

REVIEWED

By Mike Buchanan at 3:43 pm, Apr 05, 2024



ENSOLUM

January 15, 2024

New Mexico Oil Conservation Division

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

Re: Fourth Quarter 2023 – SVE System Update
 Howell M#1
 San Juan County, New Mexico
 Hilcorp Energy Company
 NMOCD Incident Number: NRM2022755502

Review of the Fourth Quarter 2023--SVE System Update for Howell M#1: Content Satisfactory to Continue to operate SVE and conduct maintenance as scheduled, bi-monthly. 2. Submit next quarterly report as scheduled.

To Whom it May Concern:

Ensolum, LLC (Ensolum), on behalf of Hilcorp Energy Company (Hilcorp), presents this *Fourth Quarter 2023 – SVE System Update* report summarizing the soil vapor extraction (SVE) system performance at the Howell M#1 natural gas production well (Site), located in Unit N of Section 30, Township 30 North, Range 8 West, San Juan County, New Mexico (Figure 1). The SVE system was put into operation on June 6, 2023, to remediate subsurface soil impacts resulting from historical impacts discovered at the Site. This report summarizes Site activities performed in October, November, and December of 2023.

SVE SYSTEM SPECIFICATIONS

The SVE system at the Site consists of a 3-phase, 3.5 horsepower Atlantic Blower AB-500 regenerative blower capable of producing 230 cubic feet per minute (cfm) flow and 88 inches of water column (IWC) vacuum. The system is powered by a permanent power drop and is intended to run 24 hours per day. Six SVE wells, SVE01 through SVE06, are currently in operation and are shown on Figure 2.

FOURTH QUARTER 2023 ACTIVITIES

The SVE system began operation on June 6, 2023. Based on the New Mexico Oil Conservation Division (NMOCD) Conditions of Approval (COAs), dated November 7, 2022, field data measurements were collected monthly from the system during the fourth quarter of 2023 and included the following parameters: total system flow, photoionization detector (PID) measurements of volatile organic compounds (VOCs) from each SVE well and the total system influent, and oxygen/carbon dioxide measurements via hand-held analyzers from each SVE well. Of note, vacuum measurements were not recorded for the individual SVE wells during fourth quarter 2023 field visits. As stated in the *Third Quarter 2023 – SVE System Update* report dated October 12, 2023, pitot tubes were installed on the individual SVE wells on November 2, 2023, in order to measure flow from each SVE well. Individual flow measurements were recorded during the November and December 2023 site visits. Field notes taken during operations and maintenance (O&M) visits are presented in Appendix A.

Since startup, vacuum extraction was performed on all Site SVE wells in order to induce flow in impacted soil zones. Between September 29 and December 1, 2023, the SVE system operated for 1,457.6 hours for a runtime efficiency of 96 percent (%). Appendix B presents photographs of the runtime meter for calculating the fourth quarter 2023 runtime efficiency. Table 1 presents the SVE system operational hours and calculated percentage runtime.

During the O&M visit conducted on November 28, 2023, the SVE system was off due to the knockout tank being frozen. Hilcorp subsequently installed heat tape around the knockout tank and piping in order to prevent freezing and was able to restart the system on November 30, 2023. Based on the November 2022 COAs, air samples were required to be collected every other month during the second through fourth quarters of the first year of operation. Hilcorp was scheduled to collect a November sample on the second visit of the month; however, because the system was down during the November 2023 O&M visit, an air sample was instead collected on December 1, 2023, once the system was thawed and restarted. Prior to collection, the emission sample was field screened with a PID for organic vapor monitoring (OVM). The emission sample was collected directly into two 1-Liter Tedlar® bags and submitted to Eurofins Environment Testing (Eurofins) in Albuquerque, New Mexico for analysis of total volatile petroleum hydrocarbons (TVPH – also known as total petroleum hydrocarbons – gasoline range organics (TPH-GRO)) following United States Environmental Protection Agency (EPA) Method 8015D, VOCs following EPA Method 8260B, and fixed gas analysis of oxygen and carbon dioxide following Gas Processors Association (GPA) Method 2261. A summary of field measurements and analytical data collected at the Site are presented in Tables 2 and 3, respectively. Full laboratory analytical reports are attached as Appendix C. Oxygen and Carbon dioxide levels over time are presented in Graphs 1 and 2, respectively.

Air sample data and measured stack flow rates are used to estimate total mass recovered and total emissions generated by the SVE system (Table 4). Based on these estimates, 20,677 pounds (10.3 tons) of TVPH have been removed by the system to date. No phase-separated hydrocarbons were recovered from the system during the O&M and sampling period described above.

DISCUSSION AND RECOMMENDATIONS

As noted above, vacuum measurements were not recorded during the fourth quarter 2023 O&M visits. During future O&M visits beginning in the first quarter of 2024, vacuum measurements will again be collected and included in future reports. In addition, flow rates calculated from the pitot tube differential pressure readings were compared to the manufacturer specifications for the Atlantic Blower AB-500 blower and found to be more accurate than the inline rotameters installed on the system. As such, the pitot tube will be used moving forward to calculate flow and mass recovery for the Site.

Monthly O&M visits and bi-monthly (every other month) sampling events will continue to be performed by Ensolum and/or Hilcorp personnel to ensure the SVE system is operating within normal working ranges (i.e., temperature, pressure, and vacuum). Deviations from regular operations will be noted on field logs and included in the following quarterly report.

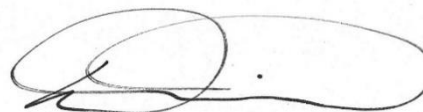
We appreciate the opportunity to provide this report to the NMOCD. If you should have any questions or comments regarding this report, please contact the undersigned.

