NV

October 6, 2021

Ms. Emily Hernandez
Bureau Chief, Environmental
New Mexico Oil Conservation Division
New Mexico Energy, Minerals, and Natural Resources Department
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

**Subject:** **Update Report and Updated Remediation Workplan**
**Hilcorp Energy Company**
**Scott 4M**
**API # 30-045-34887**
**Incident # NCE2003650476**
**San Juan County, New Mexico**

To Whom It May Concern:

WSP USA Inc. (WSP), on behalf of Hilcorp Lower 48 (Hilcorp), presents this *Update Report and Updated Remediation Work Plan* associated with subsurface impacts encountered at the Scott 4M (Site), incident number NCE2003650476. Site characterization, release description and background, and initial response and assessment activities were included in the previously submitted *Remediation Work Plan* submitted by WSP on May 29, 2020, (PO Number O547T-200501-C-1410). Hilcorp was issued a notice of violation (NOV) on September 1, 2021 for failing to meet the operational and reporting requirements conditioned by the NMOCD. The NOV requires submittal of any delinquent reports (to be submitted under separate cover), an update on site remediation, a plan for bringing the Site into compliance, and an updated remediation work plan. This report provides the update on existing site conditions, a plan to bring the existing remediation system into compliance, and an updated remediation work plan that is compliant with 19.15.29.11 and 19.15.29.12 of the New Mexico Administrative Code (NMAC).

## SITE DESCRIPTION

The Site is located approximately 1.0 mile east of Highway 550 and 0.35 miles north of County Road 2651 in Unit P of Section 17 of Township 31 North, Range 10 West, San Juan County, New Mexico (Figure 1). On January 15, 2020, approximately 42 barrels (bbls) of condensate were released from an aboveground storage tank due to internal corrosion. Upon discovery, Hilcorp removed fluids from the tank and inspected the tank. No fluids were recovered; however the release remained within secondary containment on location. Hilcorp notified the New Mexico Oil Conservation Division (NMOCD) of the release by email on January 15, 2020. Hilcorp submitted an initial C-141 to the NMOCD on January 27, 2020. The NMOCD assigned incident number NCE2003650476 to the release.

## BACKGROUND

On May 29, 2020, Hilcorp submitted a *Remediation Work Plan* to the NMOCD proposing the use of soil vapor extraction (SVE) for remediation of hydrocarbon impacted soils. Site characterization was conducted and the following NMOCD Closure Criteria apply at the Site: 100 milligrams per kilogram (mg/kg) total petroleum hydrocarbons (TPH), 10 mg/kg benzene, 50 mg/kg total for the sum of benzene, toluene, ethylbenzene, and total xylenes (BTEX), and 600 mg/kg chloride. On September 16, 2020, the NMOCD approved the *Remediation Work Plan* and provided the following conditions:

- *Hilcorp must install a full time SVE system if after one year if the site has not shown improvement.*

WSP USA
4600 WEST 60TH AVENUE
ARVADA CO 80003

Tel.: 303-433-9788
wsp.com

# UPDATE

Hilcorp installed an SVE system and conducted SVE pilot testing to confirm system design. The following information documented in this section demonstrates compliance with the conditions applied by NMOCD for approval of the *Remediation Work Plan.*

## SYSTEM INSTALLATION

In January of 2021, Hilcorp built and installed a solar powered SVE system at the Site to address the residual hydrocarbon impacted soil surrounding BH01/SVE01. On January 12, 2021, while attempting to initiate the system, it was determined that the solar charge controller was undersized and would need to be upgraded. On February 1, 2021 the upgraded solar charge controller was installed, and the system was operational. Vacuum is applied to five locations through previously installed SVE wells at the Site. The wells are screened across the various impacted depths to allow for recovery of hydrocarbon vapors. Figure 2 presents an as-built of the locations of the SVE wells, SVE skid, and aboveground piping in relation to the residual impacted area.

The SVE wells are connected via aboveground piping to a 1/3 horsepower (HP), AB-91 regenerative blower capable of producing 22 cubic feet per minute (cfm) at 29 inches of water column vacuum. The blower is connected to an adjustable manifold that allows control over which SVE wells are currently active. The blower is powered by four 12-volt deep cycle batteries that are charged throughout the day via three solar panels with a nominal maximum power output of 915 watts. The solar array features a charge controller that optimizes solar array power and battery charging. The charge controller also protects the batteries and will shut down the system if the battery bank discharge has reached its efficient limit to prevent damage and prolong the life of the batteries. The blower runs off a timer that is scheduled to maximize runtime and coincides with the seasonally available solar recharge, typically 10 hours in the winter and 12 hours in the summer for Farmington, New Mexico. All of the solar SVE system components are mounted onto a trailer. A system configuration diagram detailing the components within the SVE system, and a blower specification sheet, including a vacuum performance curve, are included in Enclosure A.

On February 1, 2021 (at the time of system start-up), WSP collected an air sample from the solar SVE system discharge exhaust stack in a Tedlar® bag and submitted to Hall Environmental Analysis Laboratory of Albuquerque, New Mexico for analysis of BTEX via EPA Method 8021 and Total Volatile Petroleum Hydrocarbons (TVPH) via EPA Method 8015. Prior to collection, the air from the stack exhaust was field screened with a PID for organic vapor monitoring (OVM). The initial air sample results indicate a benzene concentration of 85 micrograms per liter (µg/L), toluene concentration of 240 µg/L, ethylbenzene concentrations of 10 µg/L, total xylenes concentration of 64 µg/L, and a TVPH concentration of 18,000 µg/L.

## SVE PILOT TEST

On September 29, 2021, WSP conducted SVE pilot testing activities at the Site. Testing was conducted to evaluate the effectiveness of the remedial technology to achieve site remediation clean up goals by evaluating the flow rate and applied vacuum required to influence the subsurface and cause volatilization of the petroleum hydrocarbons entrained in the soil and to determine specific site design radius of influence (ROI) and radius of effect (ROE). The pilot testing program was designed based on previously observed geologic conditions, surface conditions, current locations of petroleum hydrocarbon impacts, and other site-specific factors. Two SVE tests were performed to test two different depth/geologic profiles – SVE03 (35 feet to 45 feet bgs) and SVE04 (5 feet to 25 feet bgs). The two tests were conducted to evaluate that flow, influence, and effect could be achieved throughout the impacted interval (1 foot to 40 feet bgs).

### *SVE PILOT TEST PROCEDURES*

A vacuum pump on a water hauling truck was used to apply a negative pressure to each of the pilot testing wells through a manifold designed and built by WSP to control the vacuum and measure flow, vacuum, and photo-ionization detector (PID) values at the extraction wells. For the deep test on SVE03, observation wells (SVE01 and SVE02), having screened intervals of 25 feet to 45 feet bgs and 35 feet to 45 feet bgs, were used to collected SVE pilot test monitoring data. For the shallow test on SVE04, observation well SVE05, having a screened interval of 5 feet to 25

feet bgs, was used to collect SVE pilot test monitoring data. The SVE well locations are presented on Figure 2. The following list summarizes the steps involved in the SVE pilot tests:

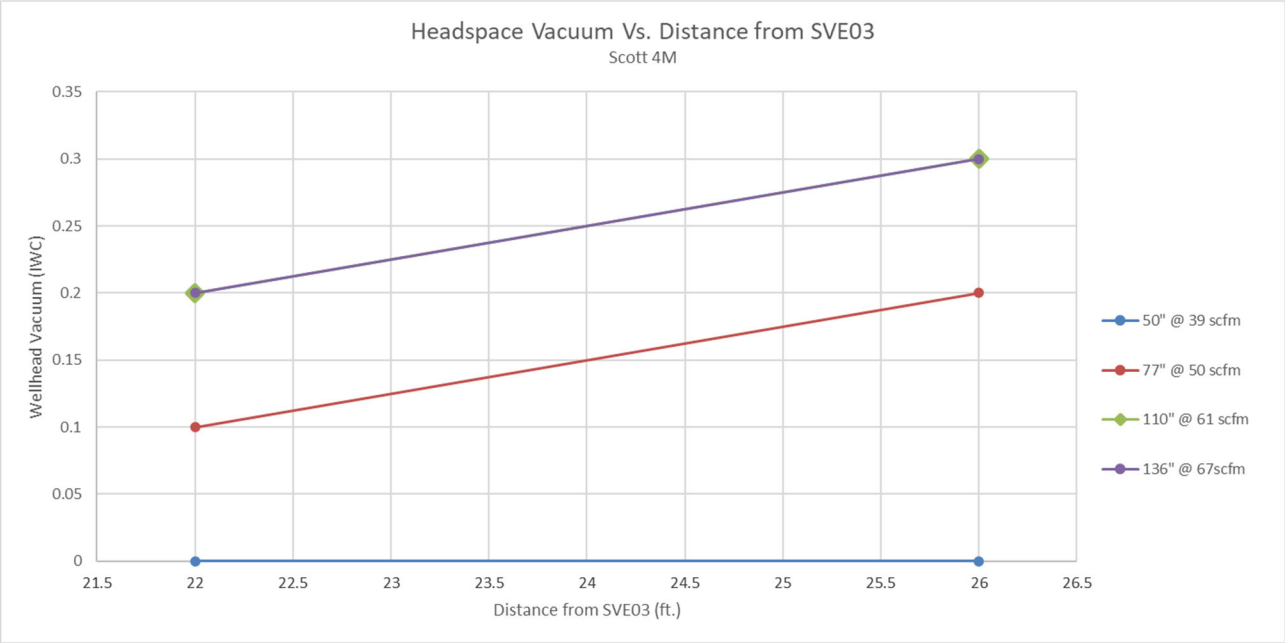
- Measured the distances from the extraction well to each observation well.
- Collected background VOCs measurements using a PID at the SVE and observation wells.
- Connected the water vacuum truck to the extraction well via a flexible hose and manifold. Slowly opened the valve and monitored the vacuum and flow.
- Applied a vacuum ranging from approximately 10 inches of water column (IWC) to 100+ IWC at the designated SVE well for each test.
- Collected at least two rounds of stabilized measurements per vacuum/flow rate. Measured the vacuum and the PID headspace at the observation wells. Collected readings 15 minutes apart.
- Collected an air sample from SVE01 in laboratory-prepared containers and delivered under COC protocol to Hall for analysis of BTEX and TVPH.

The air laboratory analytical reports are provided in Enclosure A and summarized in Table 1. All test forms and graphs are provided as Enclosure B.

## *SVE TEST RESULTS*

### Deep Interval

The vacuum response from the deep pilot test on SVE03 and observations wells SVE01 and SVE02 is shown on the graph below. Observation wells ranged in distance of 22.5 feet to 26 feet from the SVE test well (SVE03). Vacuum influence was observed at all both observation wells as shown on the figure below.




The graph illustrates that no measurable vacuum influence was observed at an applied vacuum of 50 IWC and 39 scfm flow rate. At 77 IWC and 50 scfm, influence was observed in both observation wells. At progressively higher vacuums (110 IWC and 136 IWC), influence was also detected. Based on the vacuum observations, a ROI of 26 feet was observed. An estimated influence of 26 feet is indicated on Figure 3.

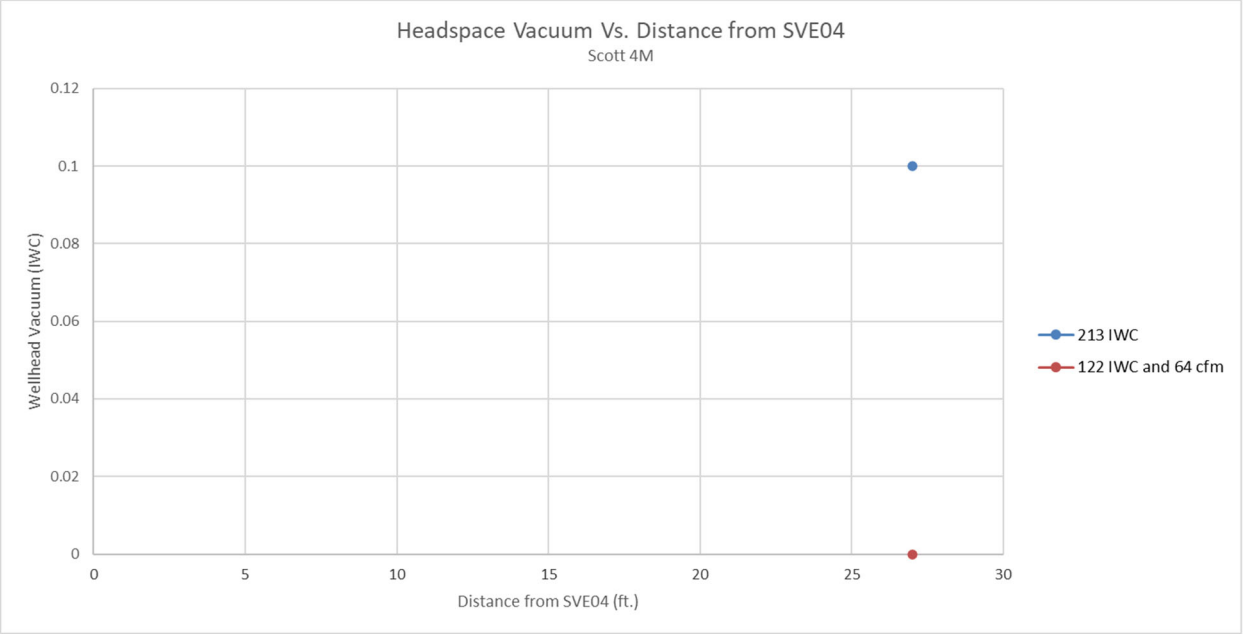
Additional calculations were performed to determine the ROE for the deep test on SVE03. These calculations are included as Enclosure D and are based on the observed influence of 26 feet and support a ROE of 26 feet. To determine a ROE, the annual pore volume exchange was calculated at 26 feet at a flow rate of 50 standard cubic feet per minute (scfm). The pore volume exchange calculated indicated an annual pore volume exchange of 4,647. The pore volume

exchange meets literature values of at least 500 pore volume exchanges annually. To further verify the ROE corresponds with the ROI, the pore velocity was calculated at the ROI of 30 feet. The pore velocity calculated was 191 feet per day (ft/day), which is above a recommended velocity of 3 ft/day. Current SVE research indicates that is desirable to achieve pore-gas velocities throughout the treatment zone in excess of 0.001 cm/sec or ~3 ft/day (DiGiulo and Ravi 1999).

