ENSOLUM

January 4, 2023

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

Re: Soil Vapor Extraction Pilot Test Report and Final Remediation Work Plan
San Juan 32-9 #41A
San Juan County, New Mexico
Hilcorp Energy Company
NMOCD Incident No: nAPP2108949980

To Whom it May Concern:

On behalf of Hilcorp Energy Company (Hilcorp), Ensolum, LLC. (Ensolum) has prepared this *Soil Vapor Extraction (SVE) Pilot Test Report and Final Remediation Work Plan* for the San Juan 32-9 #41A natural gas production well (Site). The Site is located on land managed by the Bureau of Land Management (BLM) in Unit P, Section 31, Township 32 North, Range 9 West in San Juan County, New Mexico (Figure 1). The Site is approximately four miles east of Cedar Hill, New Mexico, west of San Juan County Road 2770.

SITE BACKGROUND

On March 17, 2021, during tank gauging activities, Hilcorp discovered a release of approximately 15 barrels (bbls) of oil due to corrosion of an aboveground storage tank (AST). The hole appeared to be caused by corrosion of the steel tank. Hilcorp submitted a *Release Notification Form C-141* to the New Mexico Oil Conservation Division (NMOCD) on March 30, 2021, and the Site was assigned NMOCD incident number nAPP2108949980.

On May 19 and 20, 2021, Hilcorp retained WSP USA, Inc. (WSP) to perform delineation activities and identify the vertical and lateral extent of impacts related to the Site release. In total, five borings, BH01 through BH05, were advanced to depths up to 25 feet below ground surface (bgs). Boring locations were recorded using a handheld Global Positioning System (GPS) unit and are presented on Figure 2. During the May 2021 delineation activities, one SVE well (SVE01) was installed in boring BH01 (located near the release point at the Site) and was screened from 6 to 16 feet bgs.

Additional details regarding the May 2021 investigations were presented in the *Site Characterization Report and Remediation Work Plan* (dated June 15, 2021) prepared by WSP. The work plan, approved by the NMOCD on September 6, 2022, presents further information regarding the release background, site characterization based on potential sensitive receptors and depth to groundwater, site-specific closure criteria, delineation data, and proposed SVE as a remedy following confirmation by a pilot test.

SITE CLOSURE CRITERIA

As presented in the June 15, 2021 work plan, the following closure criteria apply to the Site in accordance with *Table I, Closure Criteria for Soils Impacted by a Release* (Table I Closure Criteria), 19.15.29.12 of the New Mexico Administrative Code (NMAC):

- Chloride: 600 milligrams per kilogram (mg/kg)
- Total Petroleum Hydrocarbons (TPH) as a combination of gasoline range organics (GRO), diesel range organics (DRO), and motor oil range organics (MRO): 100 mg/kg
- A combination of benzene, toluene, ethylbenzene, and xylenes (BTEX): 50 mg/kg
- Benzene: 10 mg/kg

SVE SYSTEM PILOT TESTING

To determine if SVE is a feasible remedy at the Site and aid in future system design, Ensolum conducted a pilot test to determine the flow rate and applied vacuum required to volatilize and remove petroleum hydrocarbons from the impacted subsurface soils. Pilot test data was also used to estimate the system's radius-of-influence (ROI) and radius-of-effect (ROE) to determine well spacing and the need for additional SVE wells at the Site.

SVE Well Installation

Prior to initiating SVE pilot testing activities, Ensolum oversaw the installation of two additional SVE wells (SVE02 and SVE03) using a Central Mining Equipment (CME) 75 hollow-stem auger drill rig. Soil lithology was logged by an Ensolum geologist according to the Unified Soil Classification System (USCS) as specified in American Society for Testing and Materials (ASTM) D2488. Soil also was inspected for visual staining and the presence or absence of odor. The soil was characterized by visually inspecting the soil samples and field screening the soil headspace using a photoionization detector (PID) to monitor for the presence of organic vapors. Drilling and sampling equipment were decontaminated prior to use and between each boring. The borings were advanced at the Site to depths of 17 feet bgs and the SVE wells were constructed with 10 feet of screen set from 7 to 17 feet bgs.

Four soil samples were collected from each boring for laboratory analysis. Soil samples were placed directly into pre-cleaned glass jars, labeled with the location, date, time, sampler name, method of analysis, and immediately placed on ice. The soil samples were transported at or below 6 degrees Celsius (°C) under strict chain-of-custody procedures and submitted to Hall Environmental Analysis Laboratory (Hall) in Albuquerque, New Mexico for analysis of BTEX by United States Environmental Protection Agency (EPA) Method 8021B; TPH-GRO, TPH-DRO, and TPH-MRO following EPA Method 8015M/D; and chloride following EPA Method 300.0. Soil analytical results are summarized in Table 1, with complete laboratory reports included as Appendix A. The boring logs for the additional SVE wells are provided as Appendix B and all SVE well locations are depicted on Figure 2. Prior to sampling, the NMOCD was notified at least 48 hours in advance as presented in Appendix C.

SVE Pilot Test Procedures

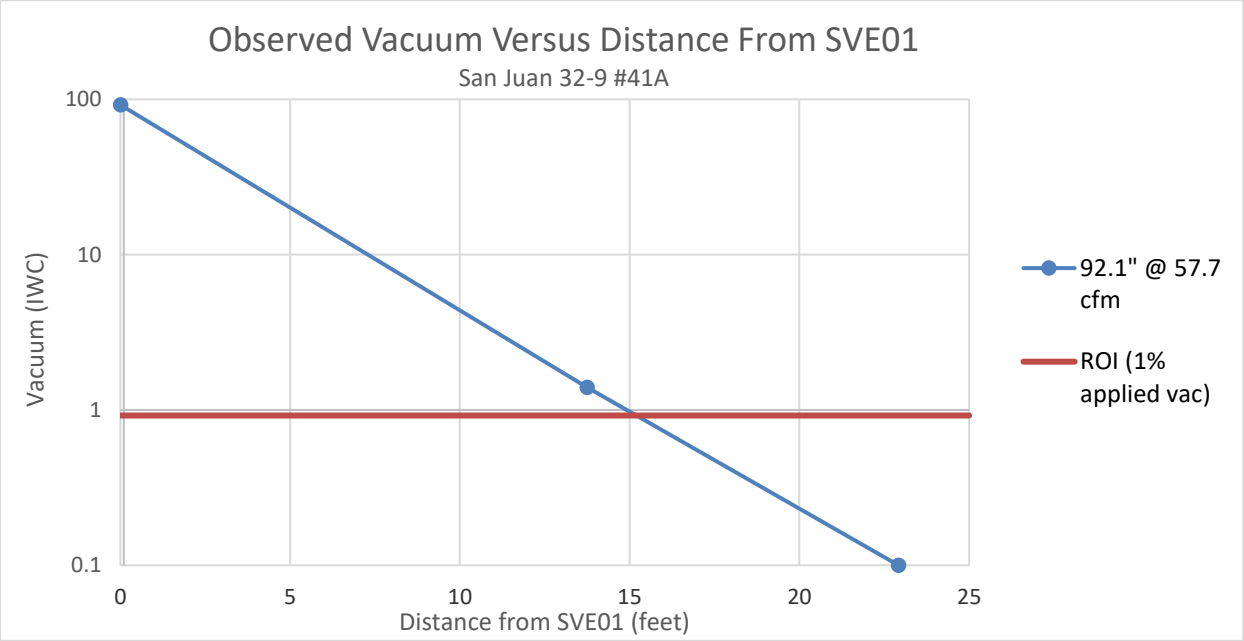
During SVE pilot testing activities, SVE01, screened from 6 feet to 16 feet bgs in fine- to coarse-grained sand, was used as the extraction well. A vacuum truck was used to apply a negative pressure to the well and an adjustable manifold was used to control the vacuum applied. Vacuum

was gradually increased to determine the minimum vacuum necessary to achieve an effective ROI. Flow, vacuum, and field headspace results at the extraction well were recorded at approximately 10- to 20-minute intervals throughout the test. Wells SVE02 and SVE03 (both screened from 7 to 17 feet bgs) were used as observation wells during testing. Vacuum influence was recorded at the observation wells at the same 10- to 20-minute intervals and headspace results were recorded using the PID at approximately 15- to 30-minute intervals. The following list summarizes the procedure of the SVE pilot test:

- Measured the distances from the extraction well to each observation well.
- Collected background measurements for volatile organic compounds (VOCs) using a PID at the SVE extraction and observation wells.
- Connected a flexible hose from the vacuum truck to the pilot test manifold, which was attached to the extraction well. Slowly opened the valve to increase flow and vacuum.
- Applied a low vacuum at approximately 3.7 inches of water column (IWC), then increased the vacuum/flow rate until influence was observed at the observation wells.
- Increased the vacuum/flow incrementally based on response observed. Tested vacuums between 3.7 IWC and 16 inches of mercury (inHg).
- Measured the vacuum at the observation wells and recorded measurements approximately 10 to 20 minutes apart.
- Measured the headspace at the observation wells and recorded measurements approximately 15 to 30 minutes apart.
- Collected one air sample from SVE01 in a 1-Liter Tedlar® bag using a high-vacuum air sampler and submitted the sample for laboratory analysis.

SVE Pilot Test Results and Conclusions

The vacuum responses observed during the pilot test are shown below for extraction well SVE01 and observation wells SVE02 and SVE03. Observation wells were spaced at different distances from the SVE test well (SVE01) in order to estimate the ROI based on varying vacuum response at varying distances. Vacuum influence was observed at both observation wells as shown on the graph below.



