

AP - 37

**STAGE 2
REPORT**
(Event 5)

Date
6-6-13



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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 OCD

2013 SEP 20 P 2: 01

PREPARED FOR:

PLAINS MARKETING, L.P.

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JUNE 6, 2013

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I. MDPE SUMMARY REPORT AND WASTE DISPOSITION

A. MDPE Results

The following report summarizes data collected during the 24-hour High Vacuum Multi-Phase Extraction (MDPE) event conducted on March 26-27, 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 24 hours (1.0 days) of PSH recovery was performed on MW2, MW13, MW-14, MW16 & MW17 for 24 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-C6+. 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 **367.88 equivalent gallons of hydrocarbons (Total)** were removed during the event. The combined volume of hydrocarbons were comprised of approximately **314 gallons of PSH (liquid phase)** and approximately **53.88 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 178.22 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 19,310 ppmv for Hydrocarbon Composition. Laboratory analytical results can be found in Attachment 2.

C. Waste Management and Disposition

A cumulative total of 3,140 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 (lb/hr)	Recovery in Period (lbs)	Total Recovery (lbs)
16:30	0.5	64	20	272.18	63.1	161.00	20957	-	19310.00	1.87	36175	43.51	26.19	13.09	13.09
17:00	0.5	64	19	258.57	64.4	170.62	11192	19310.00	19310.00	1.00	19310	23.22	14.81	7.41	20.50
18:00	1	64	19	258.57	65.3	171.81	18319	-	19310.00	1.64	31608	38.01	24.41	24.41	44.91
19:00	1	62	19	258.57	64.9	171.61	10675	-	19310.00	0.95	18418	22.24	14.26	14.26	59.18
20:00	1	60	19	258.57	65.1	172.21	4739	-	19310.00	0.42	8171	9.90	6.37	6.37	65.55
21:00	1	60	18.5	251.77	65.6	176.77	11399	-	19310.00	1.02	19645	23.61	15.73	15.73	81.28
22:00	1	60	18	244.96	62.7	176.54	12577	-	19310.00	1.12	21700	26.30	17.36	17.36	98.64
23:00	1	58	18	244.96	61.9	175.75	9871	-	19310.00	0.86	17031	20.72	13.61	13.61	112.25
0:00	1	56	15.5	210.94	59.8	169.99	5798	-	19310.00	0.52	9986	12.20	8.66	8.66	120.92
1:00	1	54	16	217.74	64.1	193.97	11358	-	19310.00	1.01	19596	24.03	17.42	17.42	138.34
2:00	1	54	15.5	210.94	65.8	200.17	17635	-	19310.00	1.58	30428	37.31	27.92	27.92	166.25
3:00	1	52	15	204.14	79.3	219.51	26111	-	19310.00	2.33	45050	55.45	45.50	45.50	211.76
4:00	1	52	15.5	210.94	78.2	218.48	20841	-	19310.00	1.86	35958	44.26	36.15	36.15	247.90
5:00	1	52	15.5	210.94	68.7	204.78	43269	-	16890.00	0.87	14616	18.21	13.94	13.94	261.85
6:00	1	52	15.5	210.94	67.9	203.13	40787	-	16890.00	0.82	13778	17.17	13.04	13.04	274.88
7:00	1	52	15.5	210.94	67.1	202.38	50000	-	16890.00	1.00	16890	21.05	15.92	15.92	290.81
8:00	1	52	15.5	210.94	66.5	201.47	50000	-	16890.00	1.00	16890	21.05	15.85	15.85	306.66
9:00	1	58	17	231.35	41.9	150.52	50000	-	16890.00	1.00	16890	20.80	11.71	11.71	316.36
10:00	1	64	15.5	210.94	38.6	152.12	46101	-	16890.00	0.96	16249	19.78	11.25	11.25	328.61
11:00	1	70	17	231.35	20.1	103.07	25548	-	16890.00	0.51	8630	10.39	4.00	4.00	333.62
12:00	1	74	17	231.35	23	109.84	15901	-	16890.00	0.31	5270	6.30	2.59	2.59	336.20
13:00	1	80	17	231.35	27.8	120.08	27321	-	16890.00	0.55	9229	10.90	4.89	4.89	341.10
14:00	1	82	17.5	236.16	27.9	117.74	50000	-	16890.00	1.00	16890	19.88	8.75	8.75	349.85
15:00	1	82	18	244.96	32.6	124.99	50000	16890.00	16890.00	1.00	16890	19.88	9.27	9.27	358.11
16:00	1	82	18	244.96	33.7	126.78	50000	-	16890.00	1.00	16890	19.88	9.42	9.42	368.54
Averages:		62.40	17.08	244.34	54.91	178.22	27283.32						Total	368.54	