### Shallow Interval

- Observation well SVE05 was 27' away from SVE04 for pilot test. Vacuum not observed in observation well until 230 IWC applied at 30 SCFM in shallow pilot well SVE04.

The graph below illustrates that no measurable vacuum influence was observed at 122 IWC and 64 scfm for the shallow test on SVE04. At 213 IWC, the maximum vacuum capable by the vacuum truck, influence was observed at 27 feet, but the flow rate at this vacuum exceeded the range of the flow meter used to calculate the ROE. Based on this result, a ROI of 27 feet is possible with enough vacuum applied (Figure 4). The ROE for this test calculated using the maximum measured flow indicates at a ROE of 27 feet, the pore volume exchange rate would be 3672 per year and the velocity at 27 feet would be 136 ft/day.




The pilot test results indicate that to influence the deep wells, at a distance of 26 feet, a vacuum blower capable of at least 50 scfm (per SVE well) at 77 IWC would be needed. To treat the shallow impact, additional testing is needed to determine blower size and well layout. Pilot test data, additional graphs, and calculations are included in Enclosure C.

## AIR EMISSIONS AND SAMPLING RESULTS

Another air sample was collected on September 7, 2021 (following six-months of operation). The air sample results indicate a benzene concentration of 40 micrograms per liter (µg/L), toluene concentration of 280 µg/L, ethylbenzene concentrations of 24 µg/L, total xylenes concentration of 240 µg/L, and a TVPH concentration of 15,000 µg/L. Laboratory analytical results from these sampling events are included in Enclosure A and summarized in Table 1.

An air emissions sample was collected September 29, 2021 with flow focused on extracting from SVE01 only. The sample results indicate a benzene concentration of 210 µg/L, toluene concentration of 1,800 µg/L, ethylbenzene

concentrations of 240 µg/L, total xylenes concentration of 2,200 µg/L, and a TVPH concentration of 85,000 µg/L. Laboratory analytical results from these sampling events are included in Enclosure A and summarized in Table 1.

## MASS REMOVAL CALCULATIONS

Estimated air emissions were calculated using air sample data collected to-date (Table 2). The impacted mass source removal via the solar SVE system to-date is an estimated 3,393 pounds (lbs) of TVPH. An estimated 547gallons (13.0 bbls) of air equivalent condensate has been recovered to-date. The recovery of vapors from the impacted soil provides evidence that site conditions have improved during operation of the solar SVE system.

## SVE RUNTIME

Initial run-time was proposed in the Remediation Work Plan and assumed to be 10 hours per day in the winter and 12 hours in the summer. This was an assumed available run time based on ideal weather conditions. Observations of run time over the first approximately 8 months of operation require the available run time to be updated. There were 240 days between startup on February 1, 2021 and the last site visit on September 29, 2021. In that time, there have been 240 days of operation with no maintenance-related downtime. During the 240-day period, the system had a run time of 2,383 hours and an average of 9.8 hours of operation per day. Of the estimated available run time of 2,497 hours since installation, the system has an actual runtime of 2,383 hours, for an overall 95.4 percent (%) run time efficiency. Below is a table showing SVE system runtime in comparison with nominal available daylight hours per month, according to the National Oceanic and Atmospheric Administration's National Weather Service for San Juan County, New Mexico.

| Time Period | Start up on February 1, 2021 to February 28, 2021 | March 1, 2021 to March 31, 2021 | April 1, 2021 to April 30, 2021 | May 1, 2021 to May 31, 2021 | June 1, 2021 to June 30, 2021 | July 1, 2021 to July 31, 2021 | August 1, 2021 to August 31, 2021 | September 1, 2021 to September 29, 2021 |
|---|---|---|---|---|---|---|---|---|
| Days | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 28 |
| Avg. Nominal Daylight Hours | 8 | 9 | 10 | 11 | 12 | 12 | 11 | 10 |
| Available Runtime Hours | 224 | 279 | 300 | 341 | 360 | 372 | 341 | 280 |
| | | | | | | **Total Available Daylight Runtime Hours** | | **2,497** |
| | | | | | | **Actual Runtime Hours** | | **2,383** |
| | | | | | | **Cumulative % Runtime** | | **95.4%** |

Based on a yearly average of 9.8 nominal daytime hours per day at the Site, to maintain a 90% runtime, the system will have to operate a minimum of 3,220 hours per year.

# UPDATED REMEDIATION WORKPLAN

While the original conditions of approval have been met, continued remediation via SVE is necessary until confirmation soil samples meet NMOCD Table 1 Closure Criteria. Pilot test data indicates that SVE is a viable technology to remediate the deeper impacted interval of the subsurface (25 feet to 45 feet bgs). There is vacuum influence in the deeper interval, but an upgrade to a blower capable of 50 cfm per SVE well at 77 IWC should be considered to fully address volatile organic compounds entrained to soil particles at depth.

The pilot test to evaluate SVE application for shallow impacts was inconclusive. This updated remediation workplan proposes additional pilot testing with installation of closer observation wells. Hilcorp will install two shallow observation wells on opposite sides of SVE04 and initiate a second pilot test to fully evaluate design options for remediation of shallow impacts.

The existing solar SVE system is successfully reducing petroleum impact, having removed almost 2 tons of vapor phase petroleum since initiation of operation. Comparing the known extent of impact to the location of SVE-01, an ROI of approximately 16 feet is believed to be adequate to volatilize the known impact. The existing solar unit is influencing at least a portion of this area, but a definitive ROI is not available using existing monitoring locations. If

a required ROI and ROE can be established, placing SVE test wells at this distance from SVE01 and SVE04 will facilitate confirmation of system performance and the potential need to upgrade the SVE blower. The existing blower, if operating on a single well at 10 cfm and an estimated ROI of 16 feet has a calculated pore velocity of 16 ft/day, and annual air exchange of 726 pore volumes assuming the entire 45-foot vertical column is influenced. The theoretical calculation indicates the solar SVE system could be adequate in terms of volume of air exchanged; however, the applied vacuum required to initiate influence during the pilot test indicates a higher vacuum blower may be required, with shallow screened SVE wells in the impacted area.

## OPERATIONS AND MAINTENANCE

While additional pilot testing and upgrades are considered, the existing SVE system will continue to operate. During current and future operations, visits to the Site will be completed monthly by WSP personnel and monthly by Hilcorp so that the SVE system is inspected bi-weekly. This will ensure 90% runtime efficiency continues and that any maintenance issues are addressed. In addition to routine O&M visits, the SVE system will be tied into Hilcorp's telemetry network. If the system experiences downtime, a Hilcorp environmental manager will be notified via email immediately. Immediate notification will allow for quick response to system down time and further help to ensure 90% runtime. An O&M form to be used during semi-monthly visits is attached in Enclosure E. An *Operations and Maintenance Manual* is also attached in Enclosure E, to be used as guidance for performing O&M.

An air sample will be collected quarterly and analyzed for BTEX by EPA Method 8021 and TVPH by EPA Method 8015. Quarterly reports with sample results, runtime, and mass source removal will be submitted each quarter, starting with the 4$^{th}$ quarter of 2021.

Quarterly air sampling and reporting will continue until air concentrations of TVPH collected from the system become asymptotic. At that time, WSP will conduct additional soil sampling to investigate potential residual impacts and request closure if concentrations of BTEX and TPH are below the applicable standards as detailed in the *Remediation Work Plan* dated May 29, 2020. Suggested soil sampling locations are indicated on Figure 5. If samples indicate results above the Table 1 closure criteria, Hilcorp will investigate reconfiguring the SVE system and/or the remediation program.

If the final closure samples indicate hydrocarbon impact has been reduced to below Table 1 Closure Criteria, WSP will present the confirmation laboratory analytical data in a report and request closure of the release. Should the results indicate that analytes in the soil exceed NMOCD Table 1 Closure Criteria, Hilcorp will continue to operate the system and make operational adjustments based on results of the investigation.

## REMEDIATION TIMELINE

The US 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'. An adequate sized system can achieve 1,500 pore volume exchanges after 4 months of operation.

One strategy would be to divide the site up into several zones to reduce the flow requirements of the system, then each zone could be remediated for a 4-month period. With 4 zones the remediation timeframe would be estimated at 16 months. WSP will assess blower size and system configuration to further determine remediation timeframe following additional pilot testing. The SVE system will remain at the Site full time until remediation is complete.

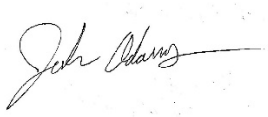
The following timeline is proposed following submittal of this report:

- 4$^{th}$ Quarter 2021: install 2 additional observation wells around SVE04 and two SVE wells at the extent of estimated impact near SVE01 and conduct additional pilot testing. Provide a report of pilot testing results and potential system upgrades to NMOCD by December 15, 2021.
- 1$^{st}$ Quarter 2022: apply any upgrades to system design.

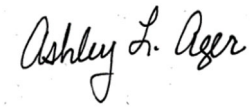
- 4th Quarter 2021 through 4th Quarter 2022: Collect air samples quarterly. Once air concentrations of TVPH collected from the system become asymptotic, soil samples will be collected from the impacted area to collect soil performance samples and assess soil concentrations.
- 4th Quarter 2022: If air concentrations of TVPH have not become asymptotic, collect soil samples for performance monitoring. Evaluate soil samples and make potential SVE system adjustments;
- 1st Quarter 2023: Final site closure

Air emissions data, mass removal calculations, and system runtime will be reported quarterly. The first quarterly report (starting with the fourth quarter of 2021) will be submitted to the NMOCD within 45 days after final laboratory analytical reports are received.

Kind regards,



Josh Adams, P.G.
Associate Consultant, Geologist



Ashley Ager, M.S., P.G.
Assistant Vice President, Geologist

Robert Rebel, P.E.
Technical Principal, Lead Consultant

Figure 1 – Site Location Map
Figure 2 – As-Built Diagram
Figure 3 – Deep Zone Estimate ROI and ROE
Figure 4 – Shallow Zone Estimated ROI
Table 1 – SVE System Laboratory Analytical Results
Table 2 – SVE System Recovery and Air Emissions Summary
Enclosure A – SVE Diagram, Blower Specifications, and Vacuum performance Curves
Enclosure B – Laboratory Analytical Reports
Enclosure C – Pilot Test Forms and Graphs
Enclosure D – ROI and ROE Calculations
Enclosure E – O&M Form

# REFERENCES CITED

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

The US Army Corps of Engineers, *Soil Vapor Extraction and Bioventing – Engineer Manual,* dated June 3, 2002

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 24, 2018
Submit to appropriate OCD District office

| | |
|---|---|
| Incident ID | NCE2003650476 |
| District RP | |
| Facility ID | |
| Application ID | |

# Release Notification

## Responsible Party

| | |
|---|---|
| Responsible Party Hilcorp Energy Company | OGRID 372171 |
| Contact Name Mitch Killough | Contact Telephone 713-757-5247 |
| Contact email mkillough@hilcorp.com | Incident # *(assigned by OCD)* NCE2003650476 |
| Contact mailing address 382 Road 3100, Aztec NM 87410 | |

## Location of Release Source

Latitude 36.8933449 Longitude -108107.8991852

*(NAD 83 in decimal degrees to 5 decimal places)*

| | |
|---|---|
| Site Name Scott 4M | Site Type Gas Well |
| Date Release Discovered 1/15/2020 @ 1:00pm | API# *(if applicable)* 30-045-34887 |

| Unit Letter | Section | Township | Range | County |
|---|---|---|---|---|
| P | 17 | 31N | 10W | San Juan |

Surface Owner: ☐ State ☐ Federal ☐ Tribal ☒ Private (*Name:Marcotte Donna R Trust*)

## Nature and Volume of Release

Material(s) Released (Select all that apply and attach calculations or specific justification for the volumes provided below)

| | | |
|---|---|---|
| ☐ Crude Oil | Volume Released (bbls) | Volume Recovered (bbls) |
| ☐ Produced Water | Volume Released (bbls) | Volume Recovered (bbls) |
| | Is the concentration of dissolved chloride in the produced water >10,000 mg/l? | ☐ Yes ☐ No |
| ☒ Condensate | Volume Released (bbls) 42 | Volume Recovered (bbls)0 |
| ☐ Natural Gas | Volume Released (Mcf) | Volume Recovered (Mcf) |
| ☐ Other (describe) | Volume/Weight Released (provide units) | Volume/Weight Recovered (provide units) |

Cause of Release
A release of ~42 bbls of condensate was released due to internal corrosion on the weld where the side wall and bottom of the tank come together. The operator removed fluids from tank. The tank was pulled and inspected. Release remained on location. 0 bbls were recovered. Environmental will provide OCD 48 hour notice of sampling.

# Site Assessment/Characterization

*This information must be provided to the appropriate district office no later than 90 days after the release discovery date.*

| | |
|---|---|
| What is the shallowest depth to groundwater beneath the area affected by the release? | 51-100 (ft bgs) |
| Did this release impact groundwater or surface water? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)? | ☒ Yes ☐ No |
| Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 1000 feet of any other fresh water well or spring? | ☐ Yes ☒ No |
| Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 300 feet of a wetland? | ☐ Yes ☒ No |
| Are the lateral extents of the release overlying a subsurface mine? | ☐ Yes ☒ No |
| Are the lateral extents of the release overlying an unstable area such as karst geology? | ☐ Yes ☒ No |
| Are the lateral extents of the release within a 100-year floodplain? | ☐ Yes ☒ No |
| Did the release impact areas **not** on an exploration, development, production, or storage site? | ☐ Yes ☒ No |

Attach a comprehensive report (electronic submittals in .pdf format are preferred) demonstrating the lateral and vertical extents of soil contamination associated with the release have been determined. Refer to 19.15.29.11 NMAC for specifics.

