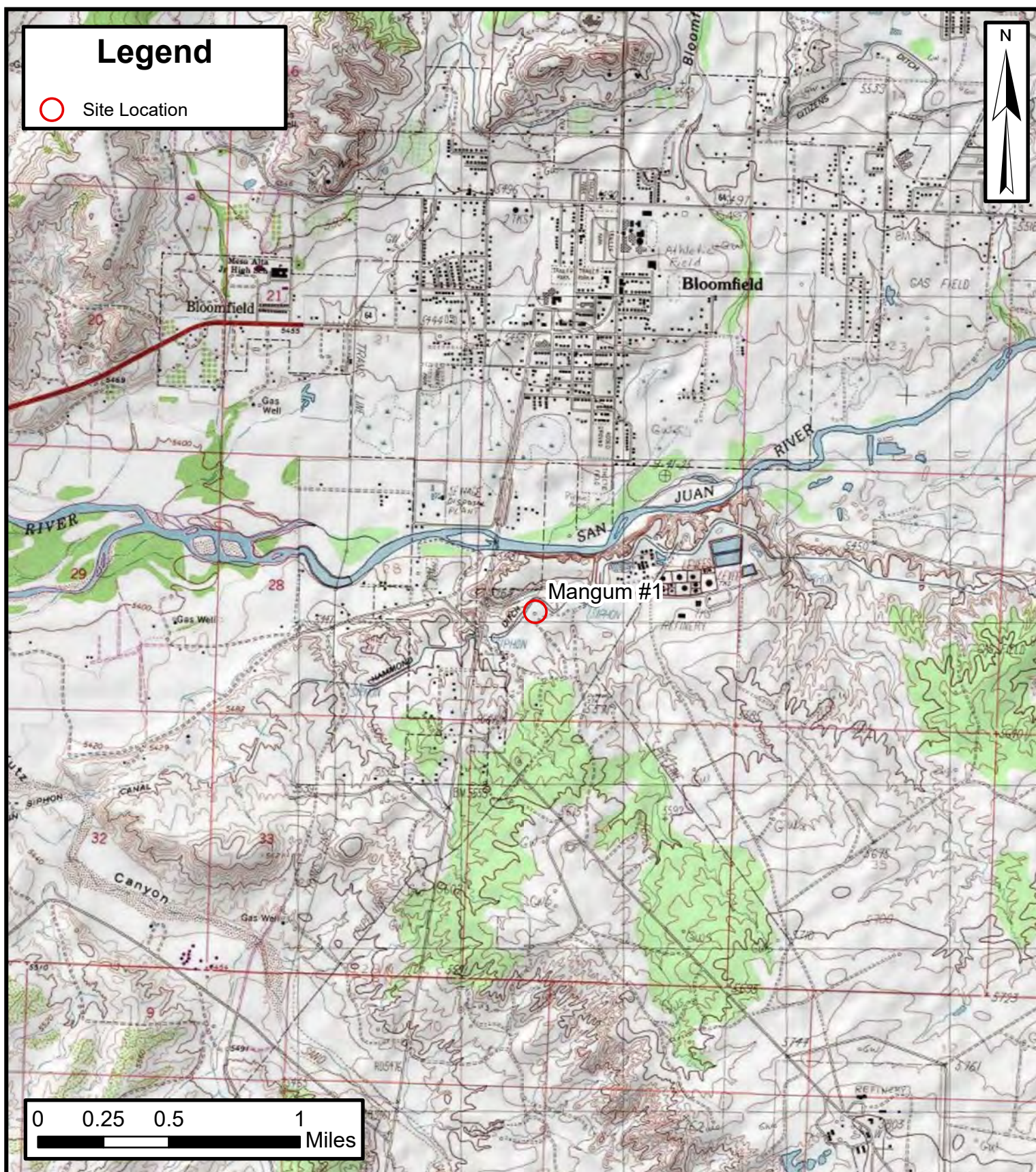
Daniel R. Moir, PG
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Attachments:

Figure 1	Site Location Map
Figure 2	Site Map
Figure 3	Q1 Groundwater Elevation Map
Figure 4	Q2 Groundwater Elevation Map
Figure 5	Q3 Groundwater Elevation Map
Figure 6	Q4 Groundwater Elevation Map
Figure 7	Groundwater Analytical Results
Table 1	Groundwater Elevations
Table 2	Groundwater Quality Measurements
Table 3	Groundwater Analytical Results
Appendix A	Analytical Laboratory Reports



FIGURES

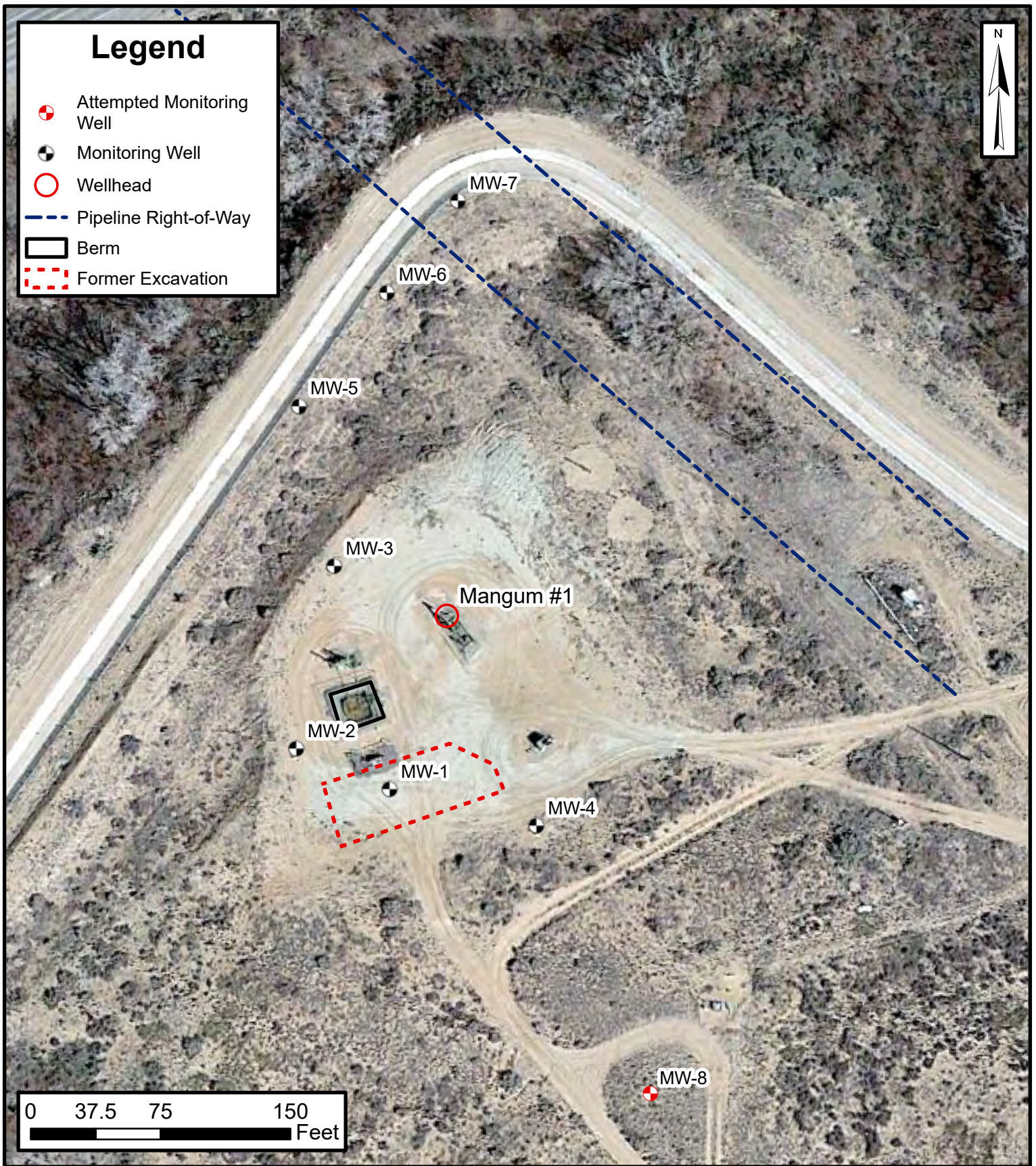


Site Location Map

Mangum #1
 Hilcorp Energy Company
 36.69579, -107.98402
 San Juan County, New Mexico

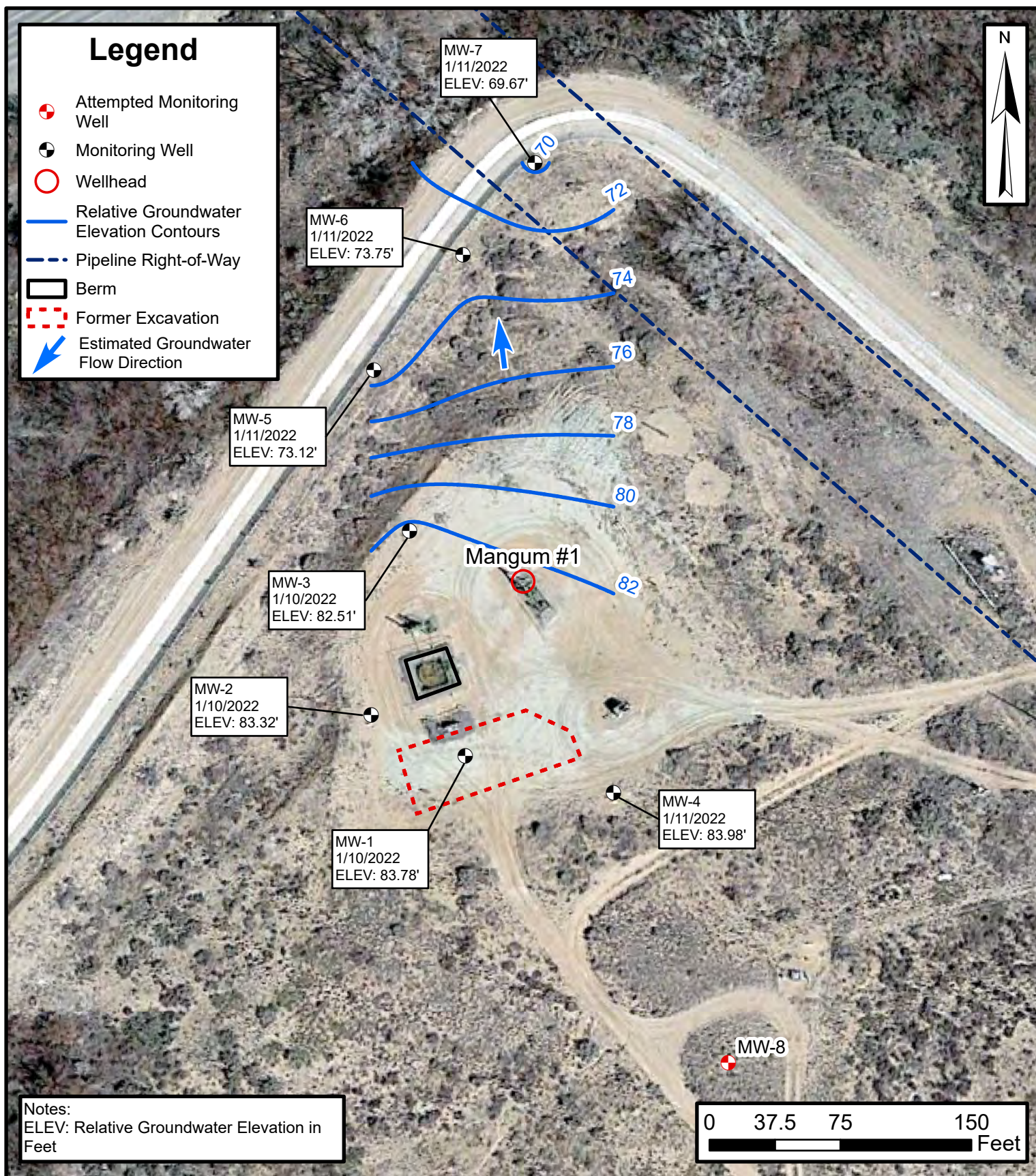
FIGURE
1

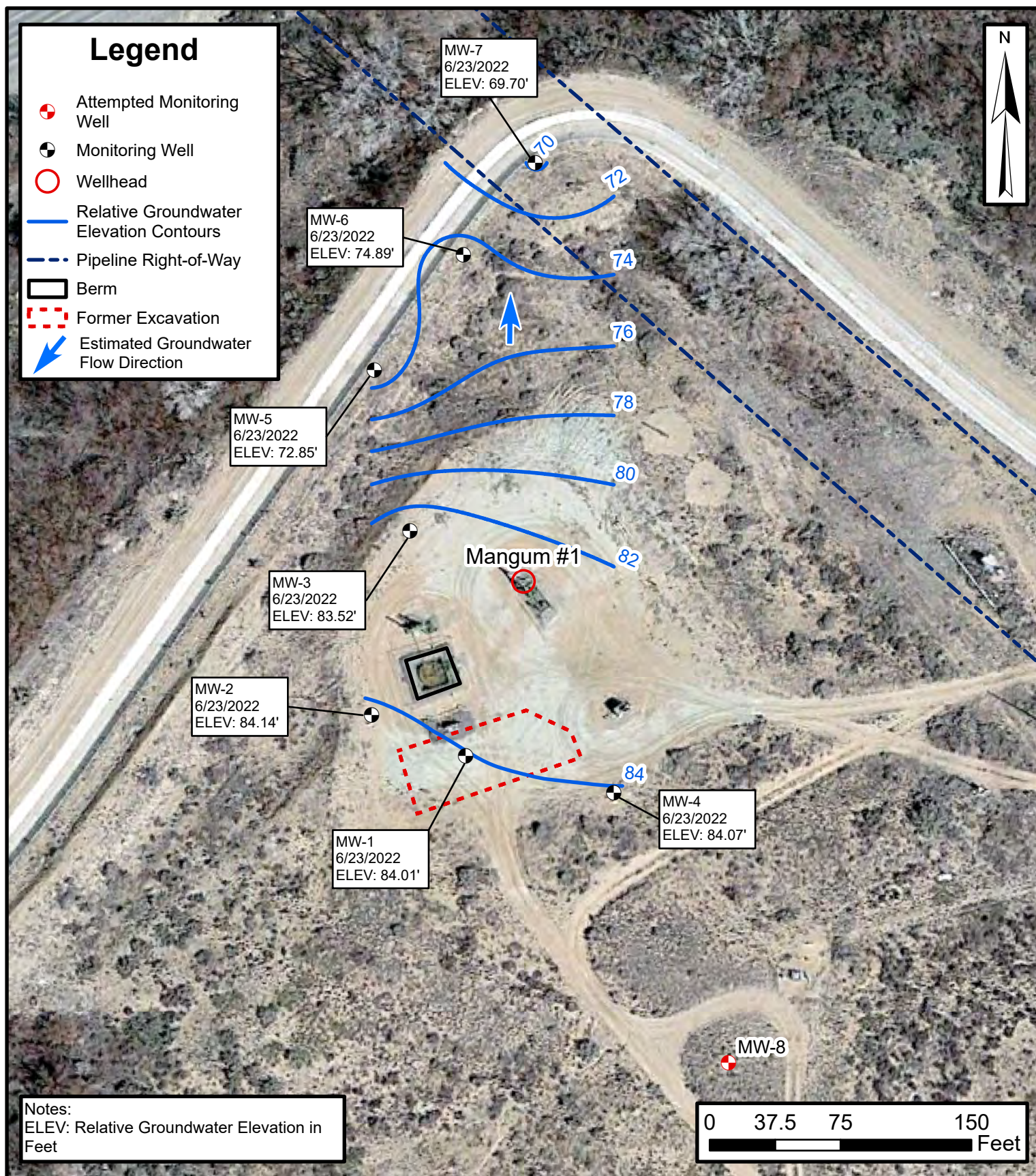




Site Map
Mangum #1
Hilcorp Energy Company
36.69579, -107.98402
San Juan County, New Mexico

