REVIEWED
By Mike Buchanan at 11:31 am, May 16, 2024

February 28, 2022

New Mexico Energy, Minerals and Natural Resources Department
New Mexico Oil Conservation Division
1000 Rio Brazos
Aztec, New Mexico 87410

**Subject:** **2021 Annual Groundwater Monitoring Report**
**Mangum #1**
**San Juan County, New Mexico**
**NMOCD Incident Number: NCS1602631162**
**NMOCD Administrative Order: 3R-1038**

Review of the Annual Groundwater Monitoring Report for Mangum#1: Content is Satisfactory
1. Continue to sample for Fe (iron) until background levels have been established for MW-8
2. Proceed to establish background concentrations by installing MW-8 as planned.
3. Continue to conduct quarterly groundwater monitoring as prescribed and analyzing for BTEX 8260 EPA method
4. Submit the 2022 annual report and 2023, if not already submitted in the online portal.Submit the 2024 Annual GW Monitoring Report by April 1, 2025.

To Whom it May Concern:

WSP USA Inc. (WSP) presents this 2021 Annual Groundwater Monitoring Report on behalf of Hilcorp Energy Company (Hilcorp) to the New Mexico Oil Conservation Division (NMOCD) to document groundwater monitoring activities conducted at the Mangum #1 natural gas production well (Site) during 2021. The Site is located approximately 1 mile south of the City of Bloomfield, New Mexico and is located on Bureau of Land Management (BLM) land within Unit L, Section 27, Township 29 North and Range 11 West, San Juan County, New Mexico (Figure 1).

## 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 3 to 9 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. One 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.

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 were determined 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 report *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 that Hilcorp (the current owner and operator of the Site) "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

WSP USA
848 EAST 2ND AVENUE
DURANGO CO 81301

Tel.: 970-385-1096
wsp.com

separate locations and was finally abandoned. During drilling, 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 in the 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 and 2020 quarterly sampling indicated BTEX constituents, dissolved iron, 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

NMOCD requires groundwater quality standards presented by the NMWQCC in 20.6.2.3103 of the New Mexico Administrative Code (NMAC) be met. The following standards are presented for the constituents of concern at the Site in milligrams per liter (mg/L).

| ANALYTE | LIMIT |
|---|---|
| Benzene | 0.005 mg/L |
| Toluene | 1.0 mg/L |
| Ethylbenzene | 0.7 mg/L |
| Total Xylenes | 0.62 mg/L |
| Dissolved Iron | 1.0 mg/L |
| Dissolved Manganese | 0.2 mg/L |
| Sulfate | 600 mg/L |
| Total Dissolved Solids (TDS) | 1,000 mg/L |

In addition, NMWQCC standards state that light non-aqueous phase liquids (LNAPLs) or phase separated hydrocarbons (PSH, as referenced in this report) shall not be present floating on the groundwater.

# GROUNDWATER SAMPLING ACTIVITIES AND RESULTS

Groundwater monitoring at the Site includes quarterly monitoring of all on-site wells MW-1 through MW-7. The following sections summarize the sampling procedures and results gathered during these events.

## GROUNDWATER-LEVEL MEASUREMENTS

Static groundwater-level monitoring included recording depth-to-groundwater measurements in 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 2021 sampling event are presented in Table 1 and were used to develop quarterly groundwater potentiometric surface maps (Figures 3, 4, 5, and 6). The inferred groundwater flow direction is to the north. No PSH was detected in any of the monitoring wells during the four quarterly events in 2021.

## GROUNDWATER SAMPLING

Groundwater was purged and sampled from each monitoring well 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 were collected during the purging process and are presented in Table 2. Following well purging, groundwater samples were placed directly into laboratory-provided jars and labeled with the date and time of collection, well designation, project name, sample collector's name, and parameters to be analyzed. They were immediately sealed and packed on ice to preserve samples. Samples collected in January 2021 were submitted to Pace Analytical for analysis of BTEX by Environmental Protection Agency (EPA) Method 8260B, dissolved iron and manganese by EPA Method 6020, sulfate by EPA Method 9056A, and TDS by Method SM2540. Samples from April, August, and October 2021 were submitted to Hall Environmental Analysis Laboratory (Hall) in Albuquerque, New Mexico, for analysis of BTEX by EPA Method 8260B, dissolved iron and manganese by EPA Method 200.7, sulfate by EPA

Method 300.0, and TDS by Method SM2540. Proper chain-of-custody (COC) 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-1, MW-2, MW-3, MW-4, and MW-6. Total xylenes were also detected above the NMWQCC standard in well MW-4 during the first quarter sampling in 2021. Ethylbenzene and toluene were not detected above the NMWQCC standards in any of the wells during 2021 sampling events.

With the exception of well MW-7 during the third quarter 2021 sampling event, dissolved manganese and TDS were detected at concentrations above the NMWQCC standards in all wells and during all four quarterly sampling events in 2021. Sulfate was detected at concentrations above the NMWQCC standard during one or more 2021 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 third quarter 2021 sampling event. Dissolved iron was not detected above the NMWQCC standards in any other wells or quarterly sampling events in 2021.

A summary of analytical results are presented in Table 3 and on Figure 7. Analytical laboratory reports from the sampling events are included as Enclosure 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 2021. Based on historical data, natural attenuation through biodegradation processes is occurring in all wells and active remediation is not currently recommended at the Site. Dissolved manganese, sulfate, and TDS concentrations detected in all wells have largely remained unchanged 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 biproduct of petroleum degradation, these constituents are often naturally occurring at elevated concentrations in areas with shallow, perched groundwater. Dissolved iron was not detected above NMWQCC standards in any of the wells during the 2021 quarterly sampling events, with the exception of wells MW-3 and MW-6 during the third quarter 2021 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.

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

- Eliminate dissolved iron as a contaminant of concern at the Site.
- 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. The necessity for active remediation will be reassessed during the preparation of the 2022 annual report.

WSP appreciates the opportunity to provide these environmental services to Hilcorp. Please contact either of the undersigned with any questions at (970) 385-1096.

Kind regards,

Stuart Hyde, L.G.
Senior Geologist

Daniel Moir, P.G.
Sr. Lead Consultant, Geologist

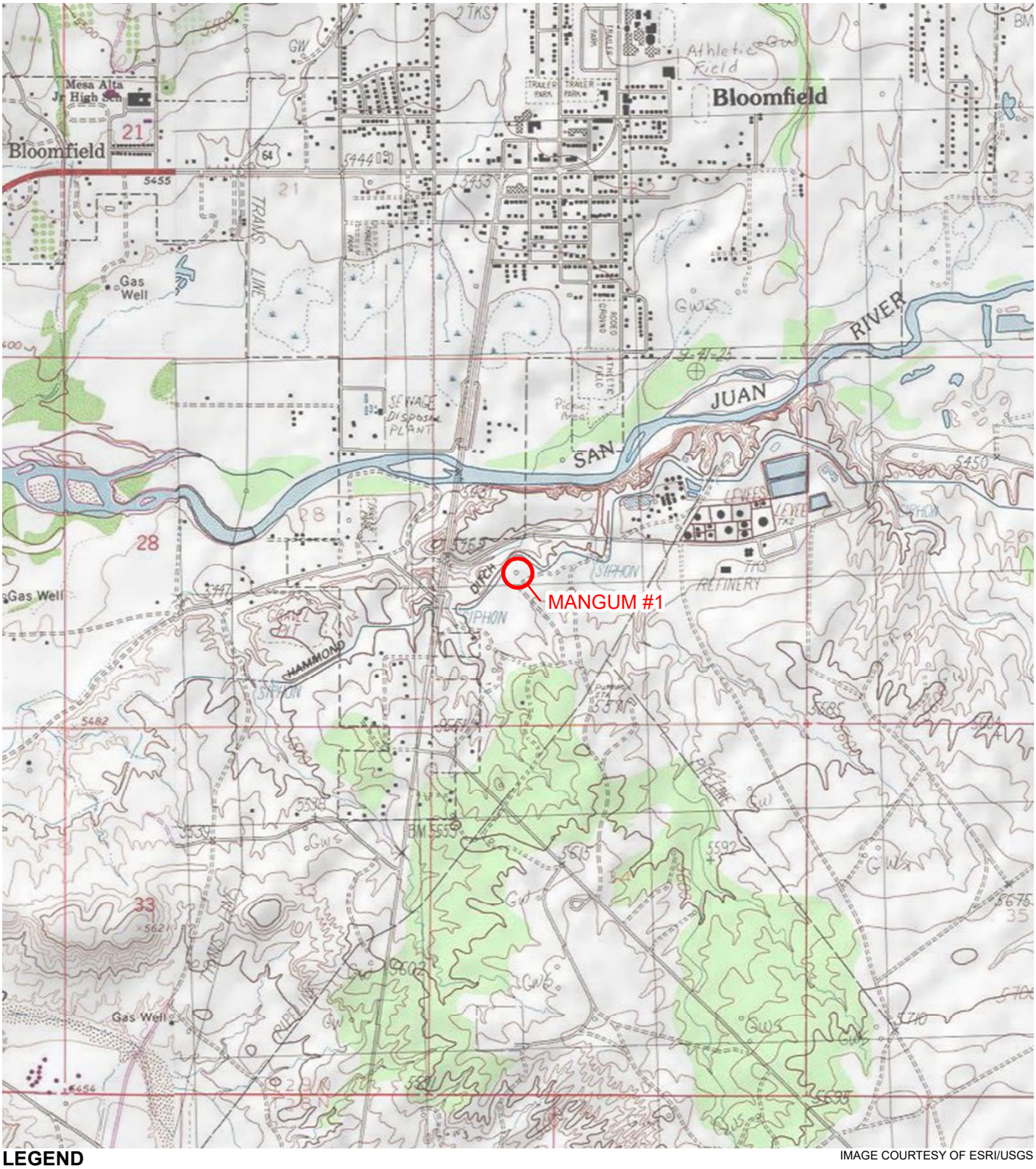
**Enclosed:**

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: Well Construction Information and Groundwater Elevations
Table 2: Field Parameter Results
Table 3: Petroleum Hydrocarbon Groundwater Analytical Results

Enclosure A: Analytical Laboratory Reports

# FIGURES




**LEGEND**

SITE LOCATION

IMAGE COURTESY OF ESRI/USGS

0 2,000 4,000

Feet

N

NEW MEXICO

FIGURE 1
SITE LOCATION MAP
MANGUM #1
SEC 27-T29N-R11W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

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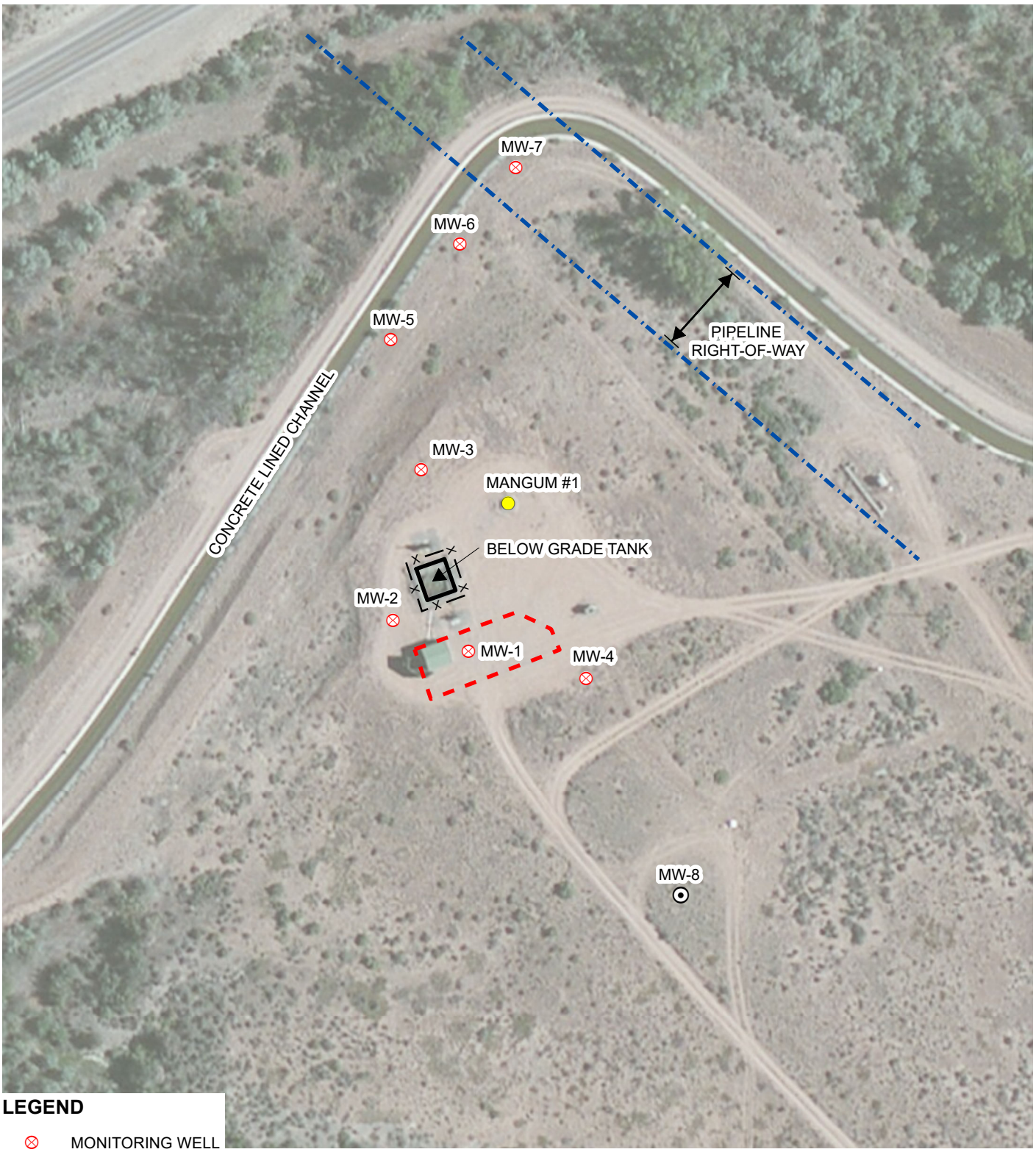


**LEGEND**

- MONITORING WELL
- ATTEMPTED MONITORING WELL
- WELLHEAD
- BERM
- FENCE
- PIPELINE RIGHT-OF-WAY
- EXCAVATION EXTENT

IMAGE COURTESY OF ESRI

0 100 200
Feet

N

FIGURE 2
SITE MAP
MANGUM #1
SEC 27-T29N-R11W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

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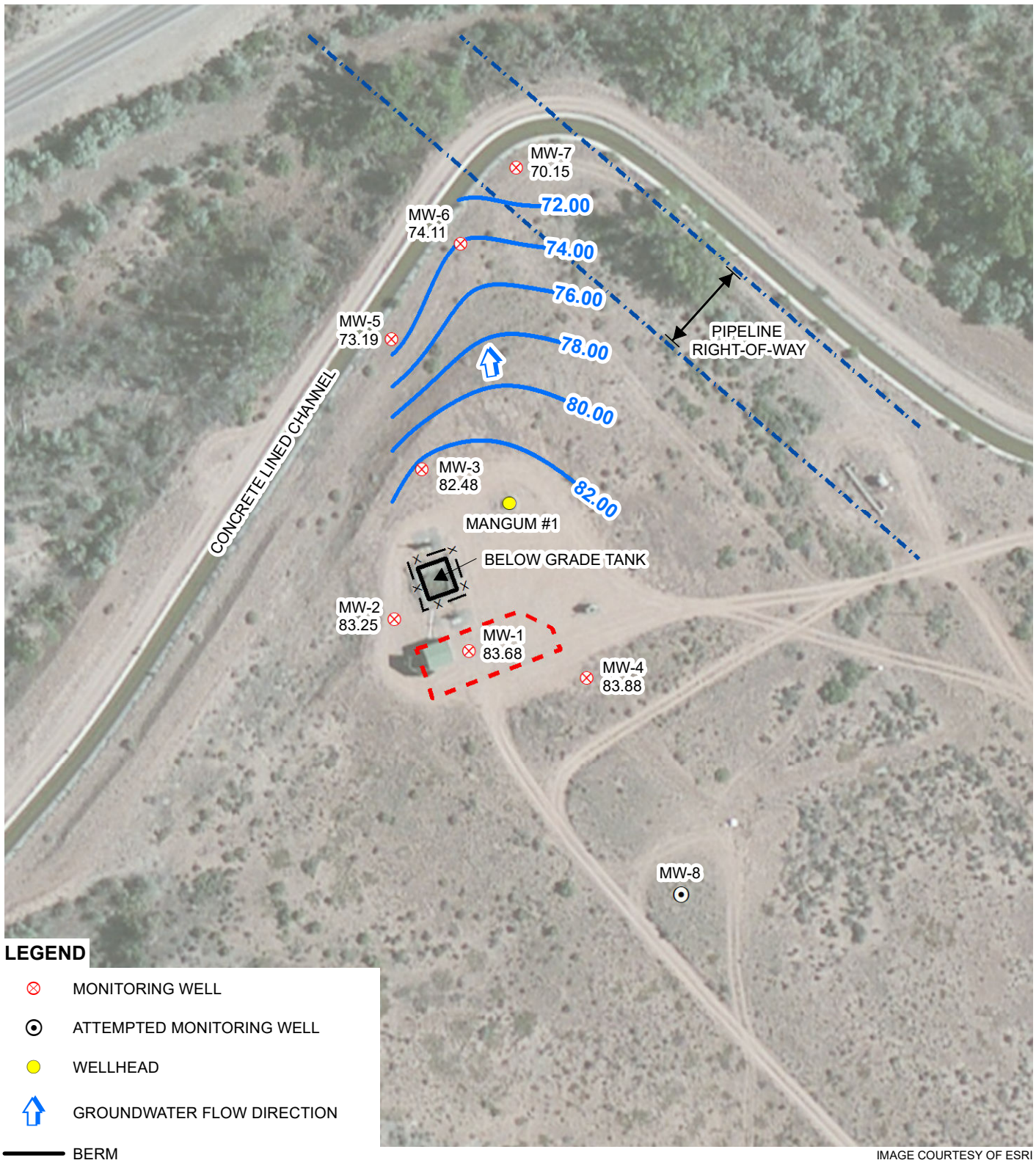