**Characterization Report Checklist**: ***Each of the following items must be included in the report.***

☒ Scaled site map showing impacted area, surface features, subsurface features, delineation points, and monitoring wells.
☒ Field data
☒ Data table of soil contaminant concentration data
☒ Depth to water determination
☒ Determination of water sources and significant watercourses within ½-mile of the lateral extents of the release
☒ Boring or excavation logs
☒ Photographs including date and GIS information
☒ Topographic/Aerial maps
☒ Laboratory data including chain of custody

If the site characterization report does not include completed efforts at remediation of the release, the report must include a proposed remediation plan. That plan must include the estimated volume of material to be remediated, the proposed remediation technique, proposed sampling plan and methods, anticipated timelines for beginning and completing the remediation. The closure criteria for a release are contained in Table 1 of 19.15.29.12 NMAC, however, use of the table is modified by site- and release-specific parameters.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: _____Mitch Killough_____ Title: _____Environmental Specialist_____

Signature:_____ _____ Date: __10/6/2021____

email: _____mkillough@hilcorp.com_____ Telephone: ____713-757-5247_____

**OCD Only**

Received by: _____ Date: _____

# Remediation Plan

**Remediation Plan Checklist**: ***Each of the following items must be included in the plan.***

☒ Detailed description of proposed remediation technique
☒ Scaled sitemap with GPS coordinates showing delineation points
☒ Estimated volume of material to be remediated
☒ Closure criteria is to Table 1 specifications subject to 19.15.29.12(C)(4) NMAC
☒ Proposed schedule for remediation (note if remediation plan timeline is more than 90 days OCD approval is required)

**Deferral Requests Only**: ***Each of the following items must be confirmed as part of any request for deferral of remediation.***

☐ Contamination must be in areas immediately under or around production equipment where remediation could cause a major facility deconstruction.

☐ Extents of contamination must be fully delineated.

☐ Contamination does not cause an imminent risk to human health, the environment, or groundwater.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: _____Mitch Killough_____ Title: _____Environmental Specialist_____

Signature: _____ _____ Date: ____10/6/2021___

email: _____mkillough@hilcorp.com_____ Telephone: _____713-757-5247_____

**OCD Only**

Received by: _____ Date: _____

☐ Approved ☐ Approved with Attached Conditions of Approval ☐ Denied ☐ Deferral Approved

Signature: _____ Date: _____

# FIGURES

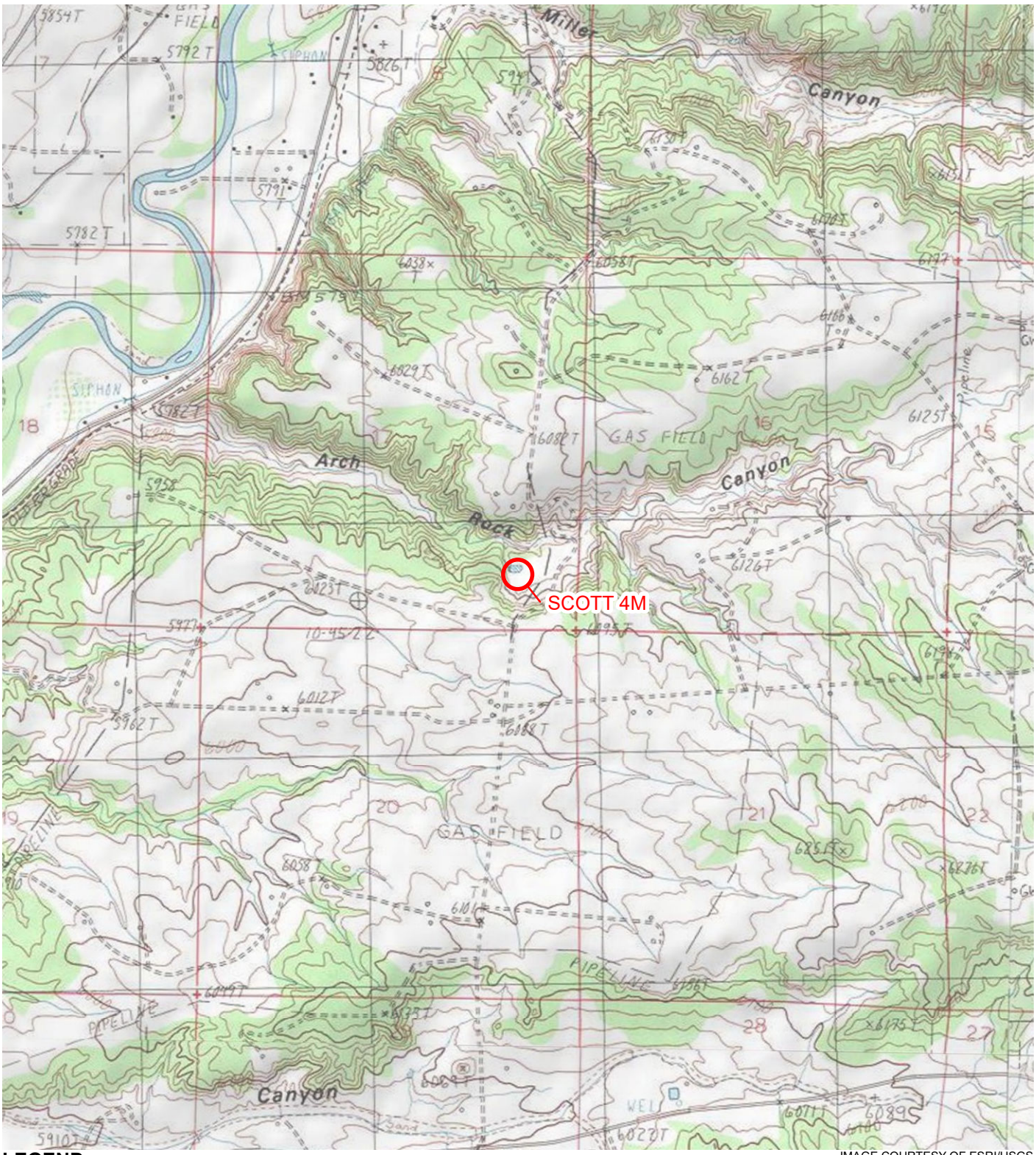



IMAGE COURTESY OF ESRI/USGS

**LEGEND**

SITE LOCATION

0 2,000 4,000

Feet

N

NEW MEXICO

FIGURE 1
SITE LOCATION MAP
SCOTT 4M
UNIT P SEC 17-T31N-R10W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

P:\Hilcorp\GIS\MXD\017820012_SCOTT 4M\017820012_FIG01_SL_2020.mxd


IMAGE COURTESY OF ESRI

**LEGEND**

- RELEASE LOCATION
- SVE WELL
- WELLHEAD
- SVE SURFACE PIPING
- SOLAR SVE SKID

BGS: BELOW GROUND SURFACE
SVE: SOIL VAPOR EXTRACTION

0 40 80
Feet

N

FIGURE 2
AS-BUILT DIAGRAM
SCOTT 4M
SESE SEC 17-T31N-R10W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

C:\Users\USTJ689650\OneDrive - WSP O365\HILCORP\TE017820012_SCOTT 4M\MXD\TE017820012_FIG02_AS_DIAGRAM_2021.mxd

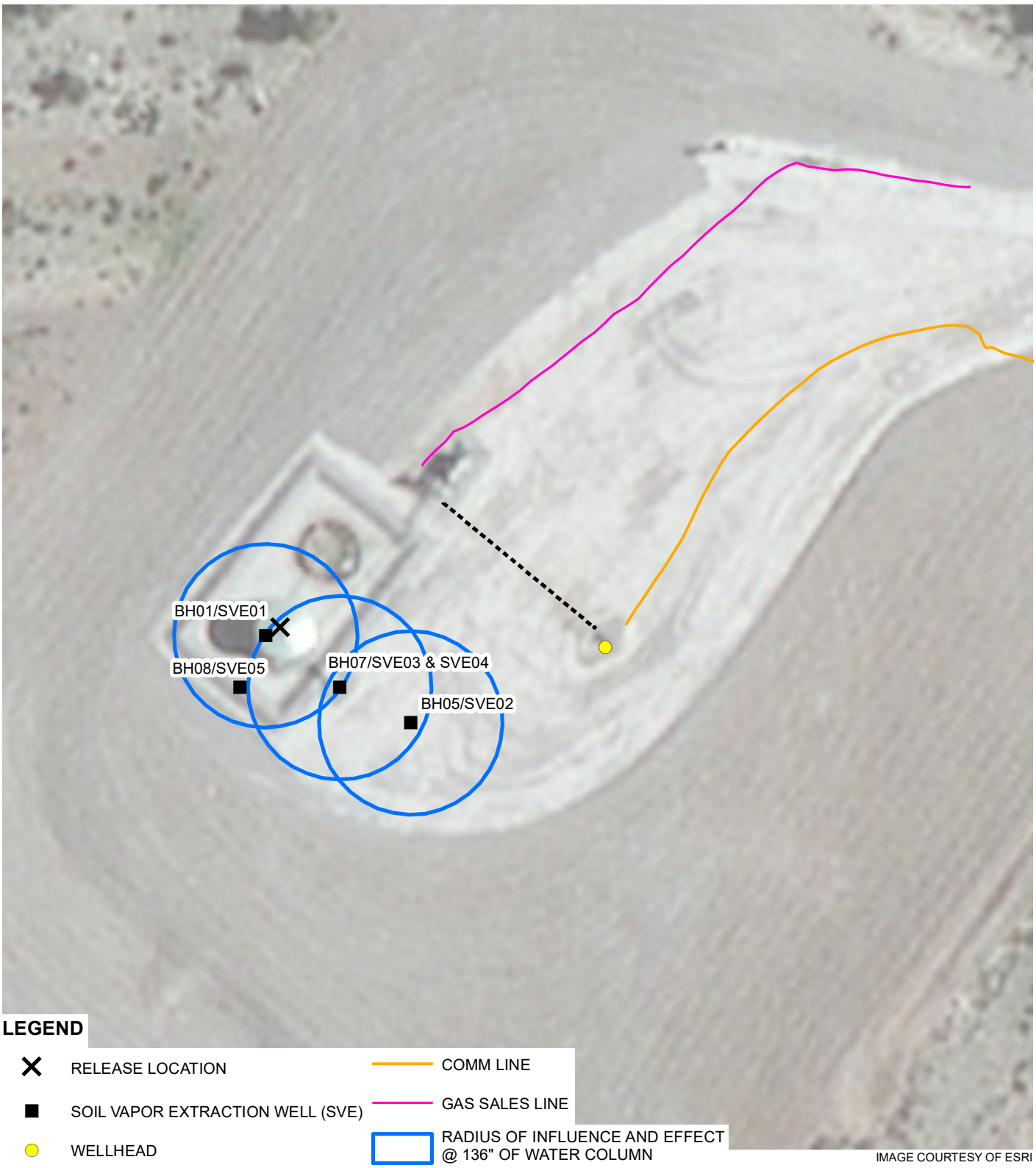



FIGURE 3
DEEP ZONE ESTIMATED ROI AND ROE
SCOTT 4M
SESE SEC 17-T31N-R10W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

BGS: BELOW GROUND SURFACE

P:\Hilcorp\GIS\TE017820012_SCOTT 4M\MXD\017820012_FIG03_DEEP_ROI_2021_1.mxd

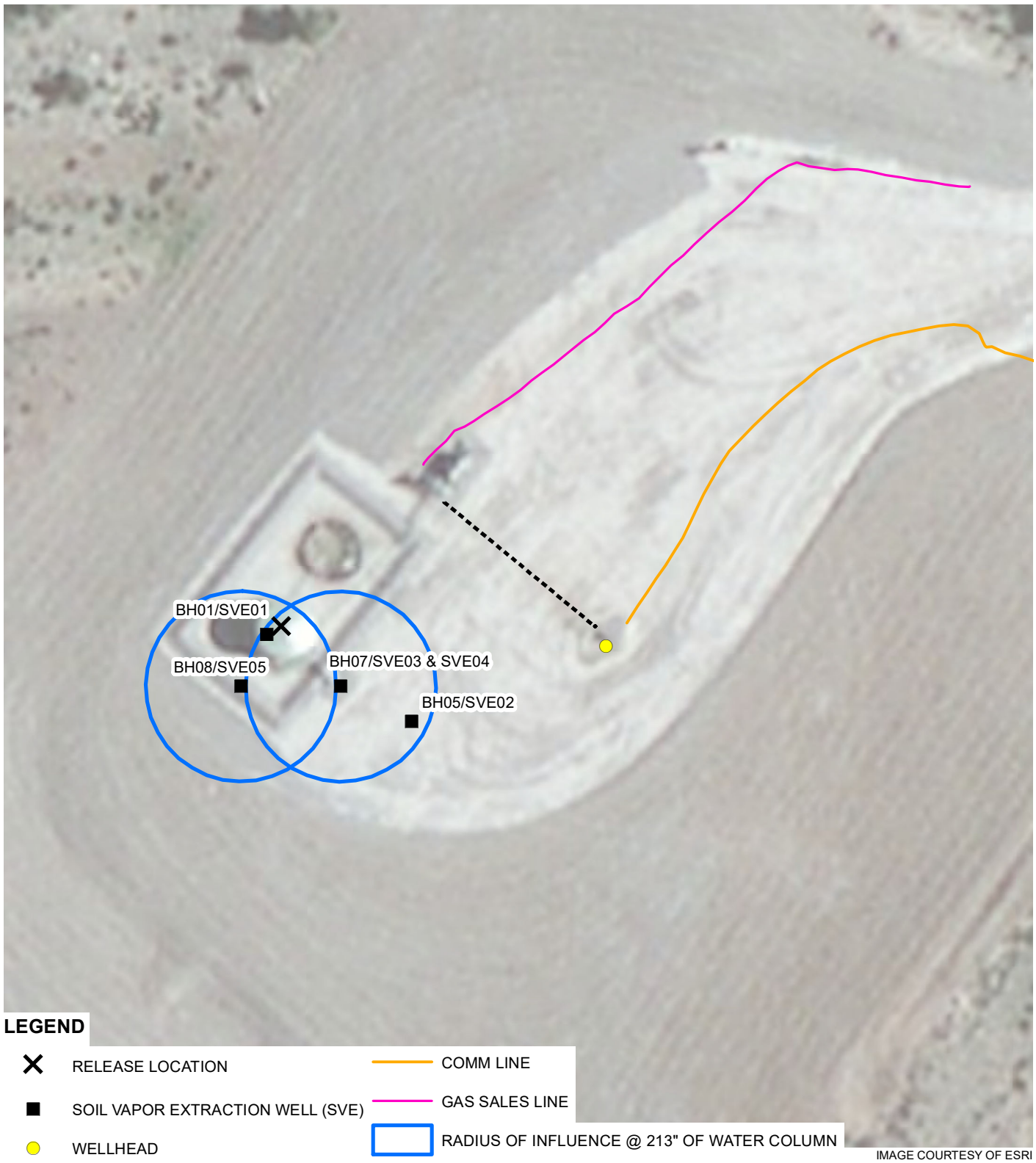



FIGURE 4
SHALLOW ZONE ESTIMATED ROI AND ROE
SCOTT 4M
SESE SEC 17-T31N-R10W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