FIGURE
2





Q2 Groundwater Elevation Map

Mangum #1

Hilcorp Energy Company

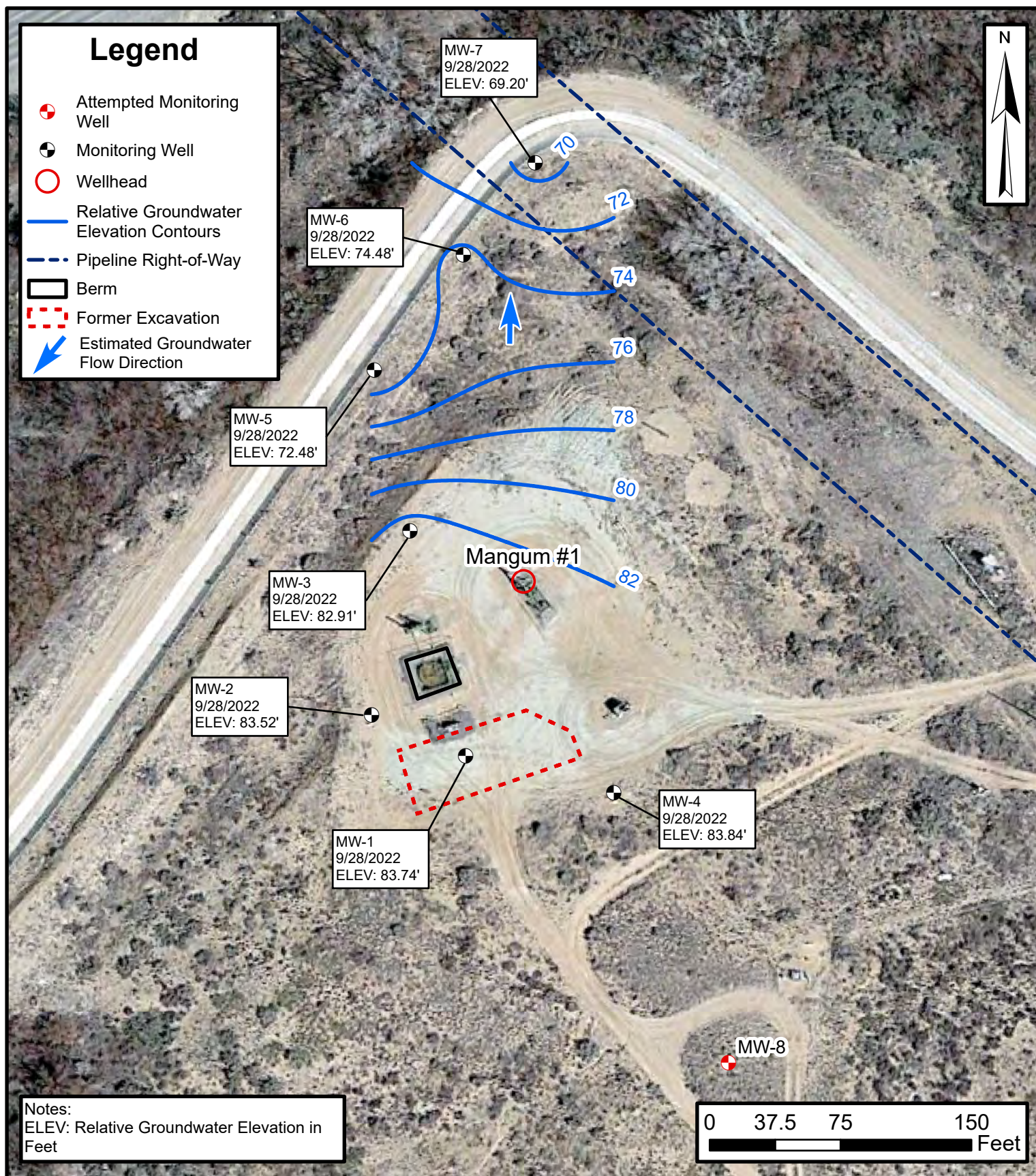
36.69579, -107.98402

San Juan County, New Mexico

FIGURE

4





Q3 Groundwater Elevation Map

Mangum #1

Hilcorp Energy Company

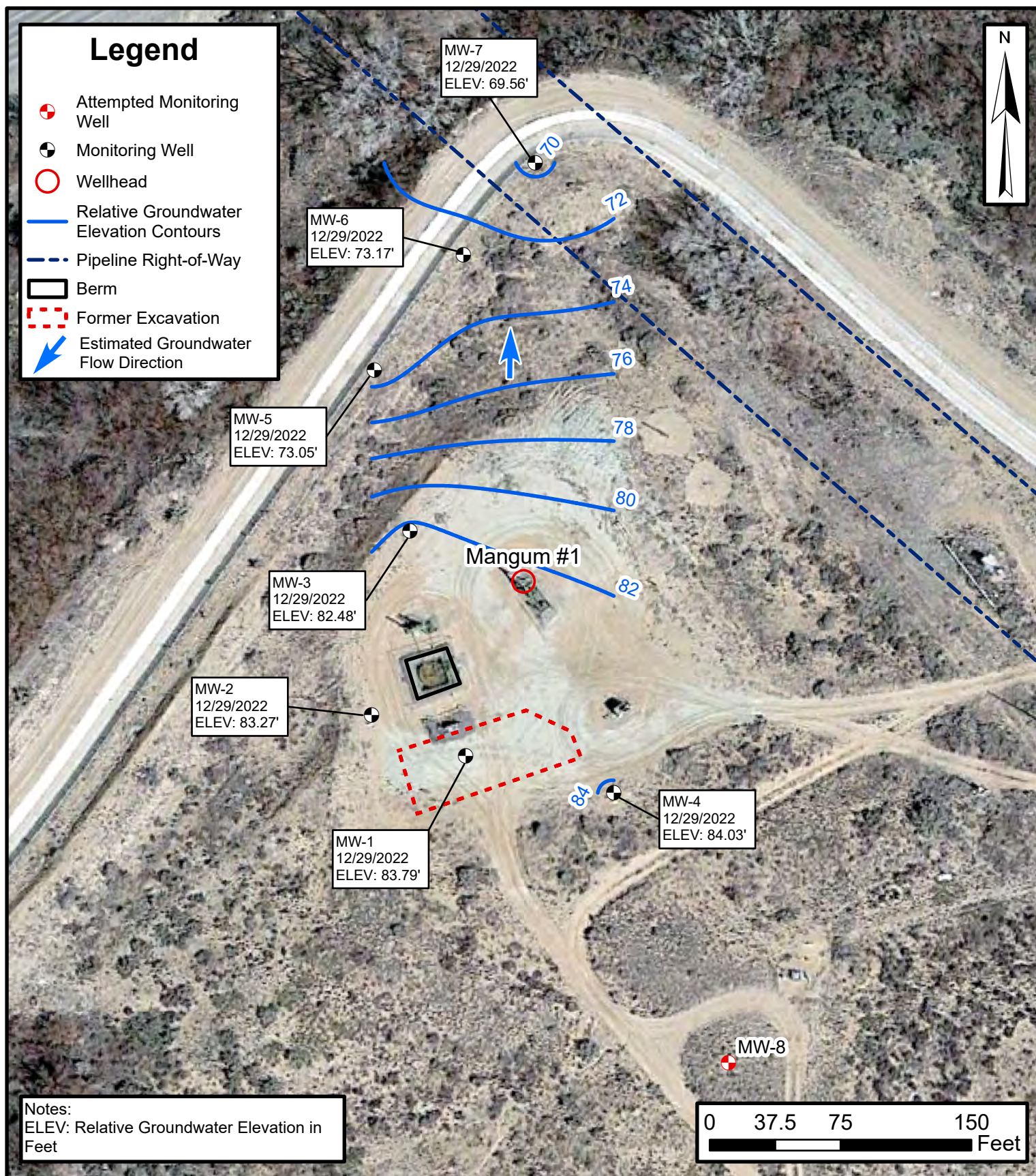
36.69579, -107.98402

San Juan County, New Mexico

FIGURE

5





Q4 Groundwater Elevation Map

Mangum #1

Hilcorp Energy Company

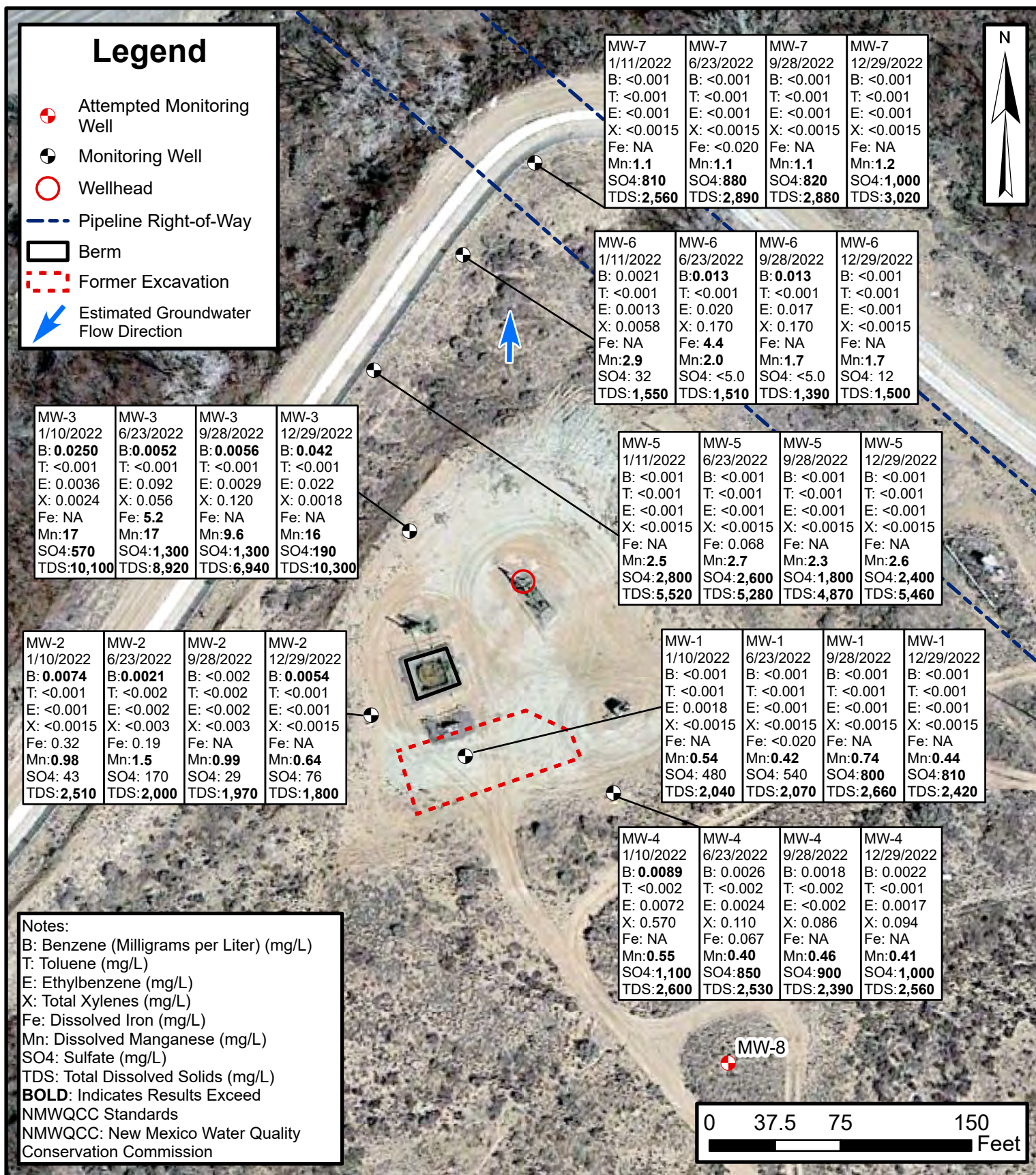
36.69579, -107.98402

San Juan County, New Mexico

FIGURE

6





Groundwater Analytical Results

Mangum #1
 Hilcorp Energy Company
 36.69579, -107.98402
 San Juan County, New Mexico

FIGURE
7





TABLES



TABLE 1
GROUNDWATER ELEVATIONS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Top of Casing Elevation (1)	Date	Depth to Groundwater (feet BTOC)	Groundwater Elevation (1)
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
		12/10/2018	15.12	83.85
		3/12/2019	15.04	83.93
		5/22/2019	14.93	84.04
		8/22/2019	15.19	83.78
		12/2/2019	15.21	83.76
		2/3/2020	15.19	83.78
		4/24/2020	15.22	83.75
		7/24/2020	15.00	83.97
		10/8/2020	15.21	83.76
		1/11/2021	15.29	83.68
		4/12/2021	15.26	83.71
		8/2/2021	14.88	84.09
		10/7/2021	15.09	83.88
		1/10/2022	15.19	83.78
		6/23/2022	14.96	84.01
		9/28/2022	15.23	83.74
		12/29/2022	15.18	83.79
MW-2	101.05	6/8/2016	17.49	83.56
		9/12/2016	17.28	83.77
		11/29/2016	17.62	83.43
		3/6/2017	17.49	83.56



TABLE 1
GROUNDWATER ELEVATIONS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Top of Casing Elevation (1)	Date	Depth to Groundwater (feet BTOC)	Groundwater Elevation (1)
MW-2	101.05	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
		12/10/2018	17.58	83.47
		3/12/2019	17.56	83.49
		5/22/2019	17.18	83.87
		8/22/2019	17.30	83.75
		12/2/2019	17.65	83.40
		2/3/2020	18.74	82.31
		4/24/2020	17.71	83.34
		7/24/2020	17.08	83.97
		10/8/2020	17.22	83.83
		1/11/2021	17.8	83.25
		4/12/2021	17.8	83.25
		8/2/2021	16.64	84.41
		10/7/2021	17.23	83.82
		1/10/2022	17.73	83.32
		6/23/2022	16.91	84.14
		9/28/2022	17.53	83.52
		12/29/2022	17.78	83.27
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



TABLE 1
GROUNDWATER ELEVATIONS

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Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Top of Casing Elevation (1)	Date	Depth to Groundwater (feet BTOC)	Groundwater Elevation (1)
MW-3	101.35	12/10/2018	18.71	82.64
		3/11/2019	18.69	82.66
		5/22/2019	18.19	83.16
		8/22/2019	18.28	83.07
		12/22/2019	18.62	82.73
		2/3/2020	18.84	82.51
		4/24/2020	18.84	82.51
		7/23/2020	18.05	83.30
		10/5/2020	18.12	83.23
		1/8/2021	18.87	82.48
		4/12/2021	18.94	82.41
		8/2/2021	17.62	83.73
		10/6/2021	18.08	83.27
		1/10/2022	18.84	82.51
		6/23/2022	17.83	83.52
		9/28/2022	18.44	82.91
		12/29/2022	18.87	82.48
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
		12/10/2018	19.69	84.07
		3/12/2019	19.63	84.13
		5/22/2019	19.57	84.19
		8/22/2019	19.92	83.84
		12/2/2019	19.81	83.95
		2/3/2020	19.79	83.97



TABLE 1
GROUNDWATER ELEVATIONS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Top of Casing Elevation (1)	Date	Depth to Groundwater (feet BTOC)	Groundwater Elevation (1)
MW-4	103.76	4/24/2020	19.78	83.98
		7/23/2020	19.66	84.10
		10/8/2020	19.94	83.82
		1/11/2021	19.88	83.88
		4/12/2021	19.84	83.92
		8/2/2021	19.88	83.88
		10/6/2021	19.78	83.98
		1/11/2022	19.78	83.98
		6/23/2022	19.69	84.07
		9/28/2022	19.92	83.84
		12/29/2022	19.73	84.03
MW-5	95.77	8/23/2019	23.32	72.45
		9/19/2019	23.13	72.64
		12/4/2019	22.51	73.26
		2/4/2020	22.42	73.35
		4/27/2020	22.63	73.14
		7/24/2020	23.05	72.72
		10/5/2020	22.85	72.92
		1/8/2021	22.58	73.19
		4/13/2021	22.61	73.16
		8/2/2021	22.86	72.91
		10/8/2021	22.44	73.33
		1/11/2022	22.65	73.12
		6/23/2022	22.92	72.85
		9/28/2022	23.29	72.48
		12/29/2022	22.72	73.05
MW-6	94.70	8/23/2019	19.98	74.72
		9/19/2019	18.63	76.07
		12/4/2019	19.09	75.61
		2/4/2020	20.22	74.48
		4/27/2020	20.53	74.17
		7/24/2020	17.53	77.17
		10/5/2020	18.82	75.88



TABLE 1
GROUNDWATER ELEVATIONS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Top of Casing Elevation (1)	Date	Depth to Groundwater (feet BTOC)	Groundwater Elevation (1)
MW-6	94.70	1/8/2021	20.59	74.11
		4/13/2021	21.19	73.51
		8/2/2021	19.24	75.46
		10/8/2021	19.02	75.68
		1/11/2022	20.95	73.75
		6/23/2022	19.81	74.89
		9/28/2022	20.22	74.48
		12/29/2022	21.53	73.17
MW-7	94.49	8/23/2019	24.04	70.45
		9/19/2019	23.66	70.83
		12/4/2019	23.69	70.80
		2/4/2020	23.62	70.87
		4/27/2020	23.24	71.25
		7/24/2020	24.01	70.48
		10/5/2020	24.35	70.14
		1/11/2021	24.34	70.15
		4/13/2021	24.54	69.95
		8/2/2021	24.94	69.55
		10/7/2021	24.62	69.87
		1/11/2022	24.82	69.67
		6/23/2022	24.79	69.70
		9/28/2022	25.29	69.20
		12/29/2022	24.93	69.56

Notes:

(1): surface elevation based on an arbitrary datum of 100 feet

amsl: above mean sea level

BTOC: below top of casing



TABLE 2
GROUNDWATER QUALITY MEASUREMENTS
 Mangum #1
 Hilcorp Energy Company
 San Juan County, New Mexico

Well Identification	Date	Temperature (°C)	pH	TDS (g/L)	Conductivity (uS/cm)	DO (mg/L)	ORP (mV)
MW-1	11/29/2016	16.54	7.42	--	2,607	1.52	-155.3
	3/6/2017	13.37	7.37	1.99	3,057	1.48	-262.6
	6/12/2017	14.35	7.14	1.82	2,800	0.89	-197.6
	10/26/2017	18.00	7.19	--	2,600	1.85	-156
	12/4/2017	15.47	7.07	1.79	2,748	1.30	-209.9
	3/13/2018	19.94	7.31	--	2,502	--	-203.6
	6/25/2018	15.81	7.22	--	2,110	0.51	-198.3
	3/12/2019	13.10	7.57	1.37	2,720	--	-24.9
	5/22/2019	16.80	7.29	1.45	2,920	0.00	-27.5
	8/22/2019	21.10	7.20	2.01	4,030	--	-16.1
	12/2/2019	13.60	6.80	1.53	3,050	--	-26.5
	2/3/2020	15.30	6.81	1.51	3,020	7.30	-28.5
	4/24/2020	16.00	6.98	1.36	2,710	3.47	-34.5
	7/24/2020	19.10	7.04	1.41	2,810	2.15	-32.7
	10/8/2020	18.30	6.99	1.63	3,260	3.57	-20.4
	1/11/2021	12.50	7.16	1.29	2,570	1.80	-24.7
	4/12/2021	17.00	7.26	1.25	2,490	8.89	-22.7
	8/2/2021	17.30	8.36	--	2,330	--	--
	10/7/2021	16.50	7.06	--	2,740	--	--
	1/10/2022	12.40	7.1	--	2,350	--	--
	6/23/2022	18.20	7.22	1.14	2,260	--	--
	9/28/2022	19.30	7.12	1.26	2,520	--	--
	12/29/2022	11.20	7.44	1.20	2,460	--	--
MW-2	11/29/2016	16.04	7.20	--	2,299	2.21	-109.3
	3/6/2017	12.74	7.15	1.74	2,683	2.05	-171.7
	6/12/2017	13.50	6.95	1.56	2,396	1.61	-155.8
	10/26/2017	18.70	7.01	--	2,264	1.74	-92.8
	12/4/2017	15.41	7.00	1.52	2,333	1.11	-178.0
	3/13/2018	14.67	7.21	--	2,334	--	-180.7
	6/25/2018	17.63	6.62	--	1,905	0.94	-187.2
	3/12/2019	13.70	7.57	9.50	1,886	NA	7.3
	5/22/2019	13.70	6.67	9.54	1,907	--	5.0
	8/22/2019	23.00	6.49	8.63	1,727	--	10.0
	12/2/2019	16.20	5.84	10.00	2,000	--	9.2
	2/3/2020	12.80	5.93	9.71	18,320	6.22	-0.1
	4/24/2020	16.50	6.25	5.81	11,630	2.28	0.9
	7/24/2020	21.40	6.55	2.79	5,580	1.73	-8.6
	10/8/2020	21.00	6.61	2.81	5,600	2.69	6.0
	1/11/2021	14.10	6.77	3.30	6,620	1.56	0.9
	4/12/2021	18.40	6.95	2.09	4,250	6.48	-11.2
	8/2/2021	17.35	7.25	--	4,808	--	--
	10/7/2021	20.10	6.38	--	3,100	--	--
	1/10/2022	14.00	6.94	--	3,080	--	--
	6/23/2022	19.30	6.74	1.16	2,330	--	--
	9/28/2022	19.80	6.83	1.15	2,300	--	--
	12/29/2022	13.30	7.2	1.04	2,090	--	--
MW-3	11/29/2016	15.01	7.09	--	3,091	2.52	-91
	3/6/2017	12.74	7.05	2.19	3,376	4.17	-151.6
	6/12/2017	15.40	7.18	2.19	3,360	6.70	-136.0
	10/26/2017	17.71	7.06	--	2,653	1.80	-177.4
	12/4/2017	14.19	7.04	1.84	2,835	3.05	-153.5
	3/13/2018	14.84	7.18	--	2,641	0.17	-167.0
	6/25/2018	Sample volume insufficient to analyze field parameters					
	3/11/2019	14.30	7.24	1.41	2,830	--	-31.5



TABLE 2
GROUNDWATER QUALITY MEASUREMENTS
 Mangum #1
 Hilcorp Energy Company
 San Juan County, New Mexico