FIGURE 3
Q1 GROUNDWATER ELEVATION MAP
MANGUM #1
SEC 27-T29N-R11W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

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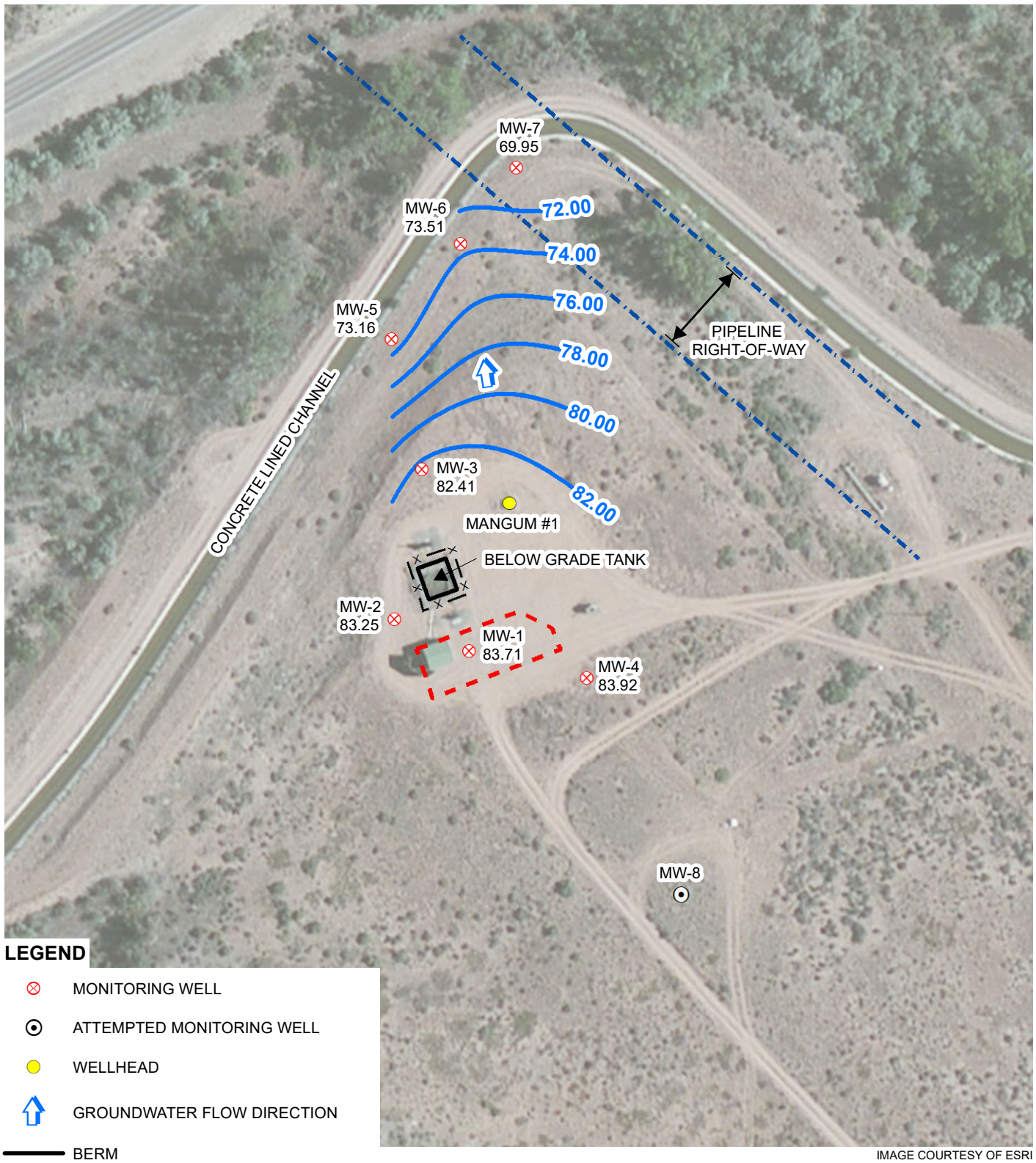


**LEGEND**

- MONITORING WELL
- ATTEMPTED MONITORING WELL
- WELLHEAD
- GROUNDWATER FLOW DIRECTION
- BERM
- FENCE
- PIPELINE RIGHT-OF-WAY
- GROUNDWATER ELEVATION CONTOUR
  - CONTOUR INTERVAL = 2.00 FEET
  - GRADIENT = 0.04 FEET/FOOT
- EXCAVATION EXTENT

GROUNDWATER ELEVATIONS WERE MEASURED ON APRIL 13 AND 13, 2021.

IMAGE COURTESY OF ESRI

0 100 200
Feet

N

FIGURE 4
Q2 GROUNDWATER ELEVATION MAP
MANGUM #1
SEC 27-T29N-R11W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

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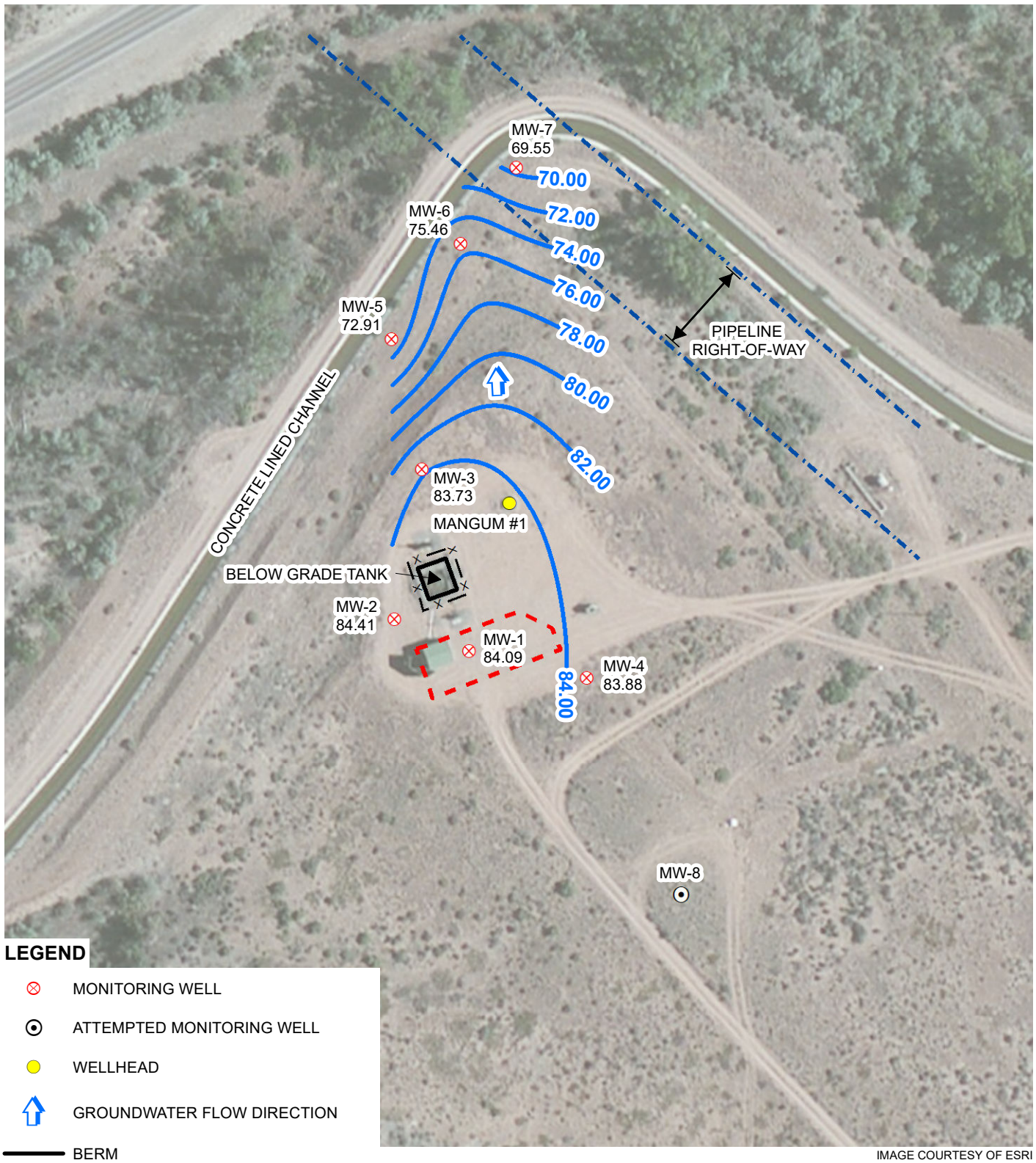


**LEGEND**

- MONITORING WELL
- ATTEMPTED MONITORING WELL
- WELLHEAD
- GROUNDWATER FLOW DIRECTION
- BERM
- FENCE
- PIPELINE RIGHT-OF-WAY
- GROUNDWATER ELEVATION CONTOUR
  - CONTOUR INTERVAL = 2.00 FEET
  - GRADIENT = 0.075 FEET/FOOT
- EXCAVATION EXTENT

GROUNDWATER ELEVATIONS WERE MEASURED ON AUGUST 2, 2021.

FIGURE 5
Q3 GROUNDWATER ELEVATION MAP
MANGUM #1
SEC 27-T29N-R11W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

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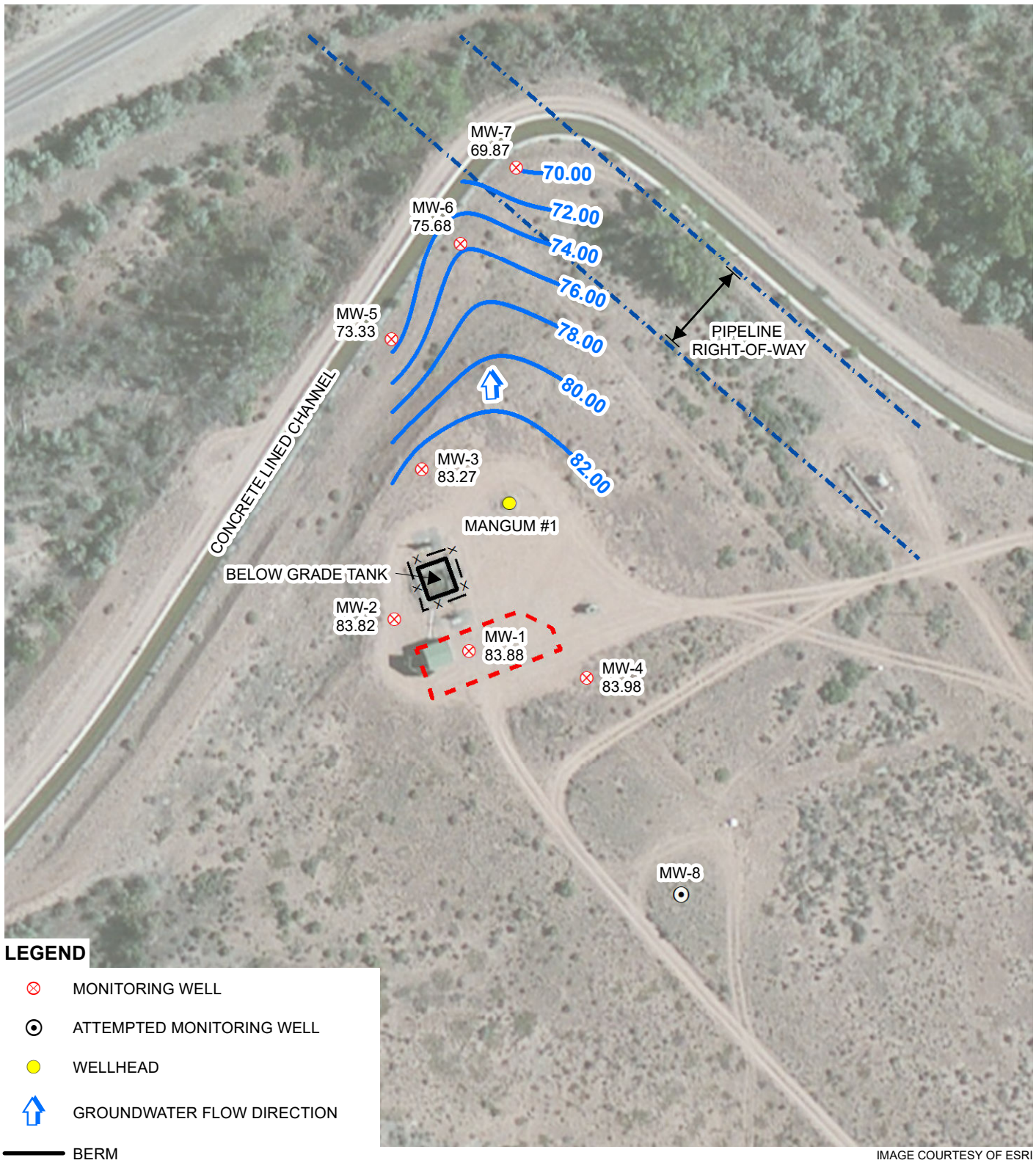


**LEGEND**

- MONITORING WELL
- ATTEMPTED MONITORING WELL
- WELLHEAD
- GROUNDWATER FLOW DIRECTION
- BERM
- x — x FENCE
- PIPELINE RIGHT-OF-WAY
- GROUNDWATER ELEVATION CONTOUR
  - CONTOUR INTERVAL = 2.00 FEET
  - GRADIENT = 0.07 FEET/FOOT
- EXCAVATION EXTENT

GROUNDWATER ELEVATIONS WERE MEASURED ON OCTOBER 6, 7, AND 8, 2021.

IMAGE COURTESY OF ESRI

0 100 200
Feet

N

FIGURE 6
Q4 GROUNDWATER ELEVATION MAP
MANGUM #1
SEC 27-T29N-R11W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

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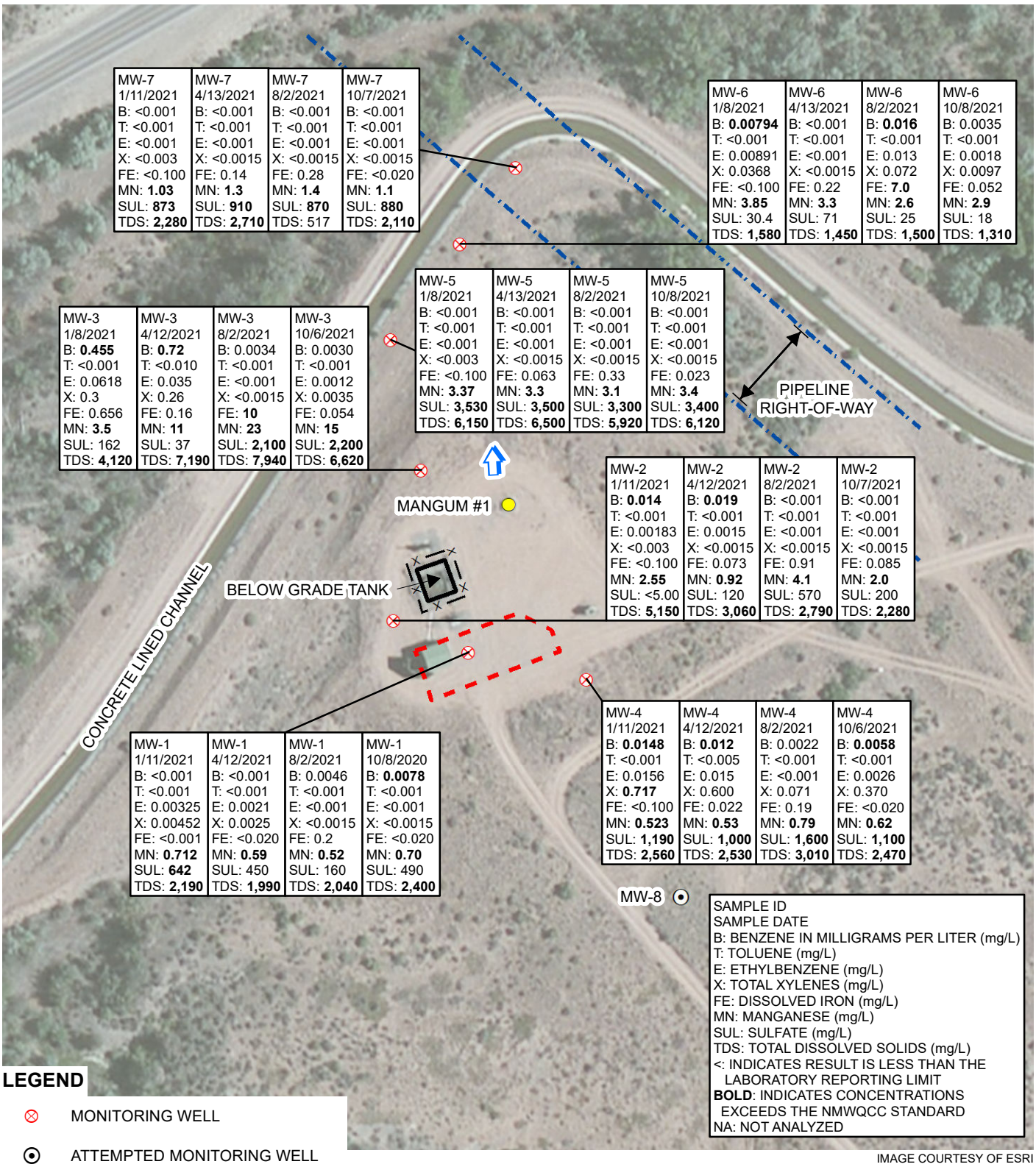


FIGURE 7
GROUNDWATER ANALYTICAL RESULTS
MANGUM #1
SEC 27-T29N-R11W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

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# TABLES

**TABLE 1**
**WELL CONSTRUCTION INFORMATION AND GROUNDWATER ELEVATIONS**

**MANGUM #1**
**HILCORP ENERGY COMPANY**
**SAN JUAN COUNTY, NEW MEXICO**

| Well ID | Top of Casing Elevation (1) | Sample Date | Depth to Groundwater (ft 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 |
| **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 |
| | | 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 |



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**TABLE 1**
**WELL CONSTRUCTION INFORMATION AND GROUNDWATER ELEVATIONS**

**MANGUM #1**
**HILCORP ENERGY COMPANY**
**SAN JUAN COUNTY, NEW MEXICO**

| | | | | |
|---|---|---|---|---|
| **MW-3** | 101.35 | 6/8/2016 | 18.47 | 82.88 |
| | | 9/12/2016 | 18.41 | 82.94 |
| | | 11/29/2016 | 18.84 | 82.51 |
| | | 3/6/2017 | 19.01 | 82.34 |
| | | 6/12/2017 | 18.32 | 83.03 |
| | | 10/26/2017 | 18.50 | 82.85 |
| | | 12/4/2017 | 18.87 | 82.48 |
| | | 3/13/2018 | 19.13 | 82.22 |
| | | 6/25/2018 | 18.14 | 83.21 |
| | | 9/5/2018 | 18.54 | 82.81 |
| | | 12/10/2018 | 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 |
| **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 |
| | | 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 |
| **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 |



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**TABLE 1**
**WELL CONSTRUCTION INFORMATION AND GROUNDWATER ELEVATIONS**

**MANGUM #1**
**HILCORP ENERGY COMPANY**
**SAN JUAN COUNTY, NEW MEXICO**

| | | | | |
|---|---|---|---|---|
| **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 |
| | | 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 |
| **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 |

**Notes:**
(1) - surface elevation based on an arbitrary datum of 100 feet
bgs - below ground surface
BTOC - below top of casing
ft = feet
NM = Not measured


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**TABLE 2**
**FIELD PARAMETER RESULTS**