As shown in the graph above, 1% of the applied vacuum was observed at a distance of approximately 15 feet when 92.1 IWC was applied to the test well; therefore, an ROI of at least 15 feet can be assumed. Based on the observed vacuum at SVE03 when a vacuum of 10 to 16 inHg is applied to the test well, a larger ROI can be achieved at the Site. However, a decrease in observed vacuum was noted at SVE02 after the applied vacuum was increased above 92.1 IWC, indicating that "short circuiting" through preferential pathways (i.e., pipeline corridors with loosely consolidated backfill) are occurring when the greater vacuum is applied.

The ROE was also calculated using the pilot test data, and calculations are included in Appendix D. The ROE was determined by calculating the annual pore volume exchange assuming an ROI of 15 feet at a flow rate of approximately 34 standard cubic feet per minute (scfm) to match the measured flow rate from the extraction well when 92.1 IWC vacuum was applied. The calculated pore volume indicates an annual pore volume exchange of 6,320, exceeding the literature values of at least 500 pore volume exchanges annually. Additionally, the pore velocity was calculated at the ROI of 15 feet for a flow rate of approximately 34 scfm to verify that the ROE corresponds with the observed ROI. The pore velocity was calculated to be 130 feet per day (ft/day), which exceeds the recommended velocity of 3 ft/day (DiGiulo and Ravi 1999).

Based on the data collected during pilot testing, Ensolum recommends installing a blower capable of producing approximately 110 scfm at Site elevation and 90 IWC. At the elevation corrected flow rate and three wells each operating at 34 scfm (for a combined system flow rate of approximately 100 scfm), the system can achieve an ROE of 15 feet, 6,320 annual pore volume exchanges, and a velocity of 130 ft/day. If an increase in individual well flow rate is observed after initial SVE system startup, the system will be designed so that SVE wells can be cycled to operate two at a time and induce the required vacuum. Pilot test calculations and additional information are presented in Appendix D.

During the pilot test, Ensolum collected an air sample from the pilot test manifold, via high vacuum air sampler. The air sample was collected in a 1-Liter Tedlar® bag and submitted to Hall for analysis of BTEX by EPA Method 8260 and TPH-GRO by EPA Method 8015. TPH-GRO was detected at a concentration of 9,300 micrograms per liter (µg/L) from well SVE01, indicating that SVE is capable of removing petroleum hydrocarbons from the subsurface. Table 2 presents a summary of analytical data collected during the pilot test, with the full analytical laboratory report included in Appendix A.

SVE SYSTEM INSTALLATION, STARTUP, AND OPERATIONS

SVE is a viable technology to remediate subsurface impacts at the Site. Based on the calculations presented above, the SVE system should be sized to apply a minimum of 90 IWC vacuum and a flow rate of approximately 175 inlet cubic feet per minute (icfm) or 100 scfm. The system will be initially constructed to induce flow and vacuum on all SVE wells concurrently. However, an adjustable manifold will be constructed for the system allowing the wells to be cycled, if necessary.

Operations and Maintenance Plan

Regular operation and maintenance (O&M) visits will be conducted at the Site to ensure that the system is operating properly and assess for any required maintenance. Specifically, Hilcorp and/or Ensolum personnel will check that the SVE system is operating within normal working temperature, pressure, and vacuum range. System runtime will be recorded during each visit and vapor concentrations will be periodically measured with a PID from a sampling port located on the inlet side of the vacuum blower and prior to the dilution valve. Vacuum, temperature, and flow measurements will also be recorded. Any deviations from normal operating parameters will be recorded and corrected by on-site personnel, if possible. The SVE system will also be connected to Hilcorp's telemetry network so that Hilcorp personnel will be notified immediately of any system

downtime via email. Immediate notification will allow for quick response to maximize system runtime.

Additional SVE Well Evaluation

Based on an estimated ROI of 15 feet (shown on Figure 3), one additional SVE well may be required to address the lateral impacts identified during the delineation activities. During SVE system operation, it is anticipated that an increase in observed vacuum and ROI will occur as the pore space dries out over time and possible condensation and runoff within that pore space is removed. Ensolum recommends installing the SVE system, using the existing three SVE wells that are currently in place, and monitoring system performance over time to identify whether the velocity and flow rate from the extraction wells increase, indicating a corresponding increase in ROI. Performance data from the SVE system will be used to determine if additional SVE wells will be required in the future.

Future Runtime Calculations and Proposed Remediation Timeline

The SVE system will be tied into grid power to allow the system to operate for 24 hours per day. Based on 24 hours of available runtime, the system will have to operate a minimum of 7,884 hours per year to maintain a 90 percent (%). A runtime meter will be installed on the SVE system in a location accessible to the NMOCD and will be used to track runtime hours. Downtime outside of Hilcorp's control (i.e., equipment failure) will be accounted for and the total available annual runtime hours will be adjusted. This information will be detailed and submitted to the NMOCD in quarterly Site reports.

The United States Army Corps of Engineers, *Soil Vapor Extraction and Bioventing – Engineer Manual,* dated June 3, 2002 states "Unless target cleanup goals are low or initial concentrations are very high, 1,000 to 1,500 pore volumes would be a good estimate of the required air exchanges". Assuming the permanent SVE system is able to achieve the anticipated flow and vacuum presented above, the system should be able to achieve 1,500 pore volume exchanges in approximately 3 months if 100% operational runtime is achieved. However, it is anticipated that the length of operation will be increased due to the following:

- Unknown factors associated with the potential for short circuiting through preferential pathways, as observed at SVE02 during pilot testing;
- The possible need for the installation of an additional SVE well after initial operational data can be collected and evaluated; and
- The potential for zone cycling between different SVE wells, if flow rates increase over time.

Based on the above precluding factors and experience with other similar SVE systems, it is estimated that the system will operate at the Site for approximately 12 to 18 months. Additionally, if TPH-GRO concentrations collected from the system become asymptotic before the estimated closure date, the system will be adjusted in attempts to maximize performance and increase mass removal.

Once the system is operational, quarterly reports will be prepared and submitted to the NMOCD to present air sample results, mass removal calculations, and any system adjustments required during the previous quarter of operation. Based on the above assumptions, the following general timeline is anticipated for the operation of the system. Day zero (0) is the date which NMOCD approvals this report and work plan.

- Months 0 to 6 – Acquire/construct and install the SVE system per the specifications outlined in this report. Additionally, a permanent power drop is not located at the Site and will need to be installed prior to system hookup. Hilcorp will work with the local electrical utility in order to install the appropriate power drop.
- 6 Months to 1.0 Years – Collect regular air samples from the SVE system at a location upstream of the blower and any dilution valves. Assess system efficacy and update the remediation timeline based on sampling analytical results after 6 to 12 months of operation. Perform system maintenance and optimize system operation, as necessary. Continue O&M visits to monitor system performance and prepare quarterly reports.
- 1.0 Years to 2.0 Years – At any point, if air concentrations of TPH-GRO collected from the system become asymptotic and/or are below 1.0 milligrams per liter (mg/L), soil samples can be collected and analyzed for TPH and BTEX constituents to determine if concentrations are below NMOCD Table I Closure Criteria (as described below). Additionally, the system will be adjusted to maximize performance and address areas with remaining soil impacts. Continue air sample collection, monitoring, and reporting as necessary.
- Year 2.0 – Collect soil confirmation samples and analyze for TPH and BTEX constituents as described below. Request site closure if soil sample results are below NMOCD Table I Closure Criteria. If soil concentrations are above Closure Criteria, the remediation timeline will be reviewed and the system will be adjusted to maximize performance and address areas with remaining soil impacts. Continue quarterly air sample collection, monitoring, and reporting as necessary.

Confirmation Soil Sampling and Closure Request

Based on soil sampling results collected during Site activities, three soil borings will be advanced at the Site in the vicinity of borings BH01, BH03, and BH07 in order to collect confirmation soil samples and confirm that the SVE system was successful in remediating petroleum hydrocarbon impacts. These three soil borings will be advanced to depths of 20 feet bgs, with soil samples collected at 5-foot intervals for analysis of TPH and BTEX. If all concentrations are below the NMOCD Table I Closure Criteria, Hilcorp will request from the NMOCD that no further action is required for the Site and closure of Incident Number nAPP2108949980.

REFERENCES

DiGiulio, D., Ravi, V., & Brusseau, M., 1999. Evaluation of mass flux to and from ground water using a vertical flux model (VFLUX): application to the soil vacuum extraction closure problem. Ground water monitoring & remediation, 19, 96-104. doi: 10.1111/j.1745-6592.1999.tb00210.x

United States Army Corps of Engineers (USACE), 2002. Engineering and Design, Soil Vapor Extraction and Bioventing - Engineer Manual, Document EM 1110-1-4001. June 3, 2002.

We appreciate the opportunity to provide this report to the NMOCD. If you should have any questions or comments regarding this document, please contact the undersigned.