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)
36175	28.110	1	0.0821	64	290.777778	43.5062230

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

PSH Mass Recovered in Vapor Phase =

336.66 gallons

Total Hydrocarbon Recovery

PSH Mass Recovered in Vapor Phase =

358.54 lbs

PSH Mass Recovered in Liquid Phase =

53.88 gallons

2147.76 lbs

314.80 gallons

TOTAL = 2516.30 lbs

367.88 gallons

Gallons removed determined at time of pick up

PSH Volume in Gallons=

314

PSH Mass in Pounds=

2147.76

SG = 0.82

% Vol. (Wt. %) Hydrocarbon to ppmv - Influent 1

Compound	Molecular Weight (g/mol)	Wt. %	=	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	0.004		40.00
n-Butane (C4H10)	58.12	0.018		180.00
iso-Pentane (C5H12)	72.15	0.053		530.00
n-Pentane (C5H12)	72.15	0.93		9300.00
Hexane+ (C6H14)	97.40	0.926		9260.00
Total				19310.00

*Hexane+ is treated as 80% hexanes, 30 % heptanes, and 10 % octanes, as such its
(0.6*93.1887)+(0.3*100.2019)+(0.1*114.2285) = 97.3866

Molecular Weight Calculations

component	Molecular Weight (g/mol)	mol%
Nitrogen (N2)	28.018	96.7180
Methane (CH4)	16.0425	0.0000
Carbon Dioxide (CO2)	44.011	2.9280
Ethane (C2H6)	30.069	0.0000
Propane (C3H8)	44.0956	0.0000
iso-Butane (C4H10)	58.1222	0.0020
n-Butane (C4H10)	58.1222	0.0090
iso-Pentane (C5H12)	72.1488	0.0210
n-Pentane (C5H12)	72.1488	0.0370
Hexane+	97.3968	0.2850
Total		100
Calculated MW	28.7110	

% Vol. (Wt. %) Hydrocarbon to ppmv - Influent 2

Compound	Molecular Weight (g/mol)	Wt. %	=	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	0.02		200.00
iso-Pentane (C5H12)	72.15	0.057		570.00
n-Pentane (C5H12)	72.15	0.117		1170.00
Hexane+ (C6H14)	97.40	1.485		14850.00
Total				16890.00

*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)	28.018	95.1180
Methane (CH4)	16.0425	0.0000
Carbon Dioxide (CO2)	44.011	4.3390
Ethane (C2H6)	30.069	0.0000
Propane (C3H8)	44.0956	0.0000
iso-Butane (C4H10)	58.1222	0.0000
n-Butane (C4H10)	58.1222	0.0100
iso-Pentane (C5H12)	72.1488	0.0230
n-Pentane (C5H12)	72.1488	0.0470
Hexane+	97.3968	0.4660
Total		100
Calculated MW	29.0688	

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

ppmv= % Vol x 10,000

ATTACHMENT 1
MDPE Field Logs

MDPE FIELD NOTES				
Site Name:	Lovington Deep 6			Event #:1
Location:	Lea County, NM			Arrive at site: 3/26/2013 15:00:00 PM
Date:	3/26/2013			
Job#:	700376.051.06	SRS:	2002-10312	Start Vac: 3/26/2013 16:00:00 PM
Phase:	MDPE5	Unit:	1107	Stop Vac: 3/27/2013 16:00:00 PM
Onsite Personnel:	L. Bridges & B. Huntington			Leave Site: 3/27/2013 17:30:00 PM