Well Identification	Date	Temperature (°C)	pH	TDS (g/L)	Conductivity (uS/cm)	DO (mg/L)	ORP (mV)
MW-3	5/22/2019	13.30	7.11	1.36	2,730	5.80	-35.6
	8/22/2019	20.80	7.19	1.43	2,860	--	-25.2
	12/2/2019	15.20	6.55	1.49	2,960	--	-25.4
	2/3/2020	13.30	6.44	1.42	2,930	--	-16.5
	4/24/2020	19.60	6.71	1.44	2,890	2.80	-27.0
	7/23/2020	24.00	6.36	2.57	5,090	1.26	-12.5
	10/5/2020	16.50	6.49	3.03	6,070	3.76	-2.9
	1/8/2021	12.60	6.80	2.75	5,510	1.59	-3.1
	4/12/2021	14.50	6.55	4.00	8,030	9.65	-17.7
	8/2/2021	17.10	7.96	--	7,920	--	--
	10/6/2021	18.80	6.43	--	6,400	--	--
	1/10/2022	16.60	5.60	--	9,470	--	--
	6/23/2022	19.10	6.20	4.28	8,540	--	--
MW-4	6/23/2016	15.10	7.29	--	2,950	1.04	-148.5
	11/29/2016	16.01	7.40	--	2,396	1.59	-127.5
	3/6/2017	13.01	7.39	2.34	3,608	2.01	-237.2
	6/21/2017	14.49	7.08	1.92	2,955	1.36	-188.7
	10/26/2017	17.37	7.29	--	2,830	1.74	-193.2
	12/4/2017	15.26	3.33	2.06	3,161	0.66	-244.2
	3/13/2018	15.08	7.41	--	3,437	--	-214.9
	6/25/2018	15.85	7.33	--	2,580	0.97	-224.9
	3/12/2019	14.10	7.49	1.48	2,960	--	-31.5
	5/22/2019	15.40	7.35	1.67	3,300	1.44	-33.6
	8/22/2019	19.50	7.35	1.55	3,090	6.90	-22.4
	12/2/2019	15.30	6.65	1.69	3,310	--	-32.7
	2/3/2020	15.00	6.81	1.57	3,140	6.51	-37.4
	4/24/2020	13.90	6.84	1.64	3,270	1.59	-47.4
	7/23/2020	24.50	6.67	1.47	2,910	0.87	-33.4
	10/8/2020	15.90	7.00	1.32	2,630	3.78	-43.2
	1/11/2021	8.40	7.50	1.23	2,420	2.73	-60.1
	4/12/2021	16.40	7.06	1.35	2,710	7.11	-43.3
	8/2/2021	16.91	7.41	--	3,845	1.84	-312.6
	10/6/2021	20.20	6.67	--	2,510	--	--
	1/10/2022	11.30	7.19	--	2,540	--	--
MW-5	8/23/2019	18.20	6.79	3.54	7,100	--	6.6
	12/4/2019	12.60	6.11	3.28	6,540	--	-1.1
	2/4/2020	8.50	6.25	3.24	6,520	--	-5.1
	4/27/2020	21.20	6.01	3.25	6,550	3.81	8.0
	7/24/2020	20.20	6.15	3.02	5,980	1.78	6.2
	10/5/2020	20.30	6.35	2.91	5,810	2.36	12.4
	1/8/2021	12.90	6.67	2.78	5,570	2.39	1.7
	4/13/2021	14.60	6.62	2.64	5,280	0.47	8.7
	8/2/2021	14.50	7.38	--	8,082	--	--
	10/8/2021	16.70	6.27	--	5,300	--	--
	1/11/2022	11.50	6.8	--	5,020	--	--
	6/23/2022	20.50	6.34	2.43	4,870	--	--
MW-5	9/28/2022	18.20	6.36	1.98	3,940	--	--
	12/29/2022	9.40	6.9	2.22	4,440	--	--



TABLE 2
GROUNDWATER QUALITY MEASUREMENTS
 Mangum #1
 Hilcorp Energy Company
 San Juan County, New Mexico

Well Identification	Date	Temperature (°C)	pH	TDS (g/L)	Conductivity (uS/cm)	DO (mg/L)	ORP (mV)
MW-6	8/23/2019	21.10	6.96	1.29	2,590	--	0.7
	12/4/2019	12.70	6.29	1.21	2,430	--	-5.0
	2/4/2020	8.50	6.52	1.27	2,540	--	-3.1
	4/27/2020	18.30	6.04	1.36	2,700	3.85	7.3
	7/24/2020	20.00	6.47	1.15	2,290	1.54	4.2
	10/5/2020	20.20	6.30	1.07	2,140	2.80	10.1
	1/8/2021	13.60	6.36	1.04	2,070	1.30	11.6
	4/13/2021	13.90	6.57	1.12	2,230	0.68	10.0
	8/2/2021	15.50	7.90	--	1,780	--	--
	10/8/2021	16.20	5.81	--	1,960	--	--
	1/11/2022	13.50	6.22	--	2,030	--	--
	6/23/2022	18.60	6.1	0.94	1,880	--	--
MW-7	8/23/2019	21.80	6.95	2.63	5,240	--	-12.2
	12/4/2019	12.80	6.11	2.40	4,800	--	-8.0
	2/4/2020	11.00	6.39	2.26	4,390	--	-17.5
	4/27/2020	17.20	6.34	1.96	3,950	4.56	-11.7
	7/24/2020	20.70	6.43	1.37	2,760	2.94	-8.9
	10/5/2020	18.50	6.55	1.26	2,530	4.23	-6.1
	1/11/2021	13.50	6.85	1.28	2,550	1.44	-0.7
	4/13/2021	16.50	6.62	1.53	3,060	9.22	-1.7
	8/2/2021	14.96	7.33	--	4,259	--	--
	10/7/2021	18.60	6.23	--	2,910	--	--
	1/11/2022	12.98	6.56	--	2,910	--	--
	6/23/2022	17.00	6.25	1.13	1,720	--	--
	9/28/2022	17.20	6.42	1.34	2,670	--	--
	12/29/2022	10.20	6.63	1.44	2,890	--	--

Notes:

°C: degrees Celsius

DO: dissolved oxygen

g/L: grams per liter

uS/cm: microsiemens per centimeter

mg/L: milligrams per liter

mV: millivolts

ORP: oxidation-reduction potential

TDS: total dissolved solids

--: data not collected



TABLE 3
GROUNDWATER ANALYTICAL RESULTS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Sample ID	Sample Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (total) (mg/L)	Iron (dissolved) (mg/L)	Manganese (dissolved) (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
NMWQCC Standards			0.005	1.00	0.70	0.62	1.0	0.20	600	1,000
MW-1	WT-11102646-060816-JWMW1	6/8/2016	0.0388	<0.020	0.358	4.01	--	1.69	1,170	2,590
	GW-11102646-091216-CM-MW-1	9/12/2016	0.0111	< 0.001	0.0946	0.382	--	0.925	577	--
	GW-11102646-112916-CN-MW-1	11/29/2016	0.0132	< 0.001	0.119	0.445	--	0.99	240	--
	GW-11102646-030617-CN-MW-1	3/6/2017	0.0041	< 0.001	0.0481	0.167	--	0.876	387	1,920
	GW-11102646-061217-CN-MW-1	6/12/2017	0.002	< 0.001	0.0265	0.12	--	0.80	312	1,830
	GW-11146006-102617-CM-MW-1	10/26/2017	< 0.001	< 0.001	0.0081	0.0307	0.256	0.71	424	1,940
	GW-11145006-120417-SP-MW-1	12/4/2017	<0.005	< 0.005	0.021	0.0814	--	0.674	321	1,710
	GW-11146006-031318-CN-MW-1	3/13/2018	< 0.001	< 0.001	0.008	0.0353	--	0.68	319	1,410
	GW-11146006-062518-CN-MW-1	6/25/2018	< 0.001	< 0.001	0.0067	0.0229	--	0.705	349	1,820
	GW-11146006-090418-JP-MW-1	9/4/2018	<0.005	<0.005	0.0154	0.0499	--	0.694	481	2,000
	MW-1	12/10/2018	<0.001	<0.001	<0.001	<0.003	<0.10	0.712	343	1,980
	MW-1	3/12/2019	<0.001	<0.001	<0.001	<.300	0.143	0.89	578	2,040
	MW-1	5/22/2019	<0.001	<0.001	0.00619	0.0119	<0.100	0.732	598	2,210
	MW-1	8/22/2019	<0.001	<0.001	0.0053	0.0095	<0.100	1.59	1,260	3,010
	MW-1	12/2/2019	<0.001	<0.001	0.0029	0.0045	<0.100	0.940	697	1,930
	MW-1	2/3/2020	<0.001	<0.001	0.00714	0.0107	0.119	0.824	735	1,820
	MW-1	4/24/2020	<0.001	<0.001	0.00337	0.00599	<0.100	0.623	568	1,910
	MW-1	7/24/2020	<0.001	<0.001	<0.001	<0.003	<0.100	0.613	570	2,230
	MW1	10/8/2020	<0.001	<0.001	<0.001	<0.003	<0.100	1.06	1,060	2,960
	MW-1	1/11/2021	<0.001	<0.001	0.00325	0.00452	<0.100	0.712	642	2,190
	MW-1	4/12/2021	<0.001	<0.001	0.0021	0.0025	<0.020	0.59	450	1,990
	MW-1	8/2/2021	0.0046	<0.001	<0.001	<0.0015	0.20	0.52	160	2,040
	MW-1	10/7/2021	0.0078	<0.001	<0.001	<0.0015	<0.020	0.70	490	2,400
	MW-1	1/10/2022	<0.001	<0.001	0.0018	<0.0015	--	0.54	480	2,040
	MW-1	6/23/2022	<0.001	<0.001	<0.001	<0.0015	<0.020	0.42	540	2,070
	MW-1	9/28/2022	<0.001	<0.001	<0.001	<0.0015	--	0.74	800	2,660
	MW-1	12/29/2022	<0.001	<0.001	<0.001	<0.0015	--	0.44	810	2,420
MW-2	WT-11102646-060816-JW-MW-2	6/8/2016	0.103	< 0.001	0.0072	0.0448	--	1.06	3.00	1,580
	GW-11102646-091216-CM-MW-2	9/12/2016	0.0647	< 0.001	0.0021	0.00320	--	1.73	2.80	--
	GW-11102646-112916-CN-MW-2	11/29/2016	0.0257	< 0.001	0.0021	< 0.003	--	1.41	2.60	--
	GW-11102646-030617-CN-MW-2	3/6/2017	0.0347	< 0.001	0.0022	< 0.003	--	1.45	7.90	1,510
	GW-11102646-061217-CN-MW-2	6/12/2017	0.009	< 0.001	0.0011	< 0.003	--	1.39	3.10	1,550
	GW-11146006-102617-CM-MW-2	10/26/2017	0.0013	< 0.001	< 0.001	< 0.003	5.1	1.26	4.50	1,560
	GW-11145006-120417-SP-MW-2	12/4/2017	0.0039	< 0.001	0.0011	< 0.003	--	1.23	14.3	1,470



TABLE 3
GROUNDWATER ANALYTICAL RESULTS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Sample ID	Sample Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (total) (mg/L)	Iron (dissolved) (mg/L)	Manganese (dissolved) (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
NMWQCC Standards			0.005	1.00	0.70	0.62	1.0	0.20	600	1,000
MW-2	GW-11146006-031318-CN-MW-2	3/13/2018	0.0036	< 0.001	0.0011	< 0.003	--	1.25	154	1,450
	GW-11146006-062518-CN-MW-2	6/25/2018	0.0079	< 0.001	< 0.001	< 0.003	--	1.37	31.3	1,600
	GW-11146006-090418-JP-MW-2	9/4/2018	< 0.001	< 0.001	< 0.001	< 0.003	--	1.13	87.0	1,730
	MW-2	12/10/2018	0.0543	< 0.001	0.0015	< 0.003	<0.10	1.15	27.7	1,470
	MW-2	3/12/2019	0.779	< 0.001	0.0317	0.0519	1.59	11.4	64.7	15,300
	MW-2	5/22/2019	0.435	< 0.005	0.0245	0.0533	4.30	7.77	29.6	15,300
	MW-2	8/22/2019	0.170	< 0.001	0.0265	0.0153	0.426	7.27	8.01	12,700
	MW-2	12/2/2019	0.130	< 0.001	0.0304	0.00870	<0.100	10.2	<5.00	15,700
	MW-2	2/3/2020	0.147	< 0.001	0.0312	0.00841	0.174	8.19	<5.00	14,400
	MW-2	4/24/2020	0.054	< 0.001	0.0106	< 0.003	< 0.100	3.63	6.08	7,800
	MW-2	7/24/2020	< 0.001	< 0.001	0.00902	< 0.003	< 0.100	2.21	10.7	3,680
	MW2	10/8/2020	< 0.001	< 0.001	0.00646	< 0.003	0.195	2.31	< 5.00	4,290
	MW-2	1/11/2021	0.014	< 0.001	0.00183	< 0.003	< 0.100	2.55	< 5.00	5,150
	MW-2	4/12/2021	0.019	< 0.001	0.0015	< 0.0015	0.073	0.92	120	3,060
	MW-2	8/2/2021	< 0.001	< 0.001	< 0.001	< 0.0015	0.91	4.1	570	2,790
	MW-2	10/7/2021	< 0.001	< 0.001	< 0.001	< 0.0015	0.085	2.0	200	2,280
	MW-2	1/10/2022	0.0074	< 0.001	< 0.001	< 0.0015	0.32	0.98	43	2,510
	MW-2	6/23/2022	0.0021	< 0.002	< 0.002	< 0.003	0.19	1.5	170	2,000
	MW-2	9/28/2022	< 0.002	< 0.002	< 0.002	< 0.003	--	0.99	29	1,970
	MW-2	12/29/2022	0.0054	< 0.001	< 0.001	< 0.0015	--	0.64	76	1,800
MW-3	WT-11102646-060816-JW-MW-3	6/8/2016	2.95	< 0.020	0.813	7.78	--	2.65	110	2,190
	GW-11102646-091216-CN-MW-3	9/12/2016	2.27	< 0.001	0.44	2.49	--	3.62	112	--
	GW-11102646-091216-CN-MW-3	11/29/2016	2.97	< 0.001	0.845	5.44	--	3.12	22.5	--
	GW-11102646-030617-CN-MW-3	3/6/2017	1.89	< 0.02	0.259	3.06	--	2.52	14.7	1,880
	GW-11102646-061217-CN-MW-3	6/12/2017	1.68	< 0.02	0.329	1.93	--	3.09	372	2,280
	GW-11146006-102617-CN-MW-3	10/26/2017	1.88	< 0.001	0.417	2.91	3.58	2.15	65.6	2,000
	GW-11145006-120417-SP-MW-3	12/4/2017	2.00	< 0.025	0.346	2.43	--	2.36	35.5	1,750
	GW-11146006-031318-CN	3/13/2018	1.43	< 0.025	0.107	1.93	--	2.34	24.6	1,530
	GW-11146006-062618-CN-MW-3	6/26/2018	2.02	< 0.025	0.287	2.69	--	3.52	606	2,560
	GW-11146006-090518-JP-MW-3	9/5/2018	1.82	< 0.005	0.160	1.40	--	2.08	241	2,300
	MW-3	12/10/2018	1.49	< 0.10	0.133	0.639	0.142	1.94	170	2,050
	MW-3	3/11/2019	1.45	< 0.001	0.015	0.655	< 0.100	2.01	95.6	1,940
	MW-3	5/22/2019	1.84	< 0.001	0.120	1.17	0.278	1.03	23.7	2,540
	MW-3	8/22/2019	0.623	< 0.001	0.0193	0.387	< 0.100	1.62	119	1,860



TABLE 3
GROUNDWATER ANALYTICAL RESULTS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Sample ID	Sample Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (total) (mg/L)	Iron (dissolved) (mg/L)	Manganese (dissolved) (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
NMWQCC Standards			0.005	1.00	0.70	0.62	1.0	0.20	600	1,000
MW-3	MW-3	12/2/2019	0.114	<0.001	0.006	0.184	<0.100	1.55	129	1,800
	MW-3	2/3/2020	1.24	<0.010	0.0224	1.05	<0.100	1.94	36.1	1,590
	MW-3	4/24/2020	1.08	<0.010	<0.010	<0.010	0.610	1.93	21.3	1,610
	MW-3	7/23/2020	0.00663	<0.001	0.00191	0.0147	0.118	5.19	1,400	4,280
	MW3	10/5/2020	0.0112	<0.001	0.00204	0.00608	<0.100	6.49	1,140	4,520
	MW-3	1/8/2021	0.455	<0.001	0.0618	0.300	0.656	3.5	162	4,120
	MW-3	4/12/2021	0.72	<0.01	0.035	0.260	0.16	11	37	7,190
	MW-3	8/2/2021	0.0034	<0.001	<0.001	<0.0015	10*	23	2,100	7,940
	MW-3	10/6/2021	0.0030	<0.001	0.0012	0.0035	0.054	15	2,200	6,620
	MW-3	1/10/2022	0.0250	<0.001	0.0036	0.0024	--	17	570	10,100
	MW-3	6/23/2022	0.0052	<0.001	0.092	0.056	5.2*	17	1,300	8,920
MW-4	MW-3	9/28/2022	0.0056	<0.001	0.0029	0.12	--	9.6	1,300	6,940
	MW-3	12/29/2022	0.042	<0.001	0.022	0.0018	--	16	190	10,300
	GW-11102646-062316-SP-MW-4	6/23/2016	0.118	< 0.001	0.186	1.06	--	0.983	838	--
	GW-11102646-091216-CM-MW-4	9/12/2016	0.0742	< 0.001	0.114	0.803	--	1.32	735	--
	GW-11102646-112916-CN-MW-4	11/29/2016	0.0853	< 0.001	0.0929	0.967	--	1.26	382	--
	GW-11102646-030617-CN-MW-4	3/6/2017	0.0886	< 0.02	0.0804	1.23	--	1.22	814	2,260
	GW-11102646-061217-CN-MW-4	6/12/2017	0.100	< 0.005	0.0747	1.44	--	1.01	738	2,140
	GW-11146006-102617-CM-MW-4	10/26/2017	0.0462	< 0.001	0.0226	0.849	0.507	0.73	1,120	2,370
	GW-11145006-120417-SP-MW-4	12/4/2017	0.0632	<0.020	0.0386	1.45	--	0.893	993	2,150
	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	--	0.827	1,370	2,350
	GW-11146006-062518-CN-MW-4	6/25/2018	0.0561	<0.020	<0.020	1.74	--	0.888	1,230	2,540
	GW-11146006-090418-JP-MW-4	9/4/2018	0.0257	< 0.005	< 0.005	0.848	--	0.889	1,450	2,410
	MW-4	12/10/2018	0.108	<0.020	0.0484	2.93	0.209	0.801	439	1,900
	MW-4	3/12/2019	0.0488	<0.0100	0.0265	1.85	<0.100	0.843	1,240	2,390
	MW-4	5/22/2019	0.0496	<0.0100	0.0309	1.84	<0.100	0.867	1,090	2,700
	MW-4	8/22/2019	0.0336	0.0013	0.0113	1.05	<0.100	0.737	1,270	2,290
	MW-4	12/2/2019	0.0172	<0.0100	<0.0100	0.937	<0.100	0.752	1,390	2,480
	MW-4	2/3/2020	0.0249	<0.0100	0.0224	1.66	<0.100	0.756	1,300	2,180
	MW-4	4/24/2020	0.0170	<0.0100	0.0120	0.694	<0.100	0.744	1,330	2,640
	MW-4	7/23/2020	0.0150	<0.0100	0.0132	0.975	<0.100	0.549	1,180	2,620
	MW4	10/8/2020	0.0137	<0.0100	<0.0100	0.657	<0.100	0.569	843	2,340
	MW-4	1/11/2021	0.0148	<0.001	0.0156	0.717	<0.100	0.523	1,190	2,560



