Houston Laboratories
8820 Interchange Drive
Houston, TX 77054
Phone 713-660-0901

Certificate of Analysis

Number: 1030-16080829-005A

Sep. 07, 2016

Amanda Graves
Sandridge Energy
123 Robert S Kerr Ave.
Oklahoma City, OK 73102

Station Name:	Mutual	Sampled By:	BB
Station Number:	0780 2-8H	Sample Of:	Liquid Spot
Sample Point:	Separator	Sample Date:	08/19/2016 11:30
Cylinder No:	8205	Sample Conditions:	60 psig, @ 122 °F
Analyzed:	08/31/2016 13:53:16 by Patrick Weber	Method:	ASTM D-1946M/GPA-2286M

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Hydrogen Sulfide	0.035	0.038		GPM TOTAL C2+	4.116
Carbon Monoxide	ND	ND		GPM TOTAL iC5+	0.394
Oxygen	1.131	1.163			
Helium	ND	ND			
Hydrogen	5.304	0.344			
Nitrogen	8.447	7.609			
Carbon Dioxide	38.395	54.339			
Methane	32.296	16.659			
Ethane	5.895	5.699	1.583		
Ethylene	ND	ND	ND		
Propane	5.490	7.784	1.519		
Propylene	ND	ND	ND		
Iso-Butane	0.383	0.716	0.126		
n-Butane	1.559	2.914	0.494		
Iso-Pentane	0.258	0.598	0.095		
n-Pentane	0.279	0.647	0.102		
Hexanes Plus	0.528	1.490	0.197		
	100.000	100.000	4.116		

Calculated Physical Properties	Total	C6+
Relative Density Real Gas	1.0777	3.0311
Calculated Molecular Weight	31.10	87.79
Compressibility Factor	0.9959	
Real Dry BTU at 14.73 Psia, 60°F	700	4660
Real Wet BTU at 14.73 Psia, 60°F	688	4579

Comments: Air Report

Hydrocarbon Laboratory Manager

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Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Hydrogen Sulfide	0.035	0.038		GPM TOTAL C2+	4.116
Carbon Monoxide	NIL	NIL		GPM TOTAL iC5+	0.394
Oxygen	1.131	1.163			
Helium	NIL	NIL			
Hydrogen	5.304	0.344			
Nitrogen	8.447	7.609			
Carbon Dioxide	38.395	54.339			
Methane	32.296	16.659			
Ethane	5.895	5.699	1.583		
Ethylene	NIL	NIL	NIL		
Propane	5.490	7.784	1.519		
Propylene	NIL	NIL	NIL		
Iso-Butane	0.383	0.716	0.126		
n-Butane	1.559	2.914	0.494		
Iso-Pentane	0.258	0.598	0.095		
n-Pentane	0.279	0.647	0.102		
Hexanes	0.188	0.494	0.071		
Heptanes Plus	0.340	0.996	0.126		
	100.000	100.000	4.116		

Calculated Physical Properties	Total	C7+
Relative Density Real Gas	1.0777	3.1377
Calculated Molecular Weight	31.10	90.88
Compressibility Factor	0.9959	
Real Dry BTU at 14.73 Psia, 60°F	700	4742
Real Wet BTU at 14.73 Psia, 60°F	688	4659

Comments: Air Report

Hydrocarbon Laboratory Manager

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Sample Point:	Separator	Sample Date:	08/19/2016 11:30
Cylinder No:	8205	Sample Conditions:	60 psig, @ 122 °F
Analyzed:	08/31/2016 13:53:16 by Patrick Weber	Method:	ASTM D-1946M/GPA-2286M

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia
Hydrogen Sulfide	0.035	0.038	
Carbon Monoxide	ND	ND	
Oxygen	1.131	1.163	
Helium	ND	ND	
Hydrogen	5.304	0.344	
Nitrogen	8.447	7.609	
Carbon Dioxide	38.395	54.339	
Methane	32.296	16.659	
Ethane	5.895	5.699	1.583
Ethylene	ND	ND	ND
Propane	5.490	7.784	1.519
Propylene	ND	ND	ND
Iso-Butane	0.383	0.716	0.126
n-Butane	1.559	2.914	0.494
Iso-Pentane	0.258	0.598	0.095
n-Pentane	0.279	0.647	0.102
i-Hexanes	0.144	0.372	0.053
n-Hexane	0.044	0.122	0.018
i-Heptanes	0.132	0.376	0.050
n-Heptane	0.010	0.032	0.004
Benzene	0.058	0.144	0.016
Cyclohexane	0.042	0.113	0.014
Toluene	0.035	0.103	0.012
i-Octanes	0.045	0.151	0.020
n-Octane	0.002	0.006	0.001
Ethylbenzene	0.002	0.008	0.001
Xylenes	0.008	0.026	0.003
i-Nonanes	0.006	0.027	0.004
n-Nonane	ND	0.002	ND
i-Decanes	ND	0.008	0.001
n-Decane	ND	ND	ND
Undecanes Plus	ND	ND	ND
	100.000	100.000	4.116