WELL#	BEFORE			AFTER			COMMENTS
	PSH	GW	PSH-T	PSH	GW	PSH-T	
MW-2	63.56	67.98	4.42	-	64.22	-	Stinger set @ 65'
MW-13	64.44	68.24	3.80		64.45		Stinger set @ 65'
MW-14	65.08	65.31	0.23	-	64.83	-	Stinger set @ 65'
MW-15	64.84	64.91	0.07	Not Gauged			
MW-16	64.65	65.09	0.42	-	64.71	-	Stinger set @ 65'
MW-17	64.05	68.36	4.31	-	65.66	-	Stinger set @ 65'
MW-3		64.78		Not Gauged			
WASTE:	H2O:	3040		PSH:	314		TOTAL (GAL): 3354

Notes:	
Tank #1 - Total 78.25" with PSH@68.75" = Total 2443 gallons with 308 gallons PSH and 2135 gallons water	
Tank #2 - Total 27.125" with PSH@26.875" = Total 697 gallons with 6 gallons PSH and 691 gallons water	

Start Date: 26-Mar-13

MDPE FIELD DATA - Event 4 1107 24hr

TIME	SAMPLE TAKEN	Well Flow						Well Data				
		Influent temp. (*f)	Diff. Pressure (INH2O) 2" Preso	Vac (In.Hg)	FID Composite (PPM)	Propane Tank (%-size) 1000 Gal.	EXHAUST TEMP F	COMMENTS:				
								MW-14	MW-2	MW-16	MW-17	MW-13
								VAC (INH2O)	VAC (INH2O)	VAC (INH2O)	VAC (INH2O)	VAC (INH2O)
16:30		64	63.1	20	20967	85	1413	25.6	7.3	6.5	5.5	27.1
17:00	*	64	64.4	19	11192	85	1411	25.3	7.5	6.8	5.8	27.3
18:00		64	65.3	19	18319	85	1413	24.8	7.7	7.1	6	26.9
19:00		62	64.9	19	10675	84	1414	23.7	7.6	7.7	6.3	27.4
20:00		60	65.1	19	4736	84	1415	21.5	7.9	7.4	6.1	27.7
21:00		60	65.6	18.5	11386	83	1408	21	8.5	7.6	6.8	26.1
22:00		60	62.7	18.5	12577	82	1409	20.4	8.4	7.3	7.5	25.8
23:00		58	61.9	18	9871	81	1413	20.6	8.5	7	7.9	25.9
0:00		56	59.6	18	5788	80	1416	20.2	8.9	6.9	8.9	25.5
1:00		54	64.1	15.5	11358	79	1414	19.3	8.7	7.5	8.6	25.4
2:00		54	65.9	16	17635	78	1415	18.5	9.1	7.4	8.1	25.6
3:00		52	76.3	15.5	26111	78	1412	16.1	9.3	7.1	8.5	25.1
4:00	*	52	78.2	15	20841	77	1410	14	9.8	7.6	8	25.2
5:00		52	68.7	15.5	43269	76	1402	15.3	9.1	7.2	8.3	25.2
6:00		52	67.6	15.5	40787	76	1407	14.8	9.6	7.3	8.4	25.7
7:00		52	67.1	15.5	>50k	75	1412	17.2	12.8	12.6	9.7	24.7
8:00		52	66.5	15.5	>50k	74	1414	17.8	12.6	12.3	9.6	25.5
9:00		58	41.9	15.5	>50k	73	1411	14.1	10.2	6.9	7.6	23.5
10:00		64	38.8	17	48101	72	1409	13.9	12.2	7.2	5.3	21.6
11:00		70	20.1	15.5	25548	71	1410	10.9	11.7	5.6	4.7	20.6
12:00		74	23	17	15601	71	1411	10.8	10.8	4.5	4.4	20.1
13:00		80	23	17	27321	70	1412	13.7	9.8	8.7	5.6	22.6
14:00		82	27.9	17.5	>50k	70	1408	13.6	10.1	5.2	5.1	23.7
15:00	*	82	32.6	18	>50k	69	1411	14	10.3	5.8	4.2	23.1
16:00		82	33.7	18	>50k	68	1414	14.1	10.3	5.7	4.9	23.6