Sincerely,

Ensolum, LLC



Stuart Hyde, LG
Senior Geologist
(970) 903-1607
shyde@ensolum.com



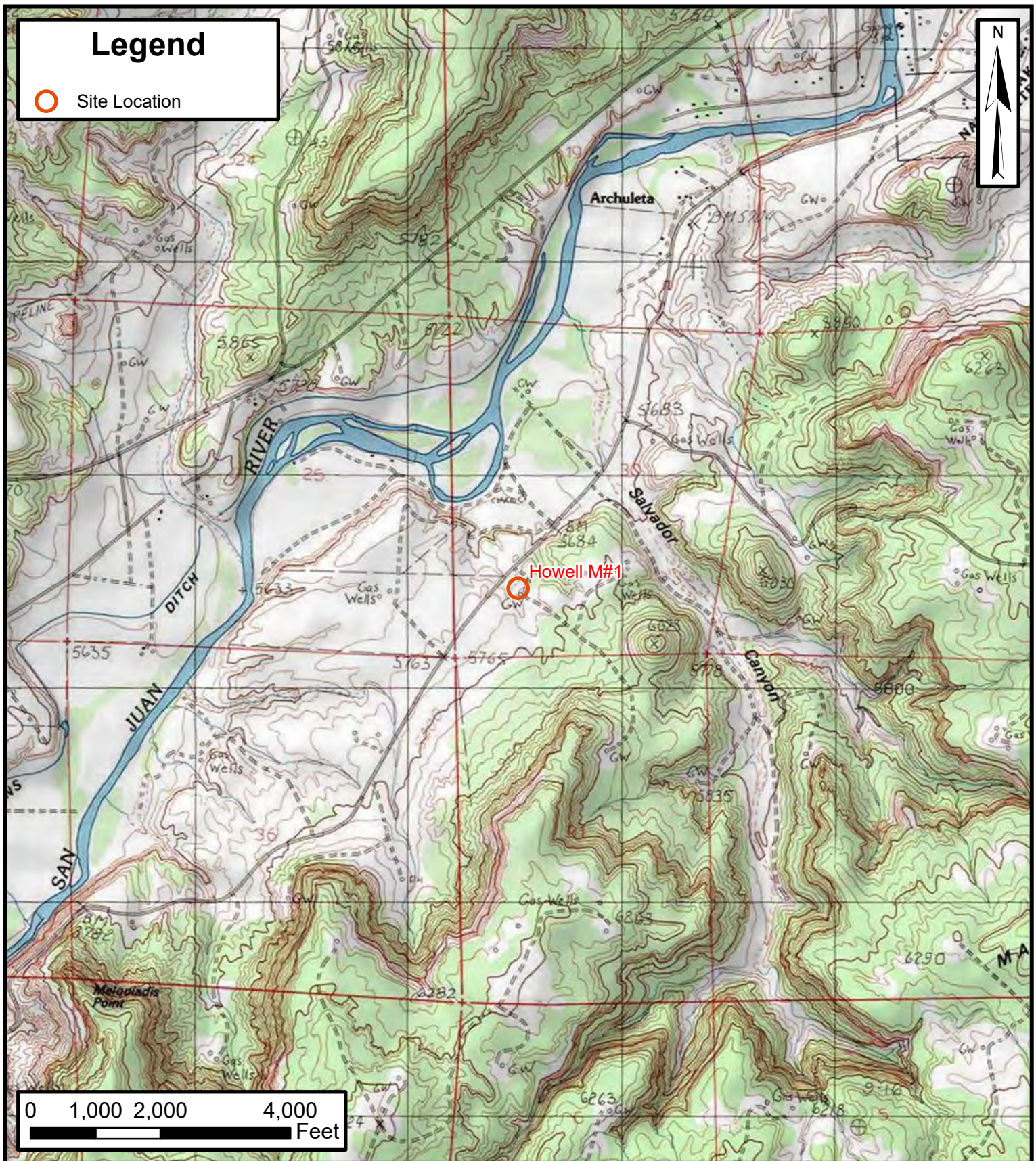
Daniel R. Moir, PG
Senior Managing Geologist
(303) 887-2946
dmoir@ensolum.com

Attachments:

Figure 1	Site Location Map
Figure 2	Radius of Influence and Effect
Table 1	Soil Vapor Extraction System Runtime Calculations
Table 2	Soil Vapor Extraction System Field Measurements
Table 3	Soil Vapor Extraction System Air Analytical Results
Table 4	Soil Vapor Extraction System Mass Removal and Emissions
Graph 1	Oxygen vs Time
Graph 2	Carbon Dioxide vs Time
Appendix A	Field Notes
Appendix B	Project Photographs
Appendix C	Laboratory Analytical Reports



FIGURES



Site Location Map

Howell M#1

Hilcorp Energy Company

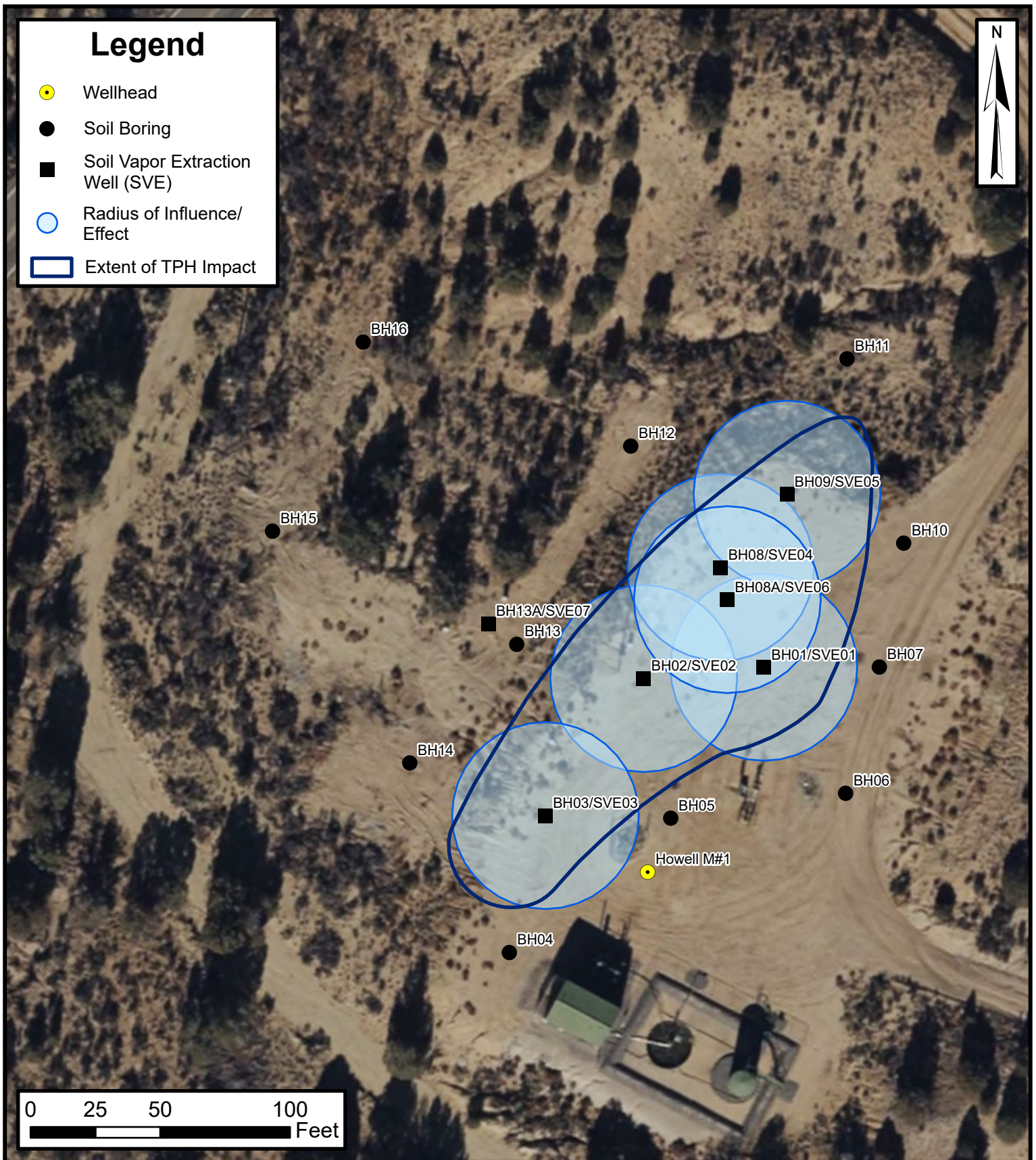
36.777808, -107.717657

San Juan County, New Mexico

FIGURE

1





RADIUS OF INFLUENCE AND EFFECT HOWELL M#1

Howell M#1
Hilcorp Energy Company
36.777808, -107.717657
San Juan County, New Mexico