BGS: BELOW GROUND SURFACE

P:\Hilcorp\GIS\TE017820012_SCOTT 4M\MXD\017820012_FIG04_SHALLOW_ROI_2021_1.mxd


**LEGEND**

- RELEASE LOCATION
- SOIL VAPOR EXTRACTION WELL (SVE)
- PROPOSED PERFORMANCE SOIL SAMPLE
- WELLHEAD
- FLOWLINE
- COMM LINE
- GAS SALES LINE

BGS: BELOW GROUND SURFACE

IMAGE COURTESY OF ESRI

0 40 80
Feet

N

FIGURE 5
PROPOSED PERFORMANCE SAMPLE LOCATIONS
SCOTT 4M
SESE SEC 17-T31N-R10W
SAN JUAN COUNTY, NEW MEXICO
**HILCORP ENERGY COMPANY**

P:\Hilcorp\GIS\TE017820012_SCOTT 4M\MXD\017820012_FIG05_PROP_PERF_2021_1.mxd

# TABLES

**TABLE 1**
**AIR SAMPLE LABORATORY ANALYTICAL RESULTS**

**SCOTT #4M**
**SAN JUAN COUNTY, NEW MEXICO**
**HILCORP ENERGY COMPANY**

| Sample ID | Sample Date | PID (ppm) | Benzene (µg/L) | Toluene (µg/L) | Ethyl-benzene (µg/L) | Xylenes (µg/L) | TVPH (µg/L) |
|---|---|---|---|---|---|---|---|
| Influent 02-01-21 | 2/1/2021 | 118 | 85 | 240 | 9.6 | 64 | 18,000 |
| Influent 09-07-21 | 9/7/2021 | 53 | 40 | 280 | 24.0 | 240 | 15,000 |
| Influent SVE01 | 9/29/2021 | 316 | 210 | 1,800 | 240 | 2,200 | 85,000 |

**Notes:**
µg/L - micrograms per Liter
PID - photoionization detector
ppm - parts per million
TVPH - total volatile petroleum hydrocarbons

**TABLE 2**
**SOIL VAPOR EXTRACTION SYSTEM RECOVERY & EMISSIONS SUMMARY**

**SCOTT 4M**
**SAN JUAN COUNTY, NEW MEXICO**
**HILCORP ENERGY COMPANY**

**Sample Information and Lab Analysis**

| Date | Total Flow (cf) | Delta Flow (cf) | PID (ppm) | Benzene (µg/L) | Toluene (µg/L) | Ethyl-benzene (µg/L) | Total Xylenes (µg/L) | TVPH (µg/L) |
|---|---|---|---|---|---|---|---|---|
| 2/1/2021 | 1,980 | 1,980 | 118 | 85 | 240 | 10 | 64 | 18,000 |
| 9/7/2021 | 2,841,168 | 2,839,188 | 53.3 | 40 | 280 | 24 | 240 | 15,000 |
| 9/29/2021 | 2,979,528 | 138,360 | 316 | 210 | 1,800 | 240 | 2,200 | 85,000 |
| **Average** | | | 162 | 112 | 773 | 91 | 835 | 39,333 |

**Vapor Extraction Calculations**

| Date | Flow Rate (cfm) | Benzene (lb/hr) | Toluene (lb/hr) | Ethyl-benzene (lb/hr) | Total Xylenes (lb/hr) | TVPH (lb/hr) |
|---|---|---|---|---|---|---|
| 2/1/2021 | 22 | 0.007 | 0.020 | 0.001 | 0.005 | 1.482 |
| 9/7/2021 | 22 | 0.003 | 0.023 | 0.002 | 0.020 | 1.235 |
| 9/29/2021 | 10 | 0.008 | 0.067 | 0.009 | 0.082 | 3.182 |
| **Average** | 18 | 0.0061 | 0.0367 | 0.0039 | 0.0358 | 1.967 |

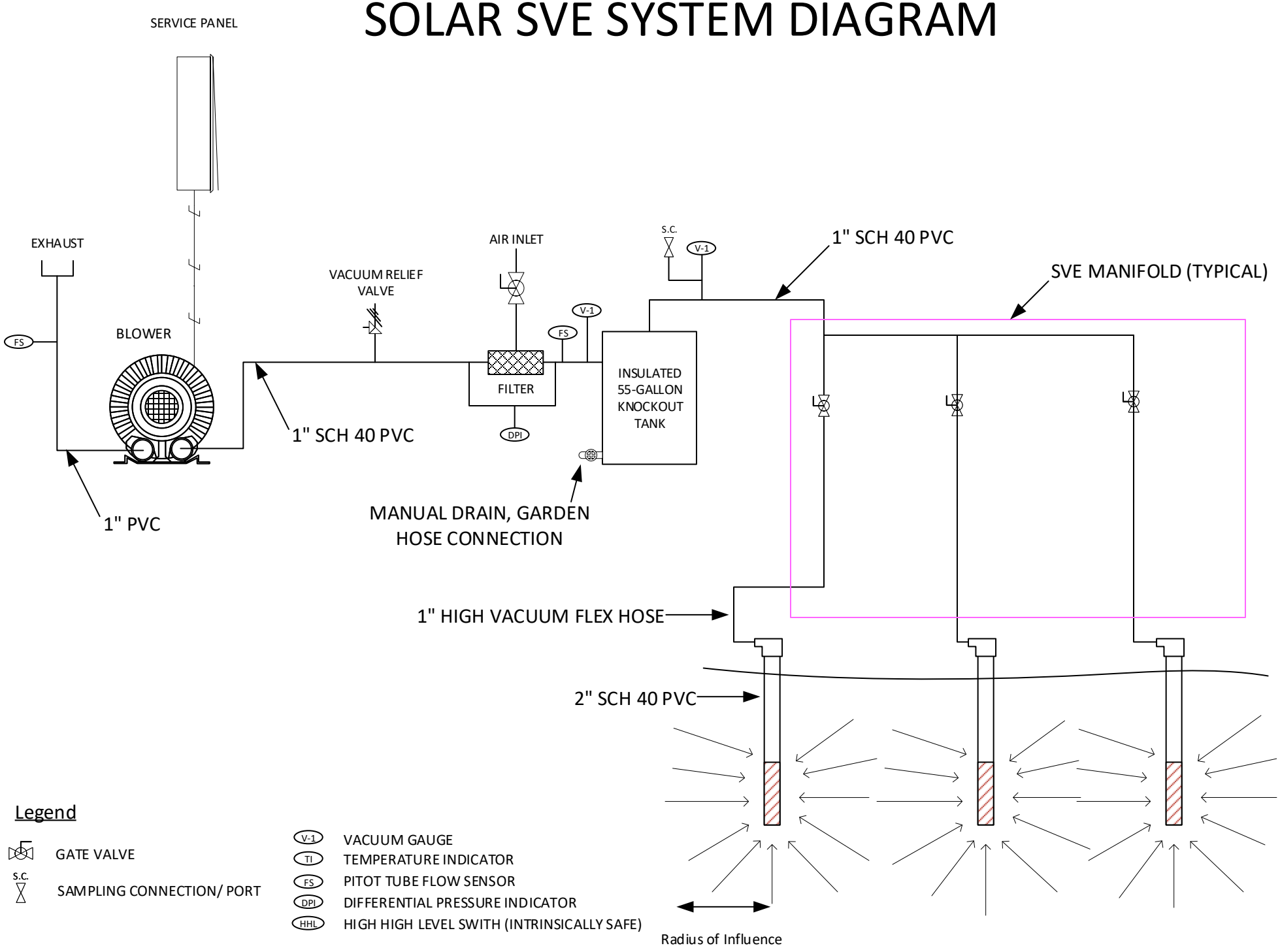
**Pounds Extracted Over Total Operating Time**

| Date | Total Operational Hours | Delta Hours | Benzene (lbs) | Toluene (lbs) | Ethyl-benzene (lbs) | Total Xylenes (lbs) | Total BTEX (lbs) | TVPH (lbs) |
|---|---|---|---|---|---|---|---|---|
| 2/1/2021 | 1.5 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.2 |
| 9/7/2021 | 2,152 | 2,151 | 7.1 | 49.6 | 4.3 | 42.5 | 103.4 | 2,657 |
| 9/29/2021 | 2,383 | 231 | 1.8 | 15.5 | 2.1 | 19.0 | 38.4 | 733.7 |
| **Total Extracted to Date** | | | 8.9 | 65.2 | 6.3 | 61.5 | 141.9 | 3,393 |

**NOTES:**
BTEX - benzene, toluene, ethylbenzene, total xylenes
cf - cubic feet
cfm - cubic feet per minute
lbs - pounds
lb/hr - pounds per hour
µg/L - microgram per liter
PID - photoionization detector
ppm - parts per million
TVPH - total volatile petroleum hydrocarbons

# ENCLOSURE A – SVE DIAGRAMS, BLOWER SPECIFICATIONS, AND VACUUM CURVES

# SOLAR SVE SYSTEM DIAGRAM

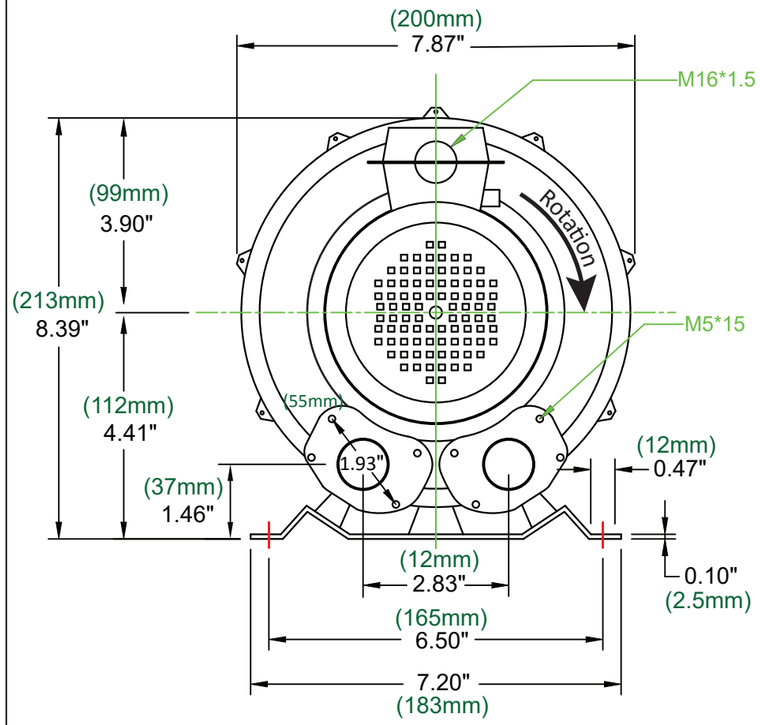


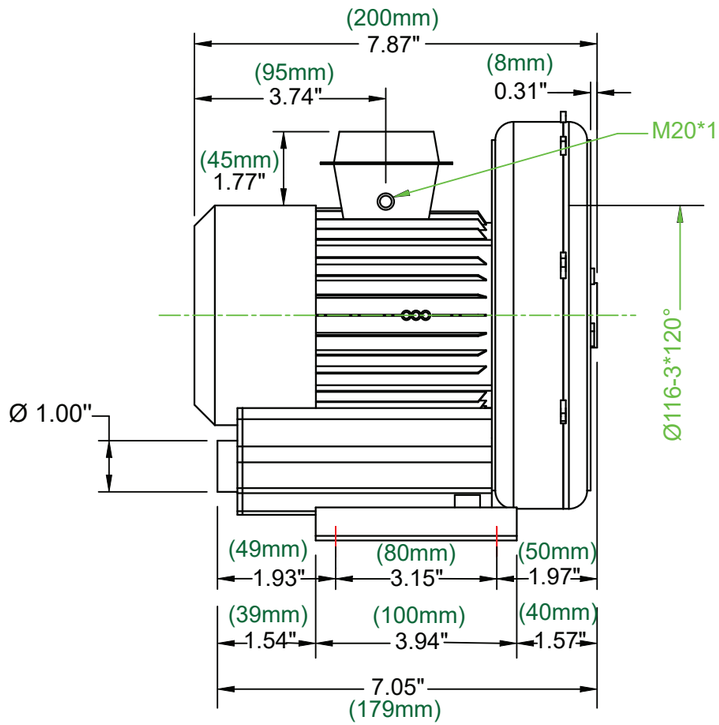
atlantic blowers

| Phase | Model Number | Curve Number | Frequency (Hz) | KW | HP | Max Flow (SCFM) | Max Pressure ("$H_2O$) | Maximum Vacuum | Sound Level (db) | Inlet Diameter | Voltage | Current (A) | Weight (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | AB-91 | A3 | 60Hz | 0.24 | 0.33 | 35 | 44 | 29 | 55 | 1.00" | 110-120/220-240 | 2.6Δ/1.3Y | 12 |
| | | | 50Hz | 0.20 | 0.27 | 29 | 31 | 20 | 52 | | 100-120/200-240 | 2.1Δ/1.1Y | |