Soil Vacuum Influence

Observation Well	MW-15
Extraction Well (EW)	
Time:	In.H2O
17:00	0
4:00	0.09
15:00	0.05

ATTACHMENT 2
Laboratory Analytical Results



HOUSTON LABORATORIES
8326 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 690-0501

Certificate of Analysis

Number: 1030-2013040004-001A

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

April 01, 2013

Sample ID:		Sampled By:	BH
Station Name :	Influent #1	Sample Of:	Gas Spot
Station Number :		Sample Date:	03/26/2013 17:00
Station Location :	Lovington, NM.	Sample Conditions:	N.G. Pres. , N.G. Temp.
Sample Point:		PO / Ref. No:	

ANALYTICAL DATA

Components	Mol %	Wt %	GPM at 14.650 psia	Method	Lab Tech.	Date Analyzed
GPA-2261 M JD 4/1/2013 11:12:13 AM						
Nitrogen	96.718	94.416				
Carbon Dioxide	2.928	4.490				
Iso Butane	0.002	0.004	0.001			
n-Butane	0.009	0.018	0.003			
Iso Pentane	0.021	0.053	0.008			
n-Pentane	0.037	0.093	0.013			
Hexanes Plus	0.285	0.926	0.124			
	100.000	100.000	0.149			
	C2 +	C3 +	iC5 +			
GPM TOTAL :	0.149	0.149	0.145			
Relative Density	Real Gas			0.9908		
Calculated Molecular Weight				28.70		
Compressibility Factor				0.9996		
GPA 2172-09 Calculation :						
Calculated Gross BTU per ft ³ @14.650 psia & 60°F						
Real Gas:	Dry BTU:		17			
	Water Sat. Gas Base BTU:		17			
Comments : H2O Mol% - 1.75_Wt% - 1.106						

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 LABORATORIES
8820 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 566-0901

Certificate of Analysis

Number: 1030-2013040004-002A

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

April 01, 2013

Sample ID:		Sampled By:	BH
Station Name :	Influent #2	Sample Of:	Gas Spot
Station Number :		Sample Date:	03/27/2013 15:00
Station Location :	Lovington, NM.	Sample Conditions:	N.G. Pres. , N.G. Temp.
Sample Point:		PO / Ref. No:	

ANALYTICAL DATA

Components	Mol %	Wt %	GPM at 14.650 psia	Method	Lab Tech.	Date Analyzed
				GPA-2261 M	JD	4/1/2013 11:30:54 AM
Nitrogen	95.118	91.741				
Carbon Dioxide	4.336	6.570				
n-Butane	0.010	0.020	0.003			
Iso Pentane	0.023	0.057	0.008			
n-Pentane	0.047	0.117	0.017			
Hexanes Plus	0.466	1.495	0.202			
	100.000	100.000	0.230			
	C2 +	C3 +	iC5 +			
GPM TOTAL :	0.230	0.230	0.227			
Relative Density	Real Gas			1.0028		
Calculated Molecular Weight				29.04		
Compressibility Factor				0.9996		
GPA 2172-09 Calculation :						
Calculated Gross BTU per ft ³ @14.650 psia & 60°F						
Real Gas:	Dry BTU:		27			
	Water Sat. Gas_Base BTU:		27			
Comments : H2O Mol% - 1.75_Wt% - 1.093						