FIGURE
2



TABLES AND GRAPHS



TABLE 1
SOIL VAPOR EXTRACTION SYSTEM RUNTIME CALCULATIONS
Howell M#1
Hilcorp Energy Company
San Juan County, New Mexico

Date	Total Operational Hours	Delta Hours	Days	Percent Runtime
9/29/2023	2,687.4	Startup		
12/1/2023	4,145.0	1,457.6	63	96%



TABLE 2
SOIL VAPOR EXTRACTION SYSTEM FIELD MEASUREMENTS
 Howell M#1
 Hilcorp Energy Company
 San Juan County, New Mexico

SVE Well ID	Date	PID (ppm)	Differential Pressure (IWC)	Flow Rate (acfm)	Flow Rate (scfm) ⁽¹⁾⁽²⁾⁽³⁾	Vacuum (IWC)	Vacuum (psi)	Oxygen (%)	Carbon Dioxide (%)
Influent, All Wells	6/6/2023	1,910	--	--	60	28	1.0	--	--
	6/7/2023	1,953	--	--	60	28	1.0	--	--
	6/13/2023	1,878	--	--	55	28	1.0	--	--
	6/22/2023	1,625	--	--	60	28	1.0	--	--
	6/29/2023	1,877	--	--	60	28	1.0	--	--
	7/13/2023	2,280	--	--	60	28	1.0	--	--
	7/27/2023	1,942	--	--	70	37	1.3	--	--
	8/9/2023	1,553	--	--	62	28	1.0	--	--
	8/24/2023	1,858	--	--	60	38	1.4	--	--
	9/8/2023	1,652	--	--	60	28	1.0	--	--
	9/21/2023	1,274	--	--	60	28	1.0	--	--
	10/30/2023	1,574	3.8	170	124	29	1.0	--	--
SVE01	11/2/2023	--	4.0	175	128	28	1.0	--	--
	12/1/2023	935	3.9	173	126	30	1.1	--	--
	6/6/2023	2,152	--	--	10.0	--	--	--	--
	6/7/2023	2,650	--	--	10.0	7.80	0.3	0.50	0.05
	6/13/2023	2,315	--	--	9.2	10.0	0.4	15.3	>5.0
	6/22/2023	1,953	--	--	10.0	9.60	0.3	19.6	3.99
	6/29/2023	1,935	--	--	10.0	9.90	0.4	21.4	1.52
	7/13/2023	1,515	--	--	10.0	--	--	21.9	0.64
	7/27/2023	2,265	--	--	11.7	9.60	0.3	21.1	1.48
	8/9/2023	1,384	--	--	10.3	10.1	0.4	21.9	0.92
	8/24/2023	541	--	--	10.00	10.3	0.4	22.4	0.02
	9/8/2023	1,333	--	--	10.0	--	--	20.9	0.56
SVE02	9/21/2023	1,015	--	--	10.0	9.30	0.3	20.9	0.64
	10/30/2023	589	--	--	21.3	29	--	20.9	0.06
	11/2/2023	--	--	--	--	28	1.0	--	--
	12/1/2023	416	0.0	0	0.0	30	1.1	20.9	0.01
	6/6/2023	2,201	--	--	10.0	--	--	--	--
	6/7/2023	2,216	--	--	10.0	8.30	0.3	3.30	0.05
	6/13/2023	2,243	--	--	9.2	9.40	0.3	20.9	2.22
	6/22/2023	1,820	--	--	10.0	8.80	0.3	21.7	0.90
	6/29/2023	2,395	--	--	10.0	8.80	0.3	21.7	0.84
	7/13/2023	264	--	--	10.0	--	--	22.5	0.02
	7/27/2023	2,205	--	--	11.7	9.10	0.3	22.9	0.54
	8/9/2023	1,520	--	--	10.3	9.30	0.3	22.4	0.42
SVE03	8/24/2023	146	--	--	10.0	9.50	0.3	22.4	0.04
	9/8/2023	1,086	--	--	10.0	--	--	20.9	0.14
	9/21/2023	1,189	--	--	10.0	8.80	0.3	20.9	0.24
	10/30/2023	404	--	--	20.7	29	1.0	20.9	0.09
	11/2/2023	--	--	--	21.3	28	1.0	--	--
	12/1/2023	1,302	0.2	42	30.5	30	1.1	20.9	0.15
	6/6/2023	1,694	--	--	10.0	--	--	--	--
	6/7/2023	1,895	--	--	10.0	7.20	0.3	1.00	0.05
	6/13/2023	1,804	--	--	9.2	9.00	0.3	17.2	4.34
	6/22/2023	1,530	--	--	10.0	8.50	0.3	20.5	2.36
	6/29/2023	1,782	--	--	10.0	8.40	0.3	20.9	1.92
	7/13/2023	2,025	--	--	10.0	--	--	20.9	1.34
SVE03	7/27/2023	1,795	--	--	11.7	8.90	0.3	21.7	1.28
	8/9/2023	1,402	--	--	10.3	9.30	0.3	21.9	0.96
	8/24/2023	1,785	--	--	10.0	9.20	0.3	21.2	0.88
	9/8/2023	1,527	--	--	10.0	--	--	20.9	0.77
	9/21/2023	1,467	--	--	10.0	8.80	0.3	20.9	0.70
	10/30/2023	1,200	--	--	20.7	29	1.0	20.9	0.44
	11/2/2023	--	--	--	21.3	28	1.0	--	--
	12/1/2023	803	0.1	23	16.8	30	1.1	20.9	0.28