TABLE 3
GROUNDWATER ANALYTICAL RESULTS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Sample ID	Sample Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (total) (mg/L)	Iron (dissolved) (mg/L)	Manganese (dissolved) (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
NMWQCC Standards			0.005	1.00	0.70	0.62	1.0	0.20	600	1,000
MW-4	MW-4	4/12/2021	0.012	<0.005	0.015	0.600	0.022	0.53	1,000	2,530
	MW-4	8/2/2021	0.0022	<0.001	<0.001	0.071	0.19	0.79	1,600	3,010
	MW-4	10/6/2021	0.0058	<0.001	0.0026	0.370	<0.020	0.62	1,100	2,470
	MW-4	1/10/2022	0.0089	<0.002	0.0072	0.570	--	0.55	1,100	2,600
	MW-4	6/23/2022	0.0026	<0.002	0.0024	0.110	0.067	0.40	850	2,530
	MW-4	9/28/2022	0.0018	<0.002	<0.002	0.086	--	0.46	900	2,390
	MW-4	12/29/2022	0.0022	<0.001	0.0017	0.094	--	0.41	1,000	2,560
MW-5	MW-5	8/23/2019	<0.001	<0.001	<0.001	0.0067	<0.100	3.33	3,660	6,620
	MW-5	12/2/2019	<0.001	<0.001	<0.0010	<0.0030	0.185	3.26	3,730	6,350
	MW-5	2/4/2020	<0.001	<0.001	<0.0010	<0.0030	<0.100	3.45	3,660	5,940
	MW-5	4/24/2020	<0.001	<0.001	<0.0010	<0.0030	<0.100	3.39	3,440	6,450
	MW-5	7/24/2020	<0.001	<0.001	<0.0010	<0.0030	<0.100	3.13	2,410	5,260
	MW5	10/5/2020	<0.001	<0.001	<0.0010	<0.0030	<0.100	3.33	3,430	4,010
	MW-5	1/8/2021	<0.001	<0.001	<0.001	<0.003	<0.100	3.37	3,530	6,150
	MW-5	4/13/2021	<0.001	<0.001	<0.001	<0.0015	0.063	3.3	3,500	6,500
	MW-5	8/2/2021	<0.001	<0.001	<0.001	<0.0015	0.33	3.1	3,300	5,920
	MW-5	10/8/2021	<0.001	<0.001	<0.001	<0.0015	0.023	3.4	3,400	6,120
	MW-5	1/11/2022	<0.001	<0.001	<0.001	<0.0015	--	2.5	2,800	5,520
	MW-5	6/23/2022	<0.001	<0.001	<0.001	<0.0015	0.068	2.7	2,600	5,280
	MW-5	9/28/2022	<0.001	<0.001	<0.001	<0.0015	--	2.3	1,800	4,870
	MW-5	12/29/2022	<0.001	<0.001	<0.001	<0.0015	--	2.6	2,400	5,460
MW-6	MW-6	8/23/2019	0.213	<0.001	0.145	0.806	<0.100	2.51	168	1,750
	MW-6	12/2/2019	0.0741	<0.001	0.168	0.170	<0.100	3.11	86.1	1,630
	MW-6	2/4/2020	0.0284	<0.001	0.0184	0.0720	<0.100	5.05	150	1,570
	MW-6	4/24/2020	0.00348	<0.001	<0.0010	<0.0030	<0.100	4.59	121	1,550
	MW-6	7/24/2020	0.0977	<0.001	0.0705	0.510	<0.100	2.54	47.0	1,650
	MW-6	10/5/2020	0.0787	<0.0100	0.114	0.025	<0.100	3.33	24.7	1,550
	MW-6	1/8/2021	0.00794	<0.001	0.00891	0.0368	<0.100	3.85	30.4	1,580
	MW-6	4/13/2021	<0.001	<0.001	<0.001	<0.0015	0.22	3.3	71	1,450
	MW-6	8/2/2021	0.016	<0.001	0.013	0.072	7.0*	2.6	25	1,500
	MW-6	10/8/2021	0.0035	<0.001	0.0018	0.0097	0.052	2.9	18	1,310
	MW-6	1/11/2022	0.0021	<0.001	0.0013	0.0058	--	2.9	32	1,550
	MW-6	6/23/2022	0.013	<0.001	0.020	0.170	4.4*	2.0	<5.0	1,510
	MW-6	9/28/2022	0.013	<0.001	0.017	0.170	--	1.7	<5.0	1,390
	MW-6	12/29/2022	<0.001	<0.001	<0.001	<0.0015	--	1.7	12	1,500



TABLE 3
GROUNDWATER ANALYTICAL RESULTS

Mangum #1
Hilcorp Energy Company
San Juan County, New Mexico

Well Identification	Sample ID	Sample Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (total) (mg/L)	Iron (dissolved) (mg/L)	Manganese (dissolved) (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
NMWQCC Standards			0.005	1.00	0.70	0.62	1.0	0.20	600	1,000
MW-7	MW-7	8/23/2019	<0.001	<0.001	<0.001	0.004	<0.100	1.75	2,950	4,930
	MW-7	12/2/2019	<0.001	<0.001	<0.001	<0.003	<0.100	1.98	2,830	3,990
	MW-7	2/4/2020	<0.001	<0.001	<0.001	<0.003	<0.100	2.01	2,580	3,860
	MW-7	4/24/2020	<0.001	<0.001	<0.001	<0.003	<0.100	2.00	1,550	4,400
	MW-7	7/24/2020	<0.001	<0.001	<0.001	<0.003	<0.100	1.04	808	2,300
	MW-7	10/5/2020	<0.001	<0.001	<0.001	<0.003	<0.100	1.06	887	2,100
	MW-7	1/11/2021	<0.001	<0.001	<0.001	<0.003	<0.100	1.03	873	2,280
	MW-7	4/13/2021	<0.001	<0.001	<0.001	<0.0015	0.14	1.3	910	2,710
	MW-7	8/2/2021	<0.001	<0.001	<0.001	<0.0015	0.28	1.4	870	517
	MW-7	10/7/2021	<0.001	<0.001	<0.001	<0.0015	<0.020	1.1	880	2,110
	MW-7	1/11/2022	<0.001	<0.001	<0.001	<0.0015	--	1.1	810	2,560
	MW-7	6/23/2022	<0.001	<0.001	<0.001	<0.0015	<0.020	1.1	880	2,890
	MW-7	9/28/2022	<0.001	<0.001	<0.001	<0.0015	--	1.1	820	2,880
	MW-7	12/29/2022	<0.001	<0.001	<0.001	<0.0015	--	1.2	1,000	3,020

Notes:

mg/L: milligrams per liter

ND: not detected, practical quantitation limit unknown

NMWQCC: New Mexico Water Quality Control Commission

--: not analyzed

*: anomalous data

<0.037: indicates result less than the stated laboratory reporting limit (PQL)

Concentrations in **bold** and shaded exceed the New Mexico Water Quality Control Commission Standards, 20.6.2 of the New Mexico Administrative Code



APPENDIX A

Laboratory Analytical Reports



Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: clients.hallenvironmental.com

January 21, 2022

Mitch Killough
HILCORP ENERGY
PO Box 4700
Farmington, NM 87499
TEL: (505) 564-0733
FAX:

RE: Mangum 1

OrderNo.: 2201456

Dear Mitch Killough:

Hall Environmental Analysis Laboratory received 7 sample(s) on 1/12/2022 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written over a light blue horizontal line.

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report

Lab Order 2201456

Date Reported: 1/21/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-1

Project: Mangum 1

Collection Date: 1/10/2022 11:55:00 AM

Lab ID: 2201456-001

Matrix: AQUEOUS

Received Date: 1/12/2022 8:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	480	50	*	mg/L	100	1/13/2022 1:43:01 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: ELS
Manganese	0.54	0.0020	*	mg/L	1	1/13/2022 1:31:28 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: CCM
Benzene	ND	1.0		µg/L	1	1/13/2022 7:39:00 PM
Toluene	ND	1.0		µg/L	1	1/13/2022 7:39:00 PM
Ethylbenzene	1.8	1.0		µg/L	1	1/13/2022 7:39:00 PM
Xylenes, Total	ND	1.5		µg/L	1	1/13/2022 7:39:00 PM
Surr: 1,2-Dichloroethane-d4	103	70-130		%Rec	1	1/13/2022 7:39:00 PM
Surr: 4-Bromofluorobenzene	90.8	70-130		%Rec	1	1/13/2022 7:39:00 PM
Surr: Dibromofluoromethane	106	70-130		%Rec	1	1/13/2022 7:39:00 PM
Surr: Toluene-d8	98.0	70-130		%Rec	1	1/13/2022 7:39:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2040	100	*D	mg/L	1	1/14/2022 5:22:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Page 1 of 12

Analytical Report

Lab Order 2201456

Date Reported: 1/21/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-2

Project: Mangum 1

Collection Date: 1/10/2022 1:20:00 PM

Lab ID: 2201456-002

Matrix: AQUEOUS

Received Date: 1/12/2022 8:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	43	5.0		mg/L	10	1/13/2022 1:55:53 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: ELS
Iron	0.32	0.020	*	mg/L	1	1/14/2022 11:41:25 AM
Manganese	0.98	0.0020	*	mg/L	1	1/13/2022 1:33:42 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: CCM
Benzene	7.4	1.0		µg/L	1	1/13/2022 8:49:00 PM
Toluene	ND	1.0		µg/L	1	1/13/2022 8:49:00 PM
Ethylbenzene	ND	1.0		µg/L	1	1/13/2022 8:49:00 PM
Xylenes, Total	ND	1.5		µg/L	1	1/13/2022 8:49:00 PM
Surr: 1,2-Dichloroethane-d4	104	70-130		%Rec	1	1/13/2022 8:49:00 PM
Surr: 4-Bromofluorobenzene	86.7	70-130		%Rec	1	1/13/2022 8:49:00 PM
Surr: Dibromofluoromethane	105	70-130		%Rec	1	1/13/2022 8:49:00 PM
Surr: Toluene-d8	96.1	70-130		%Rec	1	1/13/2022 8:49:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2510	200	*D	mg/L	1	1/14/2022 5:22:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Page 2 of 12

Analytical Report

Lab Order 2201456

Date Reported: 1/21/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-3

Project: Mangum 1

Collection Date: 1/10/2022 2:00:00 PM

Lab ID: 2201456-003

Matrix: AQUEOUS

Received Date: 1/12/2022 8:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	570	50	*	mg/L	100	1/13/2022 2:34:29 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: ELS
Manganese	17	0.040	*	mg/L	20	1/13/2022 1:56:05 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: CCM
Benzene	25	1.0		µg/L	1	1/13/2022 9:13:00 PM
Toluene	ND	1.0		µg/L	1	1/13/2022 9:13:00 PM
Ethylbenzene	3.6	1.0		µg/L	1	1/13/2022 9:13:00 PM
Xylenes, Total	2.4	1.5		µg/L	1	1/13/2022 9:13:00 PM
Surr: 1,2-Dichloroethane-d4	104	70-130		%Rec	1	1/13/2022 9:13:00 PM
Surr: 4-Bromofluorobenzene	99.1	70-130		%Rec	1	1/13/2022 9:13:00 PM
Surr: Dibromofluoromethane	105	70-130		%Rec	1	1/13/2022 9:13:00 PM
Surr: Toluene-d8	96.5	70-130		%Rec	1	1/13/2022 9:13:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	10100	200	*D	mg/L	1	1/14/2022 5:22:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Analytical Report

Lab Order 2201456

Date Reported: 1/21/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-5

Project: Mangum 1

Collection Date: 1/11/2022 2:50:00 PM

Lab ID: 2201456-005

Matrix: AQUEOUS

Received Date: 1/12/2022 8:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	2800	50	*	mg/L	100	1/13/2022 4:39:08 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: ELS
Manganese	2.5	0.010	*	mg/L	5	1/13/2022 1:58:30 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: CCM
Benzene	ND	1.0		µg/L	1	1/13/2022 10:23:00 PM
Toluene	ND	1.0		µg/L	1	1/13/2022 10:23:00 PM
Ethylbenzene	ND	1.0		µg/L	1	1/13/2022 10:23:00 PM
Xylenes, Total	ND	1.5		µg/L	1	1/13/2022 10:23:00 PM
Surr: 1,2-Dichloroethane-d4	103	70-130		%Rec	1	1/13/2022 10:23:00 PM
Surr: 4-Bromofluorobenzene	102	70-130		%Rec	1	1/13/2022 10:23:00 PM
Surr: Dibromofluoromethane	101	70-130		%Rec	1	1/13/2022 10:23:00 PM
Surr: Toluene-d8	95.6	70-130		%Rec	1	1/13/2022 10:23:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	5520	100	*D	mg/L	1	1/14/2022 5:22:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Analytical Report

Lab Order 2201456

Date Reported: 1/21/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-6

Project: Mangum 1

Collection Date: 1/11/2022 1:00:00 PM

Lab ID: 2201456-006

Matrix: AQUEOUS

Received Date: 1/12/2022 8:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	32	5.0		mg/L	10	1/13/2022 4:51:59 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: ELS
Manganese	2.9	0.010	*	mg/L	5	1/13/2022 2:00:42 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: CCM
Benzene	2.1	1.0		µg/L	1	1/13/2022 10:46:00 PM
Toluene	ND	1.0		µg/L	1	1/13/2022 10:46:00 PM
Ethylbenzene	1.3	1.0		µg/L	1	1/13/2022 10:46:00 PM
Xylenes, Total	5.8	1.5		µg/L	1	1/13/2022 10:46:00 PM
Surr: 1,2-Dichloroethane-d4	103	70-130		%Rec	1	1/13/2022 10:46:00 PM
Surr: 4-Bromofluorobenzene	99.1	70-130		%Rec	1	1/13/2022 10:46:00 PM
Surr: Dibromofluoromethane	104	70-130		%Rec	1	1/13/2022 10:46:00 PM
Surr: Toluene-d8	97.2	70-130		%Rec	1	1/13/2022 10:46:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	1550	200	*D	mg/L	1	1/14/2022 5:22:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Analytical Report

Lab Order 2201456

Date Reported: 1/21/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-7

Project: Mangum 1

Collection Date: 1/11/2022 11:50:00 AM

Lab ID: 2201456-007

Matrix: AQUEOUS

Received Date: 1/12/2022 8:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	810	50	*	mg/L	100	1/13/2022 5:30:36 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: ELS
Manganese	1.1	0.010	*	mg/L	5	1/13/2022 2:03:03 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: CCM
Benzene	ND	1.0		µg/L	1	1/13/2022 11:10:00 PM
Toluene	ND	1.0		µg/L	1	1/13/2022 11:10:00 PM
Ethylbenzene	ND	1.0		µg/L	1	1/13/2022 11:10:00 PM
Xylenes, Total	ND	1.5		µg/L	1	1/13/2022 11:10:00 PM
Surr: 1,2-Dichloroethane-d4	105	70-130		%Rec	1	1/13/2022 11:10:00 PM
Surr: 4-Bromofluorobenzene	103	70-130		%Rec	1	1/13/2022 11:10:00 PM
Surr: Dibromofluoromethane	105	70-130		%Rec	1	1/13/2022 11:10:00 PM
Surr: Toluene-d8	95.3	70-130		%Rec	1	1/13/2022 11:10:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2560	200	*D	mg/L	1	1/14/2022 5:22:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Page 7 of 12

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2201456

21-Jan-22

Client: HILCORP ENERGY**Project:** Mangum 1

Sample ID: MB	SampType: MBLK	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: PBW	Batch ID: A85144	RunNo: 85144								
Prep Date:	Analysis Date: 1/13/2022	SeqNo: 2995447		Units: mg/L						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020								

Sample ID: LL LCS	SampType: LCSLL	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: A85144	RunNo: 85144								
Prep Date:	Analysis Date: 1/13/2022	SeqNo: 2995449		Units: mg/L						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020	0.002000	0	93.5	50	150			

Sample ID: LCS	SampType: LCS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: LCSW	Batch ID: A85144	RunNo: 85144								
Prep Date:	Analysis Date: 1/13/2022	SeqNo: 2995451		Units: mg/L						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.49	0.0020	0.5000	0	98.0	85	115			

Sample ID: MB	SampType: MBLK	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: PBW	Batch ID: A85167	RunNo: 85167								
Prep Date:	Analysis Date: 1/14/2022	SeqNo: 2996213		Units: mg/L						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	ND	0.020								

Sample ID: LL LCS	SampType: LCSLL	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: A85167	RunNo: 85167								
Prep Date:	Analysis Date: 1/14/2022	SeqNo: 2996215		Units: mg/L						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	0.020	0.020	0.02000	0	102	50	150			

Sample ID: LCS	SampType: LCS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: LCSW	Batch ID: A85167	RunNo: 85167								
Prep Date:	Analysis Date: 1/14/2022	SeqNo: 2996217		Units: mg/L						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	0.50	0.020	0.5000	0	100	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quantitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2201456

21-Jan-22

Client: HILCORP ENERGY

Project: Mangum 1

Sample ID: MB	SampType: mblk	TestCode: EPA Method 300.0: Anions								
Client ID: PBW	Batch ID: R85157	RunNo: 85157								
Prep Date:	Analysis Date: 1/13/2022	SeqNo: 2995945	Units: mg/L							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	ND	0.50								

Sample ID: LCS	SampType: lcs	TestCode: EPA Method 300.0: Anions								
Client ID: LCSW	Batch ID: R85157	RunNo: 85157								
Prep Date:	Analysis Date: 1/13/2022	SeqNo: 2995953	Units: mg/L							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	9.1	0.50	10.00	0	91.4	90	110			

Qualifiers:

- * Value exceeds Maximum Contaminant Level.

D Sample Diluted Due to Matrix

H Holding times for preparation or analysis exceeded

ND Not Detected at the Reporting Limit

PQL Practical Quantitative Limit

S % Recovery outside of range due to dilution or matrix interference
- B Analyte detected in the associated Method Blank

E Estimated value

J Analyte detected below quantitation limits

P Sample pH Not In Range

RL Reporting Limit

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2201456

21-Jan-22

Client: HILCORP ENERGY**Project:** Mangum 1

Sample ID: 100ng lcs	SampType: LCS		TestCode: EPA Method 8260: Volatiles Short List							
Client ID: LCSW	Batch ID: SL85135		RunNo: 85135							
Prep Date:	Analysis Date: 1/13/2022		SeqNo: 2996015		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	21	1.0	20.00	0	106	70	130			
Toluene	20	1.0	20.00	0	98.2	70	130			
Surr: 1,2-Dichloroethane-d4	11		10.00		105	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		102	70	130			
Surr: Dibromofluoromethane	11		10.00		106	70	130			
Surr: Toluene-d8	9.5		10.00		94.9	70	130			

Sample ID: mb	SampType: MBLK		TestCode: EPA Method 8260: Volatiles Short List							
Client ID: PBW	Batch ID: SL85135		RunNo: 85135							
Prep Date:	Analysis Date: 1/13/2022		SeqNo: 2996016		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								
Ethylbenzene	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	10		10.00		105	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		103	70	130			
Surr: Dibromofluoromethane	10		10.00		103	70	130			
Surr: Toluene-d8	9.7		10.00		97.0	70	130			

Sample ID: 2201456-001ams	SampType: MS		TestCode: EPA Method 8260: Volatiles Short List							
Client ID: MW-1	Batch ID: SL85135		RunNo: 85135							
Prep Date:	Analysis Date: 1/13/2022		SeqNo: 2996018		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	21	1.0	20.00	0	104	70	130			
Toluene	19	1.0	20.00	0	97.2	70	130			
Surr: 1,2-Dichloroethane-d4	10		10.00		102	70	130			
Surr: 4-Bromofluorobenzene	9.2		10.00		92.3	70	130			
Surr: Dibromofluoromethane	10		10.00		104	70	130			
Surr: Toluene-d8	9.6		10.00		96.1	70	130			

Sample ID: 2201456-001amsd	SampType: MSD		TestCode: EPA Method 8260: Volatiles Short List							
Client ID: MW-1	Batch ID: SL85135		RunNo: 85135							
Prep Date:	Analysis Date: 1/13/2022		SeqNo: 2996019		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	20	1.0	20.00	0	99.8	70	130	4.36	20	
Toluene	18	1.0	20.00	0	91.5	70	130	6.03	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quantitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2201456

21-Jan-22

Client: HILCORP ENERGY

Project: Mangum 1

Sample ID: 2201456-001amsd	SampType: MSD	TestCode: EPA Method 8260: Volatiles Short List								
Client ID: MW-1	Batch ID: SL85135	RunNo: 85135								
Prep Date:	Analysis Date: 1/13/2022	SeqNo: 2996019	Units: µg/L							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: 1,2-Dichloroethane-d4	10		10.00		102	70	130	0	0	
Surr: 4-Bromofluorobenzene	9.8		10.00		97.9	70	130	0	0	
Surr: Dibromofluoromethane	10		10.00		104	70	130	0	0	
Surr: Toluene-d8	9.5		10.00		94.9	70	130	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quantitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix interference		

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QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2201456

