

# **FREMONT ENVIRONMENTAL INC.**

January 19, 2021

Mr. Jason Davidson  
Great Western Operating Company, LLC  
1001 17<sup>th</sup> Street, Suite 2000  
Denver, CO 80202

Subject:       **Soil Vapor Monitoring Report**  
                  Dittmer KE20 Pad  
                  NENW Sec 32, T1N, R66W  
                  Adams County, Colorado  
                  Fremont Project No. C019-095  
                  Facility #447013

Dear Mr. Davidson:

At the request of Great Western Operating Company, LLC (GWOC), Fremont Environmental Inc. (Fremont) installed soil vapor monitoring points at GWOC's Dittmer KE20 Pad in Adams County, Colorado. The site location is shown on Figure 1.

A total of 21 soil vapor points were installed in November 2020. Four soil vapor points were installed in the cardinal compass directions around five of the Dittmer KE20 well heads. An additional vapor point was installed at the KE20-037HC well. The locations of the vapor points are illustrated on Figure 2.

The soil vapor points were constructed by hand augering to a total depth of approximately 2.5 feet. A ¼" polyethylene tube was extended from the bottom of the boring to the ground surface. The boring was then backfilled with 10/20 washed silica sand from a depth of 2.0 feet to 2.5 feet. A 6 inch layer of hydrated bentonite was placed above the sand layer to provide a seal from ambient atmospheric air. The remainder of the boring was backfilled with soil cuttings. Twenty of the vapor points were installed on November 4, 2020; the 21<sup>st</sup> vapor point was installed on November 13, 2020.

On November 7, 2020, a Lantec GEM-2000 Plus landfill gas meter was used to measure methane, oxygen and carbon dioxide concentrations at each of the soil vapor points. This instrument can measure methane at concentrations up to 100% by volume. The concentrations of these constituents is summarized on Table 1 and illustrated on Figure 3.

The methane concentrations in each of the soil vapor points was 0.0% except for the South vapor point adjacent to well KE20-037HC where the methane concentration was 1.3%. The North, East and West vapor points adjacent to KE20-37HC were 0.0%.

**1759 REDWING LANE, BROOMFIELD, CO 80020  
(303) 956-8714 (DIRECT)**

Due to the elevated methane concentration in this vapor point, an additional vapor point (South South KE20-037HC) was installed approximately 10 feet south using the same construction method as the initial vapor points. On November 13, 2020, the methane concentrations in South KE20-037HC and South South KE20-037HC were 1.0% and 0.0%, respectively.

An air sample was collected from South KE20-037HC on November 13, 2020 in a 0.5 liter tedlar bag and submitted to Dolan Integration Group (DIG) for gas composition and genetic origin analyses. The DIG analysis indicated that a methane concentration of 69 ppm was present in the air sample. Since this concentration is less than the 6,000 ppm minimum concentration required for genetic origin analysis, DIG was unable to perform that analysis.

A second air sample was collected from the South KE20-037HC vapor monitoring point on December 14, 2020 in a summa canister and submitted to DIG for analysis. The methane concentration in this sample was 60 ppm; therefore, DIG was not able to conduct a genetic origin analyses. The laboratory reports are attached to this correspondence.

Please contact me at (303) 956-8714 if you require any additional information.

Fremont appreciates the opportunity to provide this service.

Sincerely,

**FREMONT ENVIRONMENTAL INC.**

A handwritten signature in blue ink, appearing to read "Paul V. Henahan".

Paul V. Henahan, P.E.  
Senior Consultant

Enclosures:

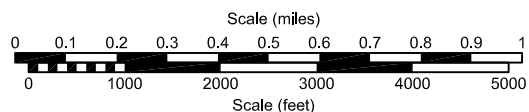
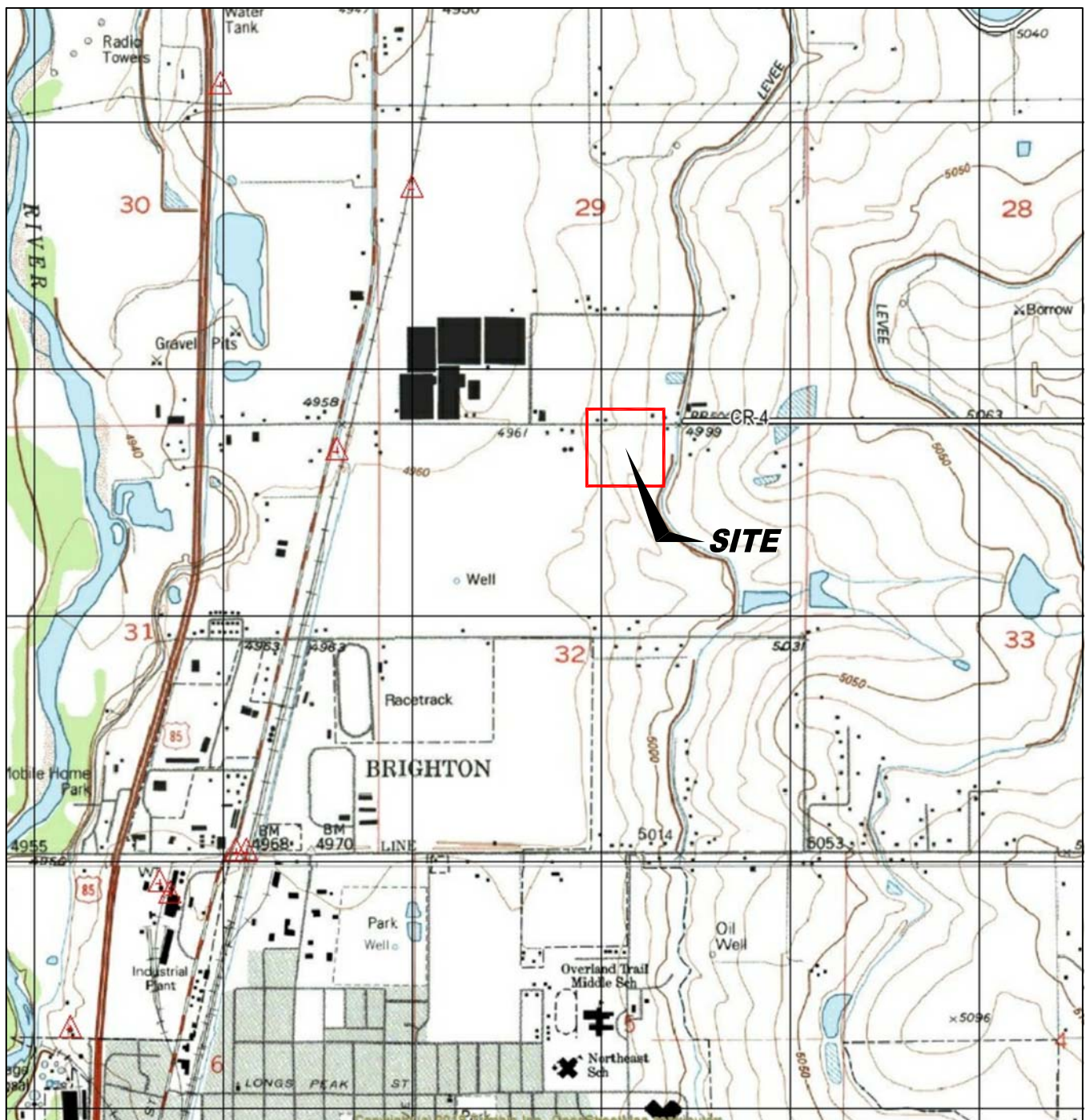
Table 1

Figures 1 to 3

Laboratory Reports

**TABLE 1**  
**SUMMARY OF SOIL VAPOR DATA**  
**GREAT WESTERN OPERATING COMPANY**  
**DITTMER KE20 PAD, WELD COUNTY, COLORADO**  
**FREMONT PROJECT C020-095**

Well	Date	Boring Location	Methane (%)	Oxygen (%)	Carbon Dioxide (%)	Methane by DIG (ppm)
KE20-035HN	11/7/2020	North	0.0	17.6	1.5	NA
	11/7/2020	South	0.0	13.7	3.5	NA
	11/7/2020	East	0.0	15.4	1.7	NA
	11/7/2020	West	0.0	14.1	2.7	NA
KE20-037HC	11/7/2020	North	0.0	16.5	1.6	NA
	11/7/2020	South	1.3	11.5	0.0	NA
	11/13/2020	South	1.0	NM	NM	69
	12/14/2020	South	NM	NM	NM	60
	11/13/2020	South South	0.0	NM	NM	NA
	11/7/2020	East	0.0	14.1	3.7	NA
	11/7/2020	West	0.0	15.4	1.7	NA
KE20-038HN	11/7/2020	North	0.0	19.1	0.3	NA
	11/7/2020	South	0.0	18.4	1.4	NA
	11/7/2020	East	0.0	19.4	0.4	NA
	11/7/2020	West	0.0	18.3	0.6	NA
KE20-027HN	11/7/2020	North	0.0	18.5	2.0	NA
	11/7/2020	South	0.0	17.7	2.6	NA
	11/7/2020	East	0.0	19.6	1.4	NA
	11/7/2020	West	0.0	18.2	2.1	NA
KE20-034HC	11/7/2020	North	0.0	20.4	0.7	NA
	11/7/2020	South	0.0	20.9	0.3	NA
	11/7/2020	East	0.0	20.2	1.2	NA
	11/7/2020	West	0.0	20.1	0.9	NA