Sincerely,

Ensolum, LLC

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hmishriki@ensolum.com

Ashley Ager, MS, PG
Principal, Geologist
(970) 946-1093
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Attachments:

Figure 1:	Site Location Map
Figure 2:	Soil Sample Analytical Results
Figure 3:	SVE System Radius of Influence and Radius of Effect
Table 1:	Delineation Soil Sample Analytical Results
Table 2:	Pilot Test Emissions Air Analytical Results
Appendix A:	Laboratory Analytical Report
Appendix B:	Field Boring Logs
Appendix C:	NMOCD Notifications
Appendix D:	Pilot Test Data and Calculations

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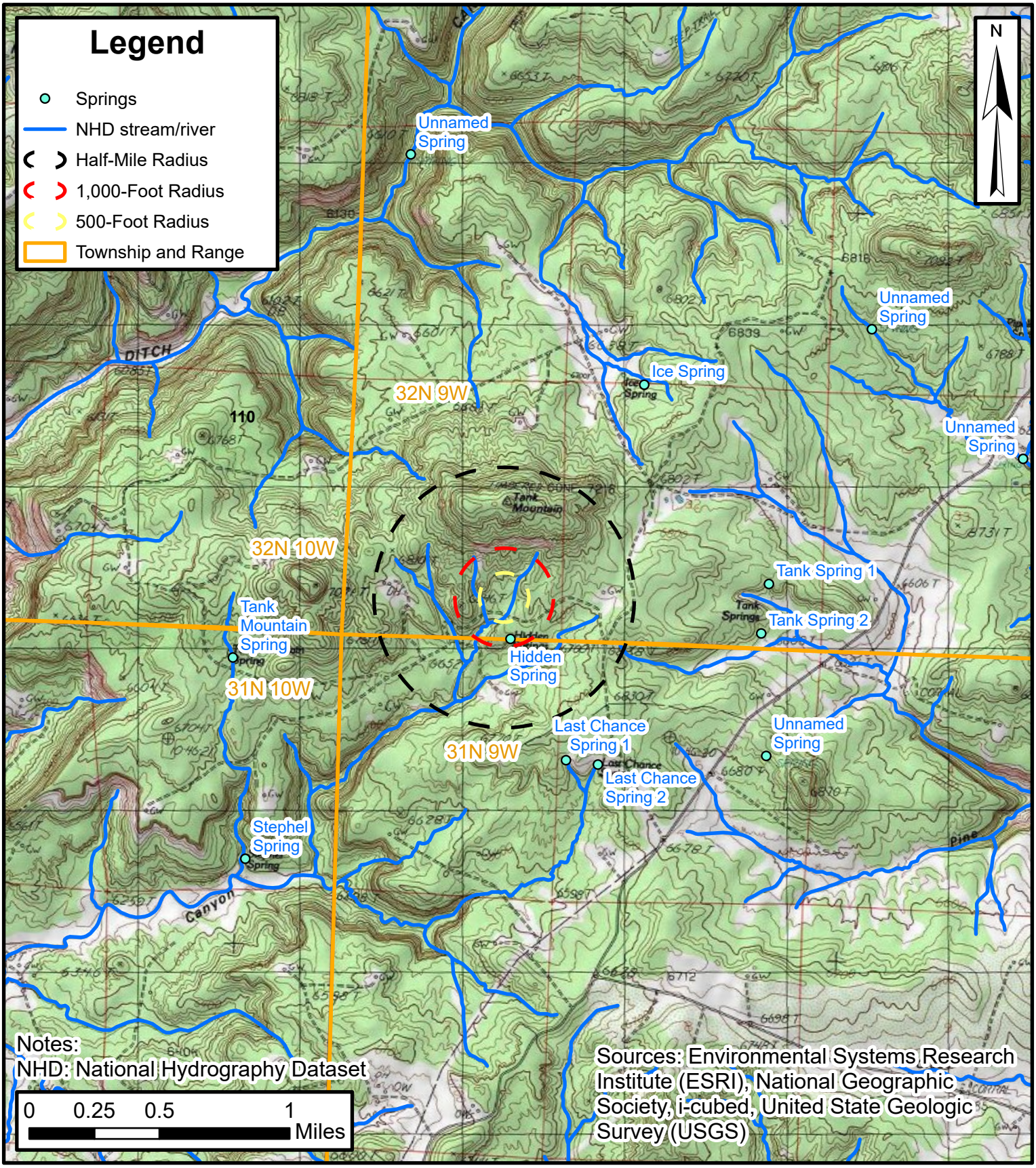
FIGURES



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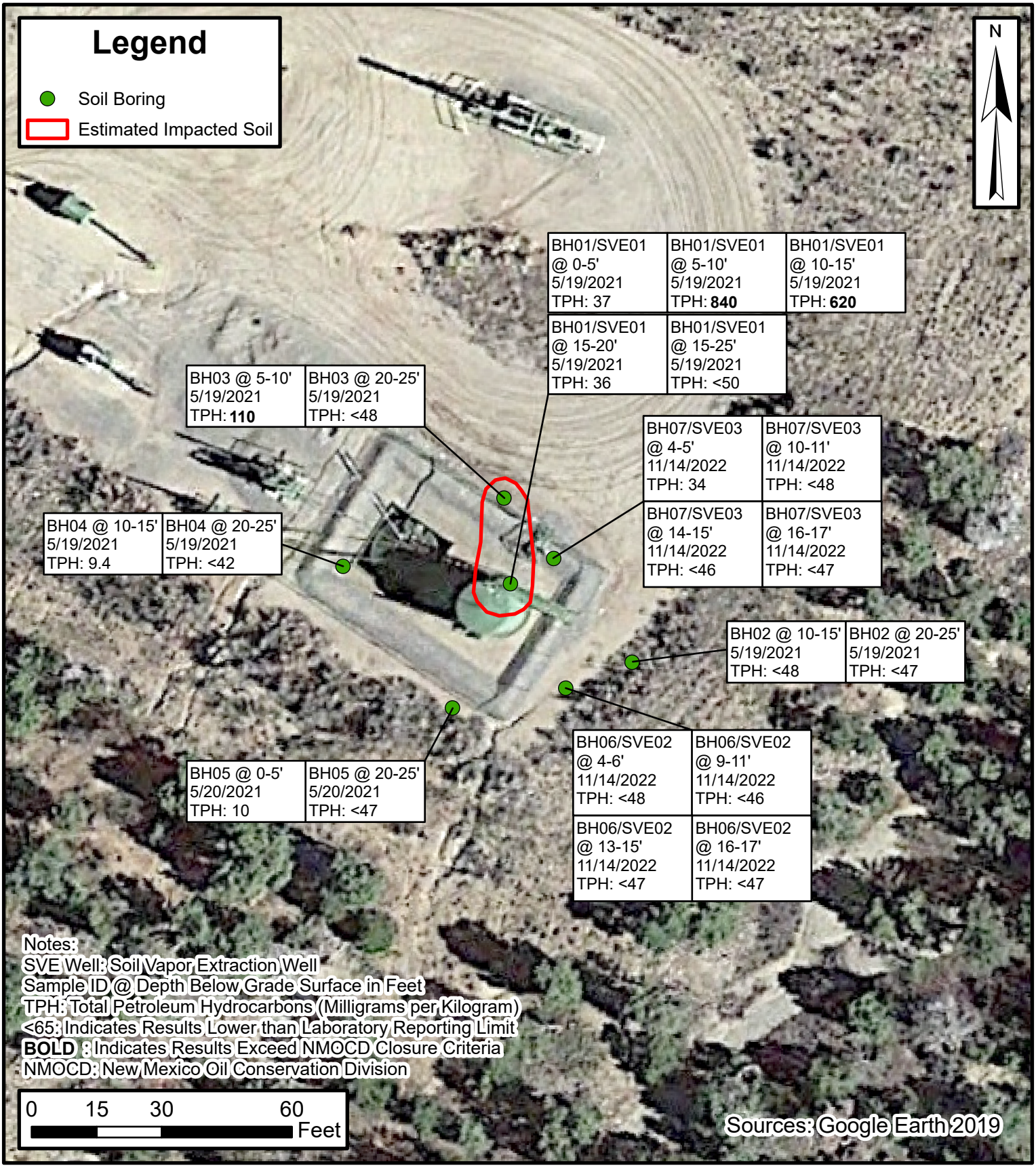
Environmental, Engineering and Hydrogeologic Consultants