21-Jan-22

Client: HILCORP ENERGY
Project: Mangum 1

Sample ID: MB-65010	SampType: MBLK	TestCode: SM2540C MOD: Total Dissolved Solids								
Client ID: PBW	Batch ID: 65010	RunNo: 85171								
Prep Date: 1/13/2022	Analysis Date: 1/14/2022	SeqNo: 2996488	Units: mg/L							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID: LCS-65010	SampType: LCS	TestCode: SM2540C MOD: Total Dissolved Solids								
Client ID: LCSW	Batch ID: 65010	RunNo: 85171								
Prep Date: 1/13/2022	Analysis Date: 1/14/2022	SeqNo: 2996489	Units: mg/L							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1010	20.0	1000	0	101	80	120			

Qualifiers:

- *

Value exceeds Maximum Contaminant Level.
- D

Sample Diluted Due to Matrix
- H

Holding times for preparation or analysis exceeded
- ND

Not Detected at the Reporting Limit
- PQL

Practical Quantitative Limit
- S

% Recovery outside of range due to dilution or matrix interference
- B

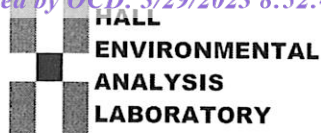
Analyte detected in the associated Method Blank
- E

Estimated value
- J

Analyte detected below quantitation limits
- P

Sample pH Not In Range
- RL

Reporting Limit



Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: clients.hallenvironmental.com

Sample Log-In Check List

Client Name: HILCORP ENERGY

Work Order Number: 2201456

RcptNo: 1

Received By: Cheyenne Cason 1/12/2022 8:00:00 AM

Completed By: Sean Livingston 1/12/2022 9:12:19 AM

Reviewed By: *Cue* 1/12/22

Chad
Sean Livingston

Chain of Custody

1. Is Chain of Custody complete? Yes ☒ No ☐ Not Present ☐
2. How was the sample delivered? Courier

Log In

3. Was an attempt made to cool the samples? Yes ☒ No ☐ NA ☐
4. Were all samples received at a temperature of $>0^{\circ}\text{C}$ to 6.0°C ? Yes ☒ No ☐ NA ☐
5. Sample(s) in proper container(s)? Yes ☒ No ☐
6. Sufficient sample volume for indicated test(s)? Yes ☒ No ☐
7. Are samples (except VOA and ONG) properly preserved? Yes ☒ No ☐
8. Was preservative added to bottles? Yes ☒ No ☐ NA ☐
9. Received at least 1 vial with headspace $<1/4"$ for AQ VOA? Yes ☐ No ☐ HNO₃ NA ☒
10. Were any sample containers received broken? Yes ☐ No ☒
11. Does paperwork match bottle labels?
(Note discrepancies on chain of custody) Yes ☒ No ☐
12. Are matrices correctly identified on Chain of Custody? Yes ☒ No ☐
13. Is it clear what analyses were requested? Yes ☒ No ☐
14. Were all holding times able to be met?
(If no, notify customer for authorization.) Yes ☒ No ☐

of preserved bottles checked for pH: 7
(≤ 2 or >12 unless noted)

Adjusted? yesChecked by: jr 1/12/22Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☒

Person Notified: _____ Date: _____
By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding: _____
Client Instructions: _____

16. Additional remarks:

Filtered off ~100mL from sample 001-007B for sample 001-007C, adding ~0.4mL HNO₃ for metals analysis, checked for pH
<2 - jr 1/12/22 LOT #: FJ2651 Used 9 filters. jr 1/12/22

17. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	0.6	Good				



Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

July 12, 2022

Kate Kaufman
HILCORP ENERGY
PO Box 4700
Farmington, NM 87499
TEL: (505) 564-0733
FAX:

RE: Mangum 1

OrderNo.: 2206D74

Dear Kate Kaufman:

Hall Environmental Analysis Laboratory received 7 sample(s) on 6/24/2022 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written over a white background.

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report

Lab Order 2206D74

Date Reported: 7/12/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-1

Project: Mangum 1

Collection Date: 6/23/2022 12:00:00 PM

Lab ID: 2206D74-001

Matrix: AQUEOUS

Received Date: 6/24/2022 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: CAS
Sulfate	540	50	*	mg/L	100	6/27/2022 9:03:24 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JLF
Iron	ND	0.020		mg/L	1	6/27/2022 3:25:04 PM
Manganese	0.42	0.0020	*	mg/L	1	6/27/2022 3:25:04 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: JR
Benzene	ND	1.0		µg/L	1	6/29/2022 3:42:35 AM
Toluene	ND	1.0		µg/L	1	6/29/2022 3:42:35 AM
Ethylbenzene	ND	1.0		µg/L	1	6/29/2022 3:42:35 AM
Xylenes, Total	ND	1.5		µg/L	1	6/29/2022 3:42:35 AM
Surr: 1,2-Dichloroethane-d4	110	70-130		%Rec	1	6/29/2022 3:42:35 AM
Surr: 4-Bromofluorobenzene	103	70-130		%Rec	1	6/29/2022 3:42:35 AM
Surr: Dibromofluoromethane	109	70-130		%Rec	1	6/29/2022 3:42:35 AM
Surr: Toluene-d8	103	70-130		%Rec	1	6/29/2022 3:42:35 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2070	40.0	*D	mg/L	1	7/1/2022 6:39:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Analytical Report

Lab Order 2206D74

Date Reported: 7/12/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-2

Project: Mangum 1

Collection Date: 6/23/2022 12:23:00 PM

Lab ID: 2206D74-002

Matrix: AQUEOUS

Received Date: 6/24/2022 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: CAS
Sulfate	170	5.0		mg/L	10	6/27/2022 9:15:49 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JLF
Iron	0.19	0.020		mg/L	1	6/27/2022 3:36:32 PM
Manganese	1.5	0.010	*	mg/L	5	6/27/2022 3:38:46 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: JR
Benzene	2.1	2.0		µg/L	2	6/29/2022 4:39:34 AM
Toluene	ND	2.0		µg/L	2	6/29/2022 4:39:34 AM
Ethylbenzene	ND	2.0		µg/L	2	6/29/2022 4:39:34 AM
Xylenes, Total	ND	3.0		µg/L	2	6/29/2022 4:39:34 AM
Surr: 1,2-Dichloroethane-d4	111	70-130		%Rec	2	6/29/2022 4:39:34 AM
Surr: 4-Bromofluorobenzene	104	70-130		%Rec	2	6/29/2022 4:39:34 AM
Surr: Dibromofluoromethane	107	70-130		%Rec	2	6/29/2022 4:39:34 AM
Surr: Toluene-d8	102	70-130		%Rec	2	6/29/2022 4:39:34 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2000	100	*D	mg/L	1	7/1/2022 6:39:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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Analytical Report

Lab Order 2206D74

Date Reported: 7/12/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-3

Project: Mangum 1

Collection Date: 6/23/2022 12:55:00 PM

Lab ID: 2206D74-003

Matrix: AQUEOUS

Received Date: 6/24/2022 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: CAS
Sulfate	1300	50	*	mg/L	100	6/27/2022 10:17:52 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JLF
Iron	5.2	0.20	*	mg/L	10	6/30/2022 10:01:21 AM
Manganese	17	0.040	*	mg/L	20	7/5/2022 1:25:09 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: JR
Benzene	52	1.0		µg/L	1	6/29/2022 5:08:00 AM
Toluene	ND	1.0		µg/L	1	6/29/2022 5:08:00 AM
Ethylbenzene	92	10		µg/L	10	6/29/2022 4:59:52 PM
Xylenes, Total	56	1.5		µg/L	1	6/29/2022 5:08:00 AM
Surr: 1,2-Dichloroethane-d4	108	70-130		%Rec	1	6/29/2022 5:08:00 AM
Surr: 4-Bromofluorobenzene	105	70-130		%Rec	1	6/29/2022 5:08:00 AM
Surr: Dibromofluoromethane	101	70-130		%Rec	1	6/29/2022 5:08:00 AM
Surr: Toluene-d8	104	70-130		%Rec	1	6/29/2022 5:08:00 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	8920	100	*D	mg/L	1	7/1/2022 6:39:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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Analytical Report

Lab Order 2206D74

Date Reported: 7/12/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-4

Project: Mangum 1

Collection Date: 6/23/2022 1:20:00 PM

Lab ID: 2206D74-004

Matrix: AQUEOUS

Received Date: 6/24/2022 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: CAS
Sulfate	850	50	*	mg/L	100	6/27/2022 10:42:41 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JLF
Iron	0.067	0.020		mg/L	1	6/27/2022 3:45:07 PM
Manganese	0.40	0.0020	*	mg/L	1	6/27/2022 3:45:07 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: JR
Benzene	2.6	2.0		µg/L	2	6/29/2022 6:04:58 AM
Toluene	ND	2.0		µg/L	2	6/29/2022 6:04:58 AM
Ethylbenzene	2.4	2.0		µg/L	2	6/29/2022 6:04:58 AM
Xylenes, Total	110	3.0		µg/L	2	6/29/2022 6:04:58 AM
Surr: 1,2-Dichloroethane-d4	111	70-130		%Rec	2	6/29/2022 6:04:58 AM
Surr: 4-Bromofluorobenzene	106	70-130		%Rec	2	6/29/2022 6:04:58 AM
Surr: Dibromofluoromethane	102	70-130		%Rec	2	6/29/2022 6:04:58 AM
Surr: Toluene-d8	101	70-130		%Rec	2	6/29/2022 6:04:58 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2530	40.0	*D	mg/L	1	7/1/2022 6:39:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Analytical Report

Lab Order 2206D74

Date Reported: 7/12/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-5

Project: Mangum 1

Collection Date: 6/23/2022 1:55:00 PM

Lab ID: 2206D74-005

Matrix: AQUEOUS

Received Date: 6/24/2022 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: CAS
Sulfate	2600	50	*	mg/L	100	6/27/2022 11:07:29 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JLF
Iron	0.068	0.020		mg/L	1	6/27/2022 3:49:34 PM
Manganese	2.7	0.010	*	mg/L	5	6/27/2022 3:51:52 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: JR
Benzene	ND	1.0		µg/L	1	6/29/2022 6:33:24 AM
Toluene	ND	1.0		µg/L	1	6/29/2022 6:33:24 AM
Ethylbenzene	ND	1.0		µg/L	1	6/29/2022 6:33:24 AM
Xylenes, Total	ND	1.5		µg/L	1	6/29/2022 6:33:24 AM
Surr: 1,2-Dichloroethane-d4	111	70-130		%Rec	1	6/29/2022 6:33:24 AM
Surr: 4-Bromofluorobenzene	108	70-130		%Rec	1	6/29/2022 6:33:24 AM
Surr: Dibromofluoromethane	108	70-130		%Rec	1	6/29/2022 6:33:24 AM
Surr: Toluene-d8	102	70-130		%Rec	1	6/29/2022 6:33:24 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	5280	100	*D	mg/L	1	7/1/2022 6:39:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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Analytical Report

Lab Order 2206D74

Date Reported: 7/12/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-6

Project: Mangum 1

Collection Date: 6/23/2022 2:15:00 PM

Lab ID: 2206D74-006

Matrix: AQUEOUS

Received Date: 6/24/2022 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: CAS
Sulfate	ND	5.0		mg/L	10	6/27/2022 11:19:54 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JLF
Iron	4.4	0.10	*	mg/L	5	6/27/2022 3:56:03 PM
Manganese	2.0	0.010	*	mg/L	5	6/27/2022 3:56:03 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: JR
Benzene	13	1.0		µg/L	1	6/29/2022 7:01:57 AM
Toluene	ND	1.0		µg/L	1	6/29/2022 7:01:57 AM
Ethylbenzene	20	1.0		µg/L	1	6/29/2022 7:01:57 AM
Xylenes, Total	170	1.5		µg/L	1	6/29/2022 7:01:57 AM
Surr: 1,2-Dichloroethane-d4	104	70-130		%Rec	1	6/29/2022 7:01:57 AM
Surr: 4-Bromofluorobenzene	90.3	70-130		%Rec	1	6/29/2022 7:01:57 AM
Surr: Dibromofluoromethane	98.8	70-130		%Rec	1	6/29/2022 7:01:57 AM
Surr: Toluene-d8	104	70-130		%Rec	1	6/29/2022 7:01:57 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	1510	100	*D	mg/L	1	7/1/2022 6:39:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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Analytical Report

Lab Order 2206D74

Date Reported: 7/12/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-7

Project: Mangum 1

Collection Date: 6/23/2022 2:35:00 PM

Lab ID: 2206D74-007

Matrix: AQUEOUS

Received Date: 6/24/2022 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: CAS
Sulfate	880	50	*	mg/L	100	6/27/2022 11:57:09 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JLF
Iron	ND	0.020		mg/L	1	6/27/2022 4:05:07 PM
Manganese	1.1	0.010	*	mg/L	5	6/27/2022 4:07:25 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: JR
Benzene	ND	1.0		µg/L	1	6/29/2022 7:30:27 AM
Toluene	ND	1.0		µg/L	1	6/29/2022 7:30:27 AM
Ethylbenzene	ND	1.0		µg/L	1	6/29/2022 7:30:27 AM
Xylenes, Total	ND	1.5		µg/L	1	6/29/2022 7:30:27 AM
Surr: 1,2-Dichloroethane-d4	117	70-130		%Rec	1	6/29/2022 7:30:27 AM
Surr: 4-Bromofluorobenzene	106	70-130		%Rec	1	6/29/2022 7:30:27 AM
Surr: Dibromofluoromethane	113	70-130		%Rec	1	6/29/2022 7:30:27 AM
Surr: Toluene-d8	104	70-130		%Rec	1	6/29/2022 7:30:27 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2890	100	*D	mg/L	1	7/1/2022 6:39:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Page 7 of 13

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2206D74

12-Jul-22

Client: HILCORP ENERGY**Project:** Mangum 1

Sample ID: MB-B	SampType: MBLK	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: PBW	Batch ID: B89068	RunNo: 89068								
Prep Date:	Analysis Date: 6/27/2022	SeqNo: 3164612 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	ND	0.020								
Manganese	ND	0.0020								

Sample ID: LLCS-B	SampType: LCSLL	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: B89068	RunNo: 89068								
Prep Date:	Analysis Date: 6/27/2022	SeqNo: 3164613 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	0.022	0.020	0.02000	0	111	50	150			
Manganese	0.0022	0.0020	0.002000	0	110	50	150			

Sample ID: LCS-B	SampType: LCS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: LCSW	Batch ID: B89068	RunNo: 89068								
Prep Date:	Analysis Date: 6/27/2022	SeqNo: 3164614 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	0.50	0.020	0.5000	0	99.3	85	115			
Manganese	0.49	0.0020	0.5000	0	98.8	85	115			

Sample ID: MB-A	SampType: MBLK	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: PBW	Batch ID: A89154	RunNo: 89154								
Prep Date:	Analysis Date: 6/30/2022	SeqNo: 3168573 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	ND	0.020								

Sample ID: LLCS-A	SampType: LCSLL	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: A89154	RunNo: 89154								
Prep Date:	Analysis Date: 6/30/2022	SeqNo: 3168574 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	0.023	0.020	0.02000	0	115	50	150			

Sample ID: LCS-A	SampType: LCS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: LCSW	Batch ID: A89154	RunNo: 89154								
Prep Date:	Analysis Date: 6/30/2022	SeqNo: 3168575 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	0.49	0.020	0.5000	0	97.7	85	115			

Qualifiers:

* Value exceeds Maximum Contaminant Level.
D Sample Diluted Due to Matrix
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
PQL Practical Quantitative Limit
S % Recovery outside of range due to dilution or matrix interference

B Analyte detected in the associated Method Blank
E Estimated value
J Analyte detected below quantitation limits
P Sample pH Not In Range
RL Reporting Limit

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2206D74

12-Jul-22

Client: HILCORP ENERGY**Project:** Mangum 1

Sample ID: MB-A	SampType: MBLK	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: PBW	Batch ID: A89290	RunNo: 89290								
Prep Date:	Analysis Date: 7/5/2022	SeqNo: 3175457 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020								

Sample ID: LLCS-A	SampType: LCSLL	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: A89290	RunNo: 89290								
Prep Date:	Analysis Date: 7/5/2022	SeqNo: 3175458 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.0020	0.0020	0.002000	0	100	50	150			

Sample ID: LCS-A	SampType: LCS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: LCSW	Batch ID: A89290	RunNo: 89290								
Prep Date:	Analysis Date: 7/5/2022	SeqNo: 3175459 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.50	0.0020	0.5000	0	101	85	115			

Qualifiers:

* Value exceeds Maximum Contaminant Level.
D Sample Diluted Due to Matrix
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
PQL Practical Quantitative Limit
S % Recovery outside of range due to dilution or matrix interference

B Analyte detected in the associated Method Blank
E Estimated value
J Analyte detected below quantitation limits
P Sample pH Not In Range
RL Reporting Limit

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: 2206D74
12-Jul-22

Client: HILCORP ENERGY
Project: Mangum 1

Sample ID: MB	SampType: mblk	TestCode: EPA Method 300.0: Anions								
Client ID: PBW	Batch ID: R89078	RunNo: 89078								
Prep Date:	Analysis Date: 6/27/2022	SeqNo: 3164513 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	ND	0.50								

Sample ID: LCS	SampType: lcs	TestCode: EPA Method 300.0: Anions								
Client ID: LCSW	Batch ID: R89078	RunNo: 89078								
Prep Date:	Analysis Date: 6/27/2022	SeqNo: 3164514 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	10	0.50	10.00	0	100	90	110			

- Qualifiers:
- * Value exceeds Maximum Contaminant Level.
 - D Sample Diluted Due to Matrix
 - H Holding times for preparation or analysis exceeded
 - ND Not Detected at the Reporting Limit
 - PQL Practical Quantitative Limit
 - S % Recovery outside of range due to dilution or matrix interference

- B Analyte detected in the associated Method Blank
- E Estimated value
- J Analyte detected below quantitation limits
- P Sample pH Not In Range
- RL Reporting Limit

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2206D74

12-Jul-22

Client: HILCORP ENERGY**Project:** Mangum 1

Sample ID: 100ng lcs	SampType: LCS			TestCode: EPA Method 8260: Volatiles Short List						
Client ID: LCSW	Batch ID: S89107			RunNo: 89107						
Prep Date:	Analysis Date: 6/28/2022			SeqNo: 3166508		Units: µg/L				
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	21	1.0	20.00	0	103	70	130			
Toluene	20	1.0	20.00	0	98.8	70	130			
Surr: 1,2-Dichloroethane-d4	11		10.00		106	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		104	70	130			
Surr: Dibromofluoromethane	11		10.00		113	70	130			
Surr: Toluene-d8	9.9		10.00		98.7	70	130			

Sample ID: 100ng lcs2	SampType: LCS			TestCode: EPA Method 8260: Volatiles Short List						
Client ID: LCSW	Batch ID: S89107			RunNo: 89107						
Prep Date:	Analysis Date: 6/28/2022			SeqNo: 3166510		Units: µg/L				
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	21	1.0	20.00	0	103	70	130			
Toluene	20	1.0	20.00	0	98.3	70	130			
Surr: 1,2-Dichloroethane-d4	10		10.00		102	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		105	70	130			
Surr: Dibromofluoromethane	11		10.00		111	70	130			
Surr: Toluene-d8	10		10.00		99.8	70	130			

Sample ID: mb	SampType: MBLK			TestCode: EPA Method 8260: Volatiles Short List						
Client ID: PBW	Batch ID: S89107			RunNo: 89107						
Prep Date:	Analysis Date: 6/28/2022			SeqNo: 3166533		Units: µg/L				
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								
Ethylbenzene	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	11		10.00		114	70	130			
Surr: 4-Bromofluorobenzene	11		10.00		107	70	130			
Surr: Dibromofluoromethane	11		10.00		110	70	130			
Surr: Toluene-d8	10		10.00		103	70	130			