USGS 7.5 MINUTE SERIES (TOPOGRAPHIC)

Figure 1  
SITE LOCATION MAP

**GREAT WESTERN OPERATING COMPANY**  
**DITTMER PAD KE20 wells**  
 NENW Sec. 32 T1N, R66W ~ 40.01206°, -104.80273°  
 Brighton, Colorado

Project No.  
**C020-095**

Prepared by

Drawn by  
**TA**

Date  
**1/19/21**

Reviewed by  
**PH**

Filename  
**20095T**







#### LEGEND



WELL LOCATION



BUILDING

BUILDING

CONTAINMENT WALL

FENCE LINE

Figure 2  
SITE MAP

**GREAT WESTERN OPERATING COMPANY**  
**DITTMER PAD KE20 wells**  
 NENW Sec. 32 T1N, R66W ~ 40.01206°, -104.80273°  
 Brighton, Colorado

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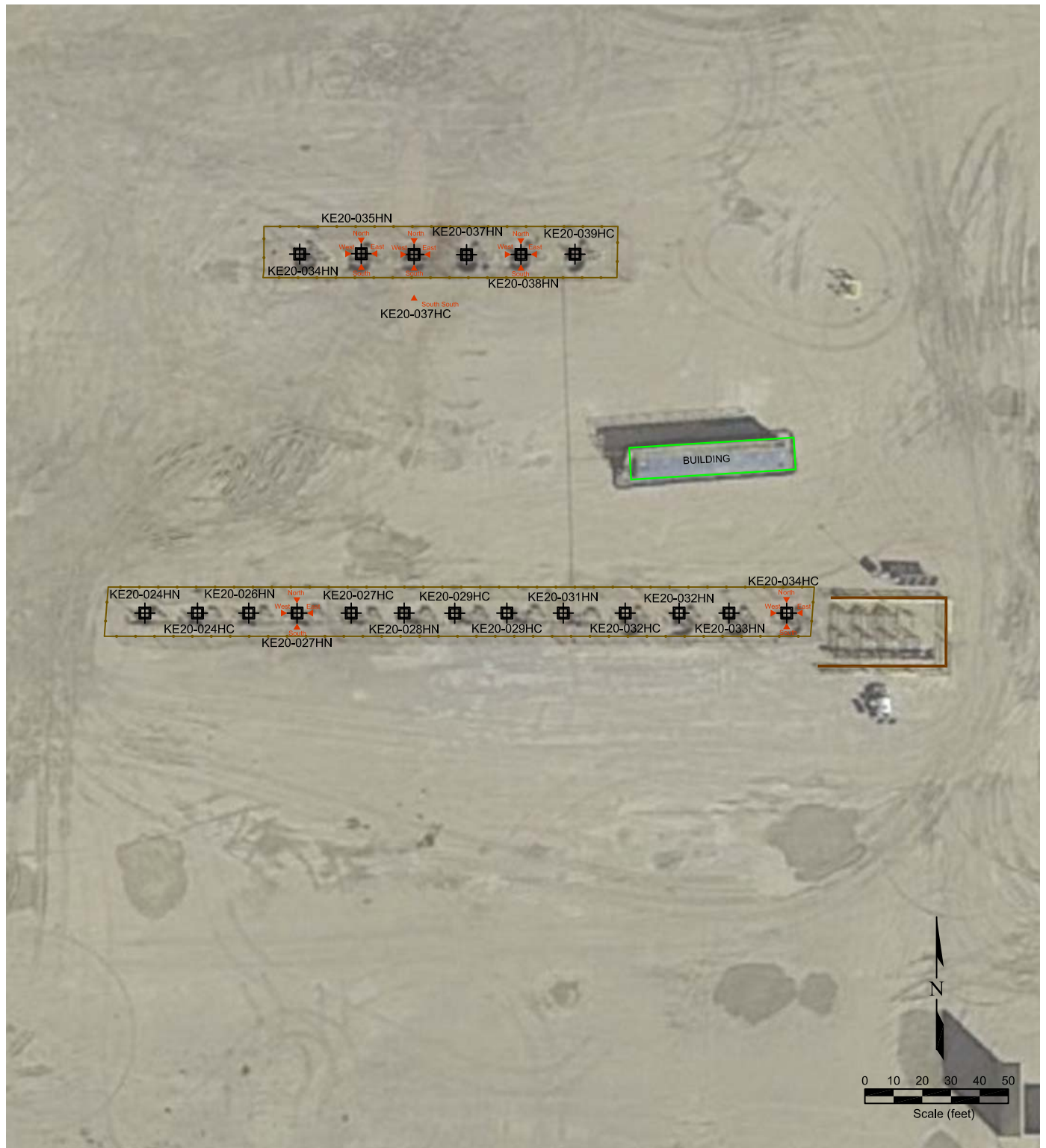
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**1/19/21**