TABLE 2
SOIL VAPOR EXTRACTION SYSTEM FIELD MEASUREMENTS

Howell M#1
Hilcorp Energy Company
San Juan County, New Mexico

SVE Well ID	Date	PID (ppm)	Differential Pressure (IWC)	Flow Rate (acfm)	Flow Rate (scfm) ⁽¹⁾⁽²⁾⁽³⁾	Vacuum (IWC)	Vacuum (psi)	Oxygen (%)	Carbon Dioxide (%)
SVE04	6/6/2023	1,859	--	--	10.0	--	--	--	--
	6/7/2023	2,260	--	--	10.0	8.60	0.3	7.40	0.05
	6/13/2023	1,944	--	--	9.20	9.00	0.3	20.9	2.26
	6/22/2023	1,650	--	--	10.0	8.90	0.3	21.9	0.94
	6/29/2023	609	--	--	10.0	8.30	0.3	23.2	0.12
	7/13/2023	2,375	--	--	10.0	--	--	21.9	0.68
	7/27/2023	1,844	--	--	11.7	8.80	0.3	22.8	0.56
	8/9/2023	1,340	--	--	10.3	9.20	0.3	22.4	0.42
	8/24/2023	325	--	--	10.0	9.30	0.3	22.4	0.08
	9/8/2023	791	--	--	10.0	--	--	21.1	0.20
	9/21/2023	192	--	--	10.0	9.20	0.3	21.1	0.00
	10/30/2023	675	--	--	20.7	29	1.0	20.9	0.12
SVE05	11/2/2023	--	--	--	21.3	28	1.0	--	--
	12/1/2023	803	0.5	62	45.4	30	1.1	20.9	0.12
	6/6/2023	1,922	--	--	10.0	--	--	--	--
	6/7/2023	2,110	--	--	10.0	10.0	0.4	16.8	0.05
	6/13/2023	1,265	--	--	9.20	10.2	0.4	22.4	1.96
	6/22/2023	950	--	--	10.0	9.70	0.4	22.8	0.90
	6/29/2023	1,043	--	--	10.0	9.40	0.3	22.8	0.72
	7/13/2023	1,205	--	--	10.0	--	--	22.5	0.58
	7/27/2023	875	--	--	11.7	9.80	0.4	23.4	0.42
	8/9/2023	795	--	--	10.3	10.0	0.4	22.5	0.38
	8/24/2023	475	--	--	10.0	10.5	0.4	22.5	0.28
	9/8/2023	398	--	--	10.0	--	--	20.9	0.28
	9/21/2023	219	--	--	10.0	10.2	0.4	21.2	0.06
SVE06	10/30/2023	404	--	--	20.7	29	1.0	20.9	0.14
	11/2/2023	--	--	--	21.3	28	1.0	--	--
	12/1/2023	387	0.1	33	23.8	30	1.1	20.9	0.09
	6/6/2023	1,713	--	--	10.0	--	--	--	--
	6/7/2023	1,701	--	--	10.0	9.20	0.3	0.80	0.05
	6/13/2023	1,262	--	--	9.20	10.4	0.4	12.1	>5.0
	6/22/2023	1,715	--	--	10.0	9.90	0.4	19.1	2.40
	6/29/2023	1,829	--	--	10.0	9.30	0.3	17.9	3.48
	7/13/2023	2,560	--	--	10.0	--	--	21.1	0.72
	7/27/2023	2,142	--	--	11.7	9.80	0.4	19.9	2.26
	8/9/2023	1,775	--	--	10.3	10.4	0.4	21.9	0.66
	8/24/2023	3,131	--	--	10.0	10.2	0.4	20.9	1.48
SVE06	9/8/2023	2,396	--	--	10.0	--	--	20.9	1.43
	9/21/2023	2,470	--	--	10.0	9.90	0.4	20.5	1.26
	10/30/2023	83	--	--	20.7	29	1.0	20.9	0.04
	11/2/2023	--	--	--	21.3	28	1.0	--	--
	12/1/2023	1,567	0.0	12	9.0	30	1.1	20.9	0.08

Notes:

(1): flow rates in scfm estimated based on total flow for total system rotometer field measurements collected between 6/6/2023 and 9/21/2023

(2): flow rates in scfm after 9/21/2023 are calculated based on total system pitot tube differential pressure measurements

(3): flow rates in scfm after 9/21/2023 based on an assumed temperature of 70°F

IWC: inches of water column

PID: photoionization detector

ppm: parts per million

acfm: actual cubic feet per minute

scfm: standard cubic feet per minute

%: percent

--: not measured



TABLE 3
SOIL VAPOR EXTRACTION SYSTEM EMISSIONS ANALYTICAL RESULTS
 Howell M#1
 Hilcorp Energy Company
 San Juan County, New Mexico

Date	PID (ppm)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	TVPH/GRO (µg/L)	Oxygen (%)	Carbon Dioxide (%)
6/6/2023	1,910	330	1,100	48	540	100,000	3.83%	10.23%
6/7/2023	1,953	190	730	31	320	93,000	8.07%	8.12%
6/13/2023	1,878	87	430	31	360	39,000	19.30%	2.47%
6/22/2023	1,625	42	200	12	120	26,000	20.33%	1.31%
6/29/2023	1,877	46	270	19	210	25,000	20.70%	0.98%
7/13/2023	2,280	51	360	28	320	25,000	21.38%	0.49%
7/27/2023	1,942	49	340	27	310	24,000	20.97%	0.72%
8/9/2023	1,553	34	230	16	180	17,000	21.35%	0.60%
8/24/2023	1,858	32	230	19	220	16,000	21.40%	0.55%
9/8/2023	1,652	23	250	25	290	18,000	21.48%	0.46%
9/21/2023	1,274	25	240	22	260	18,000	21.48%	0.48%
12/1/2023	935	13	160	11	120	9,400	21.43%	0.42%

Notes:

GRO: gasoline range organics

µg/L: microgram per liter

PID: photoionization detector

ppm: parts per million

TVPH: total volatile petroleum hydrocarbons

%: percent



TABLE 4
SOIL VAPOR EXTRACTION SYSTEM MASS REMOVAL AND EMISSIONS

Howell M#1
Hilcorp Energy Company
San Juan County, New Mexico

Laboratory Analysis

Date	PID (ppm)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	TVPH (µg/L)
6/6/2023	1,910	330	1,100	48	540	100,000
6/7/2023	1,953	190	730	31	320	93,000
6/13/2023	1,878	87	430	31	360	39,000
6/22/2023	1,625	42	200	12	120	26,000
6/29/2023	1,877	46	270	19	210	25,000
7/13/2023	2,280	51	360	28	320	25,000
7/27/2023	1,942	49	340	27	310	24,000
8/9/2023	1,553	34	230	16	180	17,000
8/24/2023	1,858	32	230	19	220	16,000
9/8/2023	1,652	23	250	25	290	18,000
9/21/2023	1,274	25	240	22	260	18,000
12/1/2023	935	13	160	11	120	9,400
Average	1,728	77	378	24	271	34,200

Vapor Extraction Summary

Date	Flow Rate (scfm)	Total System Flow (cf)	Delta Flow (cf)	Benzene (lb/hr)	Toluene (lb/hr)	Ethylbenzene (lb/hr)	Total Xylenes (lb/hr)	TVPH (lb/hr)
6/6/2023	--							
6/7/2023	60	100,440	100,440	0.058	0.21	0.0089	0.096	22
6/13/2023	55	564,420	463,980	0.030	0.12	0.0067	0.073	14
6/23/2023	60	1,427,340	862,920	0.014	0.068	0.0046	0.052	7.0
6/29/2023	60	1,950,420	523,080	0.0099	0.053	0.0035	0.037	5.7
7/13/2023	60	3,166,860	1,216,440	0.011	0.071	0.0053	0.059	5.6
7/27/2023	70	4,566,300	1,399,440	0.012	0.085	0.0067	0.077	6.0
8/9/2023	62	5,735,124	1,168,824	0.010	0.070	0.0053	0.060	5.1
8/24/2023	60	7,034,364	1,299,240	0.0075	0.052	0.0040	0.046	3.8
9/8/2023	60	8,323,164	1,288,800	0.0062	0.054	0.0049	0.057	3.8
9/21/2023	60	9,455,364	1,132,200	0.0054	0.055	0.0053	0.062	4.0
12/1/2023	126	19,141,992	9,686,628	0.0066	0.070	0.0057	0.066	4.8
Average				0.016	0.083	0.0055	0.062	7.4