Sample ID: mb2	SampType: MBLK			TestCode: EPA Method 8260: Volatiles Short List						
Client ID: PBW	Batch ID: S89107			RunNo: 89107						
Prep Date:	Analysis Date: 6/29/2022			SeqNo: 3166535		Units: µg/L				
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quantitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix interference		

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2206D74

12-Jul-22

Client: HILCORP ENERGY**Project:** Mangum 1

Sample ID: mb2	SampType: MBLK		TestCode: EPA Method 8260: Volatiles Short List							
Client ID: PBW	Batch ID: S89107		RunNo: 89107							
Prep Date:	Analysis Date: 6/29/2022		SeqNo: 3166535		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Ethylbenzene	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	12		10.00		115	70	130			
Surr: 4-Bromofluorobenzene	11		10.00		107	70	130			
Surr: Dibromofluoromethane	11		10.00		111	70	130			
Surr: Toluene-d8	10		10.00		104	70	130			

Sample ID: mb	SampType: MBLK		TestCode: EPA Method 8260: Volatiles Short List							
Client ID: PBW	Batch ID: B89138		RunNo: 89138							
Prep Date:	Analysis Date: 6/29/2022		SeqNo: 3167511		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Ethylbenzene	ND	1.0								
Surr: 1,2-Dichloroethane-d4	9.4		10.00		93.6	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		103	70	130			
Surr: Dibromofluoromethane	8.8		10.00		87.7	70	130			
Surr: Toluene-d8	10		10.00		102	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quantitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix interference		

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**WO#: **2206D74****12-Jul-22****Client:** HILCORP ENERGY**Project:** Mangum 1

Sample ID: MB-68467	SampType: MBLK	TestCode: SM2540C MOD: Total Dissolved Solids								
Client ID: PBW	Batch ID: 68467	RunNo: 89199								
Prep Date: 6/30/2022	Analysis Date: 7/1/2022	SeqNo: 3170769 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID: LCS-68467	SampType: LCS	TestCode: SM2540C MOD: Total Dissolved Solids								
Client ID: LCSW	Batch ID: 68467	RunNo: 89199								
Prep Date: 6/30/2022	Analysis Date: 7/1/2022	SeqNo: 3170770 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1010	20.0	1000	0	101	80	120			

Sample ID: 2206D74-001BDUP	SampType: DUP	TestCode: SM2540C MOD: Total Dissolved Solids								
Client ID: MW-1	Batch ID: 68467	RunNo: 89199								
Prep Date: 6/30/2022	Analysis Date: 7/1/2022	SeqNo: 3170772 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	2110	40.0						2.20	10	*D

Qualifiers:

* Value exceeds Maximum Contaminant Level.
D Sample Diluted Due to Matrix
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
PQL Practical Quantitative Limit
S % Recovery outside of range due to dilution or matrix interference

B Analyte detected in the associated Method Blank
E Estimated value
J Analyte detected below quantitation limits
P Sample pH Not In Range
RL Reporting Limit



Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: **HILCORP ENERGY**Work Order Number: **2206D74**

RcptNo: 1

Received By: **Cheyenne Cason** 6/24/2022 7:00:00 AMCompleted By: **Cheyenne Cason** 6/24/2022 10:20:07 AMReviewed By: *JA 6/24/22*

Chain of Custody

1. Is Chain of Custody complete? Yes ☒ No ☐ Not Present ☐
2. How was the sample delivered? Courier

Log In

3. Was an attempt made to cool the samples? Yes ☒ No ☐ NA ☐
4. Were all samples received at a temperature of $>0^{\circ}\text{C}$ to 6.0°C ? Yes ☒ No ☐ NA ☐
5. Sample(s) in proper container(s)? Yes ☒ No ☐
6. Sufficient sample volume for indicated test(s)? Yes ☒ No ☐
7. Are samples (except VOA and ONG) properly preserved? Yes ☒ No ☐
8. Was preservative added to bottles? Yes ☒ No ☐ NA ☐
9. Received at least 1 vial with headspace $<1/4"$ for AQ VOA? Yes ☐ No ☐ HNO₃ NA ☒
10. Were any sample containers received broken? Yes ☐ No ☒
11. Does paperwork match bottle labels?
(Note discrepancies on chain of custody) Yes ☒ No ☐
12. Are matrices correctly identified on Chain of Custody? Yes ☒ No ☐
13. Is it clear what analyses were requested? Yes ☒ No ☐
14. Were all holding times able to be met?
(If no, notify customer for authorization.) Yes ☒ No ☐

of preserved
bottles checked
for pH: 7
(\leq or >12 unless noted)

Adjusted? yesChecked by: *JA 6.24.22*

Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☒

Person Notified: _____ Date: _____
By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding: _____
Client Instructions: _____

16. Additional remarks:

On all samples poured off and filtered ~125mls from fraction B for Fraction C and added ~0.4mls HNO₃ for metals analysis --

17. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	2.9	Good	Yes			
2	3.9	Good	Yes			
3	0.7	Good	Yes			

*used 8 filters from
Lot FJ48280 FJ4820.
JA 6/24/22 JA 6/24/22*

Chain-of-Custody Record

Client: Hilcorp Farmington NM

Mailing Address: 382 Road 3100 Aztec, NM 87410

Billing Address: PO Box 61529 Houston, TX 77208

Phone #: 505-486-9543

Email or Fax#: Brandon.Sinclair@hilcorp.com

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

Accreditation: ☐ Az Compliance

☐ NELAC ☐ Other

☐ EDD (Type)

Turn-Around Time:

X Standard ☐ Rush

Project Name:

Project #: Mangum 1

Project Manager:

Project Manager: Kate Kaufman

Sampler: Brandon Sinclair

On Ice: ☒ Yes ☐ No

of Coolers: 3 2.4-0-2.4

Cooler Temp (including CF): 0.7-0-20.7

Container Type and # Preservative Type

(3) 40ml VOA HCl Cool 3.4-0-3.4 HEAL No. 2206074

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

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(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

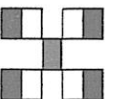
(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel

(1) Liter Plastic HCl Cool Cel

(3) 40ml VOA HCl Cool Cel



HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Dissolved Mn and Fe*
BTEX 8260
Sulfate / TDS

Remarks: *Dissolved Mn and Fe are to be filtered and preserved in the lab.

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.



Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

October 13, 2022

Kate Kaufman
HILCORP ENERGY
PO Box 4700
Farmington, NM 87499
TEL: (505) 564-0733
FAX:

RE: Mangum 1

OrderNo.: 2209G16

Dear Kate Kaufman:

Hall Environmental Analysis Laboratory received 7 sample(s) on 9/29/2022 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written over a light blue horizontal line.

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report

Lab Order 2209G16

Date Reported: 10/13/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-1

Project: Mangum 1

Collection Date: 9/28/2022 10:35:00 AM

Lab ID: 2209G16-001

Matrix: AQUEOUS

Received Date: 9/29/2022 7:05:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	800	50	*	mg/L	100	9/30/2022 9:23:26 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	0.74	0.010	*	mg/L	5	10/6/2022 12:10:04 PM
EPA METHOD 8260B: VOLATILES						Analyst: CCM
Benzene	ND	1.0		µg/L	1	10/1/2022 5:07:00 AM
Toluene	ND	1.0		µg/L	1	10/1/2022 5:07:00 AM
Ethylbenzene	ND	1.0		µg/L	1	10/1/2022 5:07:00 AM
Xylenes, Total	ND	1.5		µg/L	1	10/1/2022 5:07:00 AM
Surr: 1,2-Dichloroethane-d4	115	70-130		%Rec	1	10/1/2022 5:07:00 AM
Surr: 4-Bromofluorobenzene	99.0	70-130		%Rec	1	10/1/2022 5:07:00 AM
Surr: Dibromofluoromethane	108	70-130		%Rec	1	10/1/2022 5:07:00 AM
Surr: Toluene-d8	96.2	70-130		%Rec	1	10/1/2022 5:07:00 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: SNS
Total Dissolved Solids	2660	20.0	*	mg/L	1	10/5/2022 8:58:00 AM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Analytical Report

Lab Order 2209G16

Date Reported: 10/13/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-2

Project: Mangum 1

Collection Date: 9/28/2022 11:05:00 AM

Lab ID: 2209G16-002

Matrix: AQUEOUS

Received Date: 9/29/2022 7:05:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	29	5.0		mg/L	10	9/30/2022 9:36:18 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	0.99	0.0020	*	mg/L	1	10/4/2022 3:27:18 PM
EPA METHOD 8260B: VOLATILES						Analyst: CCM
Benzene	ND	2.0		µg/L	2	10/1/2022 5:53:00 AM
Toluene	ND	2.0		µg/L	2	10/1/2022 5:53:00 AM
Ethylbenzene	ND	2.0		µg/L	2	10/1/2022 5:53:00 AM
Xylenes, Total	ND	3.0		µg/L	2	10/1/2022 5:53:00 AM
Surr: 1,2-Dichloroethane-d4	117	70-130		%Rec	2	10/1/2022 5:53:00 AM
Surr: 4-Bromofluorobenzene	99.9	70-130		%Rec	2	10/1/2022 5:53:00 AM
Surr: Dibromofluoromethane	108	70-130		%Rec	2	10/1/2022 5:53:00 AM
Surr: Toluene-d8	98.2	70-130		%Rec	2	10/1/2022 5:53:00 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: SNS
Total Dissolved Solids	1970	40.0	*D	mg/L	1	10/5/2022 8:58:00 AM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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Analytical Report

Lab Order 2209G16

Date Reported: 10/13/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-3

Project: Mangum 1

Collection Date: 9/28/2022 11:35:00 AM

Lab ID: 2209G16-003

Matrix: AQUEOUS

Received Date: 9/29/2022 7:05:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	1300	50	*	mg/L	100	9/30/2022 10:53:30 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	9.6	0.040	*	mg/L	20	10/6/2022 12:16:35 PM
EPA METHOD 8260B: VOLATILES						Analyst: CCM
Benzene	5.6	1.0		µg/L	1	10/1/2022 6:39:00 AM
Toluene	ND	1.0		µg/L	1	10/1/2022 6:39:00 AM
Ethylbenzene	2.9	1.0		µg/L	1	10/1/2022 6:39:00 AM
Xylenes, Total	ND	1.5		µg/L	1	10/1/2022 6:39:00 AM
Surr: 1,2-Dichloroethane-d4	120	70-130		%Rec	1	10/1/2022 6:39:00 AM
Surr: 4-Bromofluorobenzene	97.7	70-130		%Rec	1	10/1/2022 6:39:00 AM
Surr: Dibromofluoromethane	109	70-130		%Rec	1	10/1/2022 6:39:00 AM
Surr: Toluene-d8	96.3	70-130		%Rec	1	10/1/2022 6:39:00 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: SNS
Total Dissolved Solids	6940	100	*D	mg/L	1	10/5/2022 8:58:00 AM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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Analytical Report

Lab Order 2209G16

Date Reported: 10/13/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-4

Project: Mangum 1

Collection Date: 9/28/2022 10:00:00 AM

Lab ID: 2209G16-004

Matrix: AQUEOUS

Received Date: 9/29/2022 7:05:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	900	50	*	mg/L	100	9/30/2022 11:19:15 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	0.46	0.0020	*	mg/L	1	10/4/2022 3:31:31 PM
EPA METHOD 8260B: VOLATILES						Analyst: CCM
Benzene	1.8	1.0		µg/L	2	10/1/2022 7:25:00 AM
Toluene	ND	2.0		µg/L	2	10/1/2022 7:25:00 AM
Ethylbenzene	ND	2.0		µg/L	2	10/1/2022 7:25:00 AM
Xylenes, Total	86	3.0		µg/L	2	10/1/2022 7:25:00 AM
Surr: 1,2-Dichloroethane-d4	117	70-130		%Rec	2	10/1/2022 7:25:00 AM
Surr: 4-Bromofluorobenzene	99.2	70-130		%Rec	2	10/1/2022 7:25:00 AM
Surr: Dibromofluoromethane	109	70-130		%Rec	2	10/1/2022 7:25:00 AM
Surr: Toluene-d8	102	70-130		%Rec	2	10/1/2022 7:25:00 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: SNS
Total Dissolved Solids	2390	40.0	*D	mg/L	1	10/5/2022 8:58:00 AM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

Analytical Report

Lab Order 2209G16

Date Reported: 10/13/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-5

Project: Mangum 1

Collection Date: 9/28/2022 12:25:00 PM

Lab ID: 2209G16-005

Matrix: AQUEOUS

Received Date: 9/29/2022 7:05:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	1800	50	*	mg/L	100	9/30/2022 11:44:59 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	2.3	0.010	*	mg/L	5	10/6/2022 12:18:52 PM
EPA METHOD 8260B: VOLATILES						Analyst: CCM
Benzene	ND	1.0		µg/L	1	10/1/2022 7:48:00 AM
Toluene	ND	1.0		µg/L	1	10/1/2022 7:48:00 AM
Ethylbenzene	ND	1.0		µg/L	1	10/1/2022 7:48:00 AM
Xylenes, Total	ND	1.5		µg/L	1	10/1/2022 7:48:00 AM
Surr: 1,2-Dichloroethane-d4	121	70-130		%Rec	1	10/1/2022 7:48:00 AM
Surr: 4-Bromofluorobenzene	105	70-130		%Rec	1	10/1/2022 7:48:00 AM
Surr: Dibromofluoromethane	109	70-130		%Rec	1	10/1/2022 7:48:00 AM
Surr: Toluene-d8	96.4	70-130		%Rec	1	10/1/2022 7:48:00 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: SNS
Total Dissolved Solids	4870	100	*D	mg/L	1	10/5/2022 8:58:00 AM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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Analytical Report

Lab Order 2209G16

Date Reported: 10/13/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-6

Project: Mangum 1

Collection Date: 9/28/2022 1:10:00 PM

Lab ID: 2209G16-006

Matrix: AQUEOUS

Received Date: 9/29/2022 7:05:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	ND	5.0		mg/L	10	9/30/2022 11:57:50 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	1.7	0.010	*	mg/L	5	10/6/2022 12:20:51 PM
EPA METHOD 8260B: VOLATILES						Analyst: CCM
Benzene	13	1.0		µg/L	1	10/5/2022 7:07:00 PM
Toluene	ND	1.0		µg/L	1	10/5/2022 7:07:00 PM
Ethylbenzene	17	1.0		µg/L	1	10/5/2022 7:07:00 PM
Xylenes, Total	170	1.5		µg/L	1	10/5/2022 7:07:00 PM
Surr: 1,2-Dichloroethane-d4	86.1	70-130		%Rec	1	10/5/2022 7:07:00 PM
Surr: 4-Bromofluorobenzene	102	70-130		%Rec	1	10/5/2022 7:07:00 PM
Surr: Dibromofluoromethane	88.5	70-130		%Rec	1	10/5/2022 7:07:00 PM
Surr: Toluene-d8	104	70-130		%Rec	1	10/5/2022 7:07:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: SNS
Total Dissolved Solids	1390	200	*D	mg/L	1	10/5/2022 8:58:00 AM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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Analytical Report

Lab Order 2209G16

Date Reported: 10/13/2022

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-7

Project: Mangum 1

Collection Date: 9/28/2022 1:55:00 PM

Lab ID: 2209G16-007

Matrix: AQUEOUS

Received Date: 9/29/2022 7:05:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: JMT
Sulfate	820	50	*	mg/L	100	9/30/2022 12:36:25 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	1.1	0.010	*	mg/L	5	10/6/2022 12:29:33 PM
EPA METHOD 8260B: VOLATILES						Analyst: CCM
Benzene	ND	1.0		µg/L	1	10/1/2022 8:57:00 AM
Toluene	ND	1.0		µg/L	1	10/1/2022 8:57:00 AM
Ethylbenzene	ND	1.0		µg/L	1	10/1/2022 8:57:00 AM
Xylenes, Total	ND	1.5		µg/L	1	10/1/2022 8:57:00 AM
Surr: 1,2-Dichloroethane-d4	122	70-130		%Rec	1	10/1/2022 8:57:00 AM
Surr: 4-Bromofluorobenzene	103	70-130		%Rec	1	10/1/2022 8:57:00 AM
Surr: Dibromofluoromethane	113	70-130		%Rec	1	10/1/2022 8:57:00 AM
Surr: Toluene-d8	95.8	70-130		%Rec	1	10/1/2022 8:57:00 AM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: SNS
Total Dissolved Solids	2880	40.0	*D	mg/L	1	10/5/2022 8:58:00 AM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Estimated value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix interference		

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QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2209G16

13-Oct-22

Client: HILCORP ENERGY

Project: Mangum 1

Sample ID: MB-B	SampType: MBLK		TestCode: EPA Method 200.7: Dissolved Metals							
Client ID: PBW	Batch ID: B91551		RunNo: 91551							
Prep Date:	Analysis Date: 10/4/2022		SeqNo: 3279591		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020								

Sample ID: LLCS-B	SampType: LCSLL		TestCode: EPA Method 200.7: Dissolved Metals							
Client ID: BatchQC	Batch ID: B91551		RunNo: 91551							
Prep Date:	Analysis Date: 10/4/2022		SeqNo: 3279592		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020	0.002000	0	95.8	50	150			

Sample ID: LCS-B	SampType: LCS		TestCode: EPA Method 200.7: Dissolved Metals							
Client ID: LCSW	Batch ID: B91551		RunNo: 91551							
Prep Date:	Analysis Date: 10/4/2022		SeqNo: 3279593		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.50	0.0020	0.5000	0	99.7	85	115			

Sample ID: MB-A	SampType: MBLK		TestCode: EPA Method 200.7: Dissolved Metals							
Client ID: PBW	Batch ID: A91612		RunNo: 91612							
Prep Date:	Analysis Date: 10/6/2022		SeqNo: 3282797		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020								

Sample ID: LCSLL-A	SampType: LCSLL		TestCode: EPA Method 200.7: Dissolved Metals							
Client ID: BatchQC	Batch ID: A91612		RunNo: 91612							
Prep Date:	Analysis Date: 10/6/2022		SeqNo: 3282798		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020	0.002000	0	93.9	50	150			

Sample ID: LCS-A	SampType: LCS		TestCode: EPA Method 200.7: Dissolved Metals							
Client ID: LCSW	Batch ID: A91612		RunNo: 91612							
Prep Date:	Analysis Date: 10/6/2022		SeqNo: 3282799		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.48	0.0020	0.5000	0	95.5	85	115			

Qualifiers:

* Value exceeds Maximum Contaminant Level.
D Sample Diluted Due to Matrix
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
PQL Practical Quantitative Limit
S % Recovery outside of range due to dilution or matrix interference

B Analyte detected in the associated Method Blank
E Estimated value
J Analyte detected below quantitation limits
P Sample pH Not In Range
RL Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2209G16

13-Oct-22

Client: HILCORP ENERGY

Project: Mangum 1

Sample ID: 2209G16-001CMS	SampType: MS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: MW-1	Batch ID: A91612	RunNo: 91612								
Prep Date:	Analysis Date: 10/6/2022	SeqNo: 3282815 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	3.1	0.010	2.500	0.7386	94.7	70	130			

Sample ID: 2209G16-001CMSD	SampType: MSD	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: MW-1	Batch ID: A91612	RunNo: 91612								
Prep Date:	Analysis Date: 10/6/2022	SeqNo: 3282816 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	3.2	0.010	2.500	0.7386	97.9	70	130	2.55	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quantitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix interference		

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QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2209G16
13-Oct-22

Client: HILCORP ENERGY
Project: Mangum 1

Sample ID: MB	SampType: mblk	TestCode: EPA Method 300.0: Anions								
Client ID: PBW	Batch ID: R91467	RunNo: 91467								
Prep Date:	Analysis Date: 9/30/2022	SeqNo: 3275657 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	ND	0.50								

Sample ID: LCS	SampType: lcs	TestCode: EPA Method 300.0: Anions								
Client ID: LCSW	Batch ID: R91467	RunNo: 91467								
Prep Date:	Analysis Date: 9/30/2022	SeqNo: 3275665 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	10	0.50	10.00	0	100	90	110			

Qualifiers:

* Value exceeds Maximum Contaminant Level.