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**PH**

Filename  
**20095Q**





#### LEGEND

	WELL LOCATION
	VAPOR POINT
	BUILDING
	CONTAINMENT WALL
	FENCE LINE

Figure 3  
**SITE MAP WITH  
 VAPOR POINT LOCATIONS**  
**GREAT WESTERN OPERATING COMPANY**  
**DITTMER PAD KE20 wells**  
 NENW Sec. 32 T1N, R66W ~ 40.01206°, -104.80273°  
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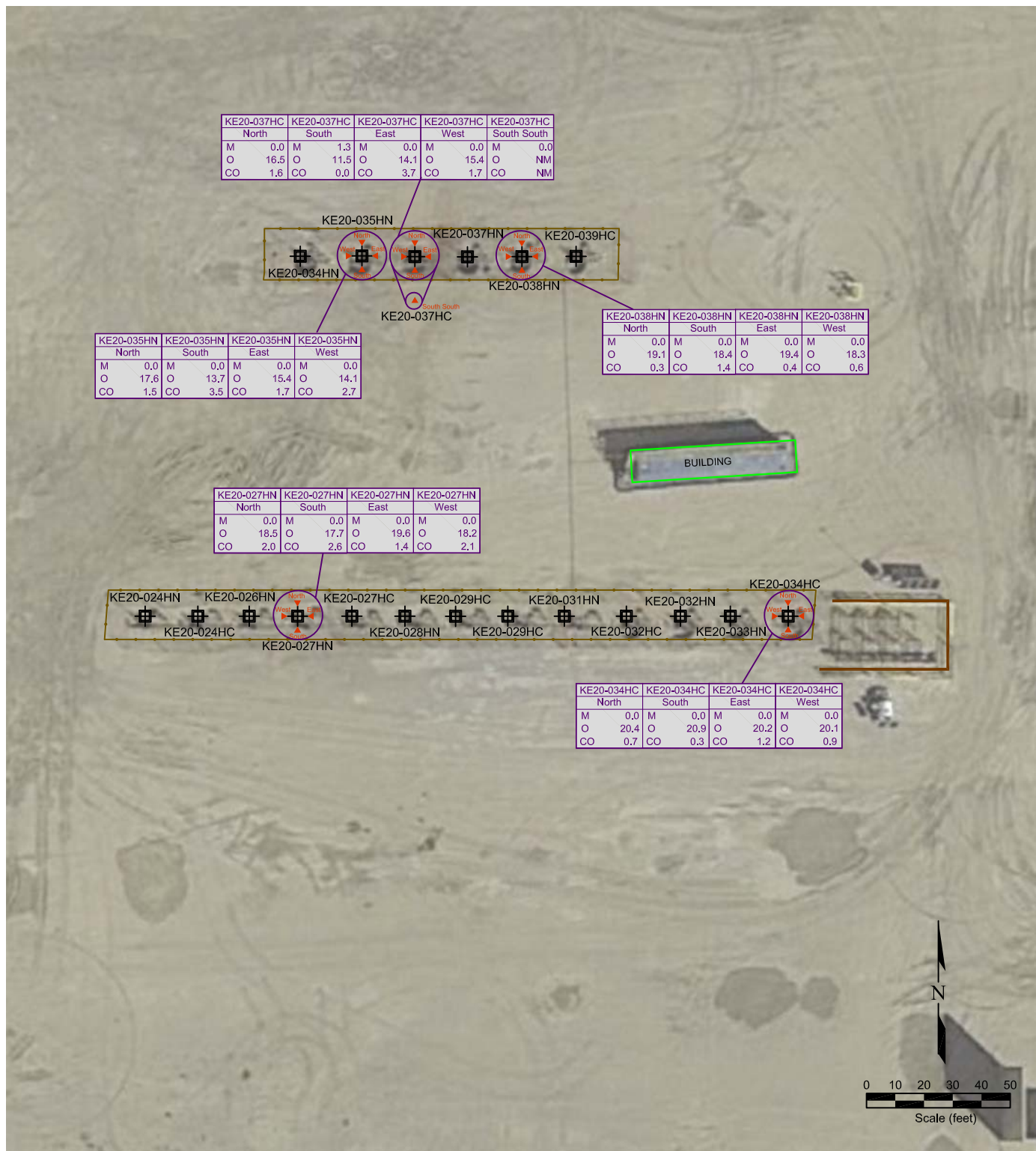
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**TA**