Mass Recovery

Date	Total Operational Hours	Delta Hours	Benzene (pounds)	Toluene (pounds)	Ethylbenzene (pounds)	Total Xylenes (pounds)	TVPH (pounds)	TVPH (tons)
6/6/2023	292							
6/7/2023	319	28	1.6	5.7	0.25	2.7	604	0.30
6/13/2023	460	141	4.2	18	0.94	10	1,996	1.00
6/23/2023	700	240	3.3	16	1.1	12	1,675	0.84
6/29/2023	845	145	1.4	7.7	0.51	5.4	831	0.42
7/13/2023	1,183	338	3.7	24	1.8	20.1	1,896	0.95
7/27/2023	1,516	333	4.1	28	2.2	26	1,985	0.99
8/9/2023	1,830	314	3.2	22	1.7	19	1,590	0.79
8/24/2023	2,191	361	2.7	19	1.4	16	1,359	0.68
9/8/2023	2,549	358	2.2	19	1.8	20	1,366	0.68
9/21/2023	2,864	315	1.7	17	1.7	19	1,270	0.64
12/1/2023	4,145	1,281	8.5	89	7.4	85	6,106	3.05
Total Mass Recovery to Date			37	266	21	236	20,677	10.3

Notes:

cf: cubic feet

scfm: cubic feet per minute

µg/L: micrograms per liter

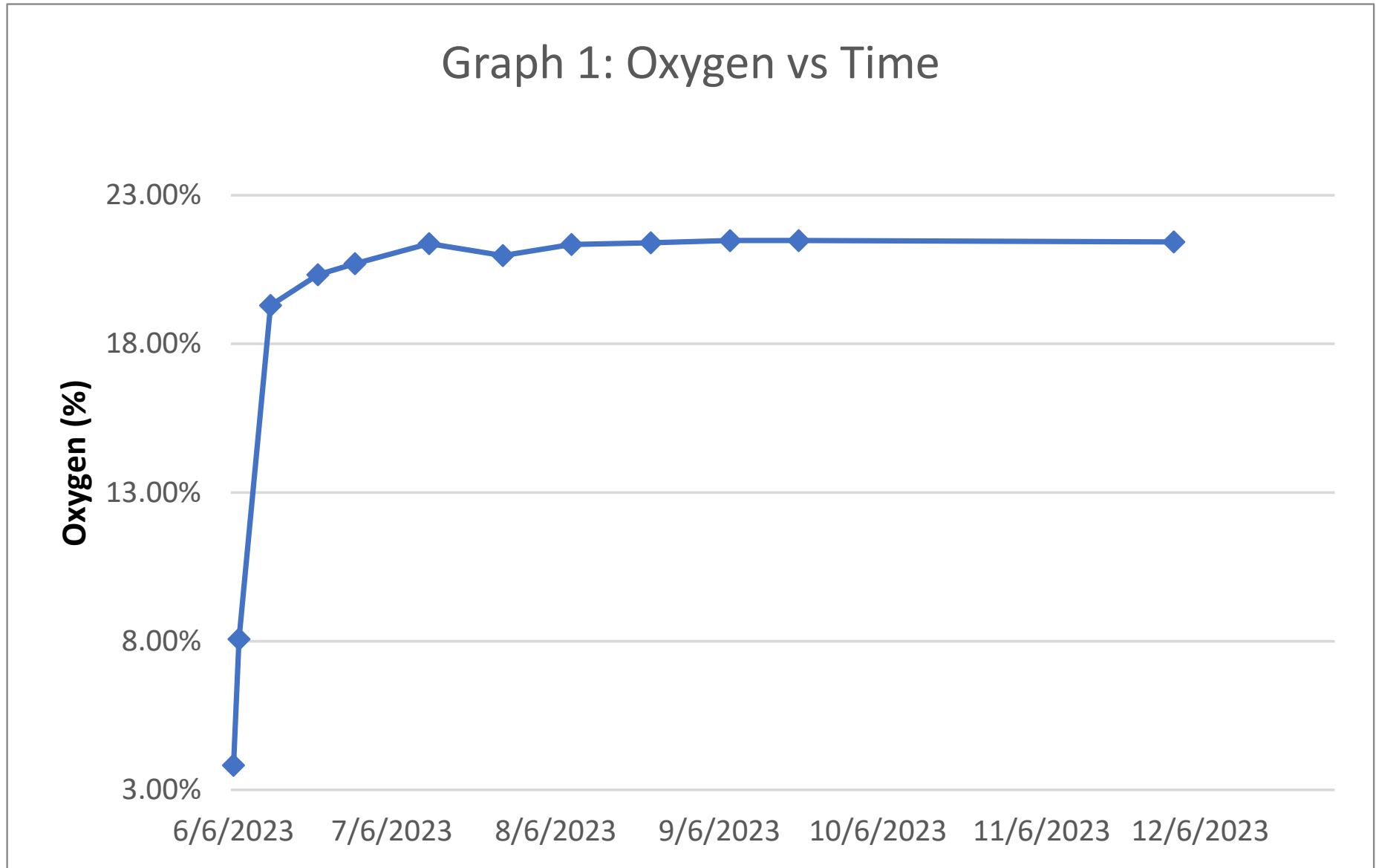
lb/hr: pounds per hour

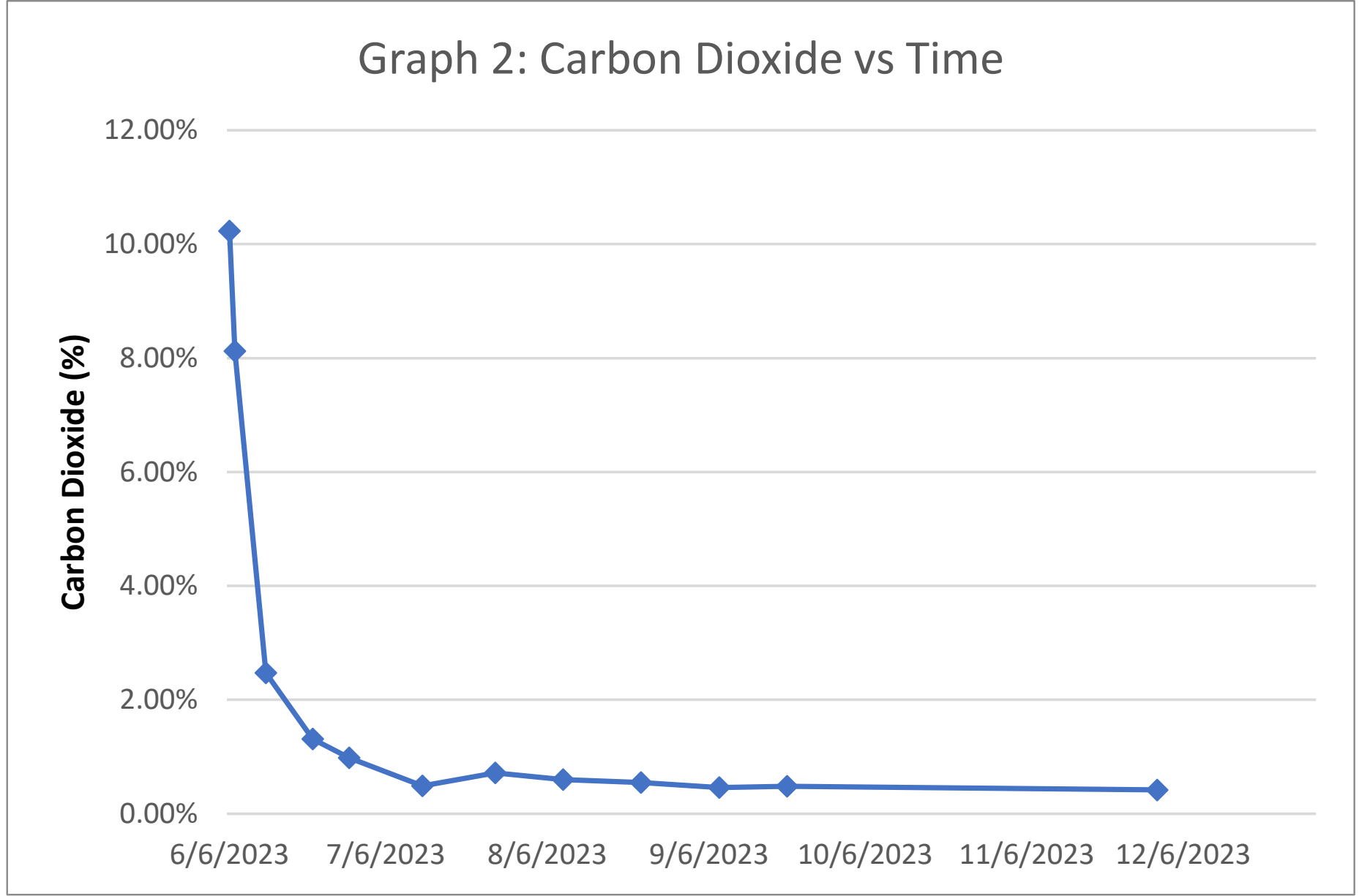
PID: photoionization detector

ppm: parts per million

TVPH: total volatile petroleum hydrocarbons

--: not measured







APPENDIX A

Field Notes



HOWELL M#1 SVE SYSTEM
O&M FORM

DATE: 10-30
TIME ONSITE: _____

O&M PERSONNEL: B Sinclair
TIME OFFSITE: _____

SVE SYSTEM - MONTHLY O&M

SVE ALARMS: [] [☒ K^o TANK HIGH LEVEL]

SVE SYSTEM	READING	TIME
Blower Hours (take photo)	3398.2	1320
Total Flow (scfm)	6.5	
Inlet Vacuum (IWC)	29	
Differential Pressure	3.8	
Inlet PID	1061	
Exhaust PID	1574	
K/O Tank Liquid Level		
K/O Liquid Drained (gallons)	7	

SVE SYSTEM - QUARTERLY SAMPLING

SAMPLE ID:	SAMPLE TIME:
Analytes:	Sample Bi-Monthly (every other month) for TVPH (8015), BTEX (8260), Fixed Gas (CO2 AND O2)
OPERATING WELLS	

Change in Well Operation:

WELLHEAD MEASUREMENTS

WELL ID	VACUUM (IWC)	PID HEADSPACE (PPM)	OXYGEN %	CARBON DIOXIDE ppm
SVE01		588.6	20.9	580
SVE02		404	20.9	900
SVE03		1200	20.9	4380
SVE04		624.8	20.9	1220
SVE05		404.1	20.9	1440
SVE06		82.7	20.9	400

COMMENTS/OTHER MAINTENANCE:

Drained 7g liquid from KO tank.

HEC

Sunny Co's

14:30 EC on site to install
pilot tubes

Turn off system
drain 50 gallons from KO Tank
water in mist filter

Install pilot tubes
vac: 28 IWC
Diff pres: 4 IWC
Flow: 70 SCFM

Need barbs and tubing
for pilot tubes

Hours: 3471.1 @ 15:30

HOWELL M#1 SVE SYSTEM
O&M FORM

DATE: 12-1
TIME ONSITE: _____

O&M PERSONNEL: B Sinclair
TIME OFFSITE: _____

SVE SYSTEM - MONTHLY O&M

SVE ALARMS: [] [KO TANK HIGH LEVEL]

SVE SYSTEM	READING	TIME
Blower Hours (take photo)	4145.0	1115
Total Flow (scfm)	7.5	
Inlet Vacuum (IWC)	30	
Differential Pressure	3.92	
Inlet PID	935.1	
Exhaust PID	1123	
K/O Tank Liquid Level		
K/O Liquid Drained (gallons)	12	

SVE SYSTEM - QUARTERLY SAMPLING

SAMPLE ID:	SAMPLE TIME:
Analytes:	Sample B i-Monthly (every other month) for TVPH (8015), BTEX (8260), Fixed Gas (CO2 AND O2)
OPERATING WELLS	

Change in Well Operation: []

WELLHEAD MEASUREMENTS

WELL ID	VA ^{Differential Pressure (IWC)} (C)	PID HEADSPACE (PPM)	OXYGEN	CARBON DIOXIDE
SVE01	0	416.2	20.9	140
SVE02	.23	1302	20.9	1480
SVE03	.07	1346	20.9	2820
SVE04	.51	802.8	20.4	1180
SVE05	.14	386.7	20.9	860
SVE06	.02	1567	20.9	840

COMMENTS/OTHER MAINTENANCE:

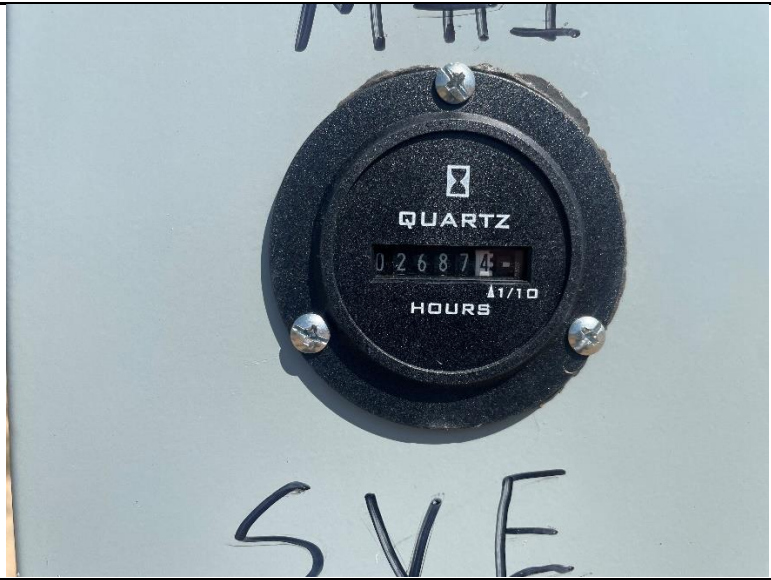

Heat trace installed
System down on 11-28 site visit due to
frozen KO tank.
~~My heat is not on - it is not on at all~~



APPENDIX B

Project Photographs

PROJECT PHOTOGRAPHS
Howell M#1
San Juan County, New Mexico
Hilcorp Energy Company

Photograph 1 Runtime meter taken on September 29, 2023 at 1:09 PM Hours = 2,687.4	
Photograph 2 Runtime meter taken on December 1, 2023 at 11:15 AM Hours = 4,145.0	



APPENDIX C

Laboratory Analytical Reports



Environment Testing

Eurofins Environment Testing South
Central, LLC
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

December 14, 2023

Mitch Killough

HILCORP ENERGY

PO Box 4700

Farmington, NM 87499

TEL: (505) 564-0733

FAX:

RE: Howell M 1

OrderNo.: 2312090

Dear Mitch Killough:

Eurofins Environment Testing South Central, LLC received 1 sample(s) on 12/2/2023 for the analyses presented in the following report.

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

Please do not hesitate to contact Eurofins Albuquerque for any additional information or clarifications.

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

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", with a stylized flourish at the end.

Andy Freeman

Laboratory Manager

4901 Hawkins NE

Albuquerque, NM 87109

Analytical Report

Lab Order 2312090

Date Reported: 12/14/2023

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HILCORP ENERGY

Client Sample ID: SVE-1

Project: Howell M 1

Collection Date: 12/1/2023 11:30:00 AM

Lab ID: 2312090-001

Matrix: AIR

Received Date: 12/2/2023 8:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015D: GASOLINE RANGE						Analyst: JJP
Gasoline Range Organics (GRO)	9400	250		µg/L	50	12/7/2023 3:52:21 PM
Surr: BFB	168	15-412		%Rec	50	12/7/2023 3:52:21 PM
EPA METHOD 8260B: VOLATILES						Analyst: CCM
Benzene	13	5.0		µg/L	50	12/6/2023 4:10:00 PM
Toluene	160	5.0		µg/L	50	12/6/2023 4:10:00 PM
Ethylbenzene	11	5.0		µg/L	50	12/6/2023 4:10:00 PM
Methyl tert-butyl ether (MTBE)	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,2,4-Trimethylbenzene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,3,5-Trimethylbenzene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,2-Dichloroethane (EDC)	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,2-Dibromoethane (EDB)	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Naphthalene	ND	10		µg/L	50	12/6/2023 4:10:00 PM
1-Methylnaphthalene	ND	20		µg/L	50	12/6/2023 4:10:00 PM
2-Methylnaphthalene	ND	20		µg/L	50	12/6/2023 4:10:00 PM
Acetone	ND	50		µg/L	50	12/6/2023 4:10:00 PM
Bromobenzene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Bromodichloromethane	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Bromoform	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Bromomethane	ND	10		µg/L	50	12/6/2023 4:10:00 PM
2-Butanone	ND	50		µg/L	50	12/6/2023 4:10:00 PM
Carbon disulfide	ND	50		µg/L	50	12/6/2023 4:10:00 PM
Carbon tetrachloride	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Chlorobenzene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Chloroethane	ND	10		µg/L	50	12/6/2023 4:10:00 PM
Chloroform	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Chloromethane	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
2-Chlorotoluene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
4-Chlorotoluene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
cis-1,2-DCE	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
cis-1,3-Dichloropropene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,2-Dibromo-3-chloropropane	ND	10		µg/L	50	12/6/2023 4:10:00 PM
Dibromochloromethane	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Dibromomethane	ND	10		µg/L	50	12/6/2023 4:10:00 PM
1,2-Dichlorobenzene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,3-Dichlorobenzene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,4-Dichlorobenzene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
Dichlorodifluoromethane	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,1-Dichloroethane	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM
1,1-Dichloroethene	ND	5.0		µg/L	50	12/6/2023 4:10:00 PM

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

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

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

Page 1 of 2



ANALYTICAL SUMMARY REPORT

December 13, 2023

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

Work Order: B23120241 Quote ID: B15626

Project Name: Not Indicated

Energy Laboratories Inc Billings MT received the following 1 sample for Hall Environmental on 12/5/2023 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
B23120241-001	2312090-001B, SVE-1	12/01/23 11:30	12/05/23	Air	Air Correction Calculations Appearance and Comments Calculated Properties GPM @ std cond./1000 cu. ft., moist. Free Natural Gas Analysis Specific Gravity @ 60/60

The analyses presented in this report were performed by Energy Laboratories, Inc., 1120 S 27th St., Billings, MT 59101, 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 test results, please contact your Project Manager.

Report Approved By:



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www.energylab.com

Billings, MT 406.252.6325 • Casper, WY 307.235.0515
Gillette, WY 307.686.7175 • Helena, MT 406.442.0711

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Hall Environmental
Project: Not Indicated
Lab ID: B23120241-001
Client Sample ID: 2312090-001B, SVE-1

Report Date: 12/13/23
Collection Date: 12/01/23 11:30
Date Received: 12/05/23
Matrix: Air

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
GAS CHROMATOGRAPHY ANALYSIS REPORT							
Oxygen	21.43	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Nitrogen	78.05	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Carbon Dioxide	0.42	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Hydrogen Sulfide	<0.01	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Methane	<0.01	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Ethane	<0.01	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Propane	<0.01	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Isobutane	<0.01	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
n-Butane	<0.01	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Isopentane	<0.01	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
n-Pentane	<0.01	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Hexanes plus	0.10	Mol %		0.01		GPA 2261-95	12/06/23 02:25 / jrj
Propane	< 0.001	gpm		0.001		GPA 2261-95	12/06/23 02:25 / jrj
Isobutane	< 0.001	gpm		0.001		GPA 2261-95	12/06/23 02:25 / jrj
n-Butane	< 0.001	gpm		0.001		GPA 2261-95	12/06/23 02:25 / jrj
Isopentane	< 0.001	gpm		0.001		GPA 2261-95	12/06/23 02:25 / jrj
n-Pentane	< 0.001	gpm		0.001		GPA 2261-95	12/06/23 02:25 / jrj
Hexanes plus	0.042	gpm		0.001		GPA 2261-95	12/06/23 02:25 / jrj
GPM Total	0.042	gpm		0.001		GPA 2261-95	12/06/23 02:25 / jrj
GPM Pentanes plus	0.042	gpm		0.001		GPA 2261-95	12/06/23 02:25 / jrj

CALCULATED PROPERTIES

Gross BTU per cu ft @ Std Cond. (HHV)	5		1		GPA 2261-95	12/06/23 02:25 / jrj
Net BTU per cu ft @ std cond. (LHV)	4		1		GPA 2261-95	12/06/23 02:25 / jrj
Pseudo-critical Pressure, psia	546		1		GPA 2261-95	12/06/23 02:25 / jrj
Pseudo-critical Temperature, deg R	240		1		GPA 2261-95	12/06/23 02:25 / jrj
Specific Gravity @ 60/60F	1.00		0.001		D3588-81	12/06/23 02:25 / jrj
Air, %	97.90		0.01		GPA 2261-95	12/06/23 02:25 / jrj

- The analysis was not corrected for air.