D Sample Diluted Due to Matrix

H Holding times for preparation or analysis exceeded

ND Not Detected at the Reporting Limit

PQL Practical Quantitative Limit

S % Recovery outside of range due to dilution or matrix interference

B Analyte detected in the associated Method Blank

E Estimated value

J Analyte detected below quantitation limits

P Sample pH Not In Range

RL Reporting Limit

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QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2209G16

13-Oct-22

Client: HILCORP ENERGY

Project: Mangum 1

Sample ID: mb 2	SampType: MBLK		TestCode: EPA Method 8260B: VOLATILES							
Client ID: PBW	Batch ID: B91440		RunNo: 91440							
Prep Date:	Analysis Date: 9/30/2022		SeqNo: 3275909		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								
Ethylbenzene	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	13		10.00		126	70	130			
Surr: 4-Bromofluorobenzene	9.8		10.00		98.0	70	130			
Surr: Dibromofluoromethane	11		10.00		114	70	130			
Surr: Toluene-d8	9.5		10.00		94.6	70	130			

Sample ID: 100ng lcs 2	SampType: LCS		TestCode: EPA Method 8260B: VOLATILES							
Client ID: LCSW	Batch ID: B91440		RunNo: 91440							
Prep Date:	Analysis Date: 9/30/2022		SeqNo: 3275925		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	22	1.0	20.00	0	111	70	130			
Toluene	20	1.0	20.00	0	99.3	70	130			
Surr: 1,2-Dichloroethane-d4	12		10.00		123	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		102	70	130			
Surr: Dibromofluoromethane	11		10.00		110	70	130			
Surr: Toluene-d8	9.5		10.00		95.1	70	130			

Sample ID: 100ng lcs	SampType: LCS		TestCode: EPA Method 8260B: VOLATILES							
Client ID: LCSW	Batch ID: R91553		RunNo: 91553							
Prep Date:	Analysis Date: 10/5/2022		SeqNo: 3279783		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	21	1.0	20.00	0	103	70	130			
Toluene	21	1.0	20.00	0	103	70	130			
Surr: 1,2-Dichloroethane-d4	9.9		10.00		98.7	70	130			
Surr: 4-Bromofluorobenzene	11		10.00		106	70	130			
Surr: Dibromofluoromethane	9.8		10.00		98.0	70	130			
Surr: Toluene-d8	9.5		10.00		95.4	70	130			

Sample ID: MB	SampType: MBLK		TestCode: EPA Method 8260B: VOLATILES							
Client ID: PBW	Batch ID: R91553		RunNo: 91553							
Prep Date:	Analysis Date: 10/5/2022		SeqNo: 3280459		Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quantitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2209G16

13-Oct-22

Client: HILCORP ENERGY

Project: Mangum 1

Sample ID: MB	SampType: MBLK	TestCode: EPA Method 8260B: VOLATILES								
Client ID: PBW	Batch ID: R91553	RunNo: 91553								
Prep Date:	Analysis Date: 10/5/2022	SeqNo: 3280459		Units: µg/L						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Ethylbenzene	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	10		10.00		101	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		100	70	130			
Surr: Dibromofluoromethane	10		10.00		100	70	130			
Surr: Toluene-d8	9.6		10.00		95.7	70	130			

Qualifiers:

- * Value exceeds Maximum Contaminant Level.

D Sample Diluted Due to Matrix

H Holding times for preparation or analysis exceeded

ND Not Detected at the Reporting Limit

PQL Practical Quantitative Limit

S % Recovery outside of range due to dilution or matrix interference
- B Analyte detected in the associated Method Blank

E Estimated value

J Analyte detected below quantitation limits

P Sample pH Not In Range

RL Reporting Limit

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2209G16

13-Oct-22

Client: HILCORP ENERGY**Project:** Mangum 1

Sample ID: MB-70542	SampType: MBLK		TestCode: SM2540C MOD: Total Dissolved Solids							
Client ID: PBW	Batch ID: 70542		RunNo: 91532							
Prep Date: 10/3/2022	Analysis Date: 10/5/2022		SeqNo: 3278878		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID: LCS-70542	SampType: LCS		TestCode: SM2540C MOD: Total Dissolved Solids							
Client ID: LCSW	Batch ID: 70542		RunNo: 91532							
Prep Date: 10/3/2022	Analysis Date: 10/5/2022		SeqNo: 3278879		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1030	20.0	1000	0	103	80	120			

Sample ID: 2209G16-001BDUP	SampType: DUP		TestCode: SM2540C MOD: Total Dissolved Solids							
Client ID: MW-1	Batch ID: 70542		RunNo: 91532							
Prep Date: 10/3/2022	Analysis Date: 10/5/2022		SeqNo: 3278881		Units: mg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	2660	20.0						0.263	10	*

Qualifiers:

* Value exceeds Maximum Contaminant Level.
D Sample Diluted Due to Matrix
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
PQL Practical Quantitative Limit
S % Recovery outside of range due to dilution or matrix interference

B Analyte detected in the associated Method Blank
E Estimated value
J Analyte detected below quantitation limits
P Sample pH Not In Range
RL Reporting Limit



Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: HILCORP ENERGY

Work Order Number: 2209G16

RcptNo: 1

Received By: Juan Rojas

9/29/2022 7:05:00 AM

Juan Rojas

Completed By: Tracy Casarrubias

9/29/2022 9:37:58 AM

Reviewed By: *JR 9/29/22*Chain of Custody

1. Is Chain of Custody complete? Yes ☒ No ☐ Not Present ☐
2. How was the sample delivered? Courier

Log In

3. Was an attempt made to cool the samples? Yes ☒ No ☐ NA ☐
4. Were all samples received at a temperature of $>0^{\circ}\text{C}$ to 6.0°C ? Yes ☒ No ☐ NA ☐
5. Sample(s) in proper container(s)? Yes ☒ No ☐
6. Sufficient sample volume for indicated test(s)? Yes ☒ No ☐
7. Are samples (except VOA and ONG) properly preserved? Yes ☒ No ☐
8. Was preservative added to bottles? Yes ☒ No ☐ NA ☐
9. Received at least 1 vial with headspace $<1/4"$ for AQ VOA? Yes ☒ No ☐ HNO₃ NA ☐
10. Were any sample containers received broken? Yes ☐ No ☒
11. Does paperwork match bottle labels?
(Note discrepancies on chain of custody) Yes ☒ No ☐
12. Are matrices correctly identified on Chain of Custody? Yes ☒ No ☐
13. Is it clear what analyses were requested? Yes ☒ No ☐
14. Were all holding times able to be met?
(If no, notify customer for authorization.) Yes ☒ No ☐

of preserved
bottles checked
for pH:

7
(<2 or >12 unless noted)

Adjusted?

yes

Checked by:

*KPA 9.29.22*Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☒

Person Notified:

Date:

By Whom:

Via:

☐ eMail☐ Phone☐ Fax☐ In Person

Regarding:

Client Instructions:

16. Additional remarks: *Poured off 500ml from original 1 L unpres for samples 001-007*

Poured 125mL from original 1 liter unpreserved bottles provided for samples 001-007 to create samples 001C-007C. Proceeded to filter and add .40mL of HNO₃ to samples 001C-007C for proper pH -

17. Cooler Information

Cooler No	Temp $^{\circ}\text{C}$	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	5.3	Good	Yes			

tot #11

Filter Cat #
FJ420 x 6
FJ5640 x 3

Chain-of-Custody Record

Client: Hilcorp Farmington NM

Mailing Address: 382 Road 3100 Aztec, NM 87410

Billing Address: PO Box 61529 Houston, TX 77208

Phone #: 505-486-9543

email or Fax#: Brandon.Sinclair@hilcorp.com

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)Accreditation: ☐ Az Compliance☐ NELAC ☐ Other☐ EDD (Type)

Turn-Around Time:

☒ Standard ☐ Rush

Project Name:

Mangum 1

Project #:

Project Manager:

Kate Kaufman

Sampler: Brandon Sinclair

On Ice: ☒ Yes ☐ No

of Coolers: 1

Cooler Temp (including CF): 54-61-55.5

Container Type and #

Preservative Type

HEAL No.

(3) 40ml VOA HCl 2209616

(1) Liter Plastic Cool 001

(3) 40ml VOA HCl 002

(1) Liter Plastic Cool 003

(3) 40ml VOA HCl 004

(1) Liter Plastic Cool 005

(3) 40ml VOA HCl 006

(1) Liter Plastic Cool 007

(3) 40ml VOA HCl

(1) Liter Plastic Cool

(3) 40ml VOA HCl

(1) Liter Plastic Cool

(3) 40ml VOA HCl

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Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

January 17, 2023

Kate Kaufman
HILCORP ENERGY
PO Box 4700
Farmington, NM 87499
TEL: (505) 564-0733
FAX:

RE: Magnum 1

OrderNo.: 2301087

Dear Kate Kaufman:

Hall Environmental Analysis Laboratory received 7 sample(s) on 1/4/2023 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written over a light blue horizontal line.

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report

Lab Order 2301087

Date Reported: 1/17/2023

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-1

Project: Magnum 1

Collection Date: 12/29/2022 1:55:00 PM

Lab ID: 2301087-001

Matrix: AQUEOUS

Received Date: 1/4/2023 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: NAI
Sulfate	810	50	*	mg/L	100	1/6/2023 8:48:41 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	0.44	0.0020	*	mg/L	1	1/9/2023 12:30:56 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: RAA
Benzene	ND	1.0		µg/L	1	1/9/2023 7:08:15 PM
Toluene	ND	1.0		µg/L	1	1/9/2023 7:08:15 PM
Ethylbenzene	ND	1.0		µg/L	1	1/9/2023 7:08:15 PM
Xylenes, Total	ND	1.5		µg/L	1	1/9/2023 7:08:15 PM
Surr: 1,2-Dichloroethane-d4	120	70-130		%Rec	1	1/9/2023 7:08:15 PM
Surr: 4-Bromofluorobenzene	108	70-130		%Rec	1	1/9/2023 7:08:15 PM
Surr: Dibromofluoromethane	103	70-130		%Rec	1	1/9/2023 7:08:15 PM
Surr: Toluene-d8	94.4	70-130		%Rec	1	1/9/2023 7:08:15 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2420	40.0	*D	mg/L	1	1/5/2023 12:52:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Above Quantitation Range/Estimated Value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of standard limits. If undiluted results may be estimated.		

Page 1 of 11

Analytical Report

Lab Order 2301087

Date Reported: 1/17/2023

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-2

Project: Magnum 1

Collection Date: 12/29/2022 1:20:00 PM

Lab ID: 2301087-002

Matrix: AQUEOUS

Received Date: 1/4/2023 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: NAI
Sulfate	76	5.0		mg/L	10	1/6/2023 9:01:05 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	0.64	0.0020	*	mg/L	1	1/9/2023 12:37:21 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: RAA
Benzene	5.4	1.0		µg/L	1	1/9/2023 8:29:36 PM
Toluene	ND	1.0		µg/L	1	1/9/2023 8:29:36 PM
Ethylbenzene	ND	1.0		µg/L	1	1/9/2023 8:29:36 PM
Xylenes, Total	ND	1.5		µg/L	1	1/9/2023 8:29:36 PM
Surr: 1,2-Dichloroethane-d4	121	70-130		%Rec	1	1/9/2023 8:29:36 PM
Surr: 4-Bromofluorobenzene	115	70-130		%Rec	1	1/9/2023 8:29:36 PM
Surr: Dibromofluoromethane	99.9	70-130		%Rec	1	1/9/2023 8:29:36 PM
Surr: Toluene-d8	103	70-130		%Rec	1	1/9/2023 8:29:36 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	1800	100	*D	mg/L	1	1/5/2023 12:52:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Above Quantitation Range/Estimated Value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of standard limits. If undiluted results may be estimated.		

Page 2 of 11

Analytical Report

Lab Order 2301087

Date Reported: 1/17/2023

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-3

Project: Magnum 1

Collection Date: 12/29/2022 2:20:00 PM

Lab ID: 2301087-003

Matrix: AQUEOUS

Received Date: 1/4/2023 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: NAI
Sulfate	190	5.0		mg/L	10	1/6/2023 10:37:31 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	16	0.040	*	mg/L	20	1/11/2023 10:05:28 AM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: RAA
Benzene	42	1.0		µg/L	1	1/9/2023 8:56:41 PM
Toluene	ND	1.0		µg/L	1	1/9/2023 8:56:41 PM
Ethylbenzene	22	1.0		µg/L	1	1/9/2023 8:56:41 PM
Xylenes, Total	1.8	1.5		µg/L	1	1/9/2023 8:56:41 PM
Surr: 1,2-Dichloroethane-d4	115	70-130		%Rec	1	1/9/2023 8:56:41 PM
Surr: 4-Bromofluorobenzene	104	70-130		%Rec	1	1/9/2023 8:56:41 PM
Surr: Dibromofluoromethane	101	70-130		%Rec	1	1/9/2023 8:56:41 PM
Surr: Toluene-d8	95.1	70-130		%Rec	1	1/9/2023 8:56:41 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	10300	100	*D	mg/L	1	1/5/2023 12:52:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Above Quantitation Range/Estimated Value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of standard limits. If undiluted results may be estimated.		

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Analytical Report

Lab Order 2301087

Date Reported: 1/17/2023

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-4

Project: Magnum 1

Collection Date: 12/29/2022 12:55:00 PM

Lab ID: 2301087-004

Matrix: AQUEOUS

Received Date: 1/4/2023 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: NAI
Sulfate	1000	50	*	mg/L	100	1/6/2023 11:14:44 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	0.41	0.0020	*	mg/L	1	1/9/2023 12:58:43 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: RAA
Benzene	2.2	1.0		µg/L	1	1/9/2023 9:23:49 PM
Toluene	ND	1.0		µg/L	1	1/9/2023 9:23:49 PM
Ethylbenzene	1.7	1.0		µg/L	1	1/9/2023 9:23:49 PM
Xylenes, Total	94	1.5		µg/L	1	1/9/2023 9:23:49 PM
Surr: 1,2-Dichloroethane-d4	118	70-130		%Rec	1	1/9/2023 9:23:49 PM
Surr: 4-Bromofluorobenzene	116	70-130		%Rec	1	1/9/2023 9:23:49 PM
Surr: Dibromofluoromethane	94.5	70-130		%Rec	1	1/9/2023 9:23:49 PM
Surr: Toluene-d8	96.3	70-130		%Rec	1	1/9/2023 9:23:49 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	2560	40.0	*D	mg/L	1	1/5/2023 12:52:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Above Quantitation Range/Estimated Value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of standard limits. If undiluted results may be estimated.		

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Analytical Report

Lab Order 2301087

Date Reported: 1/17/2023

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-5

Project: Magnum 1

Collection Date: 12/29/2022 3:10:00 PM

Lab ID: 2301087-005

Matrix: AQUEOUS

Received Date: 1/4/2023 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: NAI
Sulfate	2400	50	*	mg/L	100	1/6/2023 11:39:34 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	2.6	0.010	*	mg/L	5	1/9/2023 1:08:49 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: RAA
Benzene	ND	1.0	P	µg/L	1	1/9/2023 9:50:56 PM
Toluene	ND	1.0	P	µg/L	1	1/9/2023 9:50:56 PM
Ethylbenzene	ND	1.0	P	µg/L	1	1/9/2023 9:50:56 PM
Xylenes, Total	ND	1.5	P	µg/L	1	1/9/2023 9:50:56 PM
Surr: 1,2-Dichloroethane-d4	95.5	70-130	P	%Rec	1	1/9/2023 9:50:56 PM
Surr: 4-Bromofluorobenzene	102	70-130	P	%Rec	1	1/9/2023 9:50:56 PM
Surr: Dibromofluoromethane	106	70-130	P	%Rec	1	1/9/2023 9:50:56 PM
Surr: Toluene-d8	97.3	70-130	P	%Rec	1	1/9/2023 9:50:56 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	5460	100	*D	mg/L	1	1/5/2023 12:52:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Above Quantitation Range/Estimated Value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of standard limits. If undiluted results may be estimated.		

Analytical Report

Lab Order 2301087

Date Reported: 1/17/2023

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-6

Project: Magnum 1

Collection Date: 12/29/2022 3:50:00 PM

Lab ID: 2301087-006

Matrix: AQUEOUS

Received Date: 1/4/2023 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: NAI
Sulfate	12	5.0		mg/L	10	1/6/2023 11:51:59 AM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	1.7	0.010	*	mg/L	5	1/9/2023 1:15:10 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: RAA
Benzene	ND	1.0	P	µg/L	1	1/9/2023 10:17:57 PM
Toluene	ND	1.0	P	µg/L	1	1/9/2023 10:17:57 PM
Ethylbenzene	ND	1.0	P	µg/L	1	1/9/2023 10:17:57 PM
Xylenes, Total	ND	1.5	P	µg/L	1	1/9/2023 10:17:57 PM
Surr: 1,2-Dichloroethane-d4	95.7	70-130	P	%Rec	1	1/9/2023 10:17:57 PM
Surr: 4-Bromofluorobenzene	110	70-130	P	%Rec	1	1/9/2023 10:17:57 PM
Surr: Dibromofluoromethane	94.5	70-130	P	%Rec	1	1/9/2023 10:17:57 PM
Surr: Toluene-d8	89.7	70-130	P	%Rec	1	1/9/2023 10:17:57 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	1500	100	*D	mg/L	1	1/5/2023 12:52:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Above Quantitation Range/Estimated Value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of standard limits. If undiluted results may be estimated.		

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Analytical Report

Lab Order 2301087

Date Reported: 1/17/2023

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: MW-7

Project: Magnum 1

Collection Date: 12/29/2022 4:30:00 PM

Lab ID: 2301087-007

Matrix: AQUEOUS

Received Date: 1/4/2023 7:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: NAI
Sulfate	1000	50	*	mg/L	100	1/6/2023 12:29:12 PM
EPA METHOD 200.7: DISSOLVED METALS						Analyst: JRR
Manganese	1.2	0.010	*	mg/L	5	1/9/2023 1:21:38 PM
EPA METHOD 8260: VOLATILES SHORT LIST						Analyst: RAA
Benzene	ND	1.0		µg/L	1	1/9/2023 10:45:02 PM
Toluene	ND	1.0		µg/L	1	1/9/2023 10:45:02 PM
Ethylbenzene	ND	1.0		µg/L	1	1/9/2023 10:45:02 PM
Xylenes, Total	ND	1.5		µg/L	1	1/9/2023 10:45:02 PM
Surr: 1,2-Dichloroethane-d4	95.2	70-130		%Rec	1	1/9/2023 10:45:02 PM
Surr: 4-Bromofluorobenzene	106	70-130		%Rec	1	1/9/2023 10:45:02 PM
Surr: Dibromofluoromethane	100	70-130		%Rec	1	1/9/2023 10:45:02 PM
Surr: Toluene-d8	92.8	70-130		%Rec	1	1/9/2023 10:45:02 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: KS
Total Dissolved Solids	3020	200	*D	mg/L	1	1/5/2023 12:52:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Above Quantitation Range/Estimated Value
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of standard limits. If undiluted results may be estimated.		