Site Location Map

San Juan 32-9 #41A
Hilcorp Energy Company
San Juan County, New Mexico

FIGURE
1



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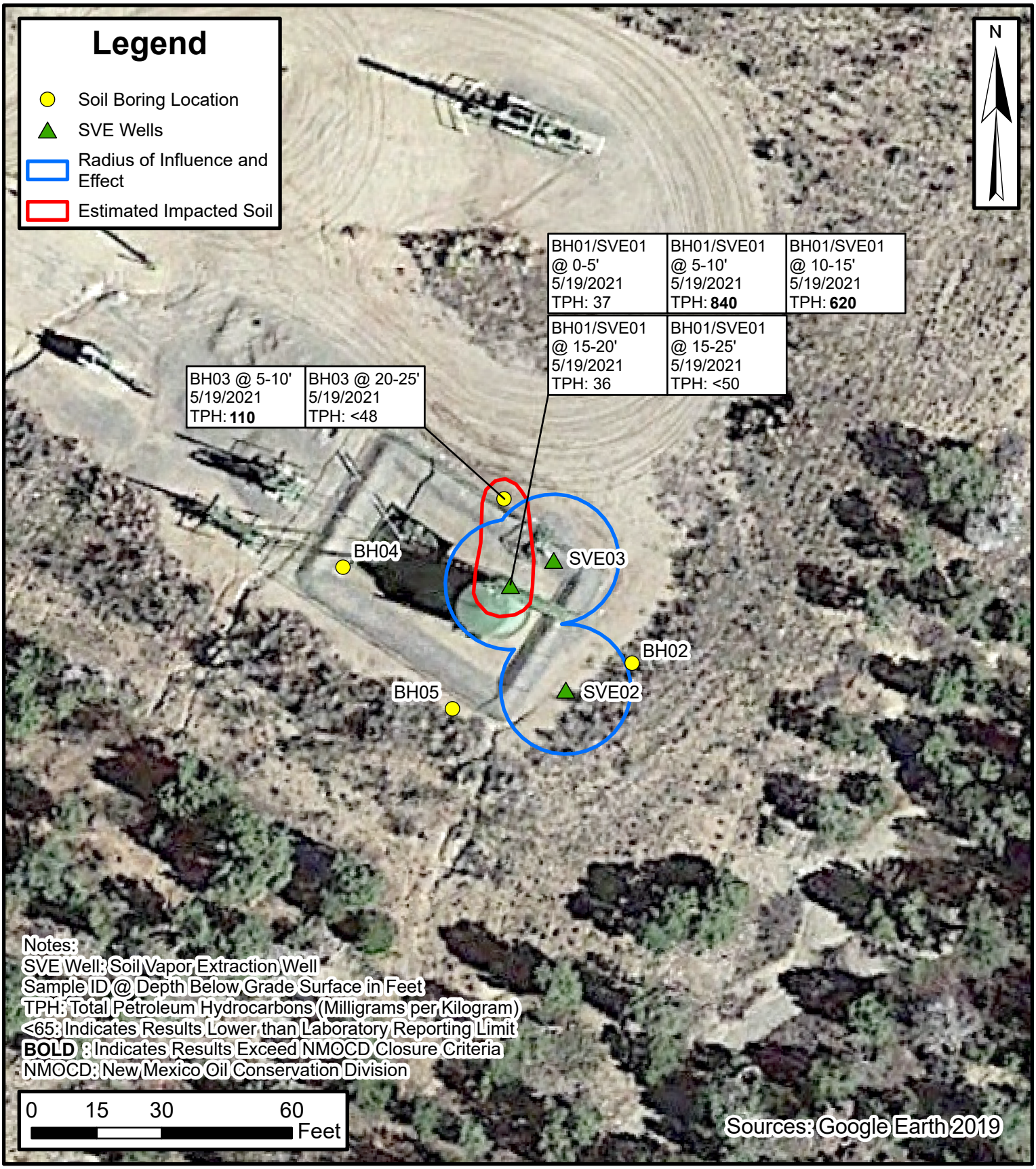
Environmental, Engineering and Hydrogeologic Consultants

Soil Sample Analytical Results

San Juan 32-9 #41A
Hilcorp Energy Company
San Juan County, New Mexico

FIGURE
2



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Environmental, Engineering and Hydrogeologic Consultants

SVE System Radius of Influence and Radius of Effect

San Juan 32-9 #41A
Hilcorp Energy Company
San Juan County, New Mexico

FIGURE
3

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TABLES

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TABLE 1
DELINEATION SOIL SAMPLE ANALYTICAL RESULTS
San Juan 32-9 #41A
Hilcorp Energy Company
San Juan County, New Mexico

Sample Designation	Date	Depth (feet)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	Total BTEX (mg/kg)	TPH GRO (mg/kg)	TPH DRO (mg/kg)	TPH MRO (mg/kg)	Total TPH (mg/kg)	Chloride (mg/kg)
NMOCD Closure Criteria for Soils Impacted by a Release (Groundwater <50 feet)			**10**	NE	NE	NE	**50**	NE	NE	NE	**100**	**600**
BH01 @ 0'-5'	5/19/2021	0 - 5	0.048	0.34	0.11	2.0	2.5	25	12	<46	37	<61
BH01 @ 5'-10'	5/19/2021	5 - 10	0.31	7.7	2.7	38	48.7	490	240	110	**840**	<60
BH01 @ 10'-15'	5/19/2021	10 - 15	<0.12	<0.24	<0.24	<0.48	<1.08	200	420	<45	**620**	<60
BH01 @ 15'-20'	5/19/2021	15 - 20	<0.024	<0.049	<0.049	<0.098	<0.220	15	21	<47	36	<60
BH01 @ 20'-25'	5/19/2021	20 - 25	<0.024	<0.047	<0.047	<0.095	<0.213	<4.7	<10	<50	<50	<60
BH02 @ 10'-15'	5/19/2021	10 - 15	<0.023	<0.047	<0.047	<0.094	<0.211	<4.7	<9.5	<48	<48	<60
BH02 @ 20'-25'	5/19/2021	20 - 25	<0.024	<0.049	<0.049	<0.098	<0.220	<4.9	<9.4	<47	<47	<60
BH03 @ 5'-10'	5/19/2021	5 - 10	<0.024	<0.047	<0.047	<0.094	<0.212	<4.7	110	<49	**110**	<60
BH03 @ 20'-25'	5/19/2021	20 - 25	<0.023	<0.047	<0.047	<0.094	<0.211	<4.7	<9.6	<48	<48	<60
BH04 @ 10'-15'	5/19/2021	10- 15	<0.024	<0.048	<0.048	<0.096	<0.216	<4.8	9.4	<46	9.4	<59
BH04 @ 20'-25'	5/19/2021	20 - 25	<0.024	<0.049	<0.049	<0.098	<0.220	<4.9	<8.4	<42	<42	<60
BH05 @ 0'-5'	5/20/2021	0 - 5	<0.023	<0.047	<0.047	<0.093	<0.210	<4.7	10	<48	10	140
BH05 @ 20'-25'	5/20/2021	20 - 25	<0.025	<0.049	<0.049	<0.099	<0.222	<4.9	<9.5	<47	<47	<60
BH06 @ 4'-6'	11/14/2022	4 - 6	<0.025	<0.050	<0.050	<0.10	<0.225	<5.0	<14	<48	<48	<60
BH06 @ 9'-11'	11/14/2022	9 - 11	<0.025	<0.050	<0.050	<0.099	<0.224	<5.0	<14	<46	<46	<60
BH06 @ 13'-15'	11/14/2022	13 - 15	<0.024	<0.048	<0.048	<0.097	<0.217	<4.8	<14	<47	<47	<60
BH06 @ 16'-17'	11/14/2022	16 - 17	<0.024	<0.047	<0.047	<0.095	<0.213	<4.7	<14	<47	<47	<60
BH07 @ 4'-5'	11/14/2022	4 - 5	<0.025	<0.050	<0.050	0.15	0.15	<5.0	34	<50	34	<60
BH07 @ 10'-11'	11/14/2022	10 - 11	<0.025	<0.050	<0.050	<0.10	<0.225	<5.0	<14	<48	<48	<60
BH07 @ 14'-15'	11/14/2022	14 - 15	<0.025	<0.049	<0.049	<0.099	<0.222	<4.9	<14	<46	<46	<60
BH07 @ 16'-17'	11/14/2022	16 - 17	<0.025	<0.049	<0.049	<0.098	<0.221	<4.9	<14	<47	<47	<60

Notes:

bgs: below ground surface
BTEX: Benzene, Toluene, Ethylbenzene, and Xylenes
mg/kg: milligrams per kilogram
NA: Not Analyzed
NE: Not Established
NMOCD: New Mexico Oil Conservation Division
': feet

GRO: Gasoline Range Organics
DRO: Diesel Range Organics
MRO: Motor Oil/Lube Oil Range Organics
TPH: Total Petroleum Hydrocarbon
<0.037: indicates result less than the stated laboratory reporting limit (RL)
*Concentrations in **bold** and shaded exceed the New Mexico Oil Conservation Division Table 1 Closure Criteria for Soils Impacted by a Release*

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TABLE 1
PILOT TEST EMISSIONS AIR ANALYTICAL RESULTS
San Juan 32-9 #41A
Hilcorp Energy Company
San Juan County, New Mexico

Date	Event	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	TPVP/GRO (µg/L)	Inlet PID (ppm)
11/30/2022	Pilot Test	<1.0	1.2	<1.0	3.3	9,300	3,042

Notes:

GRO: gasoline range hydrocarbons

µg/L: microgram per liter

PID: photoionization detector

ppm: parts per million

TVPH: total volatile petroleum hydrocarbons

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

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APPENDIX A

Laboratory 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: www.hallenvironmental.com

November 28, 2022

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

RE: SJ 32 9 41A OrderNo.: 2211809

Dear Stuart Hyde:

Hall Environmental Analysis Laboratory received 8 sample(s) on 11/15/2022 for the analyses presented in the following report.