**MANGUM #1**
**HILCORP ENERGY COMPANY**
**SAN JUAN COUNTY, NEW MEXICO**

| Well ID | Sample Date | Temperature (°C) | pH | TDS (g/L) | Conductivity (uS/cm) | DO (mg/L) | ORP (mV) | Volume (gallons) |
|---|---|---|---|---|---|---|---|---|
| MW-1 | 11/29/2016 | 16.54 | 7.42 | -- | 2,607 | 1.52 | -155.3 | -- |
| | 3/6/2017 | 13.37 | 7.37 | 1.993 | 3,057 | 1.48 | -262.6 | 2.00 |
| | 6/12/2017 | 14.35 | 7.14 | 1.820 | 2,800 | 0.89 | -197.6 | 2.00 |
| | 10/26/2017 | 18.00 | 7.19 | -- | 2,600 | 1.85 | -156 | 2.25 |
| | 12/4/2017 | 15.47 | 7.07 | 1.787 | 2,748 | 1.30 | -209.9 | 2.00 |
| | 3/13/2018 | 19.94 | 7.31 | -- | 2,502 | -0.02 | -203.6 | 1.70 |
| | 6/25/2018 | 15.81 | 7.22 | -- | 2,110 | 0.51 | -198.3 | 1.75 |
| | 3/12/2019 | 13.10 | 7.57 | 1.370 | 2,720 | NA | -24.9 | -- |
| | 5/22/2019 | 16.80 | 7.29 | 1.450 | 2,920 | 0.00 | -27.5 | -- |
| | 8/22/2019 | 21.10 | 7.20 | 2.010 | 4,030 | -- | -16.1 | -- |
| | 12/2/2019 | 13.60 | 6.80 | 1.530 | 3,050 | -- | -26.5 | -- |
| | 2/3/2020 | 15.30 | 6.81 | 1.510 | 3,020 | 7.3 | -28.5 | -- |
| | 4/24/2020 | 16.00 | 6.98 | 1.360 | 2,710 | 3.47 | -34.5 | -- |
| | 7/24/2020 | 19.10 | 7.04 | 1.410 | 2,810 | 2.15 | -32.7 | -- |
| | 10/8/2020 | 18.30 | 6.99 | 1.630 | 3,260 | 3.57 | -20.4 | -- |
| | 1/11/2021 | 12.50 | 7.16 | 1.290 | 2,570 | 1.8 | -24.7 | -- |
| | 4/12/2021 | 17.00 | 7.26 | 1.250 | 2,490 | 8.89 | -22.7 | -- |
| | 8/2/2021 | 17.30 | 8.36 | -- | 2,330 | -- | -- | 2.00 |
| | 10/7/2021 | 16.50 | 7.06 | -- | 2,740 | -- | -- | 1.75 |
| MW-2 | 11/29/2016 | 16.04 | 7.20 | -- | 2,299 | 2.21 | -109.3 | -- |
| | 3/6/2017 | 12.74 | 7.15 | 1.744 | 2,683 | 2.05 | -171.7 | 1.50 |
| | 6/12/2017 | 13.50 | 6.95 | 1.558 | 2,396 | 1.61 | -155.8 | 1.50 |
| | 10/26/2017 | 18.70 | 7.01 | -- | 2,264 | 1.74 | -92.8 | 1.50 |
| | 12/4/2017 | 15.41 | 7.00 | 1.517 | 2,333 | 1.11 | -178.0 | 1.50 |
| | 3/13/2018 | 14.67 | 7.21 | -- | 2,334 | -0.08 | -180.7 | 1.30 |
| | 6/25/2018 | 17.63 | 6.62 | -- | 1,905 | 0.94 | -187.2 | 1.75 |
| | 3/12/2019 | 13.70 | 7.57 | 9.500 | 1,886 | NA | 7.3 | -- |
| | 5/22/2019 | 13.70 | 6.67 | 9.540 | 1,907 | -- | 5.0 | -- |
| | 8/22/2019 | 23.00 | 6.49 | 8.630 | 1,727 | -- | 10.0 | -- |
| | 12/2/2019 | 16.20 | 5.84 | 10.000 | 2,000 | -- | 9.2 | -- |
| | 2/3/2020 | 12.80 | 5.93 | 9.710 | 18,320 | 6.22 | -0.1 | -- |
| | 4/24/2020 | 16.50 | 6.25 | 5.810 | 11,630 | 2.28 | 0.9 | -- |
| | 7/24/2020 | 21.40 | 6.55 | 2.790 | 5,580 | 1.73 | -8.6 | -- |
| | 10/8/2020 | 21.00 | 6.61 | 2.810 | 5,600 | 2.69 | 6.0 | -- |
| | 1/11/2021 | 14.10 | 6.77 | 3.300 | 6,620 | 1.56 | 0.9 | -- |
| | 4/12/2021 | 18.40 | 6.95 | 2.090 | 4,250 | 6.48 | -11.2 | -- |
| | 8/2/2021 | 17.35 | 7.25 | -- | 4,808 | -- | -- | 2.00 |
| | 10/7/2021 | 20.10 | 6.38 | -- | 3,100 | -- | -- | 1.75 |
| MW-3 | 11/29/2016 | 15.01 | 7.09 | -- | 3,091 | 2.52 | -91 | -- |
| | 3/6/2017 | 12.74 | 7.05 | 2.193 | 3,376 | 4.17 | -151.6 | 1.00 |
| | 6/12/2017 | 15.40 | 7.18 | 2.189 | 3,360 | 6.70 | -136.0 | 0.50 |
| | 10/26/2017 | 17.71 | 7.06 | -- | 2,653 | 1.80 | -177.4 | 1.25 |
| | 12/4/2017 | 14.19 | 7.04 | 1.838 | 2,835 | 3.05 | -153.5 | 0.25 |
| | 3/13/2018 | 14.84 | 7.18 | -- | 2,641 | 0.17 | -167.0 | 1.60 |
| | 6/25/2018 | **No parameters due to low volume** | | | | | | |
| | 3/11/2019 | 14.30 | 7.24 | 1.410 | 2,830 | NA | -31.5 | -- |
| | 5/22/2019 | 13.30 | 7.11 | 1.360 | 2,730 | 5.80 | -35.6 | -- |
| | 8/22/2019 | 20.80 | 7.19 | 1.430 | 2,860 | -- | -25.2 | -- |
| | 12/2/2019 | 15.20 | 6.55 | 1.490 | 2,960 | -- | -25.4 | -- |
| | 2/3/2020 | 13.30 | 6.44 | 1.420 | 2,930 | -- | -16.5 | -- |
| | 4/24/2020 | 19.60 | 6.71 | 1.440 | 2,890 | 2.80 | -27.0 | -- |
| | 7/23/2020 | 24.00 | 6.36 | 2.570 | 5,090 | 1.26 | -12.5 | -- |
| | 10/5/2020 | 16.50 | 6.49 | 3.030 | 6,070 | 3.76 | -2.9 | -- |



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**TABLE 2**
**FIELD PARAMETER RESULTS**

**MANGUM #1**
**HILCORP ENERGY COMPANY**
**SAN JUAN COUNTY, NEW MEXICO**

| Well ID | Sample Date | Temperature (°C) | pH | TDS (g/L) | Conductivity (uS/cm) | DO (mg/L) | ORP (mV) | Volume (gallons) |
|---|---|---|---|---|---|---|---|---|
| MW-3 | 1/8/2021 | 12.60 | 6.8 | 2.750 | 5,510 | 1.59 | -3.1 | -- |
| | 4/12/2021 | 14.50 | 6.55 | 4.000 | 8,030 | 9.65 | -17.7 | -- |
| | 8/2/2021 | 17.10 | 7.96 | -- | 7,920 | -- | -- | 0.50 |
| | 10/6/2021 | 18.80 | 6.43 | -- | 6,400 | -- | -- | 1.25 |
| MW-4 | 6/23/2016 | 15.10 | 7.29 | -- | 2,950 | 1.04 | -148.5 | 1.50 |
| | 11/29/2016 | 16.01 | 7.40 | -- | 2,396 | 1.59 | -127.5 | -- |
| | 3/6/2017 | 13.01 | 7.39 | 2.337 | 3,608 | 2.01 | -237.2 | 2.00 |
| | 6/21/2017 | 14.49 | 7.08 | 1.917 | 2,955 | 1.36 | -188.7 | 1.25 |
| | 10/26/2017 | 17.37 | 7.29 | -- | 2,830 | 1.74 | -193.2 | 1.75 |
| | 12/4/2017 | 15.26 | 3.33 | 2.055 | 3,161 | 0.66 | -244.2 | 1.50 |
| | 3/13/2018 | 15.08 | 7.41 | -- | 3,437 | -0.07 | -214.9 | 1.50 |
| | 6/25/2018 | 15.85 | 7.33 | -- | 2,580 | 0.97 | -224.9 | 1.75 |
| | 3/12/2019 | 14.10 | 7.49 | 1.480 | 2,960 | NA | -31.5 | -- |
| | 5/22/2019 | 15.40 | 7.35 | 1.670 | 3,300 | 1.44 | -33.6 | -- |
| | 8/22/2019 | 19.50 | 7.35 | 1.550 | 3,090 | 6.90 | -22.4 | -- |
| | 12/2/2019 | 15.30 | 6.65 | 1.690 | 3,310 | -- | -32.7 | -- |
| | 2/3/2020 | 15.00 | 6.81 | 1.570 | 3,140 | 6.51 | -37.4 | -- |
| | 4/24/2020 | 13.90 | 6.84 | 1.640 | 3,270 | 1.59 | -47.4 | -- |
| | 7/23/2020 | 24.50 | 6.67 | 1.470 | 2,910 | 0.87 | -33.4 | -- |
| | 10/8/2020 | 15.90 | 7.00 | 1.320 | 2,630 | 3.78 | -43.2 | -- |
| | 1/11/2021 | 8.40 | 7.50 | 1.230 | 2,420 | 2.73 | -60.1 | -- |
| | 4/12/2021 | 16.40 | 7.06 | 1.350 | 2,710 | 7.11 | -43.3 | -- |
| | 8/2/2021 | 16.91 | 7.41 | -- | 3,845 | 1.84 | -312.6 | 0.35 |
| | 10/6/2021 | 20.20 | 6.67 | -- | 2,510 | -- | -- | 1.50 |
| MW-5 | 8/23/2019 | 18.20 | 6.79 | 3.540 | 7,100 | -- | 6.6 | -- |
| | 12/4/2019 | 12.60 | 6.11 | 3.280 | 6,540 | -- | -1.1 | -- |
| | 2/4/2020 | 8.50 | 6.25 | 3.240 | 6,520 | -- | -5.1 | -- |
| | 4/27/2020 | 21.20 | 6.01 | 3.250 | 6,550 | 3.81 | 8.0 | -- |
| | 7/24/2020 | 20.20 | 6.15 | 3.020 | 5,980 | 1.78 | 6.2 | -- |
| | 10/5/2020 | 20.30 | 6.35 | 2.910 | 5,810 | 2.36 | 12.4 | -- |
| | 1/8/2021 | 12.90 | 6.67 | 2.780 | 5,570 | 2.39 | 1.7 | -- |
| | 4/13/2021 | 14.60 | 6.62 | 2.640 | 5,280 | 0.47 | 8.7 | -- |
| | 8/2/2021 | 14.50 | 7.38 | -- | 8,082 | -- | -- | 6.00 |
| | 10/8/2021 | 16.70 | 6.27 | -- | 5,300 | -- | -- | 6.50 |
| MW-6 | 8/23/2019 | 21.10 | 6.96 | 1.290 | 2,590 | -- | 0.7 | -- |
| | 12/4/2019 | 12.70 | 6.29 | 1.210 | 2,430 | -- | -5.0 | -- |
| | 2/4/2020 | 8.50 | 6.52 | 1.270 | 2,540 | -- | -3.1 | -- |
| | 4/27/2020 | 18.30 | 6.04 | 1.360 | 2,700 | 3.85 | 7.3 | -- |
| | 7/24/2020 | 20.00 | 6.47 | 1.150 | 2,290 | 1.54 | 4.2 | -- |
| | 10/5/2020 | 20.20 | 6.30 | 1.070 | 2,140 | 2.80 | 10.1 | -- |
| | 1/8/2021 | 13.60 | 6.36 | 1.040 | 2,070 | 1.30 | 11.6 | -- |
| | 4/13/2021 | 13.90 | 6.57 | 1.120 | 2,230 | 0.68 | 10.0 | -- |
| | 8/2/2021 | 15.50 | 7.90 | -- | 1,780 | -- | -- | 5.50 |
| | 10/8/2021 | 16.20 | 5.81 | -- | 1,960 | -- | -- | 6.00 |



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**TABLE 2**
**FIELD PARAMETER RESULTS**

**MANGUM #1**
**HILCORP ENERGY COMPANY**
**SAN JUAN COUNTY, NEW MEXICO**

| Well ID | Sample Date | Temperature (°C) | pH | TDS (g/L) | Conductivity (uS/cm) | DO (mg/L) | ORP (mV) | Volume (gallons) |
|---|---|---|---|---|---|---|---|---|
| MW-7 | 8/23/2019 | 21.80 | 6.95 | 2.630 | 5,240 | -- | -12.2 | -- |
| | 12/4/2019 | 12.80 | 6.11 | 2.400 | 4,800 | -- | -8.0 | -- |
| | 2/4/2020 | 11.00 | 6.39 | 2.260 | 4,390 | -- | -17.5 | -- |
| | 4/27/2020 | 17.20 | 6.34 | 1.960 | 3,950 | 4.56 | -11.7 | -- |
| | 7/24/2020 | 20.70 | 6.43 | 1.370 | 2,760 | 2.94 | -8.9 | -- |
| | 10/5/2020 | 18.50 | 6.55 | 1.260 | 2,530 | 4.23 | -6.1 | -- |
| | 1/11/2021 | 13.50 | 6.85 | 1.280 | 2,550 | 1.44 | -0.7 | -- |
| | 4/13/2021 | 16.50 | 6.62 | 1.530 | 3,060 | 9.22 | -1.7 | -- |
| | 8/2/2021 | 14.96 | 7.33 | -- | 4,259 | -- | -- | 1.50 |
| | 10/7/2021 | 18.60 | 6.23 | -- | 2,910 | -- | -- | 2.25 |

**Notes:**

g/L - gram per liter

mg/L - milligrams per liter

uS/cm - microsiemens per centimeter

°C - degrees Celcius
DO - dissolved oxygen
mV - millivolts
ORP - oxidation-reduction potential
TDS - total dissolved solids
-- - data not collected



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**TABLE 3**

**PETROLEUM HYDROCARBON GROUNDWATER ANALYTICAL RESULTS**

**MANGUM #1**

**HILCORP ENERGY COMPANY**

**SAN JUAN COUNTY, NEW MEXICO**

| Well ID | 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 | -- | **0.8** | 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 | 0.2 | **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-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** |
| | 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 | <0.1 | **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** |



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**TABLE 3**

**PETROLEUM HYDROCARBON GROUNDWATER ANALYTICAL RESULTS**

**MANGUM #1**

**HILCORP ENERGY COMPANY**

**SAN JUAN COUNTY, NEW MEXICO**

| Well ID | 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** | 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** |
| | MW2 | 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-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-CM-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-CM-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** |
| | 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 | 0.3 | 0.656 | **3.5** | **162** | **4,120** |
| | MW-3 | 4/12/2021 | **0.72** | <0.001 | 0.035 | 0.26 | 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** |



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**TABLE 3**

**PETROLEUM HYDROCARBON GROUNDWATER ANALYTICAL RESULTS**

**MANGUM #1**

**HILCORP ENERGY COMPANY**

**SAN JUAN COUNTY, NEW MEXICO**

| Well ID | 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** | 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** |
| | 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-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** |



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**TABLE 3**

**PETROLEUM HYDROCARBON GROUNDWATER ANALYTICAL RESULTS**

**MANGUM #1**

**HILCORP ENERGY COMPANY**

**SAN JUAN COUNTY, NEW MEXICO**

| Well ID | 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-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-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** |

**Notes:**

mg/L - milligrams per liter

NMWQCC - New Mexico Water Quality Control Commission

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

**BOLD** - indicates concentration exceeds the NNEPA standard

-- - not analyzed





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# ENCLOSURE A – ANALYTICAL LABORATORY REPORT

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

January 20, 2021



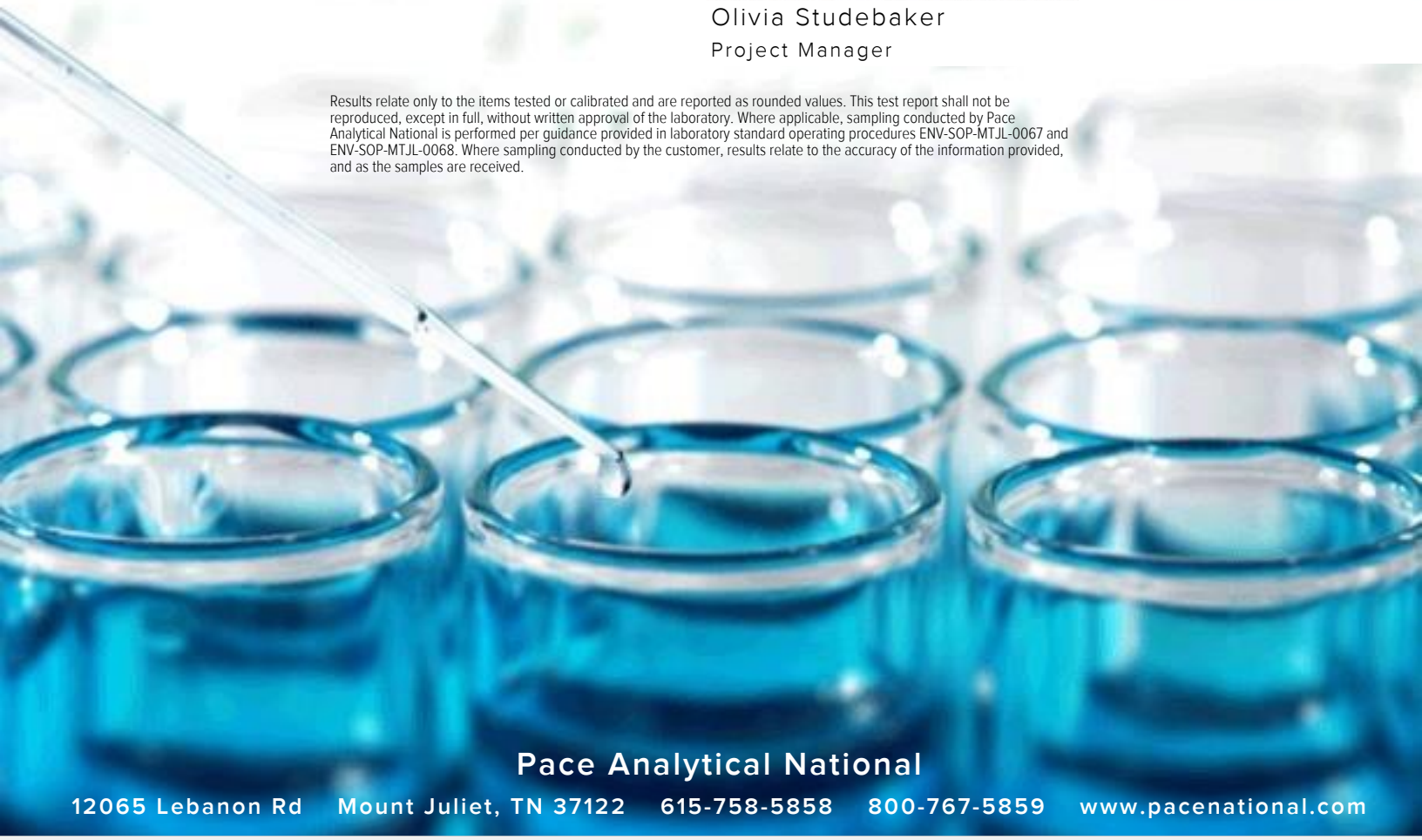
## HilCorp-Farmington, NM

| | |
|---|---|
| Sample Delivery Group: | L1306004 |
| Samples Received: | 01/13/2021 |
| Project Number: | MANGUM 1 |
| Description: | Mangum 1 |
| Site: | MANGUM 1 |
| Report To: | Kurt Hoekstra<br>382 Road 3100<br>Aztec, NM 87401 |