Date  
**1/19/21**

Reviewed by  
**PH**

Filename  
**20095Q**





#### LEGEND

	WELL LOCATION	<table><tr><td colspan="2">KE20-034HC</td></tr><tr><td colspan="2">North</td></tr><tr><td>M</td><td>0.0</td></tr><tr><td>O</td><td>20.4</td></tr><tr><td>CO</td><td>0.7</td></tr></table>	KE20-034HC		North		M	0.0	O	20.4	CO	0.7	WELL IDENTIFICATION
KE20-034HC													
North													
M	0.0												
O	20.4												
CO	0.7												
	VAPOR POINT		BORING LOCATION										
	BUILDING		METHANE (%)										
	CONTAINMENT WALL		OXYGEN (%)										
	FENCE LINE		CARBON DIOXIDE (%)										

Figure 4  
VAPOR POINT SOIL CHEMISTRY

**GREAT WESTERN OPERATING COMPANY**  
**DITTMER PAD KE20 wells**  
 NENW Sec. 32 T1N, R66W ~ 40.01206°, -104.80273°  
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**1/19/21**

Reviewed by  
**PH**

Filename  
**20095Q**





Client/Well Name: Fremont Environmental Inc. / KE20-037HC South Vapor Point  
Job #: 20114837  
Lab #: DIG-024088

SAMPLE INFORMATION						COMPLETE GAS ANALYSIS						
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	GC Date	N <sub>2</sub> ppm	O <sub>2</sub> + Ar ppm	CO <sub>2</sub> ppm	C <sub>1</sub> ppm	C <sub>2</sub> ppm	C <sub>3</sub> ppm
20114837	DIG-024088	KE20-037HC South Vapor Point Gas	Gas	11/13/20	9:00	11/17/2020	812086	184528	605	69	nd	nd

SAMPLE INFORMATION						HYDROCARBON RATIOS				STABLE ISOTOPE ANALYSIS		
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	Total HC ppm	Wetness % C <sub>2</sub> to C <sub>6</sub>	C <sub>1</sub> /C <sub>2</sub> +C <sub>3</sub> mol/mol	Balance Ratio C <sub>1</sub> +C <sub>2</sub> /C <sub>3</sub> -C <sub>5</sub>	Mass Spec Date	δ <sup>13</sup> C <sub>1</sub> ‰ VPDB	δ <sup>13</sup> C <sub>2</sub> ‰ VPDB
20114837	DIG-024088	KE20-037HC South Vapor Point Gas	Gas	11/13/20	9:00	179	61.5	#N/A	#N/A	11/20/2020		



								HYDROCARBON GAS ANALYSIS (normalized to total HC content)								BTU CONTENT*
iC <sub>4</sub> ppm	nC <sub>4</sub> ppm	iC <sub>5</sub> ppm	nC <sub>5</sub> ppm	C <sub>6</sub> + ppm	C <sub>2</sub> H <sub>4</sub> ppm	He ppm	H <sub>2</sub> ppm	C <sub>1</sub> mol%	C <sub>2</sub> mol%	C <sub>3</sub> mol%	iC <sub>4</sub> mol%	nC <sub>4</sub> mol%	iC <sub>5</sub> mol%	nC <sub>5</sub> mol%	C <sub>6</sub> + mol%	Total Gas BTU/ft <sup>3</sup>
nd	nd	nd	nd	110	nd	nd	nd	38.5	BN/A	BN/A	BN/A	BN/A	BN/A	BN/A	61.45	2