**Sound db measured at 3ft.

# MODEL NO. : AB-91 SINGLE STAGE



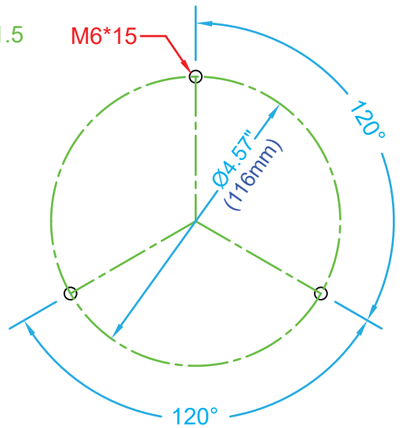



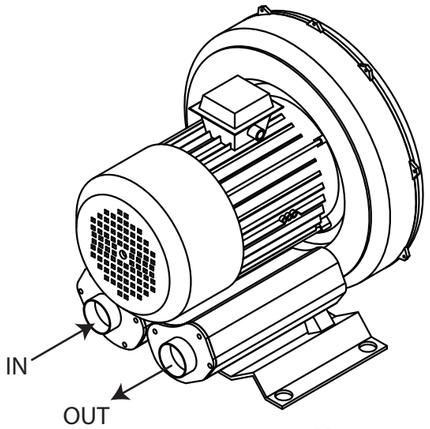

Key

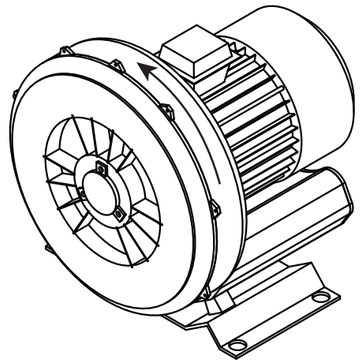
60Hz

50Hz

**Standard Conditions**
-Sea Level (14.69 PSI)
-60°F (15°C)
-0% Relative Humidity

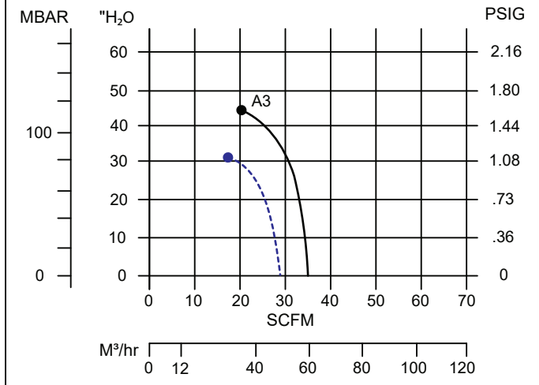


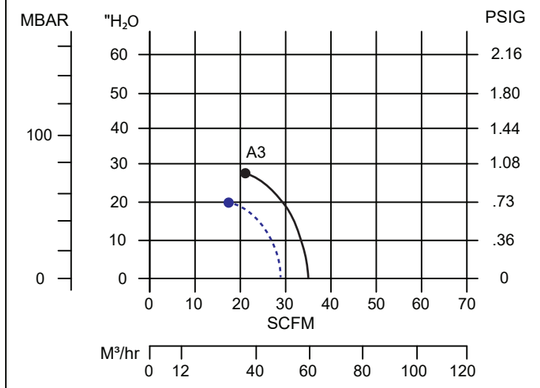
## Pressure Performance Curve

1 Phase



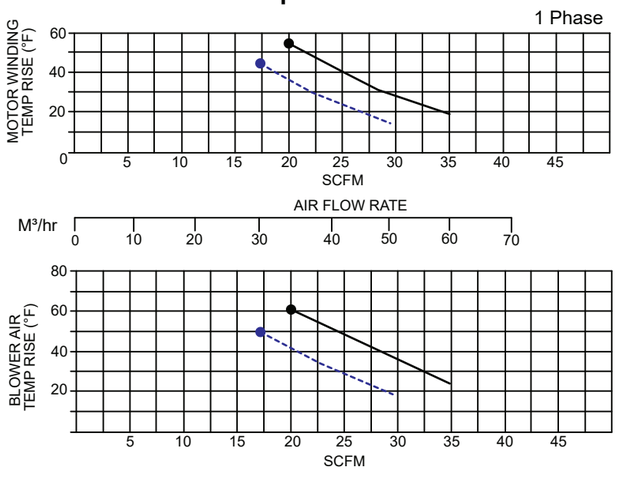

## Vacuum Performance Curve

1 Phase



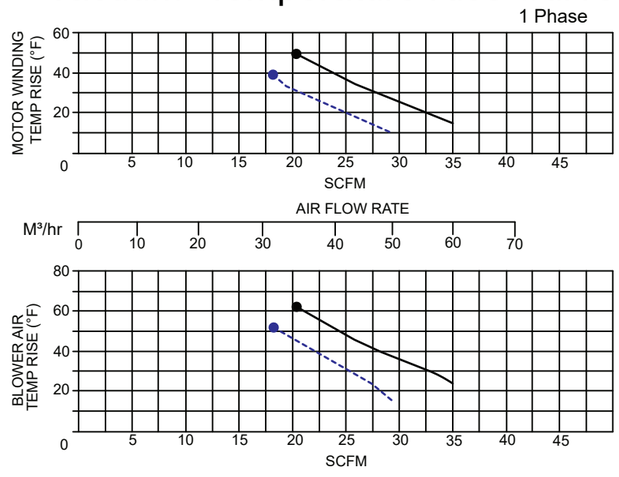

## Pressure -Temperature Rise Curve

1 Phase




## Vacuum -Temperature Rise Curve

1 Phase






(214) 233-0280
www.atlanticblowers.com

# ENCLOSURE B – LABORATORY ANALYTICAL REPORTS

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*

February 04, 2021

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

RE: Scott 4M OrderNo.: 2102078

Dear Jennifer Deal:

Hall Environmental Analysis Laboratory received 1 sample(s) on 2/2/2021 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 **2102078**
Date Reported: **2/4/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** Influent 02-01-21
**Project:** Scott 4M
**Collection Date:** 2/1/2021 12:30:00 PM
**Lab ID:** 2102078-001 **Matrix:** AIR
**Received Date:** 2/2/2021 7:30:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed | Batch |
|---|---|---|---|---|---|---|---|
| **EPA METHOD 8015D: GASOLINE RANGE** | | | | | | Analyst: **NSB** | |
| Gasoline Range Organics (GRO) | 18000 | 250 | | µg/L | 50 | 2/2/2021 12:25:11 PM | G75015 |
| Surr: BFB | 129 | 28.9-257 | | %Rec | 50 | 2/2/2021 12:25:11 PM | G75015 |
| **EPA METHOD 8021B: VOLATILES** | | | | | | Analyst: **NSB** | |
| Methyl tert-butyl ether (MTBE) | ND | 2.5 | | µg/L | 10 | 2/2/2021 11:13:55 AM | B75015 |
| Benzene | 85 | 1.0 | | µg/L | 10 | 2/2/2021 11:13:55 AM | B75015 |
| Toluene | 240 | 5.0 | | µg/L | 50 | 2/2/2021 12:25:11 PM | B75015 |
| Ethylbenzene | 9.6 | 1.0 | | µg/L | 10 | 2/2/2021 11:13:55 AM | B75015 |
| Xylenes, Total | 64 | 2.0 | | µg/L | 10 | 2/2/2021 11:13:55 AM | B75015 |
| Surr: 4-Bromofluorobenzene | 107 | 79.9-124 | | %Rec | 10 | 2/2/2021 11:13:55 AM | B75015 |

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 |

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: 2102078 RcptNo: 1

Received By: Juan Rojas 2/2/2021 7:30:00 AM

Completed By: Desiree Dominguez 2/2/2021 9:29:06 AM

Reviewed By: SGL 2/2/21

## 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 ☑ | 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: ENM 2/2/21

## 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:

17. Cooler Information

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

# Chain-of-Custody Record

Client: Hilcorp Energy Co.
Attn: Jennifer Deal
Mailing Address:
Phone #:
email or Fax#:
QA/QC Package:
☐ Standard ☐ Level 4 (Full Validation)
Accreditation: ☐ Az Compliance
☐ NELAC ☐ Other
☐ EDD (Type) PDF

Turn-Around Time:
☒ Standard ☐ Rush
Project Name: Scott 4M
Project #:
Project Manager: WSP - Danny Burns
Sampler: DB
On Ice: ☒ Yes ☐ No
# of Coolers: 6
Cooler Temp(including CF): See checklist (°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. 2102078 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-1-21 | 1230 | Air | Influent 02-01-21 | 1-Tedlar | — | -001 | X | X | | | | | | | | |

| Date: | Time: | Relinquished by: | Received by: | Via: | Date | Time |
|---|---|---|---|---|---|---|
| 2-1-21 | 13:20 | | | | 2/1/21 | 1300 |
| 2/1/21 | 1841 | | | courier | 2/2/21 | 7:30 |

Remarks:
cc: danny.burns@wsp.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: clients.hallenvironmental.com*

September 15, 2021

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

RE: Scott 4 M OrderNo.: 2109290

Dear Mitch Killough:

Hall Environmental Analysis Laboratory received 1 sample(s) on 9/8/2021 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 **2109290**
Date Reported: **9/15/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** Influent 9-7-21
**Project:** Scott 4 M
**Collection Date:** 9/7/2021 12:00:00 PM
**Lab ID:** 2109290-001 **Matrix:** AIR
**Received Date:** 9/8/2021 7:03:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 8015D: GASOLINE RANGE** | | | | | | Analyst: **NSB** |
| Gasoline Range Organics (GRO) | 15000 | 250 | | µg/L | 50 | 9/9/2021 9:56:04 AM |
| Surr: BFB | 261 | 37.3-213 | S | %Rec | 50 | 9/9/2021 9:56:04 AM |
| **EPA METHOD 8260B: VOLATILES** | | | | | | Analyst: **CCM** |
| Benzene | 40 | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Toluene | 280 | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Ethylbenzene | 24 | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Methyl tert-butyl ether (MTBE) | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,2,4-Trimethylbenzene | 11 | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,3,5-Trimethylbenzene | 11 | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,2-Dichloroethane (EDC) | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,2-Dibromoethane (EDB) | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Naphthalene | ND | 10 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1-Methylnaphthalene | ND | 20 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 2-Methylnaphthalene | ND | 20 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Acetone | ND | 50 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Bromobenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Bromodichloromethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Bromoform | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Bromomethane | ND | 10 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 2-Butanone | ND | 50 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Carbon disulfide | ND | 50 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Carbon tetrachloride | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Chlorobenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Chloroethane | ND | 10 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Chloroform | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Chloromethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 2-Chlorotoluene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 4-Chlorotoluene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| cis-1,2-DCE | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| cis-1,3-Dichloropropene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,2-Dibromo-3-chloropropane | ND | 10 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Dibromochloromethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Dibromomethane | ND | 10 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,2-Dichlorobenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,3-Dichlorobenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,4-Dichlorobenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Dichlorodifluoromethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,1-Dichloroethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,1-Dichloroethene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 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 **2109290**
Date Reported: **9/15/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** Influent 9-7-21
**Project:** Scott 4 M
**Collection Date:** 9/7/2021 12:00:00 PM
**Lab ID:** 2109290-001 **Matrix:** AIR **Received Date:** 9/8/2021 7:03:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 8260B: VOLATILES** | | | | | | Analyst: **CCM** |
| 1,2-Dichloropropane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,3-Dichloropropane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 2,2-Dichloropropane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,1-Dichloropropene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Hexachlorobutadiene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 2-Hexanone | ND | 50 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Isopropylbenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 4-Isopropyltoluene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 4-Methyl-2-pentanone | ND | 50 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Methylene chloride | ND | 15 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| n-Butylbenzene | ND | 15 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| n-Propylbenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| sec-Butylbenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Styrene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| tert-Butylbenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,1,1,2-Tetrachloroethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,1,2,2-Tetrachloroethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Tetrachloroethene (PCE) | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| trans-1,2-DCE | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| trans-1,3-Dichloropropene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,2,3-Trichlorobenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,2,4-Trichlorobenzene | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,1,1-Trichloroethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,1,2-Trichloroethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Trichloroethene (TCE) | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Trichlorofluoromethane | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| 1,2,3-Trichloropropane | ND | 10 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Vinyl chloride | ND | 5.0 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Xylenes, Total | 240 | 7.5 | | µg/L | 50 | 9/9/2021 12:24:00 PM |
| Surr: Dibromofluoromethane | 80.6 | 70-130 | | %Rec | 50 | 9/9/2021 12:24:00 PM |
| Surr: 1,2-Dichloroethane-d4 | 76.1 | 70-130 | | %Rec | 50 | 9/9/2021 12:24:00 PM |
| Surr: Toluene-d8 | 102 | 70-130 | | %Rec | 50 | 9/9/2021 12:24:00 PM |
| Surr: 4-Bromofluorobenzene | 97.6 | 70-130 | | %Rec | 50 | 9/9/2021 12:24:00 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 | | |

ENERGY LABORATORIES
Trust our People. Trust our Data.
www.energylab.com
Billings, MT 800.735.4489 • Casper, WY 888.235.0515
Gillette, WY 866.686.7175 • Helena, MT 877.472.0711

# ANALYTICAL SUMMARY REPORT

September 12, 2021

Hall Environmental
4901 Hawkins St NE Ste D
Albuquerque, NM 87109-4372

Work Order: G21090178

Project Name: Not Indicated

Energy Laboratories Inc. Gillette WY received the following 1 sample for Hall Environmental on 9/9/2021 for analysis.

| Lab ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---|---|---|---|---|---|
| G21090178-001 | 2109290-001B; Influent 9-7-21 | 09/07/21 12:00 | 09/09/21 | Gas | Natural Gas Analysis - BTU<br>Natural Gas Analysis - Compressibility Factor<br>Natural Gas Analysis - GPM<br>Natural Gas Analysis - Molecular Weight<br>Natural Gas Analysis - Routine<br>Natural Gas Analysis - Pressure Base<br>Natural Gas Analysis - Psuedo-Critical Pressure<br>Natural Gas Analysis - Psuedo-Critical Temperature<br>Natural Gas Analysis - Specific Gravity<br>Natural Gas Analysis - Temperature Base |

The analyses presented in this report were performed by Energy Laboratories, Inc., 400 W. Boxelder Rd., Gillette, WY 82718, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these tests results, please contact your Project Manager.

