

AP - 37

STAGE 2
REPORT
(Event 6)

Date

6-5-13



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MOBILE DUAL PHASE EXTRACTION REPORT
LOVINGTON DEEP 6 PIPELINE RELEASE
LEA COUNTY, NEW MEXICO

SRS # 2002-10312

NMOCD# AP-037

RECEIVED OGD

2013 SEP 20 P 2: 01

PREPARED FOR:

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JUNE 5, 2013



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I. MDPE SUMMARY REPORT AND WASTE DISPOSITION

A. MDPE Results

The following report summarizes data collected during the 12-hour High Vacuum Multi-Phase Extraction (MDPE) event conducted on April 24, 2013, at the Lovington Deep 6 Pipeline release site, located in Lea County, New Mexico. The objective of the MDPE treatment was to remove both vapor and liquid phase separated hydrocarbons (PSH) from onsite groundwater wells. Talon/LPE utilized an MDPE unit which consisted of an SVE extraction pump capable of generating vacuum up to 25" hg. Off gas vapors extracted from the extraction wells were destroyed using a propane-fired 1000-SCFM thermal oxidizer capable of processing 172.96 lbs/hr of gasoline.

A total of 12 hours (0.5 days) of PSH recovery was performed. MW2, MW13, MW-14, MW16 & MW17 for 12 hours.

Prior to and immediately following the event, the groundwater wells were gauged for groundwater elevation and PSH. Depth to groundwater ranges were measured in feet below the top of casing. Refer to Attachment 1 for a summary of data collected during the MDPE event.

The volume of PSH removed during the MDPE event is shown to reflect the portions of PSH in the liquid phase and as off-gas vapor. Air removal rates were calculated from velocity measurements recorded at the influent manifold prior to entry into the MDPE unit. PSH recovery and air flow data has been detailed and is contained in Table 1. Two influent air samples were collected over the course of the event. These samples were submitted for laboratory testing in order to compare the predicted vapor concentrations (based on field-screening or calculated based on fuel consumption) to the actual vapor concentrations. Both influent samples were tested for Total-Gas Analysis (Hydrocarbon Composition) by GPA 2261. Laboratory analytical results can be found in Attachment 2.

Based on a combination of field vapor screening and collected laboratory samples, a combined estimated total of **195.09 equivalent gallons of hydrocarbons (Total)** were removed during the event. The combined volume of hydrocarbons were comprised of approximately **172 gallons of PSH (liquid phase)** and approximately **23.09 gallons as off-gas vapor**. The calculations used to estimate the off-gas vapor mass recovered reflect the mass of total hydrocarbons recovered and does not necessarily equate to an equal mass of the product released. The mass recovery calculations may be affected by variations in the specific gravity of hydrocarbon released, age of release, activity of aerobic and/or anaerobic processes, and site specific geochemical factors.

The cumulative air flow measurements for the MDPE event were calculated using a combination of field data measurements and Preso® B+ manufacturer provided formulas. **Air flow rates extracted from the recovery wells averaged 201.39 SCFM during the event.**

A portion of the extracted air flow rates measured is attributable to compressed air, which was “injected” into the extraction wells. This “injected” air is introduced into the extraction wells for the purpose of enhancing liquid recovery rates.

B. Air Quality

Two influent air samples were collected during the event. These samples were submitted for laboratory testing in order to compare the predicted vapor concentrations (based on field-screening or calculated based on fuel consumption) to the actual vapor concentrations. The maximum influent concentration was recorded as 13,830 ppmv for Hydrocarbon Composition. Laboratory analytical results can be found in Attachment 2.

C. Waste Management and Disposition

A cumulative total of 1,668 gallons of fluid were generated during this event. The fluids were temporarily transferred to an on-site storage tank prior to being transferred to an authorized disposal facility. A copy of the waste ticket can be found in Attachment 4.