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

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

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

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report
Lab Order **2211809**
Date Reported: **11/28/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: BH06 @ 4-6
Project: SJ 32 9 41A
Collection Date: 11/14/2022 12:20:00 PM
Lab ID: 2211809-001 **Matrix:** SOIL **Received Date:** 11/15/2022 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **DGH**
Diesel Range Organics (DRO)	ND	14		mg/Kg	1	11/18/2022 8:02:56 PM
Motor Oil Range Organics (MRO)	ND	48		mg/Kg	1	11/18/2022 8:02:56 PM
Surr: DNOP	110	21-129		%Rec	1	11/18/2022 8:02:56 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	5.0		mg/Kg	1	11/19/2022 11:46:38 AM
Surr: BFB	90.3	37.7-212		%Rec	1	11/19/2022 11:46:38 AM
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**
Benzene	ND	0.025		mg/Kg	1	11/19/2022 11:46:38 AM
Toluene	ND	0.050		mg/Kg	1	11/19/2022 11:46:38 AM
Ethylbenzene	ND	0.050		mg/Kg	1	11/19/2022 11:46:38 AM
Xylenes, Total	ND	0.10		mg/Kg	1	11/19/2022 11:46:38 AM
Surr: 4-Bromofluorobenzene	95.4	70-130		%Rec	1	11/19/2022 11:46:38 AM
EPA METHOD 300.0: ANIONS						Analyst: **JTT**
Chloride	ND	60		mg/Kg	20	11/21/2022 9:02:24 PM

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

Qualifiers:

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

Analytical Report
Lab Order **2211809**
Date Reported: **11/28/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: BH06 @ 9-11
Project: SJ 32 9 41A
Collection Date: 11/14/2022 12:30:00 PM
Lab ID: 2211809-002 **Matrix:** SOIL **Received Date:** 11/15/2022 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **DGH**
Diesel Range Organics (DRO)	ND	14		mg/Kg	1	11/18/2022 8:13:16 PM
Motor Oil Range Organics (MRO)	ND	46		mg/Kg	1	11/18/2022 8:13:16 PM
Surr: DNOP	138	21-129	S	%Rec	1	11/18/2022 8:13:16 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	5.0		mg/Kg	1	11/19/2022 12:10:35 PM
Surr: BFB	91.0	37.7-212		%Rec	1	11/19/2022 12:10:35 PM
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**
Benzene	ND	0.025		mg/Kg	1	11/19/2022 12:10:35 PM
Toluene	ND	0.050		mg/Kg	1	11/19/2022 12:10:35 PM
Ethylbenzene	ND	0.050		mg/Kg	1	11/19/2022 12:10:35 PM
Xylenes, Total	ND	0.099		mg/Kg	1	11/19/2022 12:10:35 PM
Surr: 4-Bromofluorobenzene	95.4	70-130		%Rec	1	11/19/2022 12:10:35 PM
EPA METHOD 300.0: ANIONS						Analyst: **JTT**
Chloride	ND	60		mg/Kg	20	11/21/2022 9:14:44 PM

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

Qualifiers:

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

Analytical Report
Lab Order **2211809**
Date Reported: **11/28/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: BH06 @ 13-15
Project: SJ 32 9 41A
Collection Date: 11/14/2022 12:35:00 PM
Lab ID: 2211809-003 **Matrix:** SOIL **Received Date:** 11/15/2022 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **DGH**
Diesel Range Organics (DRO)	ND	14		mg/Kg	1	11/18/2022 8:23:38 PM
Motor Oil Range Organics (MRO)	ND	47		mg/Kg	1	11/18/2022 8:23:38 PM
Surr: DNOP	127	21-129		%Rec	1	11/18/2022 8:23:38 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	4.8		mg/Kg	1	11/19/2022 12:34:15 PM
Surr: BFB	89.5	37.7-212		%Rec	1	11/19/2022 12:34:15 PM
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**
Benzene	ND	0.024		mg/Kg	1	11/19/2022 12:34:15 PM
Toluene	ND	0.048		mg/Kg	1	11/19/2022 12:34:15 PM
Ethylbenzene	ND	0.048		mg/Kg	1	11/19/2022 12:34:15 PM
Xylenes, Total	ND	0.097		mg/Kg	1	11/19/2022 12:34:15 PM
Surr: 4-Bromofluorobenzene	92.6	70-130		%Rec	1	11/19/2022 12:34:15 PM
EPA METHOD 300.0: ANIONS						Analyst: **JTT**
Chloride	ND	60		mg/Kg	20	11/21/2022 9:27:05 PM

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

Qualifiers:

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

Analytical Report
Lab Order **2211809**
Date Reported: **11/28/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: BH06 @ 16-17
Project: SJ 32 9 41A
Collection Date: 11/14/2022 12:40:00 PM
Lab ID: 2211809-004 **Matrix:** SOIL **Received Date:** 11/15/2022 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **DGH**
Diesel Range Organics (DRO)	ND	14		mg/Kg	1	11/18/2022 8:34:02 PM
Motor Oil Range Organics (MRO)	ND	47		mg/Kg	1	11/18/2022 8:34:02 PM
Surr: DNOP	136	21-129	S	%Rec	1	11/18/2022 8:34:02 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	4.7		mg/Kg	1	11/19/2022 12:57:55 PM
Surr: BFB	89.9	37.7-212		%Rec	1	11/19/2022 12:57:55 PM
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**
Benzene	ND	0.024		mg/Kg	1	11/19/2022 12:57:55 PM
Toluene	ND	0.047		mg/Kg	1	11/19/2022 12:57:55 PM
Ethylbenzene	ND	0.047		mg/Kg	1	11/19/2022 12:57:55 PM
Xylenes, Total	ND	0.095		mg/Kg	1	11/19/2022 12:57:55 PM
Surr: 4-Bromofluorobenzene	94.3	70-130		%Rec	1	11/19/2022 12:57:55 PM
EPA METHOD 300.0: ANIONS						Analyst: **JTT**
Chloride	ND	60		mg/Kg	20	11/21/2022 9:39:26 PM

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

Qualifiers:

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

Analytical Report
Lab Order **2211809**
Date Reported: **11/28/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: BH07 @ 4-5
Project: SJ 32 9 41A
Collection Date: 11/14/2022 1:20:00 PM
Lab ID: 2211809-005 **Matrix:** SOIL **Received Date:** 11/15/2022 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **DGH**
Diesel Range Organics (DRO)	34	15		mg/Kg	1	11/18/2022 8:44:28 PM
Motor Oil Range Organics (MRO)	ND	50		mg/Kg	1	11/18/2022 8:44:28 PM
Surr: DNOP	109	21-129		%Rec	1	11/18/2022 8:44:28 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	5.0		mg/Kg	1	11/19/2022 1:21:38 PM
Surr: BFB	106	37.7-212		%Rec	1	11/19/2022 1:21:38 PM
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**
Benzene	ND	0.025		mg/Kg	1	11/19/2022 1:21:38 PM
Toluene	ND	0.050		mg/Kg	1	11/19/2022 1:21:38 PM
Ethylbenzene	ND	0.050		mg/Kg	1	11/19/2022 1:21:38 PM
Xylenes, Total	0.15	0.10		mg/Kg	1	11/19/2022 1:21:38 PM
Surr: 4-Bromofluorobenzene	92.1	70-130		%Rec	1	11/19/2022 1:21:38 PM
EPA METHOD 300.0: ANIONS						Analyst: **JTT**
Chloride	ND	60		mg/Kg	20	11/21/2022 10:16:29 PM

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

Qualifiers:

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

Analytical Report
Lab Order **2211809**
Date Reported: **11/28/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: BH07 @ 10-11
Project: SJ 32 9 41A
Collection Date: 11/14/2022 1:25:00 PM
Lab ID: 2211809-006 **Matrix:** SOIL **Received Date:** 11/15/2022 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **DGH**
Diesel Range Organics (DRO)	ND	14		mg/Kg	1	11/18/2022 8:54:55 PM
Motor Oil Range Organics (MRO)	ND	48		mg/Kg	1	11/18/2022 8:54:55 PM
Surr: DNOP	105	21-129		%Rec	1	11/18/2022 8:54:55 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	5.0		mg/Kg	1	11/19/2022 1:45:26 PM
Surr: BFB	91.9	37.7-212		%Rec	1	11/19/2022 1:45:26 PM
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**
Benzene	ND	0.025		mg/Kg	1	11/19/2022 1:45:26 PM
Toluene	ND	0.050		mg/Kg	1	11/19/2022 1:45:26 PM
Ethylbenzene	ND	0.050		mg/Kg	1	11/19/2022 1:45:26 PM
Xylenes, Total	ND	0.10		mg/Kg	1	11/19/2022 1:45:26 PM
Surr: 4-Bromofluorobenzene	95.6	70-130		%Rec	1	11/19/2022 1:45:26 PM
EPA METHOD 300.0: ANIONS						Analyst: **JTT**
Chloride	ND	60		mg/Kg	20	11/21/2022 10:28:49 PM

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

Qualifiers:

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

Analytical Report
Lab Order **2211809**
Date Reported: **11/28/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: BH07 @ 14-15
Project: SJ 32 9 41A
Collection Date: 11/14/2022 1:30:00 PM
Lab ID: 2211809-007 **Matrix:** SOIL **Received Date:** 11/15/2022 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **DGH**
Diesel Range Organics (DRO)	ND	14		mg/Kg	1	11/18/2022 9:05:23 PM
Motor Oil Range Organics (MRO)	ND	46		mg/Kg	1	11/18/2022 9:05:23 PM
Surr: DNOP	107	21-129		%Rec	1	11/18/2022 9:05:23 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	4.9		mg/Kg	1	11/19/2022 2:09:09 PM
Surr: BFB	94.1	37.7-212		%Rec	1	11/19/2022 2:09:09 PM
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**
Benzene	ND	0.025		mg/Kg	1	11/19/2022 2:09:09 PM
Toluene	ND	0.049		mg/Kg	1	11/19/2022 2:09:09 PM
Ethylbenzene	ND	0.049		mg/Kg	1	11/19/2022 2:09:09 PM
Xylenes, Total	ND	0.099		mg/Kg	1	11/19/2022 2:09:09 PM
Surr: 4-Bromofluorobenzene	96.6	70-130		%Rec	1	11/19/2022 2:09:09 PM
EPA METHOD 300.0: ANIONS						Analyst: **JTT**
Chloride	ND	60		mg/Kg	20	11/21/2022 10:41:10 PM