Report Approved By:

ENERGY LABORATORIES
Trust our People. Trust our Data.
www.energylab.com
Billings, MT 800.735.4489 • Casper, WY 888.235.0515
Gillette, WY 866.686.7175 • Helena, MT 877.472.0711

# LABORATORY ANALYTICAL REPORT

Prepared by Gillette, WY Branch

**Client:** Hall Environmental
**Project:** Not Indicated
**Client Sample ID:** 2109290-001B; Influent 9-7-21
**Location:**
**Lab ID:** G21090178-001

**Report Date:** 09/12/21
**Collection Date:** 09/07/21 12:00
**Date Received:** 09/09/21
**Sampled By:** Not Provided

| Analyses | Result | Units | Qualifier | Method | Analysis Date / By |
|---|---|---|---|---|---|
| **NATURAL GAS CHROMATOGRAPHIC ANALYSIS REPORT** | | | | | |
| Oxygen | 20.358 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Nitrogen | 77.450 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Carbon Dioxide | 0.839 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Hydrogen Sulfide | < 0.001 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Methane | 1.206 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Ethane | 0.066 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Propane | 0.023 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Isobutane | 0.005 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| n-Butane | 0.007 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Isopentane | 0.003 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| n-Pentane | 0.002 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| Hexanes plus | 0.041 | Mol % | | GPA 2261 | 09/10/21 15:34 / djb |
| **GPM @ STD COND/1000 CU.FT., MOISTURE FREE GAS** | | | | | |
| GPM Ethane | 0.0180 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| GPM Propane | 0.0060 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| GPM Isobutane | 0.0020 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| GPM n-Butane | 0.0020 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| GPM Isopentane | 0.0010 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| GPM n-Pentane | 0.0010 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| GPM Hexanes plus | 0.0180 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| GPM Pentanes plus | 0.0200 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| GPM Total | 0.0470 | gal/MCF | | GPA 2261 | 09/10/21 15:34 / djb |
| **CALCULATED PROPERTIES** | | | | | |
| Calculation Pressure Base | 14.730 | psia | | GPA 2261 | 09/10/21 15:34 / djb |
| Calculation Temperature Base | 60 | °F | | GPA 2261 | 09/10/21 15:34 / djb |
| Compressibility Factor, Z | 1.0000 | unitless | | GPA 2261 | 09/10/21 15:34 / djb |
| Molecular Weight | 28.85 | unitless | | GPA 2261 | 09/10/21 15:34 / djb |
| Pseudo-critical Pressure, psia | 550 | psia | | GPA 2261 | 09/10/21 15:34 / djb |
| Pseudo-critical Temperature, deg R | 243 | deg R | | GPA 2261 | 09/10/21 15:34 / djb |
| Specific Gravity (air=1.000) | 0.9990 | unitless | | GPA 2261 | 09/10/21 15:34 / djb |
| Gross BTU per cu ft @ std cond, dry | 16.67 | BTU/cu ft | | GPA 2261 | 09/10/21 15:34 / djb |
| Gross BTU per cu ft @ std cond, wet | 16.38 | BTU/cu ft | | GPA 2261 | 09/10/21 15:34 / djb |

**Report Definitions:**
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

ENERGY LABORATORIES
Trust our People. Trust our Data.
www.energylab.com
Billings, MT 800.735.4489 • Casper, WY 888.235.0515
Gillette, WY 866.686.7175 • Helena, MT 877.472.0711

# QA/QC Summary Report

Prepared by Gillette, WY Branch

**Client:** Hall Environmental **Work Order:** G21090178 **Report Date:** 09/12/21

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|
| **Method:** **GPA 2261** | | | | | | | | | Analytical Run: R266754 |
| **Lab ID:** **ICV-2109101507** | Initial Calibration Verification Standard | | | | | | | | 09/10/21 15:07 |
| Oxygen | 0.388 | Mol % | 0.001 | 97 | 75 | 110 | | | |
| Nitrogen | 5.091 | Mol % | 0.001 | 101 | 90 | 110 | | | |
| Carbon Dioxide | 4.890 | Mol % | 0.001 | 98 | 90 | 110 | | | |
| Hydrogen Sulfide | 0.127 | Mol % | 0.001 | 128 | 100 | 136 | | | |
| Methane | 73.290 | Mol % | 0.001 | 100 | 90 | 110 | | | |
| Ethane | 4.986 | Mol % | 0.001 | 100 | 90 | 110 | | | |
| Propane | 4.998 | Mol % | 0.001 | 100 | 90 | 110 | | | |
| Isobutane | 1.982 | Mol % | 0.001 | 99 | 90 | 110 | | | |
| n-Butane | 1.964 | Mol % | 0.001 | 98 | 90 | 110 | | | |
| Isopentane | 0.983 | Mol % | 0.001 | 98 | 90 | 110 | | | |
| n-Pentane | 0.994 | Mol % | 0.001 | 99 | 90 | 110 | | | |
| Hexanes plus | 0.307 | Mol % | 0.001 | 102 | 90 | 110 | | | |
| **Lab ID:** **CCV-2109101517** | Continuing Calibration Verification Standard | | | | | | | | 09/10/21 15:18 |
| Oxygen | 0.613 | Mol % | 0.001 | 102 | 90 | 110 | | | |
| Nitrogen | 1.305 | Mol % | 0.001 | 93 | 85 | 110 | | | |
| Carbon Dioxide | 0.953 | Mol % | 0.001 | 95 | 90 | 110 | | | |
| Hydrogen Sulfide | 0.031 | Mol % | 0.001 | 124 | 70 | 130 | | | |
| Methane | 93.538 | Mol % | 0.001 | 100 | 90 | 110 | | | |
| Ethane | 1.011 | Mol % | 0.001 | 101 | 90 | 110 | | | |
| Propane | 1.011 | Mol % | 0.001 | 101 | 90 | 110 | | | |
| Isobutane | 0.493 | Mol % | 0.001 | 98 | 90 | 110 | | | |
| n-Butane | 0.493 | Mol % | 0.001 | 98 | 90 | 110 | | | |
| Isopentane | 0.199 | Mol % | 0.001 | 99 | 90 | 110 | | | |
| n-Pentane | 0.199 | Mol % | 0.001 | 99 | 90 | 110 | | | |
| Hexanes plus | 0.154 | Mol % | 0.001 | 103 | 90 | 110 | | | |
| **Lab ID:** **CCV-2109101547** | Continuing Calibration Verification Standard | | | | | | | | 09/10/21 15:48 |
| Oxygen | 0.616 | Mol % | 0.001 | 103 | 90 | 110 | | | |
| Nitrogen | 1.314 | Mol % | 0.001 | 94 | 85 | 110 | | | |
| Carbon Dioxide | 0.954 | Mol % | 0.001 | 95 | 90 | 110 | | | |
| Hydrogen Sulfide | 0.032 | Mol % | 0.001 | 128 | 70 | 130 | | | |
| Methane | 93.526 | Mol % | 0.001 | 100 | 90 | 110 | | | |
| Ethane | 1.011 | Mol % | 0.001 | 101 | 90 | 110 | | | |
| Propane | 1.010 | Mol % | 0.001 | 101 | 90 | 110 | | | |
| Isobutane | 0.493 | Mol % | 0.001 | 98 | 90 | 110 | | | |
| n-Butane | 0.493 | Mol % | 0.001 | 98 | 90 | 110 | | | |
| Isopentane | 0.198 | Mol % | 0.001 | 99 | 90 | 110 | | | |
| n-Pentane | 0.199 | Mol % | 0.001 | 99 | 90 | 110 | | | |
| Hexanes plus | 0.154 | Mol % | 0.001 | 103 | 90 | 110 | | | |
| **Method:** **GPA 2261** | | | | | | | | | Batch: R266754 |
| **Lab ID:** **G21090178-001ADUP** | Sample Duplicate | | | | Run: Varian GC_210910A | | | | 09/10/21 15:39 |
| Oxygen | 20.357 | Mol % | 0.001 | | | | 0.0 | 10 | |

**Qualifiers:**

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

ENERGY LABORATORIES
Trust our People. Trust our Data.
www.energylab.com
Billings, MT 800.735.4489 • Casper, WY 888.235.0515
Gillette, WY 866.686.7175 • Helena, MT 877.472.0711

# QA/QC Summary Report

Prepared by Gillette, WY Branch

**Client:** Hall Environmental **Work Order:** G21090178 **Report Date:** 09/12/21

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|
| **Method:** **GPA 2261** | | | | | | | | | Batch: R266754 |
| **Lab ID:** **G21090178-001ADUP** | Sample Duplicate | | | | Run: Varian GC_210910A | | | | 09/10/21 15:39 |
| Nitrogen | 77.448 | Mol % | 0.001 | | | | 0.0 | 10 | |
| Carbon Dioxide | 0.838 | Mol % | 0.001 | | | | 0.1 | 10 | |
| Hydrogen Sulfide | < 0.001 | Mol % | 0.001 | | | | | 10 | |
| Methane | 1.209 | Mol % | 0.001 | | | | 0.3 | 10 | |
| Ethane | 0.066 | Mol % | 0.001 | | | | 0.0 | 10 | |
| Propane | 0.023 | Mol % | 0.001 | | | | 0.0 | 10 | |
| Isobutane | 0.005 | Mol % | 0.001 | | | | 0.0 | 10 | |
| n-Butane | 0.007 | Mol % | 0.001 | | | | 0.0 | 10 | |
| Isopentane | 0.003 | Mol % | 0.001 | | | | 0.0 | 10 | |
| n-Pentane | 0.002 | Mol % | 0.001 | | | | 0.0 | 10 | |
| Hexanes plus | 0.042 | Mol % | 0.001 | | | | 2.4 | 10 | |

**Qualifiers:**

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

ENERGY LABORATORIES
Trust our People. Trust our Data.
www.energylab.com
Billings, MT 800.735.4489 • Casper, WY 888.235.0515
Gillette, WY 866.686.7175 • Helena, MT 877.472.0711

# Work Order Receipt Checklist

## Hall Environmental

## G21090178

Login completed by: Chantel S. Johnson
Date Received: 9/9/2021
Reviewed by: Misty Stephens
Received by: csj
Reviewed Date: 9/10/2021
Carrier name: FedEx

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on all shipping container(s)/cooler(s)? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on all sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.) | Yes ☑ | No ☐ | |
| Temp Blank received in all shipping container(s)/cooler(s)? | Yes ☐ | No ☐ | Not Applicable ☑ |
| Container/Temp Blank temperature: | °C | | |
| Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4"). | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH acceptable upon receipt? | Yes ☐ | No ☐ | Not Applicable ☑ |

### Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

### Contact and Corrective Action Comments:

None

HALL ENVIRONMENTAL ANALYSIS LABORATORY

# CHAIN OF CUSTODY RECORD 1 1

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



| | | | |
|---|---|---|---|
| SUB CONTRATOR: **Energy Labs-Gillette** | COMPANY: **Energy Laboratories** | PHONE: **(866) 686-7175** | FAX: |
| ADDRESS: **400 W Boxelder Rd** | | ACCOUNT #: | EMAIL: |
| CITY, STATE, ZIP: **Gillette, WY 82718** | | | |

| ITEM | SAMPLE | CLIENT SAMPLE ID | BOTTLE TYPE | MATRIX | COLLECTION DATE | # CONTAINERS | ANALYTICAL COMMENTS |
|---|---|---|---|---|---|---|---|
| 1 | 2109290-001B | Influent 9-7-21 | TEDLAR | Air | 9/7/2021 12:00:00 PM | 1 | Fixed Gases 3 Day TAT |

**SPECIAL INSTRUCTIONS / COMMENTS:**

Please include the LAB ID and the CLIENT SAMPLE ID on all final reports. Please e-mail results to lab@hallenvironmental.com. Please return all coolers and blue ice. Thank you.

| | | | | | |
|---|---|---|---|---|---|
| Relinquished By: | Date: 9/8/2021 | Time: 7:37 AM | Received By: | Date: 9/9/2021 | Time: 1300 |
| Relinquished By: | Date: | Time: | Received By: Chantel Johnson | Date: | Time: Fed ex |
| Relinquished By: | Date: | Time: | Received By: | Date: | Time: |

TAT: Standard ☐ RUSH Next BD ☐ 2nd BD ☐ 3rd BD ☐

REPORT TRANSMITTAL DESIRED:
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

FOR LAB USE ONLY
Temp of samples _____ °C Attempt to Cool? _____
Comments: G2109078

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

WO#: **2109290**
***15-Sep-21***

**Client:** HILCORP ENERGY
**Project:** Scott 4 M

Sample ID: **2109290-001adup** SampType: **DUP** TestCode: **EPA Method 8260B: Volatiles**
Client ID: **Influent 9-7-21** Batch ID: **R81145** RunNo: **81145**
Prep Date: Analysis Date: **9/9/2021** SeqNo: **2864808** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 39 | 5.0 | | | | | | 2.87 | 20 | |
| Toluene | 280 | 5.0 | | | | | | 0.223 | 20 | |
| Ethylbenzene | 26 | 5.0 | | | | | | 6.71 | 20 | |
| Methyl tert-butyl ether (MTBE) | ND | 5.0 | | | | | | 0 | 20 | |
| 1,2,4-Trimethylbenzene | 15 | 5.0 | | | | | | 33.9 | 20 | R |
| 1,3,5-Trimethylbenzene | 14 | 5.0 | | | | | | 25.4 | 20 | R |
| 1,2-Dichloroethane (EDC) | ND | 5.0 | | | | | | 0 | 20 | |
| 1,2-Dibromoethane (EDB) | ND | 5.0 | | | | | | 0 | 20 | |
| Naphthalene | ND | 10 | | | | | | 0 | 20 | |
| 1-Methylnaphthalene | ND | 20 | | | | | | 0 | 20 | |
| 2-Methylnaphthalene | ND | 20 | | | | | | 0 | 20 | |
| Acetone | ND | 50 | | | | | | 0 | 20 | |
| Bromobenzene | ND | 5.0 | | | | | | 0 | 20 | |
| Bromodichloromethane | ND | 5.0 | | | | | | 0 | 20 | |
| Bromoform | ND | 5.0 | | | | | | 0 | 20 | |
| Bromomethane | ND | 10 | | | | | | 0 | 20 | |
| 2-Butanone | ND | 50 | | | | | | 0 | 20 | |
| Carbon disulfide | ND | 50 | | | | | | 0 | 20 | |
| Carbon tetrachloride | ND | 5.0 | | | | | | 0 | 20 | |
| Chlorobenzene | ND | 5.0 | | | | | | 0 | 20 | |
| Chloroethane | ND | 10 | | | | | | 0 | 20 | |
| Chloroform | ND | 5.0 | | | | | | 0 | 20 | |
| Chloromethane | ND | 5.0 | | | | | | 0 | 20 | |
| 2-Chlorotoluene | ND | 5.0 | | | | | | 0 | 20 | |
| 4-Chlorotoluene | ND | 5.0 | | | | | | 0 | 20 | |
| cis-1,2-DCE | ND | 5.0 | | | | | | 0 | 20 | |
| cis-1,3-Dichloropropene | ND | 5.0 | | | | | | 0 | 20 | |
| 1,2-Dibromo-3-chloropropane | ND | 10 | | | | | | 0 | 20 | |
| Dibromochloromethane | ND | 5.0 | | | | | | 0 | 20 | |
| Dibromomethane | ND | 10 | | | | | | 0 | 20 | |
| 1,2-Dichlorobenzene | ND | 5.0 | | | | | | 0 | 20 | |
| 1,3-Dichlorobenzene | ND | 5.0 | | | | | | 0 | 20 | |
| 1,4-Dichlorobenzene | ND | 5.0 | | | | | | 0 | 20 | |
| Dichlorodifluoromethane | ND | 5.0 | | | | | | 0 | 20 | |
| 1,1-Dichloroethane | ND | 5.0 | | | | | | 0 | 20 | |
| 1,1-Dichloroethene | ND | 5.0 | | | | | | 0 | 20 | |
| 1,2-Dichloropropane | ND | 5.0 | | | | | | 0 | 20 | |
| 1,3-Dichloropropane | ND | 5.0 | | | | | | 0 | 20 | |
| 2,2-Dichloropropane | ND | 5.0 | | | | | | 0 | 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#: **2109290**