II. SYSTEM OPERATION DATA AND MASS RECOVERY CALCULATIONS

Formulae:

$$\text{Concentration (C_mg/l)} = \frac{\text{C_ppmv} \times \text{Mol. wt. in mg(estimated)} \times 1000 \times 0.000001}{0.0821 \times \text{Temp (K)}}$$

$$\text{Recovery Rate (lbs/hr)} = \frac{(\text{C_mg/l}) \times 2.2 \times (\text{Flowrate}) \times 60 \times 28.32}{1,000,000}$$

$$\text{Recovery (lbs)} = (\text{lbs/hr}) \times (\text{hrs})$$

$$\text{Correction Factor (CF)} = \frac{\text{PID Reading(ppm)}}{\text{PID Reading at Time of Laboratory Analysis}}$$

$$\frac{8.34 \text{ lbs}}{\text{gallon water}} \times 0.82 \text{ average specific gravity of light crude} = \frac{6.84 \text{ lbs light crude}}{\text{gallon}} \quad \text{(estimated)}$$

Table 1
System Operation Data and Mass Recovery Calculations

Time	Period (hours)	Influent Temp. (°F)	Vacuum (in. hg)	Vacuum (in. h2O)	Differential pressure (in. h2O)	Flow (SCFM)	FID Readings (ppm)	Lab Result (ppmv)	Assigned Lab Result (ppmv)	Correction Factor (CF)	Adjusted Lab Result (ppmv)	Adjusted Lab Result (mg/L)	Recovery (lbs/hr)	Recovery in Period (lbs)	Total Recovery (lbs)
11:45	0.5	62	15	204.14	60.5	193.58	18721	-	13020.00	0.75	9773	11.77	8.51	4.28	4.28
12:15	0.5	62	15.5	210.94	63.2	194.52	24942	13020.00	13020.00	1.00	13020	15.68	11.40	5.70	9.98
13:15	1	66	16	217.74	74.8	207.14	27894	-	13020.00	1.12	14561	17.40	13.47	13.47	23.43
14:15	1	68	17	231.35	83.4	210.34	29710	-	13020.00	1.19	15509	18.46	14.51	14.51	37.94
15:15	1	70	17	231.35	80.2	205.88	44106	-	13020.00	1.77	23024	27.30	21.01	21.01	58.95
16:15	1	70	17.5	238.16	81.3	203.25	42714	-	13020.00	1.71	22297	26.44	20.09	20.09	79.04
17:15	1	70	18	244.96	82.7	200.83	46314	-	13020.00	1.66	24176	28.67	21.52	21.52	100.56
18:15	1	70	17.5	238.16	83.6	206.10	32854	-	13830.00	0.91	12635	15.09	11.63	11.63	112.19
19:15	1	68	17.5	238.16	82.7	205.38	20461	-	13830.00	0.57	7869	9.43	7.24	7.24	119.43
20:15	1	62	16	217.74	38.7	149.58	9534	-	13830.00	0.27	3697	4.45	2.49	2.49	121.92
21:15	1	60	17	231.35	82.5	210.81	27852	-	13830.00	0.77	10712	13.04	10.28	10.28	132.19
22:15	1	60	16.5	224.55	83.1	215.61	35960	13830.00	13830.00	1.00	13830	16.84	13.57	13.57	145.76
23:15	1	60	16.5	224.55	82.7	215.09	32421	-	13830.00	0.90	12469	15.16	12.20	12.20	157.97
Average:		65.23	16.69	227.17	75.34	201.39	30267.92						Total	157.97	

PSH Mass Recovered in Vapor Phase = **23.09** gallons

FID maximum Concentration = 50,000 PPM

Ex: Conversion from ppmv to mg/L (Influent 1)

Measured Conc.	Molecular Wt.	Pressure	Gas Constant	Temp.	Temp.	Conc.
(ppmv)	(Grams)	(atm)	(atm.liter/K.mole)	(F)	(K)	(C_mg/L)
9773	28.6319	1	0.0821	62	289.696667	11.7689275

Inputs are the green values.