GPM TOTAL C2+	4.116
GPM TOTAL iC5+	0.394

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Station Number:	0780 2-8H	Sample Of:	Liquid Spot
Sample Point:	Separator	Sample Date:	08/19/2016 11:30
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Analyzed:	08/31/2016 13:53:16 by Patrick Weber	Method:	ASTM D-1946M/GPA-2286M

Calculated Physical Properties	**Total**
Calculated Molecular Weight	31.10
GPA 2172-09 Calculation:	
Calculated Gross BTU per ft³ @ 14.73 psia & 60°F	
Real Gas Dry BTU	700
Water Sat. Gas Base BTU	688
Relative Density Real Gas	1.0777
Compressibility Factor	0.9959

Comments: Air Report

Hydrocarbon Laboratory Manager

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Station Number:	0780 2-8H	Sample Of:	Liquid Spot
Sample Point:	Separator	Sample Date:	08/19/2016 11:30
Cylinder No:	8205	Sample Conditions:	60 psig, @ 122 °F
Analyzed:	08/31/2016 13:53:16 by Patrick Weber	Method:	ASTM D-1946M/GPA-2286M

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Hydrogen Sulfide	0.035	0.038		GPM TOTAL C2+	4.352
Carbon Monoxide	ND	ND		GPM TOTAL iC5+	0.416
Helium	ND	ND			
Hydrogen	5.607	0.362			
Nitrogen	4.418	3.963			
Carbon Dioxide	40.587	57.204			
Methane	34.139	17.537			
Ethane	6.232	6.001	1.674		
Ethylene	ND	ND	ND		
Propane	5.803	8.194	1.606		
Propylene	ND	ND	ND		
Iso-Butane	0.405	0.754	0.133		
n-Butane	1.648	3.068	0.523		
Iso-Pentane	0.273	0.631	0.101		
n-Pentane	0.295	0.681	0.108		
Hexanes Plus	0.558	1.567	0.207		
	100.000	100.000	4.352		

Calculated Physical Properties	Total	C6+
Relative Density Real Gas	1.0825	3.0289
Calculated Molecular Weight	31.23	87.73
Compressibility Factor	0.9956	
Real Dry BTU at 14.73 Psia, 60°F	740	4657
Real Wet BTU at 14.73 Psia, 60°F	727	4576

Comments: Air Free Report

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Oklahoma City, OK 73102

Station Name:	Mutual	Sampled By:	BB
Station Number:	0780 2-8H	Sample Of:	Liquid Spot
Sample Point:	Separator	Sample Date:	08/19/2016 11:30
Cylinder No:	8205	Sample Conditions:	60 psig, @ 122 °F
Analyzed:	08/31/2016 13:53:16 by Patrick Weber	Method:	ASTM D-1946M/GPA-2286M

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Hydrogen Sulfide	0.035	0.038		GPM TOTAL C2+	4.352
Carbon Monoxide	ND	ND		GPM TOTAL iC5+	0.416
Helium	ND	ND			
Hydrogen	5.607	0.362			
Nitrogen	4.418	3.963			
Carbon Dioxide	40.587	57.204			
Methane	34.139	17.537			
Ethane	6.232	6.001	1.674		
Ethylene	ND	ND	ND		
Propane	5.803	8.194	1.606		
Propylene	ND	ND	ND		
Iso-Butane	0.405	0.754	0.133		
n-Butane	1.648	3.068	0.523		
Iso-Pentane	0.273	0.631	0.101		
n-Pentane	0.295	0.681	0.108		
Hexanes	0.198	0.519	0.075		
Heptanes Plus	0.360	1.048	0.132		
	100.000	100.000	4.352		

Calculated Physical Properties	Total	C7+
Relative Density Real Gas	1.0825	3.1347
Calculated Molecular Weight	31.23	90.79
Compressibility Factor	0.9956	
Real Dry BTU at 14.73 Psia, 60°F	740	4736
Real Wet BTU at 14.73 Psia, 60°F	727	4654

Comments: Air Free Report

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Station Name:	Mutual	Sampled By:	BB
Station Number:	0780 2-8H	Sample Of:	Liquid Spot
Sample Point:	Separator	Sample Date:	08/19/2016 11:30
Cylinder No:	8205	Sample Conditions:	60 psig, @ 122 °F
Analyzed:	08/31/2016 13:53:16 by Patrick Weber	Method:	ASTM D-1946M/GPA-2286M