***15-Sep-21***

**Client:** HILCORP ENERGY

**Project:** Scott 4 M

Sample ID: **2109290-001adup** SampType: **DUP** TestCode: **EPA Method 8260B: Volatiles**

Client ID: **Influent 9-7-21** Batch ID: **R81145** RunNo: **81145**

Prep Date: Analysis Date: **9/9/2021** SeqNo: **2864808** Units: **µg/L**

| Analyte | Result | PQL | SPK value | SPK Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloropropene | ND | 5.0 | | | | | | 0 | 20 | |
| Hexachlorobutadiene | ND | 5.0 | | | | | | 0 | 20 | |
| 2-Hexanone | ND | 50 | | | | | | 0 | 20 | |
| Isopropylbenzene | ND | 5.0 | | | | | | 0 | 20 | |
| 4-Isopropyltoluene | ND | 5.0 | | | | | | 0 | 20 | |
| 4-Methyl-2-pentanone | ND | 50 | | | | | | 0 | 20 | |
| Methylene chloride | ND | 15 | | | | | | 0 | 20 | |
| n-Butylbenzene | ND | 15 | | | | | | 0 | 20 | |
| n-Propylbenzene | ND | 5.0 | | | | | | 0 | 20 | |
| sec-Butylbenzene | ND | 5.0 | | | | | | 0 | 20 | |
| Styrene | ND | 5.0 | | | | | | 0 | 20 | |
| tert-Butylbenzene | ND | 5.0 | | | | | | 0 | 20 | |
| 1,1,1,2-Tetrachloroethane | ND | 5.0 | | | | | | 0 | 20 | |
| 1,1,2,2-Tetrachloroethane | ND | 5.0 | | | | | | 0 | 20 | |
| Tetrachloroethene (PCE) | ND | 5.0 | | | | | | 0 | 20 | |
| trans-1,2-DCE | ND | 5.0 | | | | | | 0 | 20 | |
| trans-1,3-Dichloropropene | ND | 5.0 | | | | | | 0 | 20 | |
| 1,2,3-Trichlorobenzene | ND | 5.0 | | | | | | 0 | 20 | |
| 1,2,4-Trichlorobenzene | ND | 5.0 | | | | | | 0 | 20 | |
| 1,1,1-Trichloroethane | ND | 5.0 | | | | | | 0 | 20 | |
| 1,1,2-Trichloroethane | ND | 5.0 | | | | | | 0 | 20 | |
| Trichloroethene (TCE) | ND | 5.0 | | | | | | 0 | 20 | |
| Trichlorofluoromethane | ND | 5.0 | | | | | | 0 | 20 | |
| 1,2,3-Trichloropropane | ND | 10 | | | | | | 0 | 20 | |
| Vinyl chloride | ND | 5.0 | | | | | | 0 | 20 | |
| Xylenes, Total | 260 | 7.5 | | | | | | 7.63 | 20 | |
| Surr: Dibromofluoromethane | 41 | | 50.00 | | 81.4 | 70 | 130 | 0 | 0 | |
| Surr: 1,2-Dichloroethane-d4 | 41 | | 50.00 | | 81.3 | 70 | 130 | 0 | 0 | |
| Surr: Toluene-d8 | 50 | | 50.00 | | 99.9 | 70 | 130 | 0 | 0 | |
| Surr: 4-Bromofluorobenzene | 49 | | 50.00 | | 98.6 | 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 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: 2109290  RcptNo: 1

Received By: Cheyenne Cason  9/8/2021 7:03:00 AM  Chal

Completed By: Isaiah Ortiz  9/8/2021 7:29:51 AM  I-OX

Reviewed By: DAD 9/8/21

## 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 ☑ | 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 9/8/21

## 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:

17. Cooler Information

| Cooler No | Temp °C | Condition | Seal Intact | Seal No | Seal Date | Signed By |
|---|---|---|---|---|---|---|
| 1 | 4.3 | Good | Not Present | | | |
| 2 | 0.6 | Good | Not Present | | | |

# Chain-of-Custody Record

Client: Hilcorp

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:

☐ Standard ☒ Rush 3-Day 9/10/21

Project Name: Scott 4M

Project #:

Project Manager: Josh Adams - wsp

Sampler: E. Carroll / B. Matheson

On Ice: ☒ Yes ☐ No

# of Coolers: 2 4.4 - 0.1 = 4.3

Cooler Temp(including CF): 0.7 - 0.1 = 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. 2109290 | 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) | Oxygen | Carbon dioxide $CO_2$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9-7-21 | 12:00 | Air | Influent 9-7-21 | 2 Tedlar | | 001 | | X | | | | | | X | | | X | X | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

| Date: | Time: | Relinquished by: | Received by: | Via: | Date | Time |
|---|---|---|---|---|---|---|
| 9-7-21 | 12:30 | Eric Carroll | | | | |
| 9/7/21 | 1810 | Christian Waeles | | | | |
| | | | | | 9/8/21 | 0703 |

Remarks:

CC: eric.carroll@wsp.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: clients.hallenvironmental.com*

October 04, 2021

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

RE: Scott 4M OrderNo.: 2109H14

Dear Mitch Killough:

Hall Environmental Analysis Laboratory received 1 sample(s) on 9/30/2021 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 **2109H14**
Date Reported: **10/4/2021**

# Hall Environmental Analysis Laboratory, Inc.

**CLIENT:** HILCORP ENERGY
**Client Sample ID:** Influent SVE01
**Project:** Scott 4M
**Collection Date:** 9/29/2021 2:20:00 PM
**Lab ID:** 2109H14-001 **Matrix:** AIR **Received Date:** 9/30/2021 7:10:00 AM

| Analyses | Result | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|
| **EPA METHOD 8015D: GASOLINE RANGE** | | | | | | Analyst: **NSB** |
| Gasoline Range Organics (GRO) | 90000 | 500 | E | µg/L | 100 | 10/1/2021 10:26:44 AM |
| Surr: BFB | 652 | 37.3-213 | S | %Rec | 100 | 10/1/2021 10:26:44 AM |
| **EPA METHOD 8021B: VOLATILES** | | | | | | Analyst: **NSB** |
| Benzene | 220 | 10 | | µg/L | 100 | 10/1/2021 10:26:44 AM |
| Toluene | 1900 | 10 | E | µg/L | 100 | 10/1/2021 10:26:44 AM |
| Ethylbenzene | 250 | 10 | | µg/L | 100 | 10/1/2021 10:26:44 AM |
| Xylenes, Total | 2300 | 20 | | µg/L | 100 | 10/1/2021 10:26:44 AM |
| Surr: 4-Bromofluorobenzene | 119 | 70-130 | | %Rec | 100 | 10/1/2021 10:26:44 AM |

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 |

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: 2109H14 RcptNo: 1

Received By: Cheyenne Cason 9/30/2021 7:10:00 AM

Completed By: Sean Livingston 9/30/2021 8:08:31 AM

Reviewed By: TML 9/30/21

## 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 ☑ 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: JR 9/30/21

## 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:

17. Cooler Information

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

# Chain-of-Custody Record

Client: Hilcorp
Mitch Killough
Mailing Address:
Phone #:
email or Fax#:
QA/QC Package:
☐ Standard ☐ Level 4 (Full Validation)
Accreditation: ☐ Az Compliance
☐ NELAC ☐ Other
☐ EDD (Type)

Turn-Around Time: EOD
☐ Standard ☒ Rush 9-30-21
Project Name: Scott 4M
Project #:
Project Manager: WSP- Danny Burns
Sampler: DB
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


Analysis Request

| Date | Time | Matrix | Sample Name | Container Type and # | Preservative Type | HEAL No. 2109H14 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9-29 | 1420 | Air | Influent SVE01 | Tedlar | — | 001 | X | X | | | | | | | | |

| Relinquished by: | Date | Time | Received by: | Via: | Date | Time |
|---|---|---|---|---|---|---|
| DF | 9-29-21 | 1700 | CHA Wa | | 9/29/21 | 1700 |
| CHA Wa | 9/29/21 | 1824 | Cmc Courier | | 9/30/21 | 0710 |

Remarks:
cc: stuart.hyde@wsp.com
devin.hencmann@wsp.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.

# ENCLOSURE C – PILOT TEST FORMS AND GRAPHS

**ATTACHMENT**

**SOIL VAPOR EXTRACTION PILOT TEST**
**SCOTT 4M**

**HILCORP**

Date : 9/29/2021 SVE well dia - 2"

**Extraction Test Well**
SVE03

| Pilot Test Extraction Well | | | | | | | Observation Wells | | | Observation Wells | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time | Wellhead Vacuum (in. wc) | Wellhead Vacuum (in. Hg) | Well Velocity (fpm) | Well Flow (in. wc) | Well Flow (cfm) | PID at Stack (ppm) | **SVE01** | **SVE02** | | **SVE01** | **SVE02** | |
| | | | | | | | Distance From Test Well (feet) | | | Distance From Test Well (feet) | | |
| | | | | | | | **26** | **22** | | **26** | **22** | |
| | | | | | | | Vacuum (in. wc) | | | PID Measurement (ppm) | | |
| 10:00 | 10.0 | 0.7 | 1,200 | 0.10 | 15 | 125 | 0.0 | 0.0 | | NM | NM | |
| 10:10 | 9.7 | 0.7 | 1,100 | 0.10 | 13 | 90 | 0.0 | 0.0 | | NM | NM | |
| 10:15 | 21.1 | 1.6 | 1,800 | 0.20 | 22 | 71 | 0.0 | 0.0 | | NM | NM | |
| 10:20 | 20.3 | 1.5 | 1,800 | 0.20 | 22 | 82 | 0.0 | 0.0 | | NM | NM | |
| 10:25 | 50.2 | 3.7 | 3,100 | 0.60 | 38 | 79 | 0.0 | 0.0 | | NM | NM | |
| 10:40 | 50.6 | 3.7 | 3,200 | 0.60 | 39 | 76 | 0.0 | 0.0 | | NM | NM | |
| 10:45 | 78.8 | 5.8 | 4,000 | 1.00 | 49 | 81 | 0.2 | 0.1 | | 367 | 218.0 | |
| 11:00 | 77.0 | 5.7 | 4,100 | 1.05 | 50 | 73 | 0.2 | 0.1 | | 341 | 209 | |
| 11:10 | 108.4 | 8.0 | 5,000 | 1.55 | 61 | 77 | 0.3 | 0.2 | | 420 | 195 | |
| 11:20 | 102.5 | 7.5 | 4,800 | 1.40 | 59 | 79 | 0.3 | 0.2 | | 408 | 202 | |
| 11:30 | 109.9 | 8.1 | 5,000 | 1.50 | 61 | 82 | 0.3 | 0.2 | | 387 | 182 | |
| 11:45 | 135.9 | 10.0 | 5,500 | 1.90 | 67 | 85 | 0.3 | 0.2 | | 321 | 187 | |
| 11:50 | 231.1 | 17.0 | NM | NM | | 81 | 0.4 | 0.2 | | 340 | 193 | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

**Notes:**
ND - not detected
in. wc - inches of water column
in. Hg - inches of mercury
ppm - parts per million
PID - photoionization detector
fpm - feet per minute
acfm - actual cubic feet per minute
NM - not measured

**ATTACHMENT**

**SOIL VAPOR EXTRACTION PILOT TEST**
**SCOTT 4M**

**HILCORP**

Date : 9/29/2021 SVE well dia - 2"