Calculated values are yellow.

Constants are purple values.

Outputs are the blue values.

Liquid-phase Hydrocarbon Recovery

$\pi \cdot r^2 \cdot h$ = volume

Total Hydrocarbon Recovery

PSH Mass Recovered in Vapor Phase = **157.97** lbs

PSH Mass Recovered in Liquid Phase = **23.09** gallons

1176.48 lbs

172.00 gallons

TOTAL = 1334.45 lbs
195.09 gallons

Gallons removed determined at time of pick up

PSH Volume in Gallons=

172

PSH Mass in Pounds=

1176.48

% Vol. Hydrocarbon to ppmv - Influent 1

Compound	Molecular Weight (g/mol)	% Vol	=	ppmv
Methane (CH4)	16.04	0		0.00
Ethane (C2H6)	30.07	0		0.00
Propane (C3H8)	44.10	0		0.00
iso-Butane (C4H10)	58.12	0		0.00
n-Butane (C4H10)	58.12	0.016		160.00
iso-Pentane (C5H12)	72.15	0.048		480.00
n-Pentane (C5H12)	72.15	0.101		1010.00
Hexane+ (C6H14)	97.40	1.137		11370.00
Total				13020.00

*Hexane+ is treated as 60% hexanes, 30 % heptanes, and 10 % octanes, as such its
(0.6*93.1887)+(0.3*100.2019)+(0.1*114.2285) = 97.3966

Molecular Weight Calculations

component	Molecular Weight (g/mol)	mol%
Nitrogen (N2)	28.016	97.4250
Methane (CH4)	16.0425	0.0000
Carbon Dioxide (CO2)	44.011	2.1590
Ethane (C2H6)	30.069	0.0000
Propane (C3H8)	44.0958	0.0000
iso-Butane (C4H10)	58.1222	0.0000
n-Butane (C4H10)	58.1222	0.0080
iso-Pentane (C5H12)	72.1488	0.0190
n-Pentane (C5H12)	72.1488	0.0400
Hexane+	97.3966	0.3490
Total		100
Calculated MW	28.6319	

% Vol. Hydrocarbon to ppmv - Influent 2

Compound	Molecular Weight (g/mol)	% Vol	=	ppmv
Methane (CH4)	16.04	0		0
Ethane (C2H6)	30.07	0		0.00
Propane (C3H8)	44.10	0		0.00
iso-Butane (C4H10)	58.12	0		0.00
n-Butane (C4H10)	58.12	0.014		140.00
iso-Pentane (C5H12)	72.15	0.053		530.00
n-Pentane (C5H12)	72.15	0.113		1130.00
Hexane+ (C6H14)	97.40	1.203		12030.00
Total				13830.00

*Hexane+ is treated as 60% hexanes, 30 % heptanes, and 10 % octanes, as such its
(0.6*93.1887)+(0.3*100.2019)+(0.1*114.2285) = 97.3966

Molecular Weight Calculations

component	Molecular Weight (g/mol)	mol%
Nitrogen (N2)	28.016	96.2240
Methane (CH4)	16.0425	0.0000
Carbon Dioxide (CO2)	44.011	3.3310
Ethane (C2H6)	30.069	0.0000
Propane (C3H8)	44.0958	0.0000
iso-Butane (C4H10)	58.1222	0.0000
n-Butane (C4H10)	58.1222	0.0070
iso-Pentane (C5H12)	72.1488	0.0210
n-Pentane (C5H12)	72.1488	0.0450
Hexane+	97.3966	0.3720
Total		100
Calculated MW	28.8381	