Entire Report Reviewed By:

Olivia Studebaker
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

## MW1 L1306004-01 GW

Collected by: Kurt | Collected date/time: 01/11/21 11:26 | Received date/time: 01/13/21 09:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Gravimetric Analysis by Method 2540 C-2011 | WG1605478 | 1 | 01/14/21 10:00 | 01/14/21 11:43 | KLS | Mt. Juliet, TN |
| Wet Chemistry by Method 9056A | WG1605306 | 20 | 01/14/21 07:23 | 01/14/21 07:23 | ELN | Mt. Juliet, TN |
| Metals (ICPMS) by Method 6020 | WG1605373 | 1 | 01/14/21 02:29 | 01/14/21 11:16 | TM | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1606569 | 1 | 01/16/21 01:47 | 01/16/21 01:47 | DWR | Mt. Juliet, TN |

## MW2 L1306004-02 GW

Collected by: Kurt | Collected date/time: 01/11/21 13:04 | Received date/time: 01/13/21 09:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Gravimetric Analysis by Method 2540 C-2011 | WG1605478 | 1 | 01/14/21 10:00 | 01/14/21 11:43 | KLS | Mt. Juliet, TN |
| Wet Chemistry by Method 9056A | WG1605306 | 1 | 01/14/21 07:39 | 01/14/21 07:39 | ELN | Mt. Juliet, TN |
| Metals (ICPMS) by Method 6020 | WG1605373 | 1 | 01/14/21 02:29 | 01/14/21 11:19 | TM | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1606569 | 1 | 01/16/21 02:06 | 01/16/21 02:06 | DWR | Mt. Juliet, TN |

## MW3 L1306004-03 GW

Collected by: Kurt | Collected date/time: 01/08/21 11:12 | Received date/time: 01/13/21 09:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Gravimetric Analysis by Method 2540 C-2011 | WG1605478 | 1 | 01/14/21 10:00 | 01/14/21 11:43 | KLS | Mt. Juliet, TN |
| Wet Chemistry by Method 9056A | WG1605306 | 5 | 01/14/21 07:54 | 01/14/21 07:54 | ELN | Mt. Juliet, TN |
| Metals (ICPMS) by Method 6020 | WG1606984 | 1 | 01/17/21 22:50 | 01/18/21 11:35 | LAT | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1606569 | 1 | 01/16/21 02:25 | 01/16/21 02:25 | DWR | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1608049 | 100 | 01/19/21 22:52 | 01/19/21 22:52 | JHH | Mt. Juliet, TN |

## MW4 L1306004-04 GW

Collected by: Kurt | Collected date/time: 01/11/21 10:05 | Received date/time: 01/13/21 09:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Gravimetric Analysis by Method 2540 C-2011 | WG1605478 | 1 | 01/14/21 10:00 | 01/14/21 11:43 | KLS | Mt. Juliet, TN |
| Wet Chemistry by Method 9056A | WG1605306 | 100 | 01/14/21 08:10 | 01/14/21 08:10 | ELN | Mt. Juliet, TN |
| Metals (ICPMS) by Method 6020 | WG1605373 | 1 | 01/14/21 02:29 | 01/14/21 11:22 | TM | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1606569 | 1 | 01/16/21 03:41 | 01/16/21 03:41 | DWR | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1608049 | 100 | 01/19/21 23:12 | 01/19/21 23:12 | JHH | Mt. Juliet, TN |

## MW5 L1306004-05 GW

Collected by: Kurt | Collected date/time: 01/08/21 12:30 | Received date/time: 01/13/21 09:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Gravimetric Analysis by Method 2540 C-2011 | WG1605478 | 1 | 01/14/21 10:00 | 01/14/21 11:43 | KLS | Mt. Juliet, TN |
| Wet Chemistry by Method 9056A | WG1605306 | 100 | 01/14/21 08:26 | 01/14/21 08:26 | ELN | Mt. Juliet, TN |
| Metals (ICPMS) by Method 6020 | WG1605373 | 1 | 01/14/21 02:29 | 01/14/21 11:26 | TM | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1608049 | 1 | 01/19/21 22:31 | 01/19/21 22:31 | JHH | Mt. Juliet, TN |

## MW6 L1306004-06 GW

Collected by: Kurt | Collected date/time: 01/08/21 14:00 | Received date/time: 01/13/21 09:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Gravimetric Analysis by Method 2540 C-2011 | WG1605478 | 1 | 01/14/21 10:00 | 01/14/21 11:43 | KLS | Mt. Juliet, TN |
| Wet Chemistry by Method 9056A | WG1605306 | 5 | 01/14/21 08:42 | 01/14/21 08:42 | ELN | Mt. Juliet, TN |
| Metals (ICPMS) by Method 6020 | WG1605373 | 1 | 01/14/21 02:29 | 01/14/21 11:40 | TM | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1606569 | 1 | 01/16/21 04:00 | 01/16/21 04:00 | DWR | Mt. Juliet, TN |

## MW7 L1306004-07 GW

| | Collected by | Collected date/time | Received date/time |
|---|---|---|---|
| | Kurt | 01/11/21 14:27 | 01/13/21 09:30 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Gravimetric Analysis by Method 2540 C-2011 | WG1605478 | 1 | 01/14/21 10:00 | 01/14/21 11:43 | KLS | Mt. Juliet, TN |
| Wet Chemistry by Method 9056A | WG1605306 | 10 | 01/14/21 08:58 | 01/14/21 08:58 | ELN | Mt. Juliet, TN |
| Metals (ICPMS) by Method 6020 | WG1605373 | 1 | 01/14/21 02:29 | 01/14/21 11:43 | TM | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1606569 | 1 | 01/16/21 03:03 | 01/16/21 03:03 | DWR | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Olivia Studebaker
Project Manager

## Gravimetric Analysis by Method 2540 C-2011

| Analyte | Result | Qualifier | RDL | Dilution | Analysis | Batch |
|---|---|---|---|---|---|---|
| | mg/l | | mg/l | | date / time | |
| Dissolved Solids | 2190 | | 50.0 | 1 | 01/14/2021 11:43 | WG1605478 |

## Wet Chemistry by Method 9056A

| Analyte | Result | Qualifier | RDL | Dilution | Analysis | Batch |
|---|---|---|---|---|---|---|
| | mg/l | | mg/l | | date / time | |
| Sulfate | 642 | | 100 | 20 | 01/14/2021 07:23 | WG1605306 |

## Metals (ICPMS) by Method 6020

| Analyte | Result | Qualifier | RDL | Dilution | Analysis | Batch |
|---|---|---|---|---|---|---|
| | mg/l | | mg/l | | date / time | |
| Iron,Dissolved | ND | | 0.100 | 1 | 01/14/2021 11:16 | WG1605373 |
| Manganese,Dissolved | 0.712 | | 0.00500 | 1 | 01/14/2021 11:16 | WG1605373 |

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

| Analyte | Result | Qualifier | RDL | Dilution | Analysis | Batch |
|---|---|---|---|---|---|---|
| | mg/l | | mg/l | | date / time | |
| Benzene | ND | | 0.00100 | 1 | 01/16/2021 01:47 | WG1606569 |
| Toluene | ND | | 0.00100 | 1 | 01/16/2021 01:47 | WG1606569 |
| Ethylbenzene | 0.00325 | | 0.00100 | 1 | 01/16/2021 01:47 | WG1606569 |
| Total Xylenes | 0.00452 | | 0.00300 | 1 | 01/16/2021 01:47 | WG1606569 |
| *(S) Toluene-d8* | *121* | J1 | *80.0-120* | | *01/16/2021 01:47* | WG1606569 |
| *(S) 4-Bromofluorobenzene* | *112* | | *77.0-126* | | *01/16/2021 01:47* | WG1606569 |
| *(S) 1,2-Dichloroethane-d4* | *92.5* | | *70.0-130* | | *01/16/2021 01:47* | WG1606569 |

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

## Gravimetric Analysis by Method 2540 C-2011

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Dissolved Solids | 5150 | | 100 | 1 | 01/14/2021 11:43 | WG1605478 |

## Wet Chemistry by Method 9056A

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Sulfate | ND | | 5.00 | 1 | 01/14/2021 07:39 | WG1605306 |

## Metals (ICPMS) by Method 6020

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Iron,Dissolved | ND | | 0.100 | 1 | 01/14/2021 11:19 | WG1605373 |
| Manganese,Dissolved | 2.55 | | 0.00500 | 1 | 01/14/2021 11:19 | WG1605373 |

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

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Benzene | 0.0142 | | 0.00100 | 1 | 01/16/2021 02:06 | WG1606569 |
| Toluene | ND | | 0.00100 | 1 | 01/16/2021 02:06 | WG1606569 |
| Ethylbenzene | 0.00183 | | 0.00100 | 1 | 01/16/2021 02:06 | WG1606569 |
| Total Xylenes | ND | | 0.00300 | 1 | 01/16/2021 02:06 | WG1606569 |
| *(S) Toluene-d8* | *123* | J1 | *80.0-120* | | *01/16/2021 02:06* | WG1606569 |
| *(S) 4-Bromofluorobenzene* | *131* | J1 | *77.0-126* | | *01/16/2021 02:06* | WG1606569 |
| *(S) 1,2-Dichloroethane-d4* | *87.9* | | *70.0-130* | | *01/16/2021 02:06* | WG1606569 |

## Gravimetric Analysis by Method 2540 C-2011

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Dissolved Solids | 4120 | | 100 | 1 | 01/14/2021 11:43 | WG1605478 |

## Wet Chemistry by Method 9056A

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Sulfate | 162 | | 25.0 | 5 | 01/14/2021 07:54 | WG1605306 |

## Metals (ICPMS) by Method 6020

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Iron,Dissolved | 0.656 | | 0.100 | 1 | 01/18/2021 11:35 | WG1606984 |
| Manganese,Dissolved | 3.50 | | 0.00500 | 1 | 01/18/2021 11:35 | WG1606984 |

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

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Benzene | 0.455 | | 0.100 | 100 | 01/19/2021 22:52 | WG1608049 |
| Toluene | ND | | 0.00100 | 1 | 01/16/2021 02:25 | WG1606569 |
| Ethylbenzene | 0.0618 | | 0.00100 | 1 | 01/16/2021 02:25 | WG1606569 |
| Total Xylenes | 0.300 | | 0.300 | 100 | 01/19/2021 22:52 | WG1608049 |
| *(S) Toluene-d8* | *122* | J1 | *80.0-120* | | *01/16/2021 02:25* | WG1606569 |
| *(S) Toluene-d8* | *97.9* | | *80.0-120* | | *01/19/2021 22:52* | WG1608049 |
| *(S) 4-Bromofluorobenzene* | *99.4* | | *77.0-126* | | *01/16/2021 02:25* | WG1606569 |
| *(S) 4-Bromofluorobenzene* | *108* | | *77.0-126* | | *01/19/2021 22:52* | WG1608049 |
| *(S) 1,2-Dichloroethane-d4* | *85.9* | | *70.0-130* | | *01/16/2021 02:25* | WG1606569 |
| *(S) 1,2-Dichloroethane-d4* | *93.3* | | *70.0-130* | | *01/19/2021 22:52* | WG1608049 |

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

## Gravimetric Analysis by Method 2540 C-2011

| Analyte | Result | Qualifier | RDL | Dilution | Analysis | Batch |
|---|---|---|---|---|---|---|
| | mg/l | | mg/l | | date / time | |
| Dissolved Solids | 2560 | | 50.0 | 1 | 01/14/2021 11:43 | WG1605478 |

## Wet Chemistry by Method 9056A

| Analyte | Result | Qualifier | RDL | Dilution | Analysis | Batch |
|---|---|---|---|---|---|---|
| | mg/l | | mg/l | | date / time | |
| Sulfate | 1190 | | 500 | 100 | 01/14/2021 08:10 | WG1605306 |

## Metals (ICPMS) by Method 6020

| Analyte | Result | Qualifier | RDL | Dilution | Analysis | Batch |
|---|---|---|---|---|---|---|
| | mg/l | | mg/l | | date / time | |
| Iron,Dissolved | ND | | 0.100 | 1 | 01/14/2021 11:22 | WG1605373 |
| Manganese,Dissolved | 0.523 | | 0.00500 | 1 | 01/14/2021 11:22 | WG1605373 |

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

| Analyte | Result | Qualifier | RDL | Dilution | Analysis | Batch |
|---|---|---|---|---|---|---|
| | mg/l | | mg/l | | date / time | |
| Benzene | 0.0148 | | 0.00100 | 1 | 01/16/2021 03:41 | WG1606569 |
| Toluene | ND | | 0.00100 | 1 | 01/16/2021 03:41 | WG1606569 |
| Ethylbenzene | 0.0156 | | 0.00100 | 1 | 01/16/2021 03:41 | WG1606569 |
| Total Xylenes | 0.717 | | 0.300 | 100 | 01/19/2021 23:12 | WG1608049 |
| *(S) Toluene-d8* | *108* | | *80.0-120* | | *01/16/2021 03:41* | WG1606569 |
| *(S) Toluene-d8* | *89.3* | | *80.0-120* | | *01/19/2021 23:12* | WG1608049 |
| *(S) 4-Bromofluorobenzene* | *172* | J1 | *77.0-126* | | *01/16/2021 03:41* | WG1606569 |
| *(S) 4-Bromofluorobenzene* | *104* | | *77.0-126* | | *01/19/2021 23:12* | WG1608049 |
| *(S) 1,2-Dichloroethane-d4* | *85.3* | | *70.0-130* | | *01/16/2021 03:41* | WG1606569 |
| *(S) 1,2-Dichloroethane-d4* | *95.1* | | *70.0-130* | | *01/19/2021 23:12* | WG1608049 |

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

## Gravimetric Analysis by Method 2540 C-2011

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Dissolved Solids | 6150 | | 100 | 1 | 01/14/2021 11:43 | WG1605478 |

## Wet Chemistry by Method 9056A

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Sulfate | 3530 | | 500 | 100 | 01/14/2021 08:26 | WG1605306 |

## Metals (ICPMS) by Method 6020

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Iron,Dissolved | ND | | 0.100 | 1 | 01/14/2021 11:26 | WG1605373 |
| Manganese,Dissolved | 3.37 | | 0.00500 | 1 | 01/14/2021 11:26 | WG1605373 |

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

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Benzene | ND | | 0.00100 | 1 | 01/19/2021 22:31 | WG1608049 |
| Toluene | ND | | 0.00100 | 1 | 01/19/2021 22:31 | WG1608049 |
| Ethylbenzene | ND | | 0.00100 | 1 | 01/19/2021 22:31 | WG1608049 |
| Total Xylenes | ND | | 0.00300 | 1 | 01/19/2021 22:31 | WG1608049 |
| *(S) Toluene-d8* | *88.4* | | *80.0-120* | | *01/19/2021 22:31* | WG1608049 |
| *(S) 4-Bromofluorobenzene* | *98.2* | | *77.0-126* | | *01/19/2021 22:31* | WG1608049 |
| *(S) 1,2-Dichloroethane-d4* | *96.1* | | *70.0-130* | | *01/19/2021 22:31* | WG1608049 |

## Gravimetric Analysis by Method 2540 C-2011

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Dissolved Solids | 1580 | | 25.0 | 1 | 01/14/2021 11:43 | WG1605478 |

## Wet Chemistry by Method 9056A

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Sulfate | 30.4 | | 25.0 | 5 | 01/14/2021 08:42 | WG1605306 |

## Metals (ICPMS) by Method 6020

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Iron,Dissolved | ND | | 0.100 | 1 | 01/14/2021 11:40 | WG1605373 |
| Manganese,Dissolved | 3.85 | | 0.00500 | 1 | 01/14/2021 11:40 | WG1605373 |

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

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Benzene | 0.00794 | | 0.00100 | 1 | 01/16/2021 04:00 | WG1606569 |
| Toluene | ND | | 0.00100 | 1 | 01/16/2021 04:00 | WG1606569 |
| Ethylbenzene | 0.00891 | | 0.00100 | 1 | 01/16/2021 04:00 | WG1606569 |
| Total Xylenes | 0.0368 | | 0.00300 | 1 | 01/16/2021 04:00 | WG1606569 |
| *(S) Toluene-d8* | *120* | | *80.0-120* | | *01/16/2021 04:00* | WG1606569 |
| *(S) 4-Bromofluorobenzene* | *94.7* | | *77.0-126* | | *01/16/2021 04:00* | WG1606569 |
| *(S) 1,2-Dichloroethane-d4* | *85.9* | | *70.0-130* | | *01/16/2021 04:00* | WG1606569 |

## Gravimetric Analysis by Method 2540 C-2011

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Dissolved Solids | 2280 | | 50.0 | 1 | 01/14/2021 11:43 | WG1605478 |

## Wet Chemistry by Method 9056A

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Sulfate | 873 | | 50.0 | 10 | 01/14/2021 08:58 | WG1605306 |

## Metals (ICPMS) by Method 6020

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Iron,Dissolved | ND | | 0.100 | 1 | 01/14/2021 11:43 | WG1605373 |
| Manganese,Dissolved | 1.03 | | 0.00500 | 1 | 01/14/2021 11:43 | WG1605373 |

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

| Analyte | Result mg/l | Qualifier | RDL mg/l | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Benzene | ND | | 0.00100 | 1 | 01/16/2021 03:03 | WG1606569 |
| Toluene | ND | | 0.00100 | 1 | 01/16/2021 03:03 | WG1606569 |
| Ethylbenzene | ND | | 0.00100 | 1 | 01/16/2021 03:03 | WG1606569 |
| Total Xylenes | ND | | 0.00300 | 1 | 01/16/2021 03:03 | WG1606569 |
| *(S) Toluene-d8* | *122* | J1 | *80.0-120* | | *01/16/2021 03:03* | WG1606569 |
| *(S) 4-Bromofluorobenzene* | *92.5* | | *77.0-126* | | *01/16/2021 03:03* | WG1606569 |
| *(S) 1,2-Dichloroethane-d4* | *90.9* | | *70.0-130* | | *01/16/2021 03:03* | WG1606569 |

## Method Blank (MB)

(MB) R3613033-1 01/14/21 11:43

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

## L1304828-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1304828-01 01/14/21 11:43 • (DUP) R3613033-3 01/14/21 11:43

| Analyte | Original Result mg/l | DUP Result mg/l | Dilution | DUP RPD % | DUP Qualifier | DUP RPD Limits % |
|---|---|---|---|---|---|---|
| Dissolved Solids | 125 | 134 | 1 | 6.95 | J3 | 5 |

## L1305275-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1305275-01 01/14/21 11:43 • (DUP) R3613033-4 01/14/21 11:43

| Analyte | Original Result mg/l | DUP Result mg/l | Dilution | DUP RPD % | DUP Qualifier | DUP RPD Limits % |
|---|---|---|---|---|---|---|
| Dissolved Solids | 538 | 541 | 1 | 0.556 | | 5 |