**Extraction Test Well**
SVE04

| Pilot Test Extraction Well | | | | | | | Observation Wells | | | Observation Wells | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time | Wellhead Vacuum (in. wc) | Wellhead Vacuum (in. Hg) | Well Velocity (fpm) | Well Flow (in. wc) | Well Flow (cfm) | PID at Stack (ppm) | **SVE05** | | | **SVE05** | | |
| | | | | | | | Distance From Test Well (feet) | | | Distance From Test Well (feet) | | |
| | | | | | | | **27** | | | **27** | | |
| | | | | | | | Vacuum (in. wc) | | | PID Measurement (ppm) | | |
| 12:00 | 10.5 | 0.8 | 1,600 | 0.15 | 20 | 83 | 0.0 | | | 92 | | |
| 12:05 | 10.7 | 0.8 | 1,600 | 0.15 | 20 | 45 | 0.0 | | | 88 | | |
| 12:10 | 26.1 | 1.9 | 2,200 | 0.25 | 27 | 44 | 0.0 | | | 105 | | |
| 12:15 | 25.7 | 1.9 | 2,200 | 0.30 | 27 | 43 | 0.0 | | | 110 | | |
| 12:20 | 50.1 | 3.7 | 2,900 | 0.55 | 36 | 41 | 0.0 | | | 127 | | |
| 12:30 | 48.6 | 3.6 | 3,000 | 0.60 | 37 | 39 | 0.0 | | | 116 | | |
| 12:40 | 87.3 | 6.4 | 3,700 | 0.85 | 45 | 24 | 0.0 | | | 113 | | |
| 12:45 | 71.4 | 5.3 | 3,600 | 0.80 | 44 | 29 | 0.0 | | | 102 | | |
| 12:55 | 73.2 | 5.4 | 3,600 | 0.80 | 44 | 25 | 0.0 | | | 112 | | |
| 13:15 | 102.1 | 7.5 | 4,600 | 1.30 | 56 | 23 | 0.0 | | | 119 | | |
| 13:25 | 101.5 | 7.5 | 4,600 | 1.35 | 56 | 22 | 0.0 | | | 106 | | |
| 13:30 | 122.4 | 9.0 | 5,200 | 1.70 | 64 | 25 | 0.0 | | | 113 | | |
| 13:35 | 231.1 | 17.0 | | | | | 0.1 | | | 106 | | |
| 13:45 | 231.1 | 17.0 | | | | | 0.1 | | | 102 | | |
| 13:50 | 231.1 | 17.0 | | | | | 0.1 | | | 99 | | |

**Notes:**
ND - not detected
in. wc - inches of water column
in. Hg - inches of mercury
ppm - parts per million
PID - photoionization detector
fpm - feet per minute
acfm - actual cubic feet per minute
NM - not measured

# ENCLOSURE D – ROI AND ROE CALCULATIONS

**RADIUS OF EFFECT CALCULATIONS**

**SOIL VAPOR EXTRACTION PILOT TEST**
**SCOTT 4M**
**HILCORP**

**Site Specific Information**

| | | |
|---|---|---|
| Test Well | SVE03 | |
| SVE Screen Length (H) | 10 | ft |
| Soil Type | sandy silt | |
| Porosity (n) | 20% | percent |

**Test Specific Information**

| | | |
|---|---|---|
| Radius of Influence (ROI) | 30 | feet - 0.2 IWC observed at distance of 26 feet, assume ROI of 30 |
| Flow Rate | 50 | SCFM |
| Wellhead Vacuum | 77 | IWC |

**Calculations**

| | | |
|---|---|---|
| Total Volume (ft^3) | 28,274 | = PI * ROI * ROI * H |
| Volume Pore Space (ft^3) | 5,655 | = Total Volume * n |
| | | |
| Pore Volume Exchange Rate | 0.08 | days |
| Annual Pore Volume Exchanges | 4,647 | >500 Required |
| | | |
| Velocity at ROI (ft/min) | 0.133 | = Flowrate/(2*PI * ROI* H * n) |
| Velocity at ROI (ft/day) | 191 | > 3 ft/day recommended |

**Conclusions**

Vacuum influence was observed at 26 feet (farthest observation well) at a wellhead vacuum of 77 IWC (5.7 inches mercury). It is reasonable to assume that a vacuum would have been detected at 30 feet ROI and was used in the ROE calclations. Assuming a radius of influence (ROI) of 30 feet, the radius of effect (ROE) was evaluated using annual pore volume exchange and velocity, both of these are within established guidance values.

**Notes:**

*Current SVE Research indicates that is it desirable to achieve pore-gas velocities throughout the treatment zone in excess of 0.001 cm/sec or ~3 ft/day (DiGiulo and Ravi 1999)
ft - feet
ROI - radius of influence
IWC - inches water column
min - minute
s - second
SCFM - standard cubic feet per minute

# ENCLOSURE E – O&M FORMS

# SVE SYSTEM
# BIWEEKLY O&M FORM

DATE: _____ O&M PERSONNEL: _____

TIME ONSITE: _____ TIME OFFSITE: _____

**SVE SYSTEM**

SVE STATUS: _____ SVE BLOWER HOURS: _____

GENERATOR HOURS: _____

| SVE ALARMS: (check if applicable) | | |
|---|---|---|
| | | HIGH/LOW VACUUM |
| | | KO TANK HIGH LEVEL |
| | | HIGH EXHAUST TEMPERATURE |

MANIFOLD INLET VACUUM: _____ KO TANK DRAIN: _____

AFTER FILTER VACUUM: _____ BYPASS STATUS: _____

EXHAUST TEMPERATURE: _____ BLOWER GREASE: _____

EXHAUST PRESSURE: _____ GENERATOR GREASE: _____

EXHAUST FLOW: _____ INLINE FILTER CLEAN: _____

**SVE SYSTEM**

EXHAUST PID: _____ AIR SAMPLE COLLECTION: _____

| **MANIFOLD** | VACUUM (IWC) | PID HEADSPACE (PPM) | FLOW (CFM) | ADJUSTMENTS |
|---|---|---|---|---|
| INLET | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

COMMENTS/OTHER MAINTENANCE:

# OPERATIONS AND MAINTENANCE MANUAL

# SAN JUAN BASIN, NEW MEXICO SVE SYSTEMS

**OCTOBER 2021**

**Prepared for:**

**HILCORP ENERGY COMPANY**
**1111 TRAVIS STREET**
**HOUSTON, TEXAS**

**Prepared by:**

**WSP USA, INC**
**848 EAST 2ND AVENUE**
**DURANGO, COLORADO**
**(970) 385-1096**

# SECTION 1.0

# INTRODUCTION

## 1.0 INTRODUCTION

This Operations and Maintenance (O&M) Manual has been prepared for the Hilcorp Energy Company (Hilcorp) for the purpose of successfully operating the soil vapor extraction (SVE) systems remediating subsurface hydrocarbon impacts in the San Juan Basin, New Mexico. The O&M manual is the base guide for all O&M personnel to follow at sites throughout the basin. This O&M manual is intended to serve as a guide to assist in the routine day-to-day operation and maintenance of the remediation systems. This manual also outlines the remediation system monitoring schedules to comply with regulatory agencies and to document the effectiveness of the systems. Successful operation of the systems will ensure that the environment is protected, the public welfare is promoted, and that federal/state and local laws/regulations are met.

## 1.2 SVE Process Equipment

A vacuum is applied to the wells and subsurface piping using a regenerative blower system electrified either by solar panels and batteries or directly connected to the power grid. Each system includes a manifold to control flow from each well or group of wells, and the SVE blower system. The manifold includes control valves, sample ports, and a tap plug for obtaining air velocity measurements in the individual lines. The initial flow and applied vacuum settings will be determined during pilot testing, system startup, and initial O&M procedures. As subsurface conditions change, adjustment of the flow rates and applied vacuum to each SVE well may be required. Typically, adjustments will be required to balance the air flowing from the various wells.

Starting from the manifold, the SVE skid generally contains:

- a control valve;
- a vacuum indicator;
- a sample port;
- an air/water separator with storage tank, fluid sight tube and fluid level switch;
- an additional vacuum indicator;
- a dilution air valve;
- a particulate filter;
- a vacuum relief valve;
- a regenerative blower driven by an electric motor;

- a high temperature switch;
- a temperature indicator;
- a pressure indicator;
- a SVE stack drain/sampling valve; and
- a flow indicator.

An SVE system diagram is attached.

# SECTION 2.0

# SYSTEM OPERATION

Operational procedures are summarized below. These procedures describe the adjustments needed for full system operation. Manufacturer's information for the specific system components shall be examined when seeking information regarding a particular system component. The equipment supplier provided O&M Manuals should also be consulted during operation and maintenance procedures.

## 2.1 ROUTINE O&M SITE VISITS

O&M site visits will occur as needed to achieve near continuous operation of the systems. Typically, system operation checks will be performed every other weekly (twice monthly). Site visits which shall include more involved tasks will be performed monthly, quarterly, semi-annually, annually, and on an as-needed basis. Specific O&M tasks have been determined for each of the above frequencies, and these tasks should be used as a reference guide for determining what actions are necessary for proper system operation. The O&M tasks are summarized on the site specific Monitoring Schedules. The monitoring schedule indicates the frequency required for each of the O&M tasks. The monitoring schedule also shows the monitoring required at individual wells.

Records kept during the O&M procedures shall be recorded in a field book and scanned onto the WSP server each day after returning to the office. WSP will review the site data and log book prior to each site visit to determine what O&M actions occurred during the last site visit and identify any special equipment or maintenance actions required for the planned site visit.

**Semi-Monthly System Check**

A typical system check during the weekly O&M site visit will consist of the following tasks, in sequential order beginning with arrival on site:

1. Note if the systems are running.
2. Inspect the control panel to determine if any alarms have occurred (if applicable).
3. Record any alarm conditions and the hour meter values for applicable remediation equipment onsite.
4. Note the inlet vacuum for the SVE blower.
5. Record all gauge and flow indicator values for the SVE system.
6. Record vacuum or pressure readings on the manifold assembly and perform minor valve adjustments as needed to optimize system operation.
7. Check air/water separation tank levels and transfer fluid as needed.

8. Lubricate the appropriate generators and blowers, check and add oil/grease as required.
9. Examine/check operation of building heaters and exhaust fans (if applicable).
10. Perform simple adjustments to correct any system operational problems.
11. Perform general housekeeping inside and outside of the equipment area, such as picking up trash or debris surrounding the site. Note any damage or vandalism requiring attention.
12. Collect influent samples per quarterly and annual requirements.

**Monthly System Checks**

Monthly site visits shall include the following additional efforts:

1. Collect any required air samples.
2. Monitor the SVE exhaust using a photoionization detector (PID).
3. Following the recording of measurements, adjustments of system operation may be made based on the measurements.
4. Perform any required equipment maintenance (See O&M Manual for specific maintenance requirements).
5. Check and clean filters.

**Quarterly Site Checks**

Quarterly site visits shall include:

1. Measure and record vacuum in each SVE line.
2. Measure and adjust vacuum and measure vapor concentrations using a PID at the SVE wellheads.
3. Clean and replace filters as required by manufacturer's O&M manual or as needed through visual inspection, and perform all required maintenance items, as required.
4. Clean all fluid level switches.
5. Change and check oil and oil filters, where applicable.

**Semi-annual System Checks**

Semi-annual site visits shall include:

1. Change generator and SVE blower oil. Replace with oil recommended by the equipment manufacturer or equivalent.

2. Tighten all wire terminals and check connections.

**Annual**

Annual requirements include:

1. Replace SVE blower air inlet filter elements.

**Periodic**

The following items will need to be conducted as remediation progresses. The timing of these activities is site dependent and cannot be predicted. These activities shall be performed as soon as possible following discovery of conditions affecting or limiting system performance.

1. Drain the SVE air/water separation or knockout (KO) tank fluid.

2. Clean sludge from the SVE air/water separation tanks.

## 2.2 SVE SYSTEM PERFORMANCE ADJUSTMENTS

On a routine basis, WSP will evaluate site monitoring data and may complete performance adjustments to the remediation system operation. It may be beneficial to adjust the remediation system's operation over time, and as specific areas of a site require less effort than other areas. Remediation efforts will be characterized by system monitoring information.

For example, as the concentration of contaminants in SVE wells decreases to asymptotic conditions, flow and vacuum in these areas may be adjusted in attempts to increase volatilization and contaminant removal. Additionally, as contaminant concentrations decrease to below 1 milligram per liter (mg/L), flow in individual SVE wells may be decreased and/or shut off to induce higher flow in other wells and target specific areas of the site.

### 2.2.1 SVE Flow Adjustment

Proper operation of the SVE systems entails applying an optimum vacuum at the screened interval of the SVE well such that the maximum air flow rate through the well is achieved. The SVE systems are designed to run at a specific vacuum and air flow rate, however, due to variable subsurface conditions, the air flow through the subsurface may need to be reduced by opening the blower inlet bypass valve and/or restricting flow from certain wells.

The air flow rate may be measured at the flow lines using a portable air velocity device, such as a thermal anemometer. The air flow rate and applied vacuum can be adjusted by opening/closing ball valves on the individual lines. Typically, these adjustments will be made quarterly. Ideal operation of the SVE system entails balancing flow rates from each well. To balance flow from all SVE wells, minor calculations may be required for sites with different sizes of SVE lines.

**To balance the SVE system, follow the following procedure:**

1. Measure the air velocity in each line using the thermal anemometer.

2. Calculate the total flow from the SVE wells using the equation Flowrate = Cross Sectional Area X Velocity. Area for the SVE pipes is calculated using the formula Area = π * Diameter^2 / 4.

3. Divide the total flow by the number of wells to be balanced. This number equals the average flow rate.

4. Back calculate the air velocity required to achieve the average flowrate for each pipe size using the equation: Velocity = Average Flowrate / Area.

5. Starting at the well yielding the highest flowrate, use the control valve for each line to reduce the flowrate to the average flowrate by lowering the air velocity measured with the thermal anemometer to the velocity calculated in Step #4.

6. Check lower flow wells to ensure an increase in airflow.

Note that the thermal anemometer yields a rough field estimate, and there may be a large inaccuracy inherent to the instrument. It is therefore only necessary to achieve a balance within 25% of the average flowrate. The system will also change flows as the higher flow wells are reduced and system vacuum is increased. This is another reason why it is not necessary to balance the SVE wells to closer than 25% of the calculated average flow. Also note that most SVE systems have the same sized pipes for all SVE lines, which allows for fewer calculations when balancing the SVE system.

For sites with the same size SVE lines, the average flowrate calculation and velocity back calculations are not necessary. Rather, measure the velocity from each well, calculate the average velocity, and attempt to achieve the average velocity from each well by reducing flow/velocity from the higher flow wells. As with the flowrate calculation method, velocities within 25% of the average velocity do not need adjustment.

**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

Action 54549

## CONDITIONS

| | |
|---|---|
| Operator:<br>HILCORP ENERGY COMPANY<br>1111 Travis Street<br>Houston, TX 77002 | OGRID:<br>372171 |
| | Action Number:<br>54549 |
| | Action Type:<br>[C-141] Release Corrective Action (C-141) |

**CONDITIONS**

| Created By | Condition | Condition Date |
|---|---|---|
| nvelez | Accepted for the record. See App ID 124691 for most updated status. | 10/3/2022 |