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

Qualifiers:

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

Analytical Report
Lab Order **2211809**
Date Reported: **11/28/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: BH07 @ 16-17
Project: SJ 32 9 41A
Collection Date: 11/14/2022 1:35:00 PM
Lab ID: 2211809-008 **Matrix:** SOIL **Received Date:** 11/15/2022 7:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **DGH**
Diesel Range Organics (DRO)	ND	14		mg/Kg	1	11/18/2022 9:15:53 PM
Motor Oil Range Organics (MRO)	ND	47		mg/Kg	1	11/18/2022 9:15:53 PM
Surr: DNOP	136	21-129	S	%Rec	1	11/18/2022 9:15:53 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	4.9		mg/Kg	1	11/19/2022 2:32:56 PM
Surr: BFB	91.9	37.7-212		%Rec	1	11/19/2022 2:32:56 PM
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**
Benzene	ND	0.025		mg/Kg	1	11/19/2022 2:32:56 PM
Toluene	ND	0.049		mg/Kg	1	11/19/2022 2:32:56 PM
Ethylbenzene	ND	0.049		mg/Kg	1	11/19/2022 2:32:56 PM
Xylenes, Total	ND	0.098		mg/Kg	1	11/19/2022 2:32:56 PM
Surr: 4-Bromofluorobenzene	95.8	70-130		%Rec	1	11/19/2022 2:32:56 PM
EPA METHOD 300.0: ANIONS						Analyst: **JTT**
Chloride	ND	60		mg/Kg	20	11/21/2022 10:53:31 PM

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

Qualifiers:

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

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2211809**

28-Nov-22

Client: HILCORP ENERGY

Project: SJ 32 9 41A

Sample ID: **MB-71617**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBS**	Batch ID: **71617**	RunNo: **92751**
Prep Date: **11/21/2022**	Analysis Date: **11/21/2022**	SeqNo: **3338146** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	1.5								

Sample ID: **LCS-71617**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSS**	Batch ID: **71617**	RunNo: **92751**
Prep Date: **11/21/2022**	Analysis Date: **11/21/2022**	SeqNo: **3338147** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	14	1.5	15.00	0	90.9	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 standard limits. If undiluted results may be estimated.
B	Analyte detected in the associated Method Blank
E	Above Quantitation Range/Estimated Value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2211809**

28-Nov-22

Client: HILCORP ENERGY

Project: SJ 32 9 41A

Sample ID: **MB-71567**	SampType: **MBLK**	TestCode: **EPA Method 8015M/D: Diesel Range Organics**
Client ID: **PBS**	Batch ID: **71567**	RunNo: **92689**
Prep Date: **11/17/2022**	Analysis Date: **11/18/2022**	SeqNo: **3337335** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	ND	15								
Motor Oil Range Organics (MRO)	ND	50								
Surr: DNOP	16		10.00		161	21	129			S

Sample ID: **LCS-71567**	SampType: **LCS**	TestCode: **EPA Method 8015M/D: Diesel Range Organics**
Client ID: **LCSS**	Batch ID: **71567**	RunNo: **92756**
Prep Date: **11/17/2022**	Analysis Date: **11/21/2022**	SeqNo: **3338365** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	54	15	50.00	0	109	64.4	127			
Surr: DNOP	5.7		5.000		113	21	129			

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 standard limits. If undiluted results may be estimated.
B	Analyte detected in the associated Method Blank
E	Above Quantitation Range/Estimated Value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2211809**

28-Nov-22

Client: HILCORP ENERGY

Project: SJ 32 9 41A

Sample ID: **mb-71556**	SampType: **MBLK**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **PBS**	Batch ID: **71556**	RunNo: **92694**
Prep Date: **11/16/2022**	Analysis Date: **11/19/2022**	SeqNo: **3335455** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	ND	5.0								
Surr: BFB	940		1000		93.6	37.7	212			

Sample ID: **lcs-71556**	SampType: **LCS**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **LCSS**	Batch ID: **71556**	RunNo: **92694**
Prep Date: **11/16/2022**	Analysis Date: **11/19/2022**	SeqNo: **3335456** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	23	5.0	25.00	0	90.4	72.3	137			
Surr: BFB	1800		1000		181	37.7	212			

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 standard limits. If undiluted results may be estimated.
B	Analyte detected in the associated Method Blank
E	Above Quantitation Range/Estimated Value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2211809**

28-Nov-22

Client: HILCORP ENERGY

Project: SJ 32 9 41A

Sample ID: **mb-71556**	SampType: **MBLK**	TestCode: **EPA Method 8021B: Volatiles**
Client ID: **PBS**	Batch ID: **71556**	RunNo: **92694**
Prep Date: **11/16/2022**	Analysis Date: **11/19/2022**	SeqNo: **3335533** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	0.025								
Toluene	ND	0.050								
Ethylbenzene	ND	0.050								
Xylenes, Total	ND	0.10								
Surr: 4-Bromofluorobenzene	0.97		1.000		97.1	70	130			

Sample ID: **LCS-71556**	SampType: **LCS**	TestCode: **EPA Method 8021B: Volatiles**
Client ID: **LCSS**	Batch ID: **71556**	RunNo: **92694**
Prep Date: **11/16/2022**	Analysis Date: **11/19/2022**	SeqNo: **3335534** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	0.94	0.025	1.000	0	93.8	80	120			
Toluene	0.96	0.050	1.000	0	96.5	80	120			
Ethylbenzene	0.96	0.050	1.000	0	96.2	80	120			
Xylenes, Total	2.9	0.10	3.000	0	96.7	80	120			
Surr: 4-Bromofluorobenzene	0.95		1.000		95.2	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 standard limits. If undiluted results may be estimated.
B	Analyte detected in the associated Method Blank
E	Above Quantitation Range/Estimated Value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Sample Log-In Check List

Client Name: HILCORP ENERGY Work Order Number: 2211809 RcptNo: 1

Received By: Juan Rojas 11/15/2022 7:30:00 AM

Completed By: Sean Livingston 11/15/2022 9:02:17 AM

Reviewed By: JR 11/15/22

Chain of Custody

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

Log In

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

# of preserved bottles checked for pH: _____ (<2 or >12 unless noted)

Adjusted? _____

Checked by: KPG 11.15.22

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

16. Additional remarks:

17. Cooler Information

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

Chain-of-Custody Record

Client: Hilcorp Energy Company
Mitch Killough

Mailing Address:

Phone #:

email or Fax#: mkillough@hilcorp.com

QA/QC Package:
☐ Standard ☐ Level 4 (Full Validation)

Accreditation: ☐ Az Compliance
☐ NELAC ☐ Other
☐ EDD (Type)

Turn-Around Time:
5 day
☒ Standard ☐ Rush

Project Name:
SJ 32-9 41A

Project #:

Project Manager:
Stuart Hyde - Ensolum

Sampler: E. Carroll (Ensolum)
On Ice: ☐ Yes ☐ No
# of Coolers: 1
Cooler Temp(Including CF): 0.6-0=0.6 (°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. 2211804	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)
11-14	1220	Soil	BH06 @ 4-6	1 4oz	Cool	001	X	X					X			
	1230		BH06 @ 9-11			002										
	1235		BH06 @ 13-15			003										
	1240		BH06 @ 16-17			004										
	1320		BH07 @ 4-5			005										
	1325		BH07 @ 10-11			006										
	1330		BH07 @ 14-15			007										
	1335		BH07 @ 16-17			008										

Date:	Time:	Relinquished by:	Received by:	Via:	Date	Time
11-14	15:00	Ecarroll				
11/14/22	1825				11/15/22	7:30

Remarks:
CC: shyde@ensolum.com
ecarroll@ensolum.com

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: www.hallenvironmental.com

December 29, 2022

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

RE: SJ 32 9 41A OrderNo.: 2212725

Dear Stuart Hyde:

Hall Environmental Analysis Laboratory received 1 sample(s) on 12/13/2022 for the analyses presented in the following report.

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

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

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

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report
Lab Order **2212725**
Date Reported: **12/29/2022**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY
Client Sample ID: SVE01 Pilot
Project: SJ 32 9 41A
Collection Date: 12/8/2022 4:00:00 PM
Lab ID: 2212725-001 **Matrix:** AIR
Received Date: 12/13/2022 7:50:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8260B: VOLATILES SHORT LIST						Analyst: **RAA**
Benzene	ND	1.0		µg/L	10	12/22/2022 5:45:33 PM
Toluene	1.2	1.0		µg/L	10	12/22/2022 5:45:33 PM
Ethylbenzene	ND	1.0		µg/L	10	12/22/2022 5:45:33 PM
Xylenes, Total	3.3	1.5		µg/L	10	12/22/2022 5:45:33 PM
Surr: 1,2-Dichloroethane-d4	100	70-130		%Rec	10	12/22/2022 5:45:33 PM
Surr: 4-Bromofluorobenzene	114	70-130		%Rec	10	12/22/2022 5:45:33 PM
Surr: Dibromofluoromethane	73.7	70-130		%Rec	10	12/22/2022 5:45:33 PM
Surr: Toluene-d8	114	70-130		%Rec	10	12/22/2022 5:45:33 PM
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	9300	250		µg/L	50	12/22/2022 6:39:48 PM
Surr: BFB	105	70-130		%Rec	50	12/22/2022 6:39:48 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 standard limits. If undiluted results may be estimated.
B	Analyte detected in the associated Method Blank
E	Above Quantitation Range/Estimated Value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2212725**