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QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 2301087

17-Jan-23

Client: HILCORP ENERGY

Project: Magnum 1

Sample ID: MB-A	SampType: MBLK	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: PBW	Batch ID: A93838	RunNo: 93838								
Prep Date:	Analysis Date: 1/9/2023	SeqNo: 3387404 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020								

Sample ID: LCSLL-A	SampType: LCSLL	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: A93838	RunNo: 93838								
Prep Date:	Analysis Date: 1/9/2023	SeqNo: 3387405 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.0021	0.0020	0.002000	0	106	50	150			

Sample ID: LCS-A	SampType: LCS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: LCSW	Batch ID: A93838	RunNo: 93838								
Prep Date:	Analysis Date: 1/9/2023	SeqNo: 3387406 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.49	0.0020	0.5000	0	97.1	85	115			

Sample ID: MB-A	SampType: MBLK	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: PBW	Batch ID: A93892	RunNo: 93892								
Prep Date:	Analysis Date: 1/11/2023	SeqNo: 3389233 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	ND	0.0020								

Sample ID: LCSLL-A	SampType: LCSLL	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: BatchQC	Batch ID: A93892	RunNo: 93892								
Prep Date:	Analysis Date: 1/11/2023	SeqNo: 3389236 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.0020	0.0020	0.002000	0	100	50	150			

Sample ID: LCS-A	SampType: LCS	TestCode: EPA Method 200.7: Dissolved Metals								
Client ID: LCSW	Batch ID: A93892	RunNo: 93892								
Prep Date:	Analysis Date: 1/11/2023	SeqNo: 3389238 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Manganese	0.48	0.0020	0.5000	0	95.3	85	115			

Qualifiers:

* Value exceeds Maximum Contaminant Level.
D Sample Diluted Due to Matrix
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
PQL Practical Quantitative Limit
S % Recovery outside of standard limits. If undiluted results may be estimated.

B Analyte detected in the associated Method Blank
E Above Quantitation Range/Estimated Value
J Analyte detected below quantitation limits
P Sample pH Not In Range
RL Reporting Limit

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QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: 2301087
17-Jan-23

Client: HILCORP ENERGY
Project: Magnum 1

Sample ID: MB	SampType: mblk	TestCode: EPA Method 300.0: Anions								
Client ID: PBW	Batch ID: R93791	RunNo: 93791								
Prep Date:	Analysis Date: 1/6/2023	SeqNo: 3385955 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	ND	0.50								

Sample ID: LCS	SampType: lcs	TestCode: EPA Method 300.0: Anions								
Client ID: LCSW	Batch ID: R93791	RunNo: 93791								
Prep Date:	Analysis Date: 1/6/2023	SeqNo: 3385956 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	9.9	0.50	10.00	0	98.5	90	110			

- Qualifiers:
- * Value exceeds Maximum Contaminant Level.
 - D Sample Diluted Due to Matrix
 - H Holding times for preparation or analysis exceeded
 - ND Not Detected at the Reporting Limit
 - PQL Practical Quantitative Limit
 - S % Recovery outside of standard limits. If undiluted results may be estimated.

- B Analyte detected in the associated Method Blank
- E Above Quantitation Range/Estimated Value
- J Analyte detected below quantitation limits
- P Sample pH Not In Range
- RL Reporting Limit

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2301087

17-Jan-23

Client: HILCORP ENERGY**Project:** Magnum 1

Sample ID: 2301087-001a ms	SampType: MS	TestCode: EPA Method 8260: Volatiles Short List								
Client ID: MW-1	Batch ID: SL93825	RunNo: 93825								
Prep Date:	Analysis Date: 1/9/2023	SeqNo: 3387019 Units: µg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	21	1.0	20.00	0	105	70	130			
Toluene	19	1.0	20.00	0	94.9	70	130			
Surr: 1,2-Dichloroethane-d4	11		10.00		110	70	130			
Surr: 4-Bromofluorobenzene	11		10.00		110	70	130			
Surr: Dibromofluoromethane	9.4		10.00		93.6	70	130			
Surr: Toluene-d8	9.5		10.00		95.0	70	130			

Sample ID: 2301087-001a msd	SampType: MSD	TestCode: EPA Method 8260: Volatiles Short List								
Client ID: MW-1	Batch ID: SL93825	RunNo: 93825								
Prep Date:	Analysis Date: 1/9/2023	SeqNo: 3387020 Units: µg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	20	1.0	20.00	0	99.0	70	130	6.24	20	
Toluene	18	1.0	20.00	0	89.4	70	130	5.97	20	
Surr: 1,2-Dichloroethane-d4	11		10.00		111	70	130	0	0	
Surr: 4-Bromofluorobenzene	11		10.00		113	70	130	0	0	
Surr: Dibromofluoromethane	9.7		10.00		96.9	70	130	0	0	
Surr: Toluene-d8	8.8		10.00		88.5	70	130	0	0	

Sample ID: mb	SampType: MBLK	TestCode: EPA Method 8260: Volatiles Short List								
Client ID: PBW	Batch ID: SL93825	RunNo: 93825								
Prep Date:	Analysis Date: 1/9/2023	SeqNo: 3387027 Units: µg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								
Ethylbenzene	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	9.3		10.00		92.8	70	130			
Surr: 4-Bromofluorobenzene	9.3		10.00		93.2	70	130			
Surr: Dibromofluoromethane	9.3		10.00		93.4	70	130			
Surr: Toluene-d8	9.8		10.00		97.8	70	130			

Qualifiers:

* Value exceeds Maximum Contaminant Level.
D Sample Diluted Due to Matrix
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
PQL Practical Quantitative Limit
S % Recovery outside of standard limits. If undiluted results may be estimated.

B Analyte detected in the associated Method Blank
E Above Quantitation Range/Estimated Value
J Analyte detected below quantitation limits
P Sample pH Not In Range
RL Reporting Limit

QC SUMMARY REPORT**Hall Environmental Analysis Laboratory, Inc.**

WO#: 2301087

17-Jan-23

Client: HILCORP ENERGY**Project:** Magnum 1

Sample ID: MB-72440	SampType: MBLK	TestCode: SM2540C MOD: Total Dissolved Solids								
Client ID: PBW	Batch ID: 72440	RunNo: 93735								
Prep Date: 1/4/2023	Analysis Date: 1/5/2023	SeqNo: 3383496 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID: LCS-72440	SampType: LCS	TestCode: SM2540C MOD: Total Dissolved Solids								
Client ID: LCSW	Batch ID: 72440	RunNo: 93735								
Prep Date: 1/4/2023	Analysis Date: 1/5/2023	SeqNo: 3383497 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1010	20.0	1000	0	101	80	120			

Sample ID: 2301087-004BDUP	SampType: DUP	TestCode: SM2540C MOD: Total Dissolved Solids								
Client ID: MW-4	Batch ID: 72440	RunNo: 93735								
Prep Date: 1/4/2023	Analysis Date: 1/5/2023	SeqNo: 3383530 Units: mg/L								
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	2620	40.0						2.63	10	*D

Qualifiers:

* Value exceeds Maximum Contaminant Level.
D Sample Diluted Due to Matrix
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
PQL Practical Quantitative Limit
S % Recovery outside of standard limits. If undiluted results may be estimated.

B Analyte detected in the associated Method Blank
E Above Quantitation Range/Estimated Value
J Analyte detected below quantitation limits
P Sample pH Not In Range
RL Reporting Limit



Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: HILCORP ENERGY

Work Order Number: 2301087

RcptNo: 1

Received By: Juan Rojas 1/4/2023 7:00:00 AM
Completed By: Sean Livingston 1/4/2023 11:15:10 AM
Reviewed By: *THK* 1/4/23

[Signature]

[Signature]

Chain of Custody

1. Is Chain of Custody complete? Yes ☒ No ☐ Not Present ☐
2. How was the sample delivered? Courier

Log In

3. Was an attempt made to cool the samples? Yes ☐ No ☐ NA ☒
4. Were all samples received at a temperature of $>0^{\circ}\text{C}$ to 6.0°C ? Yes ☐ No ☐ NA ☒
5. Sample(s) in proper container(s)? Yes ☒ No ☐
6. Sufficient sample volume for indicated test(s)? Yes ☒ No ☐
7. Are samples (except VOA and ONG) properly preserved? Yes ☒ No ☐
8. Was preservative added to bottles? Yes ☐ No ☒ NA ☐
9. Received at least 1 vial with headspace $<1/4"$ for AQ VOA? Yes ☒ No ☐ NA ☐
10. Were any sample containers received broken? Yes ☐ No ☒
11. Does paperwork match bottle labels?
(Note discrepancies on chain of custody) Yes ☒ No ☐
12. Are matrices correctly identified on Chain of Custody? Yes ☒ No ☐
13. Is it clear what analyses were requested? Yes ☒ No ☐
14. Were all holding times able to be met?
(If no, notify customer for authorization.) Yes ☒ No ☐

of preserved
bottles checked
for pH: 3

(<2 or >12 unless noted)

Adjusted? yes

Checked by: KRG 1.4.23

Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☒

Person Notified: _____ Date: _____
By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding: _____
Client Instructions: _____

16. Additional remarks:

Temp not recorded - Filtered ~100mL from 001-007B for 001-007C, adding ~0.4mL HNO₃ to all samples for dissolved metals analysis, checked for proper pH <2 - KRG 1.4.23 # 7051

17. Cooler Information

Filter Lot# FJ0298
x 10

Chain-of-Custody Record

Client: Hilcorp Farmington NM
Mailing Address: 382 Road 3100 Aztec, NM 87410
Billing Address: PO Box 61529 Houston, TX 77208
Phone #: 505-486-9543
email or Fax#: Brandon.Sinclair@hilcorp.com

QA/QC Package:
☐ Standard ☐ Level 4 (Full Validation)
Accreditation: ☐ Az Compliance
☐ NELAC ☐ Other
☐ EDD (Type)

Turn-Around Time:
☒ Standard ☐ Rush
Project Name: Mangum 1

Project #:
Project Manager: Kate Kautman

Sampler: Brandon Sinclair
On Ice: ☒ Yes ☐ No

of Coolers: 2
Cooler Temp (including CF): 64-67-72-74-76-78-80-82-84-86-88-90-92-94-96-98-100-102-104-106-108-110-112-114-116-118-120-122-124-126-128-130-132-134-136-138-140-142-144-146-148-150-152-154-156-158-160-162-164-166-168-170-172-174-176-178-180-182-184-186-188-190-192-194-196-198-200-202-204-206-208-210-212-214-216-218-220-222-224-226-228-230-232-234-236-238-240-242-244-246-248-250-252-254-256-258-260-262-264-266-268-270-272-274-276-278-280-282-284-286-288-290-292-294-296-298-300-302-304-306-308-310-312-314-316-318-320-322-324-326-328-330-332-334-336-338-340-342-344-346-348-350-352-354-356-358-360-362-364-366-368-370-372-374-376-378-380-382-384-386-388-390-392-394-396-398-400-402-404-406-408-410-412-414-416-418-420-422-424-426-428-430-432-434-436-438-440-442-444-446-448-450-452-454-456-458-460-462-464-466-468-470-472-474-476-478-480-482-484-486-488-490-492-494-496-498-500-502-504-506-508-510-512-514-516-518-520-522-524-526-528-530-532-534-536-538-540-542-544-546-548-550-552-554-556-558-560-562-564-566-568-570-572-574-576-578-580-582-584-586-588-590-592-594-596-598-600-602-604-606-608-610-612-614-616-618-620-622-624-626-628-630-632-634-636-638-640-642-644-646-648-650-652-654-656-658-660-662-664-666-668-670-672-674-676-678-680-682-684-686-688-690-692-694-696-698-700-702-704-706-708-710-712-714-716-718-720-722-724-726-728-730-732-734-736-738-740-742-744-746-748-750-752-754-756-758-760-762-764-766-768-770-772-774-776-778-780-782-784-786-788-790-792-794-796-798-800-802-804-806-808-810-812-814-816-818-820-822-824-826-828-830-832-834-836-838-840-842-844-846-848-850-852-854-856-858-860-862-864-866-868-870-872-874-876-878-880-882-884-886-888-890-892-894-896-898-900-902-904-906-908-910-912-914-916-918-920-922-924-926-928-930-932-934-936-938-940-942-944-946-948-950-952-954-956-958-960-962-964-966-968-970-972-974-976-978-980-982-984-986-988-990-992-994-996-998-1000-1002-1004-1006-1008-1010-1012-1014-1016-1018-1020-1022-1024-1026-1028-1030-1032-1034-1036-1038-1040-1042-1044-1046-1048-1050-1052-1054-1056-1058-1060-1062-1064-1066-1068-1070-1072-1074-1076-1078-1080-1082-1084-1086-1088-1090-1092-1094-1096-1098-1100-1102-1104-1106-1108-1110-1112-1114-1116-1118-1120-1122-1124-1126-1128-1130-1132-1134-1136-1138-1140-1142-1144-1146-1148-1150-1152-1154-1156-1158-1160-1162-1164-1166-1168-1170-1172-1174-1176-1178-1180-1182-1184-1186-1188-1190-1192-1194-1196-1198-1200-1202-1204-1206-1208-1210-1212-1214-1216-1218-1220-1222-1224-1226-1228-1230-1232-1234-1236-1238-1240-1242-1244-1246-1248-1250-1252-1254-1256-1258-1260-1262-1264-1266-1268-1270-1272-1274-1276-1278-1280-1282-1284-1286-1288-1290-1292-1294-1296-1298-1300-1302-1304-1306-1308-1310-1312-1314-1316-1318-1320-1322-1324-1326-1328-1330-1332-1334-1336-1338-1340-1342-1344-1346-1348-1350-1352-1354-1356-1358-1360-1362-1364-1366-1368-1370-1372-1374-1376-1378-1380-1382-1384-1386-1388-1390-1392-1394-1396-1398-1400-1402-1404-1406-1408-1410-1412-1414-1416-1418-1420-1422-1424-1426-1428-1430-1432-1434-1436-1438-1440-1442-1444-1446-1448-1450-1452-1454-1456-1458-1460-1462-1464-1466-1468-1470-1472-1474-1476-1478-1480-1482-1484-1486-1488-1490-1492-1494-1496-1498-1500-1502-1504-1506-1508-1510-1512-1514-1516-1518-1520-1522-1524-1526-1528-1530-1532-1534-1536-1538-1540-1542-1544-1546-1548-1550-1552-1554-1556-1558-1560-1562-1564-1566-1568-1570-1572-1574-1576-1578-1580-1582-1584-1586-1588-1590-1592-1594-1596-1598-1600-1602-1604-1606-1608-1610-1612-1614-1616-1618-1620-1622-1624-1626-1628-1630-1632-1634-1636-1638-1640-1642-1644-1646-1648-1650-1652-1654-1656-1658-1660-1662-1664-1666-1668-1670-1672-1674-1676-1678-1680-1682-1684-1686-1688-1690-1692-1694-1696-1698-1700-1702-1704-1706-1708-1710-1712-1714-1716-1718-1720-1722-1724-1726-1728-1730-1732-1734-1736-1738-1740-1742-1744-1746-1748-1750-1752-1754-1756-1758-1760-1762-1764-1766-1768-1770-1772-1774-1776-1778-1780-1782-1784-1786-1788-1790-1792-1794-1796-1798-1800-1802-1804-1806-1808-1810-1812-1814-1816-1818-1820-1822-1824-1826-1828-1830-1832-1834-1836-1838-1840-1842-1844-1846-1848-1850-1852-1854-1856-1858-1860-1862-1864-1866-1868-1870-1872-1874-1876-1878-1880-1882-1884-1886-1888-1890-1892-1894-1896-1898-1900-1902-1904-1906-1908-1910-1912-1914-1916-1918-1920-1922-1924-1926-1928-1930-1932-1934-1936-1938-1940-1942-1944-1946-1948-1950-1952-1954-1956-1958-1960-1962-1964-1966-1968-1970-1972-1974-1976-1978-1980-1982-1984-1986-1988-1990-1992-1994-1996-1998-2000-2002-2004-2006-2008-2010-2012-2014-2016-2018-2020-2022-2024-2026-2028-2030-2032-2034-2036-2038-2040-2042-2044-2046-2048-2050-2052-2054-2056-2058-2060-2062-2064-2066-2068-2070-2072-2074-2076-2078-2080-2082-2084-2086-2088-2090-2092-2094-2096-2098-2100-2102-2104-2106-2108-2110-2112-2114-2116-2118-2120-2122-2124-2126-2128-2130-2132-2134-2136-2138-2140-2142-2144-2146-2148-2150-2152-2154-2156-2158-2160-2162-2164-2166-2168-2170-2172-2174-2176-2178-2180-2182-2184-2186-2188-2190-2192-2194-2196-2198-2200-2202-2204-2206-2208-2210-2212-2214-2216-2218-2220-2222-2224-2226-2228-2230-2232-2234-2236-2238-2240-2242-2244-2246-2248-2250-2252-2254-2256-2258-22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60-4262-4264-4266-4268-4270-4272-4274-4276-4278-4280-4282-4284-4286-4288-4290-4292-4294-4296-4298-4300-4302-4304-4306-4308-4310-4312-4314-4316-4318-4320-4322-4324-4326-4328-4330-4332-4334-4336-4338-4340-4342-4344-4346-4348-4350-4352-4354-4356-4358-4360-4362-4364-4366-4368-4370-4372-4374-4376-4378-4380-4382-4384-4386-4388-4390-4392-4394-4396-4398-4400-4402-4404-4406-4408-4410-4412-4414-4416-4418-4420-4422-4424-4426-4428-4430-4432-4434-4436-4438-4440-4442-4444-4446-4448-4450-4452-4454-4456-4458-4460-4462-4464-4466-4468-4470-4472-4474-4476-4478-4480-4482-4484-4486-4488-4490-4492-4494-4496-4498-4500-4502-4504-4506-4508-4510-4512-4514-4516-4518-4520-4522-4524-4526-4528-4530-4532-4534-4536-4538-4540-4542-4544-4546-4548-4550-4552-4554-4556-4558-4560-4562-4564-4566-4568-4570-4572-4574-4576-4578-4580-4582-4584-4586-4588-4590-4592-4594-4596-4598-4600-4602-4604-4606-4608-4610-4612-4614-4616-4618-4620-4622-4624-4626-4628-4630-4632-4634-4636-4638-4640-4642-4644-4646-4648-4650-4652-4654-4656-4658-4660-4662-4664-4666-4668-4670-4672-4674-4676-4678-4680-4682-4684-4686-4688-4690-4692-4694-4696-4698-4700-4702-4704-4706-4708-4710-4712-4714-4716-4718-4720-4722-4724-4726-4728-4730-4732-4734-4736-4738-4740-4742-4744-4746-4748-4750-4752-4754-4756-4758-4760-4762-4764-4766-4768-4770-4772-4774-4776-4778-4780-4782-4784-4786-4788-4790-4792-4794-4796-4798-4800-4802-4804-4806-4808-4810-4812-4814-4816-4818-4820-4822-4824-4826-4828-4830-4832-4834-4836-4838-4840-4842-4844-4846-4848-4850-4852-4854-4856-4858-4860-4862-4864-4866-4868-4870-4872-4874-4876-4878-4880-4882-4884-4886-4888-4890-4892-4894-4896-4898-4900-4902-4904-4906-4908-4910-4912-4914-4916-4918-4920-4922-4924-4926-4928-4930-4932-4934-4936-4938-4940-4942-4944-4946-4948-4950-4952-4954-4956-4958-4960-4962-4964-4966-4968-4970-4972-4974-4976-4978-4980-4982-4984-4986-4988-4990-4992-4994-

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State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 201801

CONDITIONS

Operator: HILCORP ENERGY COMPANY 1111 Travis Street Houston, TX 77002	OGRID:
	372171
	Action Number: 201801
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

CONDITIONS

Created By	Condition	Condition Date
michael.buchanan	Review of the 2022 Annual Groundwater Monitoring Report for Mangum #1: Content Satisfactory 1. Proceed to install upgradient monitoring well as proposed at (MW-8) location and upload permit obtained from OSE if applicable. 2. Sample upgradient well for background concentrations of TDS, sulfate, manganese as recommended. 3. Continue quarterly sampling events for site wells as prescribed for BTEX. Continue to assess MW-3 for dissolved Mn. 4. Submit 2023 Annual Report if not already submitted. 5. Submit the 2024 Annual Groundwater Report by April 1, 2025.	5/24/2024