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Hydrogen Sulfide	0.035	0.038		GPM TOTAL C2+	4.352
Carbon Monoxide	ND	ND		GPM TOTAL iC5+	0.416
Helium	ND	ND			
Hydrogen	5.607	0.362			
Nitrogen	4.418	3.963			
Carbon Dioxide	40.587	57.204			
Methane	34.139	17.537			
Ethane	6.232	6.001	1.674		
Ethylene	ND	ND	ND		
Propane	5.803	8.194	1.606		
Propylene	ND	ND	ND		
Iso-Butane	0.405	0.754	0.133		
n-Butane	1.648	3.068	0.523		
Iso-Pentane	0.273	0.631	0.101		
n-Pentane	0.295	0.681	0.108		
i-Hexanes	0.151	0.391	0.056		
n-Hexane	0.047	0.128	0.019		
i-Heptanes	0.142	0.400	0.053		
n-Heptane	0.010	0.033	0.005		
Benzene	0.061	0.151	0.017		
Cyclohexane	0.045	0.119	0.015		
Toluene	0.037	0.108	0.012		
i-Octanes	0.046	0.158	0.020		
n-Octane	0.002	0.006	0.001		
Ethylbenzene	0.003	0.009	0.001		
Xylenes	0.008	0.028	0.003		
i-Nonanes	0.006	0.026	0.004		
n-Nonane	ND	0.002	ND		
i-Decanes	ND	0.008	0.001		
n-Decane	ND	ND	ND		
Undecanes Plus	ND	ND	ND		
	100.000	100.000	4.352		

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Station Name:	Mutual	Sampled By:	BB
Station Number:	0780 2-8H	Sample Of:	Liquid Spot
Sample Point:	Separator	Sample Date:	08/19/2016 11:30
Cylinder No:	8205	Sample Conditions:	60 psig, @ 122 °F
Analyzed:	08/31/2016 13:53:16 by Patrick Weber	Method:	ASTM D-1946M/GPA-2286M

Calculated Physical Properties	**Total**
Calculated Molecular Weight	31.23
GPA 2172-09 Calculation:	
Calculated Gross BTU per ft³ @ 14.73 psia & 60°F	
Real Gas Dry BTU	740
Water Sat. Gas Base BTU	727
Relative Density Real Gas	1.0825
Compressibility Factor	0.9956

Comments: Air Free Report

Hydrocarbon Laboratory Manager

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Sep. 07, 2016

Station Name:	Mutual	Sampled By:	BB
Station Number:	0780 2-8H	Sample Of:	Liquid Spot
Sample Point:	Separator	Sample Date:	08/19/2016 11:30
Cylinder No:	8205	Sample Conditions:	60 psig, @ 122 °F
Analyzed:	09/02/2016 by EM	Method:	ASTM D-5504

Sulfur Analysis

SULFIDES	ppmw	MERCAPTANS	ppmw	DISULFIDES	ppmw
Hydrogen	349.7	Methyl	0.7	Carbon	ND
Carbonyl	ND	Ethyl	4.3	Dimethyl	ND
Dimethyl	1.6	Isopropyl	ND	Methyl Ethyl	ND
Methyl Ethyl	ND	n-Propyl	ND	Diethyl	ND
Diethyl	ND	Isobutyl	ND	Di-iso-Propyl	ND
Di-iso-Propyl	ND	sec-Butyl	ND	Di-n-Propyl	ND
Di-n-Propyl	ND	tert-Butyl	ND	Di-iso-Butyl	ND
Di-iso-Butyl	ND	n-Butyl	ND	Di-sec-Butyl	ND
Di-sec-Butyl	ND	Isoamyl	ND	Di-tert-Butyl	ND
Di-tert-Butyl	ND	pri-Amyl	ND	Di-n-Butyl	ND
Di-n-Butyl	ND	n-Amyl	ND		

OTHER	ppmw	OTHER	ppmw	OTHER	ppmw
Misc. Sulfurs	ND	Thiophene	ND	Thiophane	ND
Sulfur Dioxide	ND				

Comments: Detection limit = 0.1 ppmw
ND = Not Detected

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Sep. 07, 2016

Station Name: Mutual
Station Number: 0780 2-8H
Sample Point: Separator
Cylinder No: 8205

Sampled By: BB
Sample Of: Liquid Spot
Sample Date: 08/19/2016 11:30
Sample Conditions: 60 psig, @ 122 °F

Analytical Data

Test	Method	Result	Units	Detection Limit	Lab Tech.	Analysis Date
Flash Gas	Proprietary	0.31	Cu.Ft./STBbl.		MES	09/02/2016
Flash Gas (Air Free)	Proprietary	0.29	Cu.Ft./STBbl.		MES	09/02/2016

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