Hydrocarbon Laboratory Manager

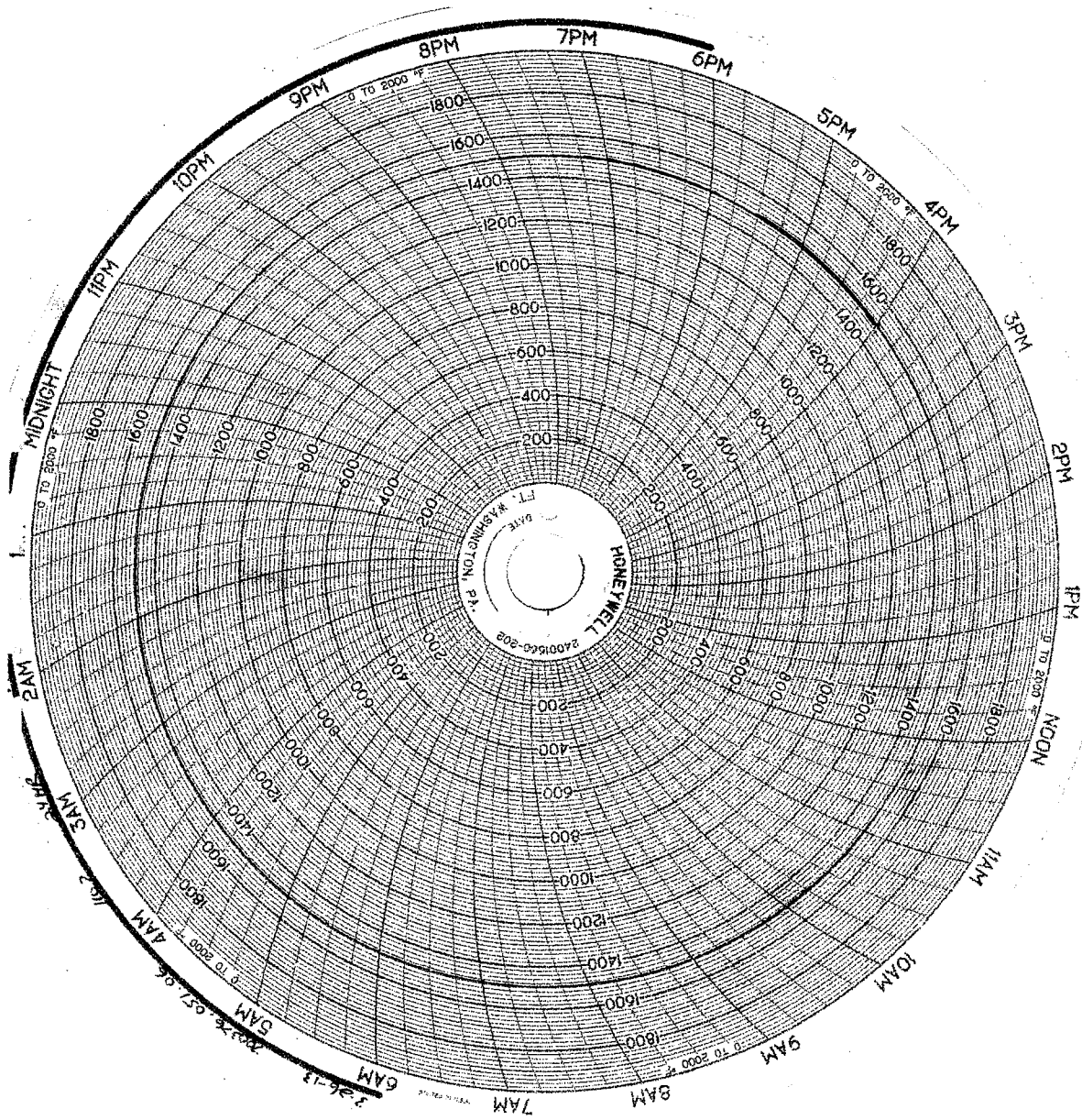
Quality Assurance:

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

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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



ATTACHMENT 4

Waste Ticket