29-Dec-22

Client: HILCORP ENERGY

Project: SJ 32 9 41A

Sample ID: **2212725-001adup**	SampType: **DUP**	TestCode: **EPA Method 8260B: Volatiles Short List**
Client ID: **SVE01 Pilot**	Batch ID: **SLA93530**	RunNo: **93530**
Prep Date:	Analysis Date: **12/22/2022**	SeqNo: **3374140** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0						0	20	
Toluene	1.2	1.0						2.33	20	
Ethylbenzene	ND	1.0						0	20	
Xylenes, Total	3.2	1.5						3.84	20	
Surr: 1,2-Dichloroethane-d4	11		10.00		106	70	130	0	0	
Surr: 4-Bromofluorobenzene	12		10.00		121	70	130	0	0	
Surr: Dibromofluoromethane	8.0		10.00		79.5	70	130	0	0	
Surr: Toluene-d8	12		10.00		120	70	130	0	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 standard limits. If undiluted results may be estimated.
B	Analyte detected in the associated Method Blank
E	Above Quantitation Range/Estimated Value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2212725**

29-Dec-22

Client: HILCORP ENERGY

Project: SJ 32 9 41A

Sample ID: **2212725-001adup**	SampType: **DUP**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **SVE01 Pilot**	Batch ID: **GA93530**	RunNo: **93530**
Prep Date:	Analysis Date: **12/22/2022**	SeqNo: **3374119** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	11000	50						12.9	20	E
Surr: BFB	12000		10000		119	70	130	0	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 standard limits. If undiluted results may be estimated.
B	Analyte detected in the associated Method Blank
E	Above Quantitation Range/Estimated Value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Sample Log-In Check List

Client Name: HILCORP ENERGY Work Order Number: 2212725 RcptNo: 1

Received By: Cheyenne Cason 12/13/2022 7:50:00 AM

Completed By: Isaiah Ortiz 12/13/2022 8:40:33 AM

Reviewed By: 12-13-22

Chain of Custody

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

Log In

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

# of preserved bottles checked for pH: _____ (<2 or >12 unless noted)

Adjusted? _____

Checked by: KPG 12-13-22

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

16. Additional remarks:

17. **Cooler Information**

Chain-of-Custody Record

Client: Hilcorp

Mailing Address: Mitch Killough

Phone #:

email or Fax#: mKillough@hilcorp.com

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

Accreditation: ☐ Az Compliance

☐ NELAC ☐ Other

☐ EDD (Type)

Turn-Around Time:

☒ Standard ☐ Rush

Project Name: SJ 32-9 41A

Project #:

Project Manager: Stuart Hyde - Ensolum

Sampler: E. Carroll

On Ice: ☐ Yes ☒ No

# of Coolers: 1

Cooler Temp (Including CF): NA (°C)

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. 2212725	Analysis Request: 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)
12-8	16:00	Air	SVE01 Pilot	Tedlar		001	X	X								

Date:	Time:	Relinquished by:	Received by:	Via:	Date	Time
12/12/22	1501				12/12/22	1501
12/14/22	744			Courier	12/13/22	0750

Remarks: cc: ecarroll@ensolum.com

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.

ENSOLUM

APPENDIX B

Field Boring Logs

ENSOLUM

SOIL BORING/MONITORING WELL LOG: BH06/SVE02

This log for field use only

PROJECT NUMBER	DRILLING DATE 11/14/22	WELL DIAMETER 2"
PROJECT NAME SJ 32-9 #41R	DRILLER Enviro drill	TOTAL DEPTH 17'
CLIENT Hilcorp	LATITUDE	CASING 10'
LOCATION Aztec, NM	LONGITUDE	SCREEN 10'
PROJECT MANAGER S. Hyde	TOC Elevation	SURFACE COMPLETION

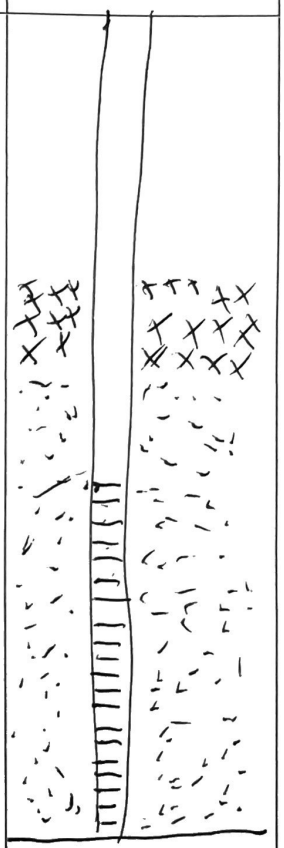
COMMENTS *State drilling technology used, outside auger diameter, sampler type, and sampler diameter.* CME 75 HSA, Split spoon, Auger 8 1/2" OD, spoon 4" OD

LOGGED BY E. Carroll

CHECKED BY

PID	Samples	% Recovery	Water	Depth (ft)	Graphic Log	Material Description *State lithology, color, plasticity (fine grain soils only), moisture, density, and odor.*
0.6	4-6 ~~0-5~~ 12:20	20%		2 4	SP	Dark brown, moist, coarse Sand, little silt
0.0	9-11 12:30	100		6 8 10	SP	light, yellow brown, moist, compact med-fine Sand, little silt
0.0	13-15 ~~14-16~~ 12:35	100		12 14 16	SP	SAA
0.0	16-17 12:46	100		18 20 22 24	SP	SAA

Well Completion
Sand Interval: 17-5
Bentonite Interval: 5-3
Grout Interval: 3-0



produced by ESlog.ESdat.net on 26 Sep 2022

ENSOLUM

SOIL BORING/MONITORING WELL LOG: BH07 / SVE03

This log for field use only

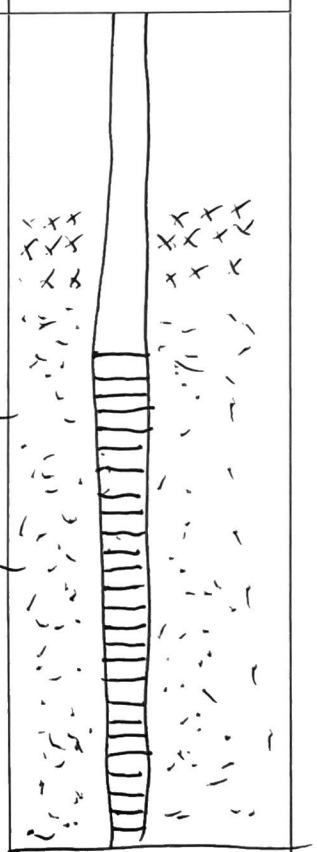
PROJECT NUMBER	DRILLING DATE 11-14-22	WELL DIAMETER 2"
PROJECT NAME SJ 32-9 41A	DRILLER Enviro Drill	TOTAL DEPTH 17'
CLIENT HEC	LATITUDE	CASING 10'
LOCATION Aztec, NM	LONGITUDE	SCREEN 10'
PROJECT MANAGER S. Hyde	TOC Elevation	SURFACE COMPLETION

COMMENTS *State drilling technology used, outside auger diameter, sampler type, and sampler diameter.*

LOGGED BY E. Carroll
CHECKED BY

PID	Samples	% Recovery	Water	Depth (ft)	Graphic Log	Material Description *State lithology, color, plasticity (fine grain soils only), moisture, density, and odor.*
					SC	very moist dark brown, clayey sand
7.9	2-3	100%		2		
14.2	4-5 13:20	100%		4		moist yellow brown med sand
9.6	6-7	100		6		
				8		moist gray brown, coarse sand
4.1	10-11 13:25	100		10		
6.1	12-13			12		moist yellow brown, med. sand compact little silt
6.9	14-15 13:30			14		
				16		SAA
0.1	16-17 13:35			18		
				20		
				22		
				24		

Well Completion
Sand Interval: 17-5
Bentonite Interval: 5-3
Grout Interval: 3-0



produced by ESlog.ESdat.net on 26 Sep 2022

ENSOLUM

APPENDIX C

NMOCD Notifications

From: Velez, Nelson, EMNRD
To: Stuart Hyde; Adeloye, Abiodun A
Cc: Mitch Killough; Devin Hencmann
Subject: RE: [EXTERNAL] nAPP2108949980 - San Juan 32-9 #41A Drilling and Sampling Notification
Date: Wednesday, November 9, 2022 9:40:32 AM
Attachments: image006.png
image007.png
image008.png
image009.png

[**EXTERNAL EMAIL**]

Stuart,

Thank you for the notice.

If an OCD representative is not on-site on the date &/or time given, please sample per 19.15.29 NMAC. For whatever reason, if the sampling timeframe is altered, please notify the OCD as soon as possible so we may adjust our schedule(s). Failure to notify the OCD of this change may result in the closure sample(s) not being accepted.

Please keep a copy of this communication for inclusion within the appropriate report submittal.

The OCD requires a copy of all correspondence relative to remedial activities be included in all proposals and/or final closure reports. Correspondence required to be included in reports may include, but not limited to, notifications for liner inspections, sample events, spill/release/fire, and request for time extensions or variances.