Calculated MW= $\frac{\text{sum (individual component MW x their reported mol\%)}}{100}$

ppmv= % Vol x 10,000

Lovington Deep 6 – 700376.051.07 - SRS# 2002-10312 – Event 6 – 12 Hour

ATTACHMENT 1

MDPE Field Logs

MDPE FIELD NOTES				
Site Name:	Lovington Deep 6			Event #: 1
Location:	Lea County, NM			Arrive at site: 4/24/2013 10:30
Date:	4/24/2013			
Job#:	700376.051.07	SRS:	2002-10312	Start Vac: 4/24/2013 11:15
Phase:	MDPE6	Unit:	1107	Stop Vac: 4/24/2013 23:20
Onsite Personnel:	L. Bridges & B. Huntington			Leave Site: 4/25/2013 10:30

WELL#	BEFORE			AFTER			COMMENTS	
	PSH	GW	PSH-T	PSH	GW	PSH-T		
MW-2	63.59	68.10	4.51	-	64.59	-	Stinger set @ 65'	
MW-13	64.53	67.89	3.36		65.12		Stinger set @ 65'	
MW-14	65.08	65.45	0.37	-	65.09	-	Stinger set @ 65'	
MW-15	64.89	65.03	0.14	Not Gauged			hand bailed	
MW-16	64.67	65.02	0.35	-	64.38	-	Stinger set @ 65'	
MW-17	64.06	68.43	4.37	-	64.68	-	Stinger set @ 65'	
WASTE:	H2O:	1496		PSH:	172		TOTAL (GAL):	1668

Notes:	
Tank #1 - Total 53.25" with PSH@47.75" = Total 1668 gallons with 172 gallons PSH	
Hand Bail MW15- 5 gallons	

Start Date: 24-Apr-13

MDPE FIELD DATA

		Well Flow						Well Data				
TIME	SAMPLE TAKEN	Influent temp. (°f)	Diff. Pressure (INH2O) 2" Preso	Vac (In.Hg)	FID Composite (PPM)	Propane Tank (%-size) 1000 Gal.	EXHAUST TEMP F	COMMENTS:				
								MW-2	MW-13	MW-14	MW-16	MW-17
								VAC (INH2O)	VAC (INH2O)	VAC (INH2O)	VAC (INH2O)	VAC (INH2O)
11:45		62	60.5	15	18721	68	1909	14.1	16	8.1	17.9	18.3
12:15	*	62	63.2	15.5	24942	67	1413	14.4	16.5	8.2	18.8	18
13:15		66	74.8	16	27894	66	1410	14.1	15.8	7.7	20.1	18.3
14:15		68	83.4	17	29710	65	1409	14.6	12.6	7.3	22.2	17.9
15:15		70	80.2	17	44106	63	1408	14.2	14.6	7.4	21.8	18.5
16:15		70	81.3	17.5	42714	62	1407	14.3	13.8	7.5	16.8	17.8
17:15		70	82.7	18	46314	61	1410	13.7	14	7.8	15.7	18
18:15		70	83.6	17.5	32854	61	1409	12	17.7	6.9	20.9	10.3
19:15		68	82.7	17.5	20461	60	1414	12.6	18.3	7.2	21.2	10.1
20:15		62	38.7	16	9534	60	1409	10.6	15.7	4.2	19.1	15.5
21:15		60	82.5	17	27852	59	1405	9.3	16.9	8.9	22.2	16.7
22:15	*	60	83.1	16.5	35960	57	1405	10.1	15.8	7.9	21.6	12.1
23:15		60	82.7	16.5	32421	56	1409	9.8	15.2	7.3	22.1	13.5

Soil Vacuum Influence

Observation Well	MW-15
Extraction Well (EW)	MW-2
Time:	In.H2O
12:15	0
22:15	0.07

Lovington Deep 6 – 700376.051.07 - SRS# 2002-10312 – Event 6 – 12 Hour

ATTACHMENT 2
Laboratory Analytical Results



HOUSTON LABORATORIES
2500 FORT BRANCH ROAD
HOUSTON, TEXAS 77058
PHONE 713-661-0000

Certificate of Analysis

Number: 1030-2013040735-001A

Simon I. Walshe, CAPM
Talon/LPE
921 N. Bivins St.
Amarillo Texas 79107

May 03, 2013

Sample ID:
Station Name : Influent #1
Station Number : 700376.051.07
Station Location : Hobbs, NM.
Sample Point:

Sampled By: LB
Sample Of: Gas Spot
Sample Date: 04/24/2013 12:15
Sample Conditions: N.G. Pres. , N.G. Temp.
PO / Ref. No:

ANALYTICAL DATA

Components	Mol %	Wt %	GPM at 14.650 psia	Method	Lab Tech.	Date Analyzed
GPA-2261 M JD 5/2/2013 9:17:56 AM						
Nitrogen	97.425	95.377				
Carbon Dioxide	2.159	3.321				
n-Butane	0.008	0.016	0.003			
Iso Pentane	0.019	0.048	0.007			
n-Pentane	0.040	0.101	0.014			
Hexanes Plus	0.349	1.137	0.151			
	100.000	100.000	0.175			
	C2 +	C3 +	iC5 +			
GPM TOTAL :	0.175	0.175	0.172			
Relative Density	Real Gas			0.9880		
Calculated Molecular Weight				28.61		
Compressibility Factor				0.9996		
GPA 2172-09 Calculation :						
Calculated Gross BTU per ft ³ @14.650 psia & 60°F						
Real Gas:	Dry BTU:		20			
	Water Sat. Gas_Base BTU:		20			
Comments : H2O Mol% - 1.75_Wt% - 1.109						

Chris Staley

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP or GPA guidelines for quality assurance, unless otherwise stated



HOUSTON LABORATORY
2800 INDUSTRIAL BOULEVARD
HOUSTON, TEXAS 77054
PHONE 713-661-1871

Certificate of Analysis

Number: 1030-2013040735-002A

Simon I. Walshe, CAPM
Talon/LPE
921 N. Bivins St.
Amarillo Texas 79107

May 03, 2013

Sample ID:
Station Name : Influent #2
Station Number :
Station Location : Hobbs, NM.
Sample Point: Lovington to Deep 6

Sampled By: LB
Sample Of: Gas Spot
Sample Date: 04/24/2013 22:15
Sample Conditions: N.G. Pres. , N.G. Temp.
PO / Ref. No:

ANALYTICAL DATA

Components	Mol %	Wt %	GPM at 14.650 psia	Method	Lab Tech.	Date Analyzed
GPA-2261 M JD 5/2/2013 9:38:31 AM						
Nitrogen	96.224	93.530				
Carbon Dioxide	3.331	5.087				
n-Butane	0.007	0.014	0.002			
Iso Pentane	0.021	0.053	0.008			
n-Pentane	0.045	0.113	0.016			
Hexanes Plus	0.372	1.203	0.161			
	100.000	100.000	0.187			
GPM TOTAL :	C2 + 0.187	C3 + 0.187	iC5 + 0.185			
Relative Density	Real Gas			0.9950		
Calculated Molecular Weight				28.82		
Compressibility Factor				0.9996		
GPA 2172-09 Calculation :						
Calculated Gross BTU per ft ³ @14.650 psia & 60°F						
Real Gas:	Dry BTU:		22			
	Water Sat. Gas_Base BTU:		22			
Comments : H2O Mol% - 1.75_Wt% - 1.101						