## Laboratory Control Sample (LCS)

(LCS) R3613033-2 01/14/21 11:43

| Analyte | Spike Amount mg/l | LCS Result mg/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Dissolved Solids | 8800 | 8780 | 99.8 | 77.4-123 | |

## Method Blank (MB)

(MB) R3612476-1 01/14/21 01:01

| Analyte | MB Result mg/l | MB Qualifier | MB MDL mg/l | MB RDL mg/l |
|---|---|---|---|---|
| Sulfate | U | | 0.594 | 5.00 |

## L1305739-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1305739-01 01/14/21 01:32 • (DUP) R3612476-3 01/14/21 01:48

| Analyte | Original Result mg/l | DUP Result mg/l | Dilution | DUP RPD % | DUP Qualifier | DUP RPD Limits % |
|---|---|---|---|---|---|---|
| Sulfate | ND | ND | 1 | 4.33 | | 15 |

## L1305739-25 Original Sample (OS) • Duplicate (DUP)

(OS) L1305739-25 01/14/21 06:03 • (DUP) R3612476-6 01/14/21 06:19

| Analyte | Original Result mg/l | DUP Result mg/l | Dilution | DUP RPD % | DUP Qualifier | DUP RPD Limits % |
|---|---|---|---|---|---|---|
| Sulfate | ND | ND | 1 | 10.1 | | 15 |

## Laboratory Control Sample (LCS)

(LCS) R3612476-2 01/14/21 01:17

| Analyte | Spike Amount mg/l | LCS Result mg/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Sulfate | 40.0 | 42.0 | 105 | 80.0-120 | |

## L1305739-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1305739-03 01/14/21 02:04 • (MS) R3612476-4 01/14/21 02:20 • (MSD) R3612476-5 01/14/21 02:36

| Analyte | Spike Amount mg/l | Original Result mg/l | MS Result mg/l | MSD Result mg/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 50.0 | ND | 52.1 | 51.6 | 98.6 | 97.7 | 1 | 80.0-120 | | | 0.908 | 15 |

## L1305739-25 Original Sample (OS) • Matrix Spike (MS)

(OS) L1305739-25 01/14/21 06:03 • (MS) R3612476-7 01/14/21 06:35

| Analyte | Spike Amount mg/l | Original Result mg/l | MS Result mg/l | MS Rec. % | Dilution | Rec. Limits % | MS Qualifier |
|---|---|---|---|---|---|---|---|
| Sulfate | 50.0 | ND | 54.1 | 106 | 1 | 80.0-120 | |

## Method Blank (MB)

(MB) R3612500-1 01/14/21 10:24

| Analyte | MB Result mg/l | MB Qualifier | MB MDL mg/l | MB RDL mg/l |
|---|---|---|---|---|
| Iron,Dissolved | U | | 0.0281 | 0.100 |
| Manganese,Dissolved | 0.000920 | J | 0.000704 | 0.00500 |

## Laboratory Control Sample (LCS)

(LCS) R3612500-2 01/14/21 10:28

| Analyte | Spike Amount mg/l | LCS Result mg/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Iron,Dissolved | 5.00 | 5.04 | 101 | 80.0-120 | |
| Manganese,Dissolved | 0.0500 | 0.0490 | 98.1 | 80.0-120 | |

## L1305093-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1305093-02 01/14/21 10:31 • (MS) R3612500-4 01/14/21 10:39 • (MSD) R3612500-5 01/14/21 10:42

| Analyte | Spike Amount mg/l | Original Result | MS Result mg/l | MSD Result mg/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Iron,Dissolved | 5.00 | | 5.16 | 5.15 | 102 | 101 | 1 | 75.0-125 | | | 0.123 | 20 |
| Manganese,Dissolved | 0.0500 | | 0.0547 | 0.0533 | 94.1 | 91.4 | 1 | 75.0-125 | | | 2.47 | 20 |

## Method Blank (MB)

(MB) R3613543-1 01/18/21 10:46

| Analyte | MB Result mg/l | MB Qualifier | MB MDL mg/l | MB RDL mg/l |
|---|---|---|---|---|
| Iron,Dissolved | U | | 0.0281 | 0.100 |
| Manganese,Dissolved | U | | 0.000704 | 0.00500 |

## Laboratory Control Sample (LCS)

(LCS) R3613543-2 01/18/21 10:50

| Analyte | Spike Amount mg/l | LCS Result mg/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Iron,Dissolved | 5.00 | 4.92 | 98.4 | 80.0-120 | |
| Manganese,Dissolved | 0.0500 | 0.0487 | 97.4 | 80.0-120 | |

## L1305591-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1305591-05 01/18/21 10:53 • (MS) R3613543-4 01/18/21 11:00 • (MSD) R3613543-5 01/18/21 11:03

| Analyte | Spike Amount mg/l | Original Result mg/l | MS Result mg/l | MSD Result mg/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Iron,Dissolved | 5.00 | 6.86 | 12.1 | 12.2 | 105 | 107 | 1 | 75.0-125 | | | 1.19 | 20 |

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

## Method Blank (MB)

(MB) R3614014-3 01/15/21 20:08

| Analyte | MB Result mg/l | MB Qualifier | MB MDL mg/l | MB RDL mg/l |
|---|---|---|---|---|
| Benzene | U | | 0.0000941 | 0.00100 |
| Ethylbenzene | U | | 0.000137 | 0.00100 |
| Toluene | U | | 0.000278 | 0.00100 |
| Xylenes, Total | U | | 0.000174 | 0.00300 |
| *(S) Toluene-d8* | *118* | | | *80.0-120* |
| *(S) 4-Bromofluorobenzene* | *92.6* | | | *77.0-126* |
| *(S) 1,2-Dichloroethane-d4* | *82.9* | | | *70.0-130* |

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

(LCS) R3614014-1 01/15/21 18:09 • (LCSD) R3614014-2 01/15/21 18:28

| Analyte | Spike Amount mg/l | LCS Result mg/l | LCSD Result mg/l | LCS Rec. % | LCSD Rec. % | Rec. Limits % | LCS Qualifier | LCSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 0.00500 | 0.00431 | 0.00453 | 86.2 | 90.6 | 70.0-123 | | | 4.98 | 20 |
| Ethylbenzene | 0.00500 | 0.00511 | 0.00539 | 102 | 108 | 79.0-123 | | | 5.33 | 20 |
| Toluene | 0.00500 | 0.00506 | 0.00527 | 101 | 105 | 79.0-120 | | | 4.07 | 20 |
| Xylenes, Total | 0.0150 | 0.0141 | 0.0153 | 94.0 | 102 | 79.0-123 | | | 8.16 | 20 |
| *(S) Toluene-d8* | | | | *115* | *116* | *80.0-120* | | | | |
| *(S) 4-Bromofluorobenzene* | | | | *94.8* | *95.2* | *77.0-126* | | | | |
| *(S) 1,2-Dichloroethane-d4* | | | | *79.6* | *80.5* | *70.0-130* | | | | |

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

## Method Blank (MB)

(MB) R3614301-3 01/19/21 16:36

| Analyte | MB Result mg/l | MB Qualifier | MB MDL mg/l | MB RDL mg/l |
|---|---|---|---|---|
| Benzene | U | | 0.0000941 | 0.00100 |
| Ethylbenzene | U | | 0.000137 | 0.00100 |
| Toluene | U | | 0.000278 | 0.00100 |
| Xylenes, Total | U | | 0.000174 | 0.00300 |
| *(S) Toluene-d8* | *100* | | | *80.0-120* |
| *(S) 4-Bromofluorobenzene* | *107* | | | *77.0-126* |
| *(S) 1,2-Dichloroethane-d4* | *93.9* | | | *70.0-130* |

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

(LCS) R3614301-1 01/19/21 15:15 • (LCSD) R3614301-2 01/19/21 15:35

| Analyte | Spike Amount mg/l | LCS Result mg/l | LCSD Result mg/l | LCS Rec. % | LCSD Rec. % | Rec. Limits % | LCS Qualifier | LCSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 0.00500 | 0.00434 | 0.00440 | 86.8 | 88.0 | 70.0-123 | | | 1.37 | 20 |
| Ethylbenzene | 0.00500 | 0.00463 | 0.00489 | 92.6 | 97.8 | 79.0-123 | | | 5.46 | 20 |
| Toluene | 0.00500 | 0.00438 | 0.00454 | 87.6 | 90.8 | 79.0-120 | | | 3.59 | 20 |
| Xylenes, Total | 0.0150 | 0.0146 | 0.0153 | 97.3 | 102 | 79.0-123 | | | 4.68 | 20 |
| *(S) Toluene-d8* | | | | *93.8* | *96.3* | *80.0-120* | | | | |
| *(S) 4-Bromofluorobenzene* | | | | *107* | *110* | *77.0-126* | | | | |
| *(S) 1,2-Dichloroethane-d4* | | | | *96.3* | *95.1* | *70.0-130* | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDL | Method Detection Limit. |
| ND | Not detected at the Reporting Limit (or MDL where applicable). |
| RDL | Reported Detection Limit. |
| Rec. | Recovery. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (S) | Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media. |
| U | Not detected at the Reporting Limit (or MDL where applicable). |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| J | The identification of the analyte is acceptable; the reported value is an estimate. |
| J1 | Surrogate recovery limits have been exceeded; values are outside upper control limits. |
| J3 | The associated batch QC was outside the established quality control range for precision. |

# ACCREDITATIONS & LOCATIONS



ONE LAB. NATIONWIDE.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN, 37122

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN000032021-1 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | TN00003 |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LA000356 |
| Kentucky [1 6] | KY90010 | South Carolina | 84004002 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana | LA018 | Texas | T104704245-20-18 |
| Maine | TN00003 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN000032021-11 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 110033 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 998093910 |
| Montana | CERT0086 | Wyoming | A2LA |
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

## Pace Analytical National 1313 Point Mallard Parkway SE Suite B Decatur, AL, 35601

| | |
|---|---|
| Alabama | 40160 |
| ANSI National Accreditation Board | L2239 |

## Pace Analytical National 660 Bercut Dr. Ste. C Sacramento, CA, 95811

| | | | |
|---|---|---|---|
| California | 2961 | Oregon | CA300002 |
| Minnesota | 006-999-465 | Washington | C926 |
| North Dakota | R-214 | | |

## Pace Analytical National 6000 South Eastern Avenue Ste 9A Las Vegas, NV, 89119

| | |
|---|---|
| Nevada | NV009412021-1 |

## Pace Analytical National 1606 E. Brazos Street Suite D Victoria, TX, 77901

| | |
|---|---|
| Texas | T104704328-20-18 |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

**HilCorp-Farmington, NM**

382 Road 3100
Aztec, NM 87401

Billing Information:
Clara Cardoza
PO Box 61529
Houston, TX 77208

Report to: Kurt Hoekstra

Email To: jdeal@hilcorp.com;khoekstra@hilcorp.com

Project Description: Mangum 1

City/State Collected:

Please Circle: PT MT CT ET

Phone: 505-486-9543

Client Project # MANGUM 1

Lab Project # HILCORANM-MANGUM

Collected by (print): Kurt

Collected by (signature): Kurt Hoekstra

Immediately Packed on Ice N ___ Y X

Site/Facility ID # MANGUM 1

P.O. #

Quote #

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

Date Results Needed

Analysis / Container / Preservative

Pres Chk

| Sample ID | Comp/Grab | Matrix * | Depth | Date | Time | No. of Cntrs | Dissolved Fe, Mn 250mlHDPE-NoPres | SULFATE, TDS 250mlHDPE-NoPres | V8260BTEX 40mlAmb-HCl | Remarks | Sample # (lab only) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MW1 | | GW | | 1-11 | 11:26 | 5 | X | X | X | | -01 |
| MW2 | | GW | | 1-11 | 1:04 | 5 | X | X | X | | -02 |
| MW3 | | GW | | 1-8 | 11:12 | 5 | X | X | X | | -03 |
| MW4 | | GW | | 1-11 | 10:05 | 5 | X | X | X | | -04 |
| MW5 | | GW | | 1-8 | 12:30 | 5 | X | X | X | | -05 |
| MW6 | | GW | | 1-8 | 2:00 | 5 | X | X | X | | -06 |
| MW7 | | GW | | 1-11 | 2:27 | 5 | X | X | X | | -07 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Chain of Custody Page ___ of ___

Pace Analytical® National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

SDG # 130604

J018

Acctnum: HILCORANM

Template: T153792

Prelogin: P816017

PM: 823 - Olivia Studebaker

PB: CT 12/9/2020

Shipped Via: FedEX Ground

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via: __ UPS ✓ FedEx __ Courier _____

Tracking # 9348 1611 2504

Sample Receipt Checklist

| | | | |
|---|---|---|---|
| COC Seal Present/Intact: | ✓NP | Y | N |
| COC Signed/Accurate: | | ✓Y | N |
| Bottles arrive intact: | | ✓Y | N |
| Correct bottles used: | | ✓Y | N |
| Sufficient volume sent: | | ✓Y | N |
| If Applicable | | | |
| VOA Zero Headspace: | | ✓Y | N |
| Preservation Correct/Checked: | | Y | N |
| RAD Screen <0.5 mR/hr: | | ✓Y | N |

| | Date: | Time: | | |
|---|---|---|---|---|
| Relinquished by : (Signature) Kurt Hoekstra | 1-12-21 | 1:45 | Received by: (Signature) | Trip Blank Received: Yes / (No) HCL / MeoH TBR |
| Relinquished by : (Signature) | Date: | Time: | Received by: (Signature) | Temp: 4.2+1=2.3 °C Bottles Received: 35 |
| Relinquished by : (Signature) | Date: | Time: | Received for lab by: (Signature) Patricia Madrid | Date: 1-13-21 Time: 0930 |

If preservation required by Login: Date/Time

Hold:

Condition: NCF (OK)

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

April 21, 2021

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

RE: Mangum 1 OrderNo.: 2104614

Dear Kate Kaufman:

Hall Environmental Analysis Laboratory received 7 sample(s) on 4/14/2021 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,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

**Analytical Report**
Lab Order **2104614**
Date Reported: **4/21/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-1
**Project:** Mangum 1 **Collection Date:** 4/12/2021 12:45:00 PM
**Lab ID:** 2104614-001 **Matrix:** AQUEOUS **Received Date:** 4/14/2021 8:34:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **JMT** |
| Sulfate | 450 | 50 | * | mg/L | 100 | 4/15/2021 12:42:25 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | ND | 0.020 | | mg/L | 1 | 4/16/2021 10:43:18 AM |
| Manganese | 0.59 | 0.0020 | * | mg/L | 1 | 4/16/2021 10:43:18 AM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **BRM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 4/20/2021 1:43:31 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 4/20/2021 1:43:31 PM |
| Ethylbenzene | 2.1 | 1.0 | | µg/L | 1 | 4/20/2021 1:43:31 PM |
| Xylenes, Total | 2.5 | 1.5 | | µg/L | 1 | 4/20/2021 1:43:31 PM |
| Surr: 1,2-Dichloroethane-d4 | 112 | 70-130 | | %Rec | 1 | 4/20/2021 1:43:31 PM |
| Surr: 4-Bromofluorobenzene | 137 | 70-130 | S | %Rec | 1 | 4/20/2021 1:43:31 PM |
| Surr: Dibromofluoromethane | 113 | 70-130 | | %Rec | 1 | 4/20/2021 1:43:31 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 1990 | 100 | *D | mg/L | 1 | 4/16/2021 3:20:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2104614**
Date Reported: **4/21/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-2
**Project:** Mangum 1 **Collection Date:** 4/12/2021 1:45:00 PM
**Lab ID:** 2104614-002 **Matrix:** AQUEOUS **Received Date:** 4/14/2021 8:34:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **JMT** |
| Sulfate | 120 | 5.0 | | mg/L | 10 | 4/15/2021 1:21:03 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.073 | 0.020 | | mg/L | 1 | 4/16/2021 10:44:53 AM |
| Manganese | 0.92 | 0.010 | * | mg/L | 5 | 4/16/2021 11:39:25 AM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **BRM** |
| Benzene | 19 | 1.0 | | µg/L | 1 | 4/19/2021 6:24:30 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 4/19/2021 6:24:30 PM |
| Ethylbenzene | 1.5 | 1.0 | | µg/L | 1 | 4/19/2021 6:24:30 PM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 4/19/2021 6:24:30 PM |
| Surr: 1,2-Dichloroethane-d4 | 110 | 70-130 | | %Rec | 1 | 4/19/2021 6:24:30 PM |
| Surr: 4-Bromofluorobenzene | 117 | 70-130 | | %Rec | 1 | 4/19/2021 6:24:30 PM |
| Surr: Dibromofluoromethane | 113 | 70-130 | | %Rec | 1 | 4/19/2021 6:24:30 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 3060 | 100 | *D | mg/L | 1 | 4/16/2021 3:20:00 PM |

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

**Qualifiers:**

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

**Analytical Report**
Lab Order **2104614**
Date Reported: **4/21/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-3
**Project:** Mangum 1 **Collection Date:** 4/12/2021 10:45:00 AM
**Lab ID:** 2104614-003 **Matrix:** AQUEOUS **Received Date:** 4/14/2021 8:34:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **JMT** |
| Sulfate | 37 | 5.0 | | mg/L | 10 | 4/15/2021 1:46:48 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.16 | 0.020 | | mg/L | 1 | 4/16/2021 10:55:15 AM |
| Manganese | 11 | 0.040 | * | mg/L | 20 | 4/16/2021 11:44:13 AM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **BRM** |
| Benzene | 720 | 10 | | µg/L | 10 | 4/19/2021 6:51:31 PM |
| Toluene | ND | 10 | | µg/L | 10 | 4/19/2021 6:51:31 PM |
| Ethylbenzene | 35 | 10 | | µg/L | 10 | 4/19/2021 6:51:31 PM |
| Xylenes, Total | 260 | 15 | | µg/L | 10 | 4/19/2021 6:51:31 PM |
| Surr: 1,2-Dichloroethane-d4 | 111 | 70-130 | | %Rec | 10 | 4/19/2021 6:51:31 PM |
| Surr: 4-Bromofluorobenzene | 102 | 70-130 | | %Rec | 10 | 4/19/2021 6:51:31 PM |
| Surr: Dibromofluoromethane | 114 | 70-130 | | %Rec | 10 | 4/19/2021 6:51:31 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 7190 | 200 | *D | mg/L | 1 | 4/16/2021 3:20:00 PM |

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

**Qualifiers:**

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

**Analytical Report**
Lab Order **2104614**
Date Reported: **4/21/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** MW-4
**Project:** Mangum 1
**Collection Date:** 4/12/2021 11:50:00 AM
**Lab ID:** 2104614-004 **Matrix:** AQUEOUS **Received Date:** 4/14/2021 8:34:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **JMT** |
| Sulfate | 1000 | 50 | * | mg/L | 100 | 4/15/2021 2:25:26 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.022 | 0.020 | | mg/L | 1 | 4/16/2021 11:00:04 AM |
| Manganese | 0.53 | 0.0020 | * | mg/L | 1 | 4/16/2021 11:00:04 AM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **BRM** |
| Benzene | 12 | 5.0 | | µg/L | 5 | 4/20/2021 2:10:34 PM |
| Toluene | ND | 5.0 | | µg/L | 5 | 4/20/2021 2:10:34 PM |
| Ethylbenzene | 15 | 5.0 | | µg/L | 5 | 4/20/2021 2:10:34 PM |
| Xylenes, Total | 600 | 7.5 | | µg/L | 5 | 4/20/2021 2:10:34 PM |
| Surr: 1,2-Dichloroethane-d4 | 94.3 | 70-130 | | %Rec | 5 | 4/20/2021 2:10:34 PM |
| Surr: 4-Bromofluorobenzene | 135 | 70-130 | S | %Rec | 5 | 4/20/2021 2:10:34 PM |
| Surr: Dibromofluoromethane | 94.6 | 70-130 | | %Rec | 5 | 4/20/2021 2:10:34 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 2530 | 200 | *D | mg/L | 1 | 4/16/2021 3:20:00 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 | Value above quantitation range |
| 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 Quanitative Limit |
| RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix |

**Analytical Report**
Lab Order **2104614**
Date Reported: **4/21/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-5
**Project:** Mangum 1 **Collection Date:** 4/13/2021 3:00:00 PM
**Lab ID:** 2104614-005 **Matrix:** AQUEOUS **Received Date:** 4/14/2021 8:34:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **JMT** |
| Sulfate | 3500 | 50 | * | mg/L | 100 | 4/15/2021 2:51:11 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.063 | 0.020 | | mg/L | 1 | 4/16/2021 11:01:42 AM |
| Manganese | 3.3 | 0.010 | * | mg/L | 5 | 4/16/2021 11:45:47 AM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **BRM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 4/19/2021 7:45:33 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 4/19/2021 7:45:33 PM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 4/19/2021 7:45:33 PM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 4/19/2021 7:45:33 PM |
| Surr: 1,2-Dichloroethane-d4 | 114 | 70-130 | | %Rec | 1 | 4/19/2021 7:45:33 PM |
| Surr: 4-Bromofluorobenzene | 104 | 70-130 | | %Rec | 1 | 4/19/2021 7:45:33 PM |
| Surr: Dibromofluoromethane | 118 | 70-130 | | %Rec | 1 | 4/19/2021 7:45:33 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 6500 | 200 | *D | mg/L | 1 | 4/16/2021 3:20:00 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 | Value above quantitation range |
| 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 Quanitative Limit |
| RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix |

**Analytical Report**
Lab Order **2104614**
Date Reported: **4/21/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** MW-6
**Project:** Mangum 1
**Collection Date:** 4/13/2021 2:00:00 PM
**Lab ID:** 2104614-006 **Matrix:** AQUEOUS **Received Date:** 4/14/2021 8:34:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **JMT** |
| Sulfate | 71 | 5.0 | | mg/L | 10 | 4/15/2021 3:04:04 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.22 | 0.020 | | mg/L | 1 | 4/16/2021 11:03:18 AM |
| Manganese | 3.3 | 0.010 | * | mg/L | 5 | 4/16/2021 11:47:24 AM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **BRM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 4/19/2021 8:12:36 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 4/19/2021 8:12:36 PM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 4/19/2021 8:12:36 PM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 4/19/2021 8:12:36 PM |
| Surr: 1,2-Dichloroethane-d4 | 114 | 70-130 | | %Rec | 1 | 4/19/2021 8:12:36 PM |
| Surr: 4-Bromofluorobenzene | 109 | 70-130 | | %Rec | 1 | 4/19/2021 8:12:36 PM |
| Surr: Dibromofluoromethane | 121 | 70-130 | | %Rec | 1 | 4/19/2021 8:12:36 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 1450 | 200 | *D | mg/L | 1 | 4/16/2021 3:20:00 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 | Value above quantitation range |
| 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 Quanitative Limit |
| RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix |

**Analytical Report**
Lab Order **2104614**
Date Reported: **4/21/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** MW-7
**Project:** Mangum 1
**Collection Date:** 4/13/2021 12:15:00 PM
**Lab ID:** 2104614-007 **Matrix:** AQUEOUS **Received Date:** 4/14/2021 8:34:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **JMT** |
| Sulfate | 910 | 50 | * | mg/L | 100 | 4/15/2021 4:08:28 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.14 | 0.020 | | mg/L | 1 | 4/16/2021 11:04:53 AM |
| Manganese | 1.3 | 0.010 | * | mg/L | 5 | 4/16/2021 11:48:58 AM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **BRM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 4/19/2021 8:39:37 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 4/19/2021 8:39:37 PM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 4/19/2021 8:39:37 PM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 4/19/2021 8:39:37 PM |
| Surr: 1,2-Dichloroethane-d4 | 108 | 70-130 | | %Rec | 1 | 4/19/2021 8:39:37 PM |
| Surr: 4-Bromofluorobenzene | 107 | 70-130 | | %Rec | 1 | 4/19/2021 8:39:37 PM |
| Surr: Dibromofluoromethane | 116 | 70-130 | | %Rec | 1 | 4/19/2021 8:39:37 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 2710 | 200 | *D | mg/L | 1 | 4/16/2021 3:20:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: **2104614**

***21-Apr-21***

**Client:** HILCORP ENERGY

**Project:** Mangum 1

| Sample ID: **2104614-002CMS** | SampType: **MS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **MW-2** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719491** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Manganese | 3.4 | 0.010 | 2.500 | 0.9192 | 97.6 | 70 | 130 | | | |

| Sample ID: **2104614-002CMSD** | SampType: **MSD** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **MW-2** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719492** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Manganese | 3.3 | 0.010 | 2.500 | 0.9192 | 95.0 | 70 | 130 | 1.95 | 20 | |

| Sample ID: **MB** | SampType: **MBLK** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **PBW** | Batch ID: **A76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719504** 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: **LLLCS** | SampType: **LCSLL** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **BatchQC** | Batch ID: **A76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719506** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | ND | 0.020 | 0.02000 | 0 | 91.2 | 50 | 150 | | | |
| Manganese | 0.0023 | 0.0020 | 0.002000 | 0 | 113 | 50 | 150 | | | |

| Sample ID: **LCS** | SampType: **LCS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **LCSW** | Batch ID: **A76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719616** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.51 | 0.020 | 0.5000 | 0 | 103 | 85 | 115 | | | |
| Manganese | 0.53 | 0.0020 | 0.5000 | 0 | 107 | 85 | 115 | | | |

| Sample ID: **MB** | SampType: **MBLK** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **PBW** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719617** 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 | | | | | | | | |

**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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2104614**
***21-Apr-21***

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

| Sample ID: **LLLCS** | SampType: **LCSLL** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **BatchQC** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719618** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | ND | 0.020 | 0.02000 | 0 | 98.6 | 50 | 150 | | | |
| Manganese | 0.0021 | 0.0020 | 0.002000 | 0 | 105 | 50 | 150 | | | |

| Sample ID: **LCS** | SampType: **LCS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **LCSW** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719619** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.53 | 0.020 | 0.5000 | 0 | 105 | 85 | 115 | | | |
| Manganese | 0.54 | 0.0020 | 0.5000 | 0 | 107 | 85 | 115 | | | |

| Sample ID: **2104614-002CMS** | SampType: **MS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **MW-2** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719668** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.62 | 0.020 | 0.5000 | 0.07254 | 109 | 70 | 130 | | | |

| Sample ID: **2104614-002CMSD** | SampType: **MSD** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **MW-2** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719669** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.60 | 0.020 | 0.5000 | 0.07254 | 105 | 70 | 130 | 3.83 | 20 | |

| Sample ID: **2104614-003CMS** | SampType: **MS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **MW-3** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719671** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.69 | 0.020 | 0.5000 | 0.1600 | 106 | 70 | 130 | | | |

| Sample ID: **2104614-003CMSD** | SampType: **MSD** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **MW-3** | Batch ID: **B76742** | RunNo: **76742** |
| Prep Date: | Analysis Date: **4/16/2021** | SeqNo: **2719672** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.70 | 0.020 | 0.5000 | 0.1600 | 108 | 70 | 130 | 0.986 | 20 | |

**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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: **2104614**

***21-Apr-21***

**Client:** HILCORP ENERGY

**Project:** Mangum 1

| Sample ID: **MB** | SampType: **mblk** | TestCode: **EPA Method 300.0: Anions** |
|---|---|---|
| Client ID: **PBW** | Batch ID: **R76728** | RunNo: **76728** |
| Prep Date: | Analysis Date: **4/15/2021** | SeqNo: **2718949** 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: **R76728** | RunNo: **76728** |
| Prep Date: | Analysis Date: **4/15/2021** | SeqNo: **2718950** 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 | 99.3 | 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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2104614**
***21-Apr-21***

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

Sample ID: **100ng lcs** SampType: **LCS** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **LCSW** Batch ID: **C76779** RunNo: **76779**
Prep Date: Analysis Date: **4/19/2021** SeqNo: **2721355** 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 | 19 | 1.0 | 20.00 | 0 | 93.0 | 70 | 130 | | | |
| Surr: 1,2-Dichloroethane-d4 | 10 | | 10.00 | | 104 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 10 | | 10.00 | | 101 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 10 | | 10.00 | | 102 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.3 | | 10.00 | | 93.1 | 70 | 130 | | | |

Sample ID: **mb** SampType: **MBLK** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **PBW** Batch ID: **C76779** RunNo: **76779**
Prep Date: Analysis Date: **4/19/2021** SeqNo: **2721364** 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 | | 100 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 11 | | 10.00 | | 107 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 10 | | 10.00 | | 101 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.7 | | 10.00 | | 97.1 | 70 | 130 | | | |

Sample ID: **100ng lcs** SampType: **LCS** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **LCSW** Batch ID: **B76826** RunNo: **76826**
Prep Date: Analysis Date: **4/20/2021** SeqNo: **2722850** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 19 | 1.0 | 20.00 | 0 | 95.9 | 70 | 130 | | | |
| Toluene | 19 | 1.0 | 20.00 | 0 | 94.7 | 70 | 130 | | | |
| Surr: 1,2-Dichloroethane-d4 | 11 | | 10.00 | | 112 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 12 | | 10.00 | | 115 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 11 | | 10.00 | | 109 | 70 | 130 | | | |
| Surr: Toluene-d8 | 11 | | 10.00 | | 112 | 70 | 130 | | | |

Sample ID: **mb** SampType: **MBLK** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **PBW** Batch ID: **B76826** RunNo: **76826**
Prep Date: Analysis Date: **4/20/2021** SeqNo: **2722863** 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. |
| D | Sample Diluted Due to Matrix |
| H | Holding times for preparation or analysis exceeded |
| ND | Not Detected at the Reporting Limit |
| PQL | Practical Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2104614**
***21-Apr-21***

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

Sample ID: **mb** SampType: **MBLK** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **PBW** Batch ID: **B76826** RunNo: **76826**
Prep Date: Analysis Date: **4/20/2021** SeqNo: **2722863** 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 | | 118 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 11 | | 10.00 | | 112 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 12 | | 10.00 | | 116 | 70 | 130 | | | |
| Surr: Toluene-d8 | 11 | | 10.00 | | 114 | 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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2104614**
***21-Apr-21***

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

Sample ID: **MB-59429** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW** Batch ID: **59429** RunNo: **76744**
Prep Date: **4/15/2021** Analysis Date: **4/16/2021** SeqNo: **2719704** 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-59429** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW** Batch ID: **59429** RunNo: **76744**
Prep Date: **4/15/2021** Analysis Date: **4/16/2021** SeqNo: **2719705** Units: **mg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 1040 | 20.0 | 1000 | 0 | 104 | 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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

HALL ENVIRONMENTAL ANALYSIS LABORATORY

*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: **2104614** RcptNo: **1**

Received By: **Juan Rojas** **4/14/2021 8:34:00 AM** Juan Rojas

Completed By: **Sean Livingston** **4/14/2021 9:21:41 AM** Sean Livingston

Reviewed By: DAD 4.14.21

## 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° 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 preserved added to bottles? Yes ☑ No ☐ NA ☐
9. Received at least 1 vial with headspace <1/4" for AQ VOA? Yes ☑ No ☐ NA ☐ HNO3
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: SPA 4.14.21

## 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:

Filtered off ~100ml from samples 001B-007B to 001C-007C and added ~0.4ml HNO3 for dissolved metals anaylsis, checked for preferred pH <2 - SPA 4.14.21

17. **Cooler Information**

| Cooler No | Temp °C | Condition | Seal Intact | Seal No | Seal Date | Signed By |
|---|---|---|---|---|---|---|
| 1 | 3.8 | Good | | | | |

Released to Imaging: 5/16/2024 3:06:07 PM
Received by OCD: 3/7/2022 2:53:21 PM

# 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#: khoekstra@hilcorp.com

QA/QC Package: kkaufman@hilcorp.com

☐ Standard ☐ Level 4 (Full Validation)

Accreditation: ☐ Az Compliance

☐ NELAC ☐ Other_____

☐ EDD (Type) _____

Turn-Around Time:

X Standard ☐ Rush_____

Project Name: Mangum 1

Project #:

Project Manager: ~~Mitch Killough~~ KATE KAUFMAN

Sampler: Kurt Hoekstra

On Ice: ~~X~~ Yes ☐ No

# of Coolers: 1

Cooler Temp(including CF): 3.7 +0.1=3.8

HALL ENVIRONMENTAL ANALYSIS LABORATORY
www.hallenvironmental.com
4901 Hawkins NE - Albuquerque, NM 87109
Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

| Date | Time | Matrix | Sample Name | Container Type and # | Preservative Type | HEAL No. 2104614 | Dissolved Mn and Fe 500ml HDPE * | BTEX 8260 40ml VOA HCl | Sulfate/TDS 500ml HDPE |
|---|---|---|---|---|---|---|---|---|---|
| 4-12 | 12:45 | Water | MW-1 | Various | Various | 001 | X | X | X |
| 4-12 | 1:45 | Water | MW-2 | Various | Various | 002 | X | X | X |
| 4-12 | 10:45 | Water | MW-3 | Various | Various | 003 | X | X | X |
| 4-12 | 11:50 | Water | MW-4 | Various | Various | 004 | X | X | X |
| 4-13 | 3:00 | Water | MW-5 | Various | Various | 005 | X | X | X |
| 4-13 | 2:00 | Water | MW-6 | Various | Various | 006 | X | X | X |
| 4-13 | 12:15 | Water | MW-7 | Various | Various | 007 | X | X | X |

| Date | Time | Relinquished by: | Received by: | Via: | Date | Time |
|---|---|---|---|---|---|---|
| 4-13 | 15:30 | Kurt Hoekstra | Christine Walker | | 4/13/21 | 1530 |
| 4/13/21 | 1811 | Christine Walker | Courier | | 4/14/21 | 8:34 |

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

Special Pricing See Andy

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

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

August 11, 2021

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

RE: Mangum 1 OrderNo.: 2108063

Dear Kate Kaufman:

Hall Environmental Analysis Laboratory received 8 sample(s) on 8/3/2021 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,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