Regards

Nelson Velez ● Environmental Specialist - Adv
Environmental Bureau | EMNRD - Oil Conservation Division
1000 Rio Brazos Road | Aztec, NM 87410
(505) 469-6146 | nelson.velez@emnrd.nm.gov *NOTE NEW EMAIL ADDRESS*
http://www.emnrd.state.nm.us/OCD/

From: Stuart Hyde <shyde@ensolum.com>
Sent: Wednesday, November 9, 2022 9:29 AM
To: Velez, Nelson, EMNRD <Nelson.Velez@emnrd.nm.gov>; Adeloye, Abiodun A <aadeloye@blm.gov>
Cc: Mitch Killough <mkillough@hilcorp.com>; Devin Hencmann <dhencmann@ensolum.com>
Subject: [EXTERNAL] nAPP2108949980 - San Juan 32-9 #41A Drilling and Sampling Notification

CAUTION: This email originated outside of our organization. Exercise caution prior to clicking on links or opening attachments.

On behalf of Hilcorp Energy Company, Ensolum is submitting this notification of sampling at the San Juan 32-9 #41A site located in San Juan County, NM at coordinates 36.9363251, -107.8159561. Drilling and sampling work will commence on Monday November 14, 2022 at 10:30 AM. Please call or email with any questions. Thanks.

Stuart Hyde, LG
Senior Geologist
970-903-1607
Ensolum, LLC

ENSOLUM

APPENDIX D

Pilot Test Data and Calculations

SOIL VAPOR EXTRACTION SYSTEM PILOT TEST DATA

SAN JUAN 32-9 #41A
SAN JUAN COUNTY, NEW MEXICO
HILCORP ENERGY COMPANY

Date : 11/30/2022 Test Well Diameter: 2"

Extraction Test Well

SVE01/BH01

Pilot Test Extraction Well							Observation Wells		Observation Wells	
Time	Wellhead Vacuum (in. wc)	Well Velocity (fpm)	Vapor Temp* (F)	Well Flow** (acfm)	Well Flow (scfm)	PID at Stack (ppm)	**SVE02** Distance From Test Well (feet) **22.92**	**SVE03** Distance From Test Well (feet) **13.75**	**SVE02** Distance From Test Well (feet) **22.92**	**SVE03** Distance From Test Well (feet) **13.75**
							Vacuum (in. wc)		PID Measurement (ppm)	
10:20	---	---	--	--	--	234	0.0	0.0	3.8	24.7
10:42	3.7	36	72.5	0.4	0	557	0.0	0.2	--	--
10:50	15.0	1,600	72.5	19.6	15	832	0.1	0.3	--	--
10:55	20.3	2,200	72.5	27.0	21	901	0.2	0.4	0.0	8.9
11:05	42.9	3,500	72.5	43.0	33	1222	0.2	0.7	--	--
11:15	61	4,000	72.5	49.1	33	1467	0.2	1.0	0.0	3.2
11:24	77.3	4,300	72.5	52.8	33	2173	0.2	1.1	--	--
11:32	92.1	4,700	72.5	57.7	34	2634	0.1	1.4	0.0	0.0
11:40	136	OVR	72.5	N/A	N/A	2966	0.0	2.0	--	--
11:46	190.4	OVR	72.5	N/A	N/A	3030	0.0	2.9	--	--
11:57	217.6	OVR	72.5	N/A	N/A	3042	0.0	3.4	0.0	0.0

Notes:

ND - not detected
in. wc - inches of water column
ppm - parts per million
PID - photoionization detector
fpm - feet per minute
acfm - actual cubic feet per minute
NM - not measured
OVR - over the maximum limit of the anemometer

ENSOLUM
Environmental, Engineering and Hydrogeologic Consultants

RADIUS OF EFFECT CALCULATIONS - SVE01

SAN JUAN 32-9 #41A
SAN JUAN COUNTY, NEW MEXICO
HILCORP ENERGY COMPANY

Site Specific Information		
Test Well	SVE01	
SVE Screen Length (H)	10	ft
Soil Type	sand	
Porosity (n)	40%	percent
Test Specific Information		
Radius of Influence (ROI)	15	feet - 1.4 IWC and 0.1 IWC observed in at a distance of 13.75 feet
Flow Rate (1)	34	SCFM
Wellhead Vacuum (1)	92.1	IWC
Calculations (Flowrate - 12.1 SCFM)		
Total Volume (ft^3)	7,069	= PI * ROI * ROI * H
Volume Pore Space (ft^3)	2,827	= Total Volume * n
Pore Volume Exchange Rate	0.06	days
Annual Pore Volume Exchanges	6,320	>500 Required
Velocity at ROI (ft/min)	0.090	= Flowrate/(2*PI * ROI * H * n)
Velocity at ROI (ft/day)	130	> 3 ft/day recommended

Conclusions

A conservative ROI and ROE can be at least 15 feet for a flowrate of 44.4 scfm. The radius of effect (ROE) was evaluated using annual pore volume exchange rate and subsurface air velocity. Acceptable annual pore volume exchanges >500 and acceptable pore space velocity.

Notes:
ft - feet
ROI - radius of influence
IWC - inches water column
min - minute
s - second
SCFM - standard cubic feet per minute

ENSOLUM
Environmental, Engineering and Hydrogeologic Consultants

State of New Mexico
Energy, Minerals and Natural Resources Department

Mitch Killough - Environmental Specialist
Hilcorp Energy Company
1111 Travis Street
Houston, TX 77002

RE: Conditional Approval of Soil Vapor Extraction (SVE) Remediation Method for San Juan 32 9 Unit 041A; (API #: 30-045-29129; Incident #: NAPP2108949980; Application ID: 172460)

Mr. Killough,

The Oil Conservation Division (OCD) has reviewed and approved the subject work plan with the following conditions;

1. Hilcorp's SVE system must be designed to have a minimum of 90% operational runtime, 24/7, start to finish.
2. On-site analog or digital runtime counter must be installed and viewable to OCD personnel. Any alternative method must be explained and pre-approved by OCD.
3. The following field data measurement parameters will be required and reported (prior to reaching vacuum pump);
    a. Total Extracted Flow Rate via a Flow Meter
    b. Flow Rates from each vapor extraction point/well (VEP)
    c. Volatile Organic Compound (VOC) Concentrations for each VEP and/or VEP cluster being implemented via Handheld Gas Analyzer (e.g. – Photo Ionization Detector (PID)
    d. Record vacuum pressure at each VEP and/or VEP cluster being implemented
    e. Oxygen (O_2) and carbon di-oxide (CO_2) levels via hand-held analyzers from each VEP and/or VEP cluster being implemented, prior to reaching vacuum pump and at discharge orifice or vent stack
4. The following minimum timeline will be required for the above data recordings;
    a. Daily for the first week
    b. Weekly for the next three (3) months
    c. Monthly thereafter for the first calendar year
    d. Then contingent upon the recorded data output
5. Any water condensation will be categorized as oil field waste and must be disposed of accordingly. System modifications to address increased water collection and disposal must be pre-approved by OCD.
6. Extracted vapor sampling (prior to reaching vacuum pump) for laboratory testing will be required as follows;
    a. Approximately 15-30 minutes and approximately 8-10 hours after startup (or at the end of the same day if initial sample collected in early morning), one full round of sampling for constituents noted in b, c, & d below
    b. BTEX per US EPA Method 8021B or 8260B
    c. TPH per US EPA Method 8015M
    d. O_2 and CO_2

RE:Conditional Approval of Soil Vapor Extraction (SVE) Remediation Method for San Juan 32 9 Unit 041A; (API #: 30-045-29129; Incident #: NAPP2108949980; Application ID: 172460)

7. The following timeline will be required for the above laboratory sampling elements;
    a. Weekly - next three (3) weeks (first month)
    b. Bi-weekly (twice a month) – next two (2) months (first quarter)
    c. Bi-Monthly (every other month) - next nine (9) months (first year)
    d. Quarterly – Year #2 until diminishing returns has been consistently documented
8. Hilcorp must submit to OCD quarterly reports for the first 2 years of operation, then bi-annual thereafter, detailing the following;
    a. Summary of remediation activity
    b. Chart of O_2 & CO_2 levels over time
    c. SVE runtime
    d. SVE mass removal
    e. Product recovery, if applicable
    f. Laboratory air sample analysis, if applicable
9. Hilcorp must notify OCD of its initial system startup which is required within 90 days of this approval. If this cannot be achieved, Hilcorp must verify the delay within its request for a time extension.
10. Hilcorp must submit to OCD a closure plan prior to initiating confirmation sampling for final remediation termination.

These conditions by the OCD does not relieve Hilcorp of responsibility for compliance with any federal, state, or local law.

If you have any questions, please contact Nelson Velez of the Environmental Incident Group at (505) 469-6146 or by email at nelson.velez@emnrd.nm.gov.

Respectfully,

Mike Bratcher
Incident Group Supervisor
(575) 626-0857

Nelson Velez
Environmental Specialist – Adv

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

COMMENTS

Action 172460

COMMENTS

Operator: HILCORP ENERGY COMPANY 1111 Travis Street Houston, TX 77002	OGRID: 372171
	Action Number: 172460
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

COMMENTS

Created By	Comment	Comment Date
csmith	App ID 172460 Returned to OCD Review due to errors in the Condition of approval letter.	3/28/2023

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CONDITIONS

Action 172460

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Operator: HILCORP ENERGY COMPANY 1111 Travis Street Houston, TX 77002	OGRID: 372171
	Action Number: 172460
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

CONDITIONS

Created By	Condition	Condition Date
nvelez	See SVE condition of approval letter at the end of report.	3/22/2023
nvelez	App ID 172460 Returned to OCD Review due to typo errors within the Condition of approval letter.	3/29/2023