COMMENTS

-	-	12/06/23 02:25 / jrj
- BTU, GPM, and specific gravity are corrected for deviation from ideal gas behavior. - GPM = gallons of liquid at standard conditions per 1000 cu. ft. of moisture free gas @ standard conditions. - To convert BTU to a water-saturated basis @ standard conditions, multiply by 0.9825. - Standard conditions: 60 F & 14.73 psi on a dry basis.		

Report Definitions: RL - Analyte Reporting Limit
QCL - Quality Control Limit

MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)



QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Hall Environmental

Work Order: B23120241

Report Date: 12/13/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: GPA 2261-95									Batch: R413302	
Lab ID: B23120241-001ADUP 12 Sample Duplicate									Run: GCNGA-B_231206A 12/06/23 04:07	
Oxygen		21.4	Mol %	0.01				0	20	
Nitrogen		78.0	Mol %	0.01				0.0	20	
Carbon Dioxide		0.42	Mol %	0.01				0.0	20	
Hydrogen Sulfide		<0.01	Mol %	0.01					20	
Methane		<0.01	Mol %	0.01					20	
Ethane		<0.01	Mol %	0.01					20	
Propane		<0.01	Mol %	0.01					20	
Isobutane		<0.01	Mol %	0.01					20	
n-Butane		<0.01	Mol %	0.01					20	
Isopentane		<0.01	Mol %	0.01					20	
n-Pentane		<0.01	Mol %	0.01					20	
Hexanes plus		0.11	Mol %	0.01				9.5	20	
Lab ID: LCS120623 11 Laboratory Control Sample									Run: GCNGA-B_231206A 12/06/23 03:15	
Oxygen		0.52	Mol %	0.01	104	70	130			
Nitrogen		6.39	Mol %	0.01	106	70	130			
Carbon Dioxide		0.99	Mol %	0.01	100	70	130			
Methane		74.6	Mol %	0.01	100	70	130			
Ethane		6.03	Mol %	0.01	100	70	130			
Propane		5.07	Mol %	0.01	103	70	130			
Isobutane		1.76	Mol %	0.01	88	70	130			
n-Butane		1.97	Mol %	0.01	98	70	130			
Isopentane		0.98	Mol %	0.01	98	70	130			
n-Pentane		0.96	Mol %	0.01	96	70	130			
Hexanes plus		0.74	Mol %	0.01	93	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)



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Gillette, WY 307.686.7175 • Helena, MT 406.442.0711

Work Order Receipt Checklist

Hall Environmental

B23120241

Login completed by: Crystal M. Jones

Date Received: 12/5/2023

Reviewed by: Icadreau

Received by: cmj

Reviewed Date: 12/7/2023

Carrier name: FedEx

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on all shipping container(s)/cooler(s)?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on all sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Not Applicable <input type="checkbox"/>
Container/Temp Blank temperature:	13.4°C No Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Applicable <input checked="" type="checkbox"/>

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.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

For methods that require zero headspace or require preservation check at the time of analysis due to potential interference, the pH is verified at analysis. Nonconforming sample pH is documented as part of the analysis and included in the sample analysis comments.

Contact and Corrective Action Comments:

None



Environment Testing

CHAIN OF CUSTODY RECORD

PAGE: 1 OF: 1

Eurofins Environment Testing South Central, LLC
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975
FAX: 505-345-4107
Website: www.hallenvironmental.com

SUB CONTRACTOR: Energy Labs -Billings		COMPANY: Energy Laboratories		PHONE: (406) 869-6253	FAX: (406) 252-6069
ADDRESS: 1120 South 27th Street		ACCOUNT #:		EMAIL:	
CITY, STATE, ZIP: Billings, MT 59107		823120241			
ITEM	SAMPLE	CLIENT SAMPLE ID	BOTTLE TYPE	MATRIX	COLLECTION DATE
1	2312090-001B	SVE-1	TEDLAR	Air	12/1/2023 11:30:00 AM
			# CONTAINERS		1
ANALYTICAL COMMENTS Natural Gas Analysis- CO2+O2					

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: <i>CM</i>	Date: 12/4/2023	Time: 10:06 AM	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By: <i>gty Capital Inc</i>	Date: 12/5/23	Time: 0910
TAT: Standard <input checked="" type="checkbox"/> RUSH			Next BD <input type="checkbox"/>	2nd BD <input type="checkbox"/>	3rd BD <input type="checkbox"/>
REPORT TRANSMITTAL DESIRED: <input type="checkbox"/> HARDCOPY (extra cost) <input type="checkbox"/> FAX <input type="checkbox"/> EMAIL <input type="checkbox"/> ONLINE					
FOR LAB USE ONLY Temp of samples _____ °C Attempt to Cool? _____ Comments: _____					



Environment Testin

Eurofins Environment Testing South
Central, LLC

4901 Hawkins NE

Albuquerque, NM 87109

TEL: 505-345-3975 FAX: 505-345-4107

Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: HILCORP ENERGY Work Order Number: 2312090 RcptNo: 1

Received By: Tracy Casarrubias 12/2/2023 8:30:00 AM

Completed By: Tracy Casarrubias 12/2/2023 9:20:43 AM

Reviewed By: *TC 12/4/23*

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: *TMC 12/2/23***Special Handling (if applicable)**

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

Person Notified:

Date:

By Whom:

Via:

☐ eMail☐ Phone☐ Fax☐ In Person

Regarding:

Client Instructions:

Mailing address and phone number are missing on COC - TMC 12/2/23

16. Additional remarks:

17. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	N/A	Good	Yes			

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 303738

CONDITIONS

Operator: HILCORP ENERGY COMPANY 1111 Travis Street Houston, TX 77002	OGRID: 372171
	Action Number: 303738
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

CONDITIONS

Created By	Condition	Condition Date
michael.buchanan	Review of the Fourth Quarter 2023--SVE System Update for Howell M#1: Content Satisfactory 1. Continue to operate SVE and conduct maintenance as scheduled, bi-monthly. 2. Submit next quarterly report as scheduled.	4/5/2024