**Analytical Report**
Lab Order **2108063**
Date Reported: **8/11/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-1
**Project:** Mangum 1 **Collection Date:** 8/2/2021 11:45:00 AM
**Lab ID:** 2108063-001 **Matrix:** GROUNDWA **Received Date:** 8/3/2021 7:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 160 | 5.0 | | mg/L | 10 | 8/3/2021 12:08:59 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.20 | 0.10 | | mg/L | 5 | 8/4/2021 1:06:03 PM |
| Manganese | 0.52 | 0.010 | * | mg/L | 5 | 8/4/2021 1:06:03 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | 4.6 | 1.0 | | µg/L | 1 | 8/5/2021 4:02:00 AM |
| Toluene | ND | 1.0 | | µg/L | 1 | 8/5/2021 4:02:00 AM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 4:02:00 AM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 8/5/2021 4:02:00 AM |
| Surr: 1,2-Dichloroethane-d4 | 87.7 | 70-130 | | %Rec | 1 | 8/5/2021 4:02:00 AM |
| Surr: Dibromofluoromethane | 87.9 | 70-130 | | %Rec | 1 | 8/5/2021 4:02:00 AM |
| Surr: Toluene-d8 | 95.7 | 70-130 | | %Rec | 1 | 8/5/2021 4:02:00 AM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 2040 | 20.0 | * | mg/L | 1 | 8/7/2021 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2108063**
Date Reported: **8/11/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-2
**Project:** Mangum 1 **Collection Date:** 8/2/2021 12:15:00 PM
**Lab ID:** 2108063-002 **Matrix:** GROUNDWA **Received Date:** 8/3/2021 7:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 570 | 50 | * | mg/L | 100 | 8/3/2021 1:13:23 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.91 | 0.020 | * | mg/L | 1 | 8/4/2021 12:30:38 PM |
| Manganese | 4.1 | 0.010 | * | mg/L | 5 | 8/4/2021 1:10:37 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 4:25:00 AM |
| Toluene | ND | 1.0 | | µg/L | 1 | 8/5/2021 4:25:00 AM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 4:25:00 AM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 8/5/2021 4:25:00 AM |
| Surr: 1,2-Dichloroethane-d4 | 90.4 | 70-130 | | %Rec | 1 | 8/5/2021 4:25:00 AM |
| Surr: Dibromofluoromethane | 87.1 | 70-130 | | %Rec | 1 | 8/5/2021 4:25:00 AM |
| Surr: Toluene-d8 | 97.1 | 70-130 | | %Rec | 1 | 8/5/2021 4:25:00 AM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 2790 | 20.0 | * | mg/L | 1 | 8/7/2021 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2108063**
Date Reported: **8/11/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-3
**Project:** Mangum 1 **Collection Date:** 8/2/2021 12:10:00 PM
**Lab ID:** 2108063-003 **Matrix:** GROUNDWA **Received Date:** 8/3/2021 7:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 2100 | 50 | * | mg/L | 100 | 8/3/2021 2:04:51 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 10 | 1.0 | * | mg/L | 50 | 8/4/2021 1:12:21 PM |
| Manganese | 23 | 0.10 | * | mg/L | 50 | 8/4/2021 1:12:21 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | 3.4 | 1.0 | | µg/L | 1 | 8/5/2021 1:41:00 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 8/5/2021 1:41:00 PM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 1:41:00 PM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 8/5/2021 1:41:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 91.8 | 70-130 | | %Rec | 1 | 8/5/2021 1:41:00 PM |
| Surr: Dibromofluoromethane | 89.0 | 70-130 | | %Rec | 1 | 8/5/2021 1:41:00 PM |
| Surr: Toluene-d8 | 95.6 | 70-130 | | %Rec | 1 | 8/5/2021 1:41:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 7940 | 100 | *D | mg/L | 1 | 8/7/2021 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2108063**
Date Reported: **8/11/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-4
**Project:** Mangum 1 **Collection Date:** 8/2/2021 11:00:00 AM
**Lab ID:** 2108063-004 **Matrix:** GROUNDWA **Received Date:** 8/3/2021 7:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 1600 | 50 | * | mg/L | 100 | 8/3/2021 2:30:35 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.19 | 0.020 | | mg/L | 1 | 8/4/2021 12:33:28 PM |
| Manganese | 0.79 | 0.0020 | * | mg/L | 1 | 8/4/2021 12:33:28 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | 2.2 | 1.0 | | µg/L | 1 | 8/5/2021 2:04:00 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 8/5/2021 2:04:00 PM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 2:04:00 PM |
| Xylenes, Total | 71 | 1.5 | | µg/L | 1 | 8/5/2021 2:04:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 92.8 | 70-130 | | %Rec | 1 | 8/5/2021 2:04:00 PM |
| Surr: Dibromofluoromethane | 88.2 | 70-130 | | %Rec | 1 | 8/5/2021 2:04:00 PM |
| Surr: Toluene-d8 | 97.5 | 70-130 | | %Rec | 1 | 8/5/2021 2:04:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 3010 | 20.0 | * | mg/L | 1 | 8/7/2021 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2108063**
Date Reported: **8/11/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-5
**Project:** Mangum 1 **Collection Date:** 8/2/2021 12:45:00 PM
**Lab ID:** 2108063-005 **Matrix:** GROUNDWA **Received Date:** 8/3/2021 7:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 3300 | 50 | * | mg/L | 100 | 8/3/2021 2:56:19 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.33 | 0.020 | * | mg/L | 1 | 8/4/2021 12:40:09 PM |
| Manganese | 3.1 | 0.010 | * | mg/L | 5 | 8/4/2021 1:14:05 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 5:35:00 AM |
| Toluene | ND | 1.0 | | µg/L | 1 | 8/5/2021 5:35:00 AM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 5:35:00 AM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 8/5/2021 5:35:00 AM |
| Surr: 1,2-Dichloroethane-d4 | 94.5 | 70-130 | | %Rec | 1 | 8/5/2021 5:35:00 AM |
| Surr: Dibromofluoromethane | 89.4 | 70-130 | | %Rec | 1 | 8/5/2021 5:35:00 AM |
| Surr: Toluene-d8 | 96.6 | 70-130 | | %Rec | 1 | 8/5/2021 5:35:00 AM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 5920 | 100 | *D | mg/L | 1 | 8/7/2021 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2108063**
Date Reported: **8/11/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-6
**Project:** Mangum 1 **Collection Date:** 8/2/2021 1:16:00 PM
**Lab ID:** 2108063-006 **Matrix:** GROUNDWA **Received Date:** 8/3/2021 7:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 25 | 5.0 | | mg/L | 10 | 8/3/2021 3:09:11 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 7.0 | 0.20 | * | mg/L | 10 | 8/4/2021 1:15:46 PM |
| Manganese | 2.6 | 0.020 | * | mg/L | 10 | 8/4/2021 1:15:46 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | 16 | 1.0 | | µg/L | 1 | 8/5/2021 5:58:00 AM |
| Toluene | ND | 1.0 | | µg/L | 1 | 8/5/2021 5:58:00 AM |
| Ethylbenzene | 13 | 1.0 | | µg/L | 1 | 8/5/2021 5:58:00 AM |
| Xylenes, Total | 72 | 1.5 | | µg/L | 1 | 8/5/2021 5:58:00 AM |
| Surr: 1,2-Dichloroethane-d4 | 91.1 | 70-130 | | %Rec | 1 | 8/5/2021 5:58:00 AM |
| Surr: Dibromofluoromethane | 86.7 | 70-130 | | %Rec | 1 | 8/5/2021 5:58:00 AM |
| Surr: Toluene-d8 | 95.6 | 70-130 | | %Rec | 1 | 8/5/2021 5:58:00 AM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 1500 | 100 | *D | mg/L | 1 | 8/7/2021 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2108063**
Date Reported: **8/11/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-7
**Project:** Mangum 1 **Collection Date:** 8/2/2021 1:15:00 PM
**Lab ID:** 2108063-007 **Matrix:** GROUNDWA **Received Date:** 8/3/2021 7:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 870 | 50 | * | mg/L | 100 | 8/3/2021 3:47:47 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.28 | 0.020 | | mg/L | 1 | 8/4/2021 12:43:19 PM |
| Manganese | 1.4 | 0.010 | * | mg/L | 5 | 8/4/2021 1:22:26 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 6:21:00 AM |
| Toluene | ND | 1.0 | | µg/L | 1 | 8/5/2021 6:21:00 AM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 6:21:00 AM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 8/5/2021 6:21:00 AM |
| Surr: 1,2-Dichloroethane-d4 | 91.5 | 70-130 | | %Rec | 1 | 8/5/2021 6:21:00 AM |
| Surr: Dibromofluoromethane | 88.7 | 70-130 | | %Rec | 1 | 8/5/2021 6:21:00 AM |
| Surr: Toluene-d8 | 96.6 | 70-130 | | %Rec | 1 | 8/5/2021 6:21:00 AM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 517 | 20.0 | * | mg/L | 1 | 8/7/2021 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2108063**
Date Reported: **8/11/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** Trip Blank
**Project:** Mangum 1 **Collection Date:**
**Lab ID:** 2108063-008 **Matrix:** GROUNDWA **Received Date:** 8/3/2021 7:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 7:30:00 AM |
| Toluene | ND | 1.0 | | µg/L | 1 | 8/5/2021 7:30:00 AM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 8/5/2021 7:30:00 AM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 8/5/2021 7:30:00 AM |
| Surr: 1,2-Dichloroethane-d4 | 92.6 | 70-130 | | %Rec | 1 | 8/5/2021 7:30:00 AM |
| Surr: Dibromofluoromethane | 90.1 | 70-130 | | %Rec | 1 | 8/5/2021 7:30:00 AM |
| Surr: Toluene-d8 | 98.7 | 70-130 | | %Rec | 1 | 8/5/2021 7:30:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: **2108063**

***11-Aug-21***

**Client:** HILCORP ENERGY

**Project:** Mangum 1

| Sample ID: **MB** | SampType: **MBLK** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **PBW** | Batch ID: **A80313** | RunNo: **80313** |
| Prep Date: | Analysis Date: **8/4/2021** | SeqNo: **2829596** 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: **LLLCS** | SampType: **LCSLL** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **BatchQC** | Batch ID: **A80313** | RunNo: **80313** |
| Prep Date: | Analysis Date: **8/4/2021** | SeqNo: **2829598** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.024 | 0.020 | 0.02000 | 0 | 120 | 50 | 150 | | | |
| Manganese | 0.0021 | 0.0020 | 0.002000 | 0 | 104 | 50 | 150 | | | |

| Sample ID: **LCS** | SampType: **LCS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **LCSW** | Batch ID: **A80313** | RunNo: **80313** |
| Prep Date: | Analysis Date: **8/4/2021** | SeqNo: **2829600** 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 | 98.2 | 85 | 115 | | | |
| Manganese | 0.49 | 0.0020 | 0.5000 | 0 | 97.9 | 85 | 115 | | | |

| Sample ID: **2108063-001CMS** | SampType: **MS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **MW-1** | Batch ID: **A80313** | RunNo: **80313** |
| Prep Date: | Analysis Date: **8/4/2021** | SeqNo: **2829638** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 2.7 | 0.10 | 2.500 | 0.2037 | 98.3 | 70 | 130 | | | |
| Manganese | 3.0 | 0.010 | 2.500 | 0.5163 | 98.6 | 70 | 130 | | | |

| Sample ID: **2108063-001CMSD** | SampType: **MSD** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **MW-1** | Batch ID: **A80313** | RunNo: **80313** |
| Prep Date: | Analysis Date: **8/4/2021** | SeqNo: **2829639** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 2.7 | 0.10 | 2.500 | 0.2037 | 102 | 70 | 130 | 3.12 | 20 | |
| Manganese | 3.0 | 0.010 | 2.500 | 0.5163 | 98.9 | 70 | 130 | 0.236 | 20 | |

**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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: **2108063**

***11-Aug-21***

**Client:** HILCORP ENERGY

**Project:** Mangum 1

| Sample ID: **MB** | SampType: **mblk** | TestCode: **EPA Method 300.0: Anions** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Client ID: **PBW** | Batch ID: **R80286** | RunNo: **80286** | | | | | | | |
| Prep Date: | Analysis Date: **8/3/2021** | SeqNo: **2828425** | 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: **R80286** | RunNo: **80286** | | | | | | | |
| Prep Date: | Analysis Date: **8/3/2021** | SeqNo: **2828433** | Units: **mg/L** | | | | | | |
| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Sulfate | 10 | 0.50 | 10.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID: **2108063-001BMS** | SampType: **ms** | TestCode: **EPA Method 300.0: Anions** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Client ID: **MW-1** | Batch ID: **R80286** | RunNo: **80286** | | | | | | | |
| Prep Date: | Analysis Date: **8/3/2021** | SeqNo: **2828441** | Units: **mg/L** | | | | | | |
| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Sulfate | 260 | 5.0 | 100.0 | 164.3 | 99.2 | 83.3 | 112 | | | |

| Sample ID: **2108063-001BMSD** | SampType: **msd** | TestCode: **EPA Method 300.0: Anions** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Client ID: **MW-1** | Batch ID: **R80286** | RunNo: **80286** | | | | | | | |
| Prep Date: | Analysis Date: **8/3/2021** | SeqNo: **2828442** | Units: **mg/L** | | | | | | |
| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Sulfate | 260 | 5.0 | 100.0 | 164.3 | 98.5 | 83.3 | 112 | 0.253 | 20 | |

**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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2108063**
***11-Aug-21***

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

Sample ID: **100ng 8260 lcs2** SampType: **LCS** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **LCSW** Batch ID: **D80304** RunNo: **80304**
Prep Date: Analysis Date: **8/5/2021** SeqNo: **2830144** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 20 | 1.0 | 20.00 | 0 | 100 | 70 | 130 | | | |
| Toluene | 20 | 1.0 | 20.00 | 0 | 99.2 | 70 | 130 | | | |
| Surr: 1,2-Dichloroethane-d4 | 9.2 | | 10.00 | | 91.5 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 11 | | 10.00 | | 106 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 8.9 | | 10.00 | | 88.6 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.7 | | 10.00 | | 96.9 | 70 | 130 | | | |

Sample ID: **mb-2** SampType: **MBLK** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **PBW** Batch ID: **D80304** RunNo: **80304**
Prep Date: Analysis Date: **8/5/2021** SeqNo: **2830145** 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 | 9.0 | | 10.00 | | 90.1 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 10 | | 10.00 | | 105 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 8.7 | | 10.00 | | 86.8 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.8 | | 10.00 | | 97.6 | 70 | 130 | | | |

Sample ID: **2108063-007ams** SampType: **MS** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **MW-7** Batch ID: **D80304** RunNo: **80304**
Prep Date: Analysis Date: **8/5/2021** SeqNo: **2830153** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 19 | 1.0 | 20.00 | 0 | 95.3 | 70 | 130 | | | |
| Toluene | 18 | 1.0 | 20.00 | 0 | 92.3 | 70 | 130 | | | |
| Surr: 1,2-Dichloroethane-d4 | 9.4 | | 10.00 | | 93.6 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 11 | | 10.00 | | 106 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 8.9 | | 10.00 | | 89.3 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.8 | | 10.00 | | 98.2 | 70 | 130 | | | |

Sample ID: **2108063-007amsd** SampType: **MSD** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **MW-7** Batch ID: **D80304** RunNo: **80304**
Prep Date: Analysis Date: **8/5/2021** SeqNo: **2830154** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 19 | 1.0 | 20.00 | 0 | 96.5 | 70 | 130 | 1.25 | 20 | |
| Toluene | 18 | 1.0 | 20.00 | 0 | 91.6 | 70 | 130 | 0.718 | 20 | |

**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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2108063**
***11-Aug-21***

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

Sample ID: **2108063-007amsd** SampType: **MSD** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **MW-7** Batch ID: **D80304** RunNo: **80304**
Prep Date: Analysis Date: **8/5/2021** SeqNo: **2830154** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Surr: 1,2-Dichloroethane-d4 | 9.3 | | 10.00 | | 92.9 | 70 | 130 | 0 | 0 | |
| Surr: 4-Bromofluorobenzene | 11 | | 10.00 | | 106 | 70 | 130 | 0 | 0 | |
| Surr: Dibromofluoromethane | 8.8 | | 10.00 | | 87.9 | 70 | 130 | 0 | 0 | |
| Surr: Toluene-d8 | 9.7 | | 10.00 | | 97.4 | 70 | 130 | 0 | 0 | |

Sample ID: **100ng 8260 lcs** SampType: **LCS** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **LCSW** Batch ID: **SL80327** RunNo: **80327**
Prep Date: Analysis Date: **8/5/2021** SeqNo: **2831736** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 20 | 1.0 | 20.00 | 0 | 100 | 70 | 130 | | | |
| Toluene | 19 | 1.0 | 20.00 | 0 | 95.8 | 70 | 130 | | | |
| Surr: 1,2-Dichloroethane-d4 | 9.2 | | 10.00 | | 91.5 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 11 | | 10.00 | | 105 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 8.6 | | 10.00 | | 86.1 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.6 | | 10.00 | | 96.1 | 70 | 130 | | | |

Sample ID: **mb** SampType: **MBLK** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **PBW** Batch ID: **SL80327** RunNo: **80327**
Prep Date: Analysis Date: **8/5/2021** SeqNo: **2831737** 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 | 9.4 | | 10.00 | | 93.9 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 10 | | 10.00 | | 105 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 9.2 | | 10.00 | | 91.7 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.6 | | 10.00 | | 95.5 | 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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2108063**
***11-Aug-21***

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

Sample ID: **MB-61772** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW** Batch ID: **61772** RunNo: **80378**
Prep Date: **8/5/2021** Analysis Date: **8/7/2021** SeqNo: **2832567** 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-61772** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW** Batch ID: **61772** RunNo: **80378**
Prep Date: **8/5/2021** Analysis Date: **8/7/2021** SeqNo: **2832568** Units: **mg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 1020 | 20.0 | 1000 | 0 | 102 | 80 | 120 | | | |

Sample ID: **2108063-001BDUP** SampType: **DUP** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **MW-1** Batch ID: **61772** RunNo: **80378**
Prep Date: **8/5/2021** Analysis Date: **8/7/2021** SeqNo: **2832584** Units: **mg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 2040 | 20.0 | | | | | | 0.196 | 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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

HALL ENVIRONMENTAL ANALYSIS LABORATORY

*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: **2108063** RcptNo: 1

Received By: **Cheyenne Cason** **8/3/2021 7:00:00 AM**

Completed By: **Desiree Dominguez** **8/3/2021 9:27:05 AM**

Reviewed By: JR 8/3/21

## 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° 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 ☑ SPA 8.3.21 | 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: 7 (<2 or >12 unless noted)

Adjusted? YES

Checked by: SPA 8.3.21

## 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: ADDed (0.4 / 0.5 ml) $HNO_3$ to (001c, 006c / 004c) For pH<2, Metals Analysis.

SPA 8.3.21

17. **Cooler Information**

| Cooler No | Temp °C | Condition | Seal Intact | Seal No | Seal Date | Signed By |
|---|---|---|---|---|---|---|
| 1 | 5.5 | Good | Yes | | | |
| 2 | 3.5 | Good | Yes | | | |

Released to Imaging: 5/16/2024 3:06:07 PM
Received by OCD: 3/7/2022 2:53:21 PM

# Chain-of-Custody Record

Client: Hilcorp
Kate Kaufman
Mailing Address: 1111 Travis St
Houston TX
Phone #:
email or Fax#: kkaufman@hilcorp.com
QA/QC Package:
☒ Standard ☐ Level 4 (Full Validation)
Accreditation: ☐ Az Compliance
☐ NELAC ☐ Other
☒ EDD (Type) Excel

Turn-Around Time:
☒ Standard ☐ Rush
Project Name: Magnum #1
Project #:
Project Manager: Stuart Hyde
Sampler: Stuart Hyde
On Ice: ☑ Yes ☐ No
# of Coolers: 2 5.6 - 0.1 = 5.5
Cooler Temp(including CF): 3.6 - 0.1 = 3.5 (°C)

HALL ENVIRONMENTAL ANALYSIS LABORATORY
www.hallenvironmental.com
4901 Hawkins NE - Albuquerque, NM 87109
Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

| Date | Time | Matrix | Sample Name | Container Type and # | Preservative Type | HEAL No. 2108063 | BTEX / MTBE / TMB's (8021) | TPH:8015D(GRO / DRO / MRO) | 8081 Pesticides/8082 PCB's | EDB (Method 504.1) | PAHs by 8310 or 8270SIMS | RCRA 8 Metals | Cl, F, Br, $NO_3$, $NO_2$, $PO_4$, $SO_4$ | 8260 (VOA) | 8270 (Semi-VOA) | Total Coliform (Present/Absent) | Dissolved Fe, Mn | TDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/2/21 | 1145 | GW | MW-1 | 3 VOAs HCl poly HNO3 | | -001 | X | | | | | | X | | | | X | X |
| | 1215 | | MW-2 | poly - | | -002 | X | | | | | | X | | | | X | X |
| | 1210 | | MW-3 | | | -003 | X | | | | | | X | | | | X | X |
| | 1100 | | MW-4 | | | -004 | X | | | | | | X | | | | X | X |
| | 1245 | | MW-5 | | | -005 | X | | | | | | X | | | | X | X |
| | 1316 | | MW-6 | | | -006 | X | | | | | | X | | | | X | X |
| | 1315 | | MW-7 | | | -007 | X | | | | | | X | | | | X | X |
| | | | ~~MW-8~~ SH | | | DAD 8/3/21 ~~00~~ | | | | | | | | | | | | |
| | | | TRIP BLANK | | | -008 | | | | | | | | | | | | |
| | | | SPK | 8.3.21 | | | | | | | | | | | | | | |

| Date | Time | Relinquished by: | Received by: | Via: | Date | Time |
|---|---|---|---|---|---|---|
| 8/2/21 | 1400 | | Christine Walker | | 8/2/21 | 1400 |
| 8/2/21 | 1806 | Christine Walker | | Courier | 8/3/21 | 0700 |

Remarks: PO # 60003045

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

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

October 28, 2021

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

RE: Mangum 1 OrderNo.: 2110522

Dear Kate Kaufman:

Hall Environmental Analysis Laboratory received 7 sample(s) on 10/9/2021 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,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