Hydrocarbon Laboratory Manager

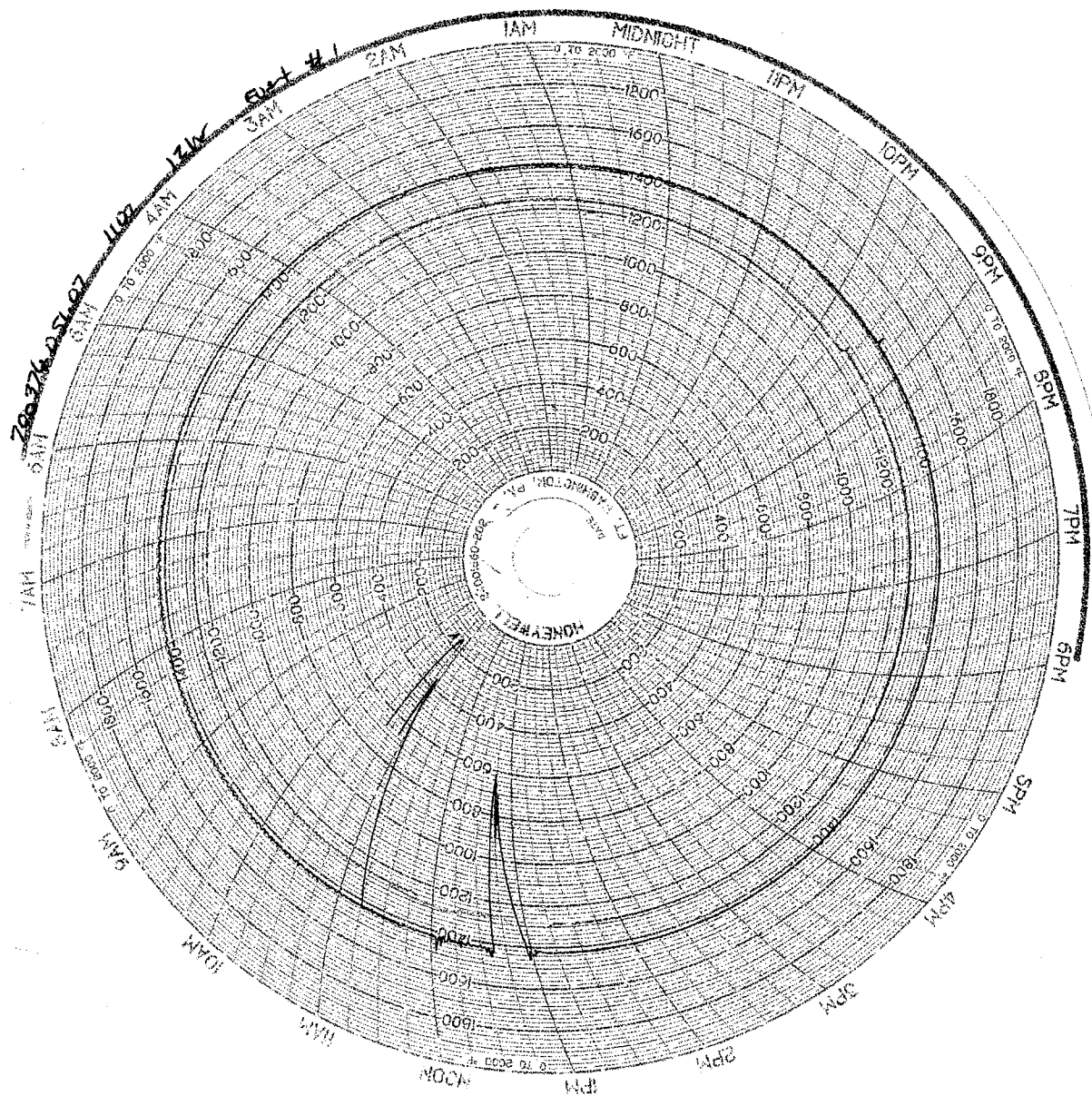
Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP or GPA guidelines for quality assurance, unless otherwise stated

[illegible]

Note: As a convenience to our clients, this form is available in an electronic format. Please contact one of our offices above for the form to be e-mailed to you.

ATTACHMENT 3
Oxidizer Charts



Lovington Deep 6 – 700376.051.07 - SRS# 2002-10312 – Event 6 – 12 Hour

ATTACHMENT 4

Waste Ticket