δ <sup>13</sup> <sub>C<sub>3</sub></sub> ‰ VPDB	δ <sup>13</sup> <sub>iC<sub>4</sub></sub> ‰ VPDB	δ <sup>13</sup> <sub>nC<sub>4</sub></sub> ‰ VPDB	δ <sup>13</sup> <sub>iC<sub>5</sub></sub> ‰ VPDB	δ <sup>13</sup> <sub>nC<sub>5</sub></sub> ‰ VPDB	δ <sup>13</sup> <sub>CO<sub>2</sub></sub> ‰ VPDB	δD ‰ VSMOW	Comments
							Concentration too low for isotopic analysis

Stable isotope results based on multi-point laboratory calibration

Values in red represent low signal; interpret with caution

Precision δ13C < 0.5 ‰

Precision δD < 5 ‰

\* As ideal gas, with gas concentrations normalized to 100%;  
caculations based on GPA 2145-09 physical constants.

SPECIFIC GRAVITY*	
Total Gas Spec Grav	HCs only Spec Grav
0.993	2.042



Client/Well Name: Fremont Environmental Inc. / GWOG KE20-037HC South Vapor Point  
Job #: 20124993  
Lab #: DIG-024319

SAMPLE INFORMATION						COMPLETE GAS ANALYSIS					
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	GC Date	N <sub>2</sub> ppm	O <sub>2</sub> + Ar ppm	CO <sub>2</sub> ppm	C <sub>1</sub> ppm	C <sub>2</sub> ppm
20124993	DIG-024319	GWOG KE20-037HC South Vapor Point	Gas	12/14/20	9:00:00 AM	12/17/2020	778709	195742	583	60	nd

SAMPLE INFORMATION						HYDROCARBON RATIOS				STABLE ISOTOPE ANALYSIS	
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	Total HC ppm	Wetness % C <sub>2</sub> to C <sub>6</sub>	C <sub>1</sub> /C <sub>2</sub> +C <sub>3</sub> mol/mol	Balance Ratio C <sub>2</sub> +C <sub>2</sub> /C <sub>3</sub> -C <sub>5</sub>	Mass Spec Date	δ <sup>13</sup> C <sub>1</sub> ‰ VPDB
20124993	DIG-024319	GWOG KE20-037HC South Vapor Point	Gas	12/14/20	9:00:00 AM	60	0.0	#N/A	#VALUE!	12/18/2020	

									HYDROCARBON GAS ANALYSIS (normalized to total HC content)								BTU CONTENT*
C <sub>3</sub> ppm	iC <sub>4</sub> ppm	nC <sub>4</sub> ppm	iC <sub>5</sub> ppm	nC <sub>5</sub> ppm	C <sub>6</sub> + ppm	C <sub>7</sub> H <sub>4</sub> ppm	He ppm	H <sub>2</sub> ppm	C <sub>1</sub> mol%	C <sub>2</sub> mol%	C <sub>3</sub> mol%	iC <sub>4</sub> mol%	nC <sub>4</sub> mol%	iC <sub>5</sub> mol%	nC <sub>5</sub> mol%	C <sub>6</sub> + mol%	Total Gas BTU/ft <sup>3</sup>
nd	nd	nd	nd	nd	nd	nd	nd	nd	100.0	BN/A	BN/A	BN/A	BN/A	BN/A	BN/A	BN/A	1

δ <sup>13</sup> C <sub>2</sub> ‰ VPDB	δ <sup>13</sup> C <sub>3</sub> ‰ VPDB	δ <sup>13</sup> iC <sub>4</sub> ‰ VPDB	δ <sup>13</sup> nC <sub>4</sub> ‰ VPDB	δ <sup>13</sup> iC <sub>5</sub> ‰ VPDB	δ <sup>13</sup> nC <sub>5</sub> ‰ VPDB	δ <sup>13</sup> CO <sub>2</sub> ‰ VPDB	δD ‰ VSMOW	Comments
								Concentration too low for isotopic analysis

Stable isotope results based on multi-point laboratory calibration  
Values in red represent low signal; interpret with caution  
Precision δ13C < 0.5 ‰  
Precision δD < 5 ‰

\* As ideal gas, with gas concentrations normalized to 100%;  
caculations based on GPA 2145-09 physical constants.

SPECIFIC GRAVITY*	
Total Gas Spec Grav	HCs only Spec Grav
0.995	0.554