**Analytical Report**
Lab Order **2110522**
Date Reported: **10/28/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-1
**Project:** Mangum 1 **Collection Date:** 10/7/2021 10:03:00 AM
**Lab ID:** 2110522-001 **Matrix:** AQUEOUS **Received Date:** 10/9/2021 8:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 490 | 50 | * | mg/L | 100 | 10/11/2021 4:04:57 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | ND | 0.020 | | mg/L | 1 | 10/16/2021 12:45:43 PM |
| Manganese | 0.70 | 0.0020 | * | mg/L | 1 | 10/16/2021 12:45:43 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | 7.8 | 1.0 | P | µg/L | 1 | 10/15/2021 7:10:00 PM |
| Toluene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 7:10:00 PM |
| Ethylbenzene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 7:10:00 PM |
| Xylenes, Total | ND | 1.5 | P | µg/L | 1 | 10/15/2021 7:10:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 92.9 | 70-130 | P | %Rec | 1 | 10/15/2021 7:10:00 PM |
| Surr: 4-Bromofluorobenzene | 88.6 | 70-130 | P | %Rec | 1 | 10/15/2021 7:10:00 PM |
| Surr: Dibromofluoromethane | 93.7 | 70-130 | P | %Rec | 1 | 10/15/2021 7:10:00 PM |
| Surr: Toluene-d8 | 95.9 | 70-130 | P | %Rec | 1 | 10/15/2021 7:10:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 2400 | 100 | *D | mg/L | 1 | 10/15/2021 10:14:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2110522**
Date Reported: **10/28/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** MW-2
**Project:** Mangum 1
**Collection Date:** 10/7/2021 1:05:00 PM
**Lab ID:** 2110522-002 **Matrix:** AQUEOUS **Received Date:** 10/9/2021 8:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 200 | 5.0 | | mg/L | 10 | 10/11/2021 4:17:21 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.085 | 0.020 | | mg/L | 1 | 10/16/2021 12:50:24 PM |
| Manganese | 2.0 | 0.020 | * | mg/L | 10 | 10/16/2021 12:52:46 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | ND | 1.0 | | µg/L | 1 | 10/15/2021 7:33:00 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 10/15/2021 7:33:00 PM |
| Ethylbenzene | ND | 1.0 | | µg/L | 1 | 10/15/2021 7:33:00 PM |
| Xylenes, Total | ND | 1.5 | | µg/L | 1 | 10/15/2021 7:33:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 91.9 | 70-130 | | %Rec | 1 | 10/15/2021 7:33:00 PM |
| Surr: 4-Bromofluorobenzene | 85.2 | 70-130 | | %Rec | 1 | 10/15/2021 7:33:00 PM |
| Surr: Dibromofluoromethane | 93.1 | 70-130 | | %Rec | 1 | 10/15/2021 7:33:00 PM |
| Surr: Toluene-d8 | 97.0 | 70-130 | | %Rec | 1 | 10/15/2021 7:33:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 2280 | 200 | *D | mg/L | 1 | 10/15/2021 10:14:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2110522**
Date Reported: **10/28/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** MW-3
**Project:** Mangum 1
**Collection Date:** 10/6/2021 2:05:00 PM
**Lab ID:** 2110522-003 **Matrix:** AQUEOUS **Received Date:** 10/9/2021 8:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 2200 | 50 | * | mg/L | 100 | 10/11/2021 4:54:34 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.054 | 0.020 | | mg/L | 1 | 10/16/2021 12:55:06 PM |
| Manganese | 15 | 0.040 | * | mg/L | 20 | 10/18/2021 9:25:30 AM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | 3.0 | 1.0 | | µg/L | 1 | 10/15/2021 7:56:00 PM |
| Toluene | ND | 1.0 | | µg/L | 1 | 10/15/2021 7:56:00 PM |
| Ethylbenzene | 1.2 | 1.0 | | µg/L | 1 | 10/15/2021 7:56:00 PM |
| Xylenes, Total | 3.5 | 1.5 | | µg/L | 1 | 10/15/2021 7:56:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 92.7 | 70-130 | | %Rec | 1 | 10/15/2021 7:56:00 PM |
| Surr: 4-Bromofluorobenzene | 96.9 | 70-130 | | %Rec | 1 | 10/15/2021 7:56:00 PM |
| Surr: Dibromofluoromethane | 92.3 | 70-130 | | %Rec | 1 | 10/15/2021 7:56:00 PM |
| Surr: Toluene-d8 | 96.9 | 70-130 | | %Rec | 1 | 10/15/2021 7:56:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 6620 | 200 | *D | mg/L | 1 | 10/15/2021 10:14:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2110522**
Date Reported: **10/28/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** MW-4
**Project:** Mangum 1
**Collection Date:** 10/6/2021 2:55:00 PM
**Lab ID:** 2110522-004 **Matrix:** AQUEOUS **Received Date:** 10/9/2021 8:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 1100 | 50 | * | mg/L | 100 | 10/11/2021 5:19:23 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | ND | 0.020 | | mg/L | 1 | 10/16/2021 1:00:05 PM |
| Manganese | 0.62 | 0.0020 | * | mg/L | 1 | 10/16/2021 1:00:05 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | 5.8 | 1.0 | P | µg/L | 1 | 10/15/2021 8:20:00 PM |
| Toluene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 8:20:00 PM |
| Ethylbenzene | 2.6 | 1.0 | P | µg/L | 1 | 10/15/2021 8:20:00 PM |
| Xylenes, Total | 370 | 15 | P | µg/L | 10 | 10/19/2021 3:47:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 87.2 | 70-130 | P | %Rec | 1 | 10/15/2021 8:20:00 PM |
| Surr: 4-Bromofluorobenzene | 84.0 | 70-130 | P | %Rec | 1 | 10/15/2021 8:20:00 PM |
| Surr: Dibromofluoromethane | 90.3 | 70-130 | P | %Rec | 1 | 10/15/2021 8:20:00 PM |
| Surr: Toluene-d8 | 120 | 70-130 | P | %Rec | 1 | 10/15/2021 8:20:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 2470 | 100 | *D | mg/L | 1 | 10/15/2021 10:14:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2110522**
Date Reported: **10/28/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** MW-5
**Project:** Mangum 1
**Collection Date:** 10/8/2021 11:05:00 AM
**Lab ID:** 2110522-005 **Matrix:** AQUEOUS **Received Date:** 10/9/2021 8:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 3400 | 50 | * | mg/L | 100 | 10/11/2021 6:09:01 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.023 | 0.020 | | mg/L | 1 | 10/16/2021 1:04:54 PM |
| Manganese | 3.4 | 0.020 | * | mg/L | 10 | 10/16/2021 1:19:27 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 8:43:00 PM |
| Toluene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 8:43:00 PM |
| Ethylbenzene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 8:43:00 PM |
| Xylenes, Total | ND | 1.5 | P | µg/L | 1 | 10/15/2021 8:43:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 95.2 | 70-130 | P | %Rec | 1 | 10/15/2021 8:43:00 PM |
| Surr: 4-Bromofluorobenzene | 96.9 | 70-130 | P | %Rec | 1 | 10/15/2021 8:43:00 PM |
| Surr: Dibromofluoromethane | 95.4 | 70-130 | P | %Rec | 1 | 10/15/2021 8:43:00 PM |
| Surr: Toluene-d8 | 97.6 | 70-130 | P | %Rec | 1 | 10/15/2021 8:43:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 6120 | 100 | *D | mg/L | 1 | 10/15/2021 10:14:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2110522**
Date Reported: **10/28/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-6
**Project:** Mangum 1 **Collection Date:** 10/8/2021 9:45:00 AM
**Lab ID:** 2110522-006 **Matrix:** AQUEOUS **Received Date:** 10/9/2021 8:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 18 | 5.0 | | mg/L | 10 | 10/11/2021 6:21:26 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | 0.052 | 0.020 | | mg/L | 1 | 10/16/2021 1:21:55 PM |
| Manganese | 2.9 | 0.020 | * | mg/L | 10 | 10/16/2021 1:24:10 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | 3.5 | 1.0 | P | µg/L | 1 | 10/15/2021 9:06:00 PM |
| Toluene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 9:06:00 PM |
| Ethylbenzene | 1.8 | 1.0 | P | µg/L | 1 | 10/15/2021 9:06:00 PM |
| Xylenes, Total | 9.7 | 1.5 | P | µg/L | 1 | 10/15/2021 9:06:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 90.7 | 70-130 | P | %Rec | 1 | 10/15/2021 9:06:00 PM |
| Surr: 4-Bromofluorobenzene | 93.2 | 70-130 | P | %Rec | 1 | 10/15/2021 9:06:00 PM |
| Surr: Dibromofluoromethane | 91.1 | 70-130 | P | %Rec | 1 | 10/15/2021 9:06:00 PM |
| Surr: Toluene-d8 | 96.5 | 70-130 | P | %Rec | 1 | 10/15/2021 9:06:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 1310 | 200 | *D | mg/L | 1 | 10/15/2021 10:14:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

**Analytical Report**
Lab Order **2110522**
Date Reported: **10/28/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY **Client Sample ID:** MW-7
**Project:** Mangum 1 **Collection Date:** 10/7/2021 2:00:00 PM
**Lab ID:** 2110522-007 **Matrix:** AQUEOUS **Received Date:** 10/9/2021 8:00:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 300.0: ANIONS** | | | | | | Analyst: **CAS** |
| Sulfate | 880 | 50 | * | mg/L | 100 | 10/11/2021 6:58:40 PM |
| **EPA METHOD 200.7: DISSOLVED METALS** | | | | | | Analyst: **ELS** |
| Iron | ND | 0.020 | | mg/L | 1 | 10/16/2021 1:26:29 PM |
| Manganese | 1.1 | 0.020 | * | mg/L | 10 | 10/16/2021 1:28:52 PM |
| **EPA METHOD 8260: VOLATILES SHORT LIST** | | | | | | Analyst: **CCM** |
| Benzene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 9:29:00 PM |
| Toluene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 9:29:00 PM |
| Ethylbenzene | ND | 1.0 | P | µg/L | 1 | 10/15/2021 9:29:00 PM |
| Xylenes, Total | ND | 1.5 | P | µg/L | 1 | 10/15/2021 9:29:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 94.8 | 70-130 | P | %Rec | 1 | 10/15/2021 9:29:00 PM |
| Surr: 4-Bromofluorobenzene | 96.1 | 70-130 | P | %Rec | 1 | 10/15/2021 9:29:00 PM |
| Surr: Dibromofluoromethane | 97.5 | 70-130 | P | %Rec | 1 | 10/15/2021 9:29:00 PM |
| Surr: Toluene-d8 | 96.4 | 70-130 | P | %Rec | 1 | 10/15/2021 9:29:00 PM |
| **SM2540C MOD: TOTAL DISSOLVED SOLIDS** | | | | | | Analyst: **KS** |
| Total Dissolved Solids | 2110 | 200 | *D | mg/L | 1 | 10/15/2021 10:14:00 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 | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: **2110522**

***28-Oct-21***

**Client:** HILCORP ENERGY

**Project:** Mangum 1

| Sample ID: **MB** | SampType: **MBLK** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **PBW** | Batch ID: **A82115** | RunNo: **82115** |
| Prep Date: | Analysis Date: **10/16/2021** | SeqNo: **2908771** 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: **LLLCS** | SampType: **LCSLL** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **BatchQC** | Batch ID: **A82115** | RunNo: **82115** |
| Prep Date: | Analysis Date: **10/16/2021** | SeqNo: **2908773** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | ND | 0.020 | 0.02000 | 0 | 96.6 | 50 | 150 | | | |
| Manganese | 0.0020 | 0.0020 | 0.002000 | 0 | 102 | 50 | 150 | | | |

| Sample ID: **LCS** | SampType: **LCS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **LCSW** | Batch ID: **A82115** | RunNo: **82115** |
| Prep Date: | Analysis Date: **10/16/2021** | SeqNo: **2908775** 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 | 99.0 | 85 | 115 | | | |
| Manganese | 0.48 | 0.0020 | 0.5000 | 0 | 96.1 | 85 | 115 | | | |

| Sample ID: **MB** | SampType: **MBLK** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **PBW** | Batch ID: **A82144** | RunNo: **82144** |
| Prep Date: | Analysis Date: **10/18/2021** | SeqNo: **2910254** Units: **mg/L** |

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Manganese | ND | 0.0020 | | | | | | | | |

| Sample ID: **LLLCS** | SampType: **LCSLL** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **BatchQC** | Batch ID: **A82144** | RunNo: **82144** |
| Prep Date: | Analysis Date: **10/18/2021** | SeqNo: **2910256** 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 | 103 | 50 | 150 | | | |

| Sample ID: **LCS** | SampType: **LCS** | TestCode: **EPA Method 200.7: Dissolved Metals** |
|---|---|---|
| Client ID: **LCSW** | Batch ID: **A82144** | RunNo: **82144** |
| Prep Date: | Analysis Date: **10/18/2021** | SeqNo: **2910258** 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 | 97.8 | 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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2110522**
***28-Oct-21***

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

| Sample ID: **MB** | SampType: **mblk** | TestCode: **EPA Method 300.0: Anions** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Client ID: **PBW** | Batch ID: **R81960** | RunNo: **81960** | | | | | | | |
| Prep Date: | Analysis Date: **10/11/2021** | SeqNo: **2901493** | 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: **R81960** | RunNo: **81960** | | | | | | | |
| Prep Date: | Analysis Date: **10/11/2021** | SeqNo: **2901502** | Units: **mg/L** | | | | | | |
| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Sulfate | 10 | 0.50 | 10.00 | 0 | 101 | 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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

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

WO#: **2110522**
***28-Oct-21***

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

Sample ID: **100ng 8260 lcs** SampType: **LCS** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **LCSW** Batch ID: **SL82087** RunNo: **82087**
Prep Date: Analysis Date: **10/15/2021** SeqNo: **2908045** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 19 | 1.0 | 20.00 | 0 | 93.5 | 70 | 130 | | | |
| Toluene | 19 | 1.0 | 20.00 | 0 | 97.3 | 70 | 130 | | | |
| Surr: 1,2-Dichloroethane-d4 | 9.3 | | 10.00 | | 92.9 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 9.5 | | 10.00 | | 95.1 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 9.5 | | 10.00 | | 94.6 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.6 | | 10.00 | | 96.0 | 70 | 130 | | | |

Sample ID: **mb** SampType: **MBLK** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **PBW** Batch ID: **SL82087** RunNo: **82087**
Prep Date: Analysis Date: **10/15/2021** SeqNo: **2908046** 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 | 9.6 | | 10.00 | | 96.1 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 9.8 | | 10.00 | | 97.6 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 9.5 | | 10.00 | | 94.9 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.9 | | 10.00 | | 98.6 | 70 | 130 | | | |

Sample ID: **MB** SampType: **MBLK** TestCode: **EPA Method 8260: Volatiles Short List**
Client ID: **PBW** Batch ID: **SL82165** RunNo: **82165**
Prep Date: Analysis Date: **10/19/2021** SeqNo: **2911412** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Xylenes, Total | ND | 1.5 | | | | | | | | |
| Surr: 1,2-Dichloroethane-d4 | 10 | | 10.00 | | 102 | 70 | 130 | | | |
| Surr: 4-Bromofluorobenzene | 9.5 | | 10.00 | | 95.1 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | 10 | | 10.00 | | 102 | 70 | 130 | | | |
| Surr: Toluene-d8 | 9.6 | | 10.00 | | 96.0 | 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 Quanitative Limit |
| S | % Recovery outside of range due to dilution or matrix |
| B | Analyte detected in the associated Method Blank |
| E | Value above quantitation range |
| J | Analyte detected below quantitation limits |
| P | Sample pH Not In Range |
| RL | Reporting Limit |

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: **2110522**

***28-Oct-21***

**Client:** HILCORP ENERGY

**Project:** Mangum 1

Sample ID: **MB-63264** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**

Client ID: **PBW** Batch ID: **63264** RunNo: **82074**

Prep Date: **10/13/2021** Analysis Date: **10/15/2021** SeqNo: **2907245** 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-63264** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**

Client ID: **LCSW** Batch ID: **63264** RunNo: **82074**

Prep Date: **10/13/2021** Analysis Date: **10/15/2021** SeqNo: **2907246** Units: **mg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 1000 | 20.0 | 1000 | 0 | 100 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds Maximum Contaminant Level. | B | Analyte detected in the associated Method Blank |
| D | Sample Diluted Due to Matrix | E | Value above quantitation range |
| 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 Quanitative Limit | RL | Reporting Limit |
| S | % Recovery outside of range due to dilution or matrix | | |

HALL ENVIRONMENTAL ANALYSIS LABORATORY

*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: 2110522 RcptNo: 1

Received By: **Isaiah Ortiz** 10/9/2021 8:00:00 AM I-OX

Completed By: **Sean Livingston** 10/11/2021 9:45:52 AM Sean Livingston

Reviewed By:

## 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° 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 preserved added to bottles? Yes ☑ No ☐ NA ☐
9. Received at least 1 vial with headspace <1/4" for AQ VOA? Yes ☑ No ☐ NA ☐ HNO3
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: TMC 10/11/21

## 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:

Filtered off ~100mL from sample 001-007B for sample 001-007C, adding ~0.4mL HNO3 for dissolved metals analysis, checked for preferred pH <2 - TMC 10/11/21

17. **Cooler Information**

| Cooler No | Temp °C | Condition | Seal Intact | Seal No | Seal Date | Signed By |
|---|---|---|---|---|---|---|
| 1 | 3.7 | Good | | | | |

Released to Imaging: 5/16/2024 3:06:07 PM

Received by OCD: 3/7/2022 2:53:21 PM

# 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#: khoekstra@hilcorp.com

QA/QC Package: kkaufman@hilcorp.com

☐ Standard ☐ Level 4 (Full Validation)

Accreditation: ☐ Az Compliance

☐ NELAC ☐ Other

☐ EDD (Type)

Turn-Around Time:

X Standard ☐ Rush

Project Name: Mangum 1

Project #:

Project Manager: KATE KAUFMAN

Sampler: Kurt Hoekstra

On Ice: X Yes ☐ No

# of Coolers: 1

Cooler Temp(including CF): 3.7 +0

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

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

| Date | Time | Matrix | Sample Name | Container Type and # | Preservative Type | HEAL No. 2110522 | Dissolved Mn and Fe* | BTEX 8260 | Sulfate/TDS | No Samples Field Filtered |
|---|---|---|---|---|---|---|---|---|---|---|
| 10-7 | 10:03 | Water | MW-1 | (3) 40ml VOA (1) Liter Plastic | HCl Cool | 001 | X | X | X | |
| 10-7 | 1:05 | Water | MW-2 | (3) 40ml VOA (1) Liter Plastic | HCl Cool | 002 | X | X | X | |
| 10-6 | 2:05 | Water | MW-3 | (3) 40ml VOA (1) Liter Plastic | HCl Cool | 003 | X | X | X | |
| 10-6 | 2:55 | Water | MW-4 | (3) 40ml VOA (1) Liter Plastic | HCl Cool | 004 | X | X | X | |
| 10-8 | 11:05 | Water | MW-5 | (3) 40ml VOA (1) Liter Plastic | HCl Cool | 005 | X | X | X | |
| 10-8 | 9:45 | Water | MW-6 | (3) 40ml VOA (1) Liter Plastic | HCl Cool | 006 | X | X | X | |
| 10-7 | 2:00 | Water | MW-7 | (3) 40ml VOA (1) Liter Plastic | HCl Cool | 007 | X | X | X | |

Analysis Request

| Date: | Time: | Relinquished by: | Received by: | Via: | Date | Time |
|---|---|---|---|---|---|---|
| 10-8 | 1609 | Kurt Hoekstra | Christine Walker | | 10/8/21 | 1605 |
| 10/8/21 | 1746 | Christine Walker | [illegible] | courier | 10/9/21 | 0800 |

Remarks: *Dissolved Mn and Fe are to be filterd 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.

**District I**
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
**District II**
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
**District III**
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
**District IV**
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

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



## CONDITIONS

| | |
|---|---|
| Operator:<br>HILCORP ENERGY COMPANY<br>1111 Travis Street<br>Houston, TX 77002 | OGRID:<br>372171 |
| | Action Number:<br>87756 |
| | Action Type:<br>[UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT) |

**CONDITIONS**

| Created By | Condition | Condition Date |
|---|---|---|
| michael.buchanan | Review of the Annual Groundwater Monitoring Report for Mangum#1: Content is Satisfactory 1. Continue to sample for Fe (iron) until background levels have been established for MW-8 2. Proceed to establish background concentrations by installing MW-8 as planned. 3. Continue to conduct quarterly groundwater monitoring as prescribed.and analyzing for BTEX 8260 EPA method 4. Submit the 2022 annual report and 2023, if not already submitted in the online portal. Submit the 2024 Annual GW Monitoring Report by April 1, 2025. | 5/16/2024 |