EXTENDED NATURAL GAS ANALYSIS (*DHA)

MAIN PAGE

LEASE #:		NAME/DESCRIP :	**STATE 16-3-61 1H TREATER**
PROJECT NO. :	**201708042**	ANALYSIS NO. :	**07**
COMPANY NAME :	**IRONHORSE RESOURCES**	ANALYSIS DATE:	AUGUST 15, 2017 13:35
OFFICE / BRANCH:	DENVER, CO	SAMPLE DATE :	AUGUST 12, 2017
CUSTOMER REF:		TO:	
PRODUCER :		EFFECTIVE DATE:	
FIELD DATA			
SAMPLE CYCLE:		SAMPLE TYPE:	SPOT
SAMPLE PRES. :	20 psig	CYLINDER NO. :	1943
LAB PRES:	psig	SAMPLED BY :	PETER LAUER
SAMPLE TEMP. :	70 ºf	SAMPLING COMPANY	IRONHORSE RESOURCES
AMBIENT TEMP.:	ºf	H2S BY STAIN TUBE:	**0.05** ppm
H2O BY STAIN TUBE:	- #/mmcf	CO2 BY STAIN TUBE:	- Mol %
FIELD COMMENTS:	PROBE		
LAB COMMENTS:			

COMPONENT	MOLE %	MASS %	GPM @ 14.730	GPM @ 14.650
HELIUM	0.02	0.00	---	---
HYDROGEN	0.07	0.00	---	---
OXYGEN/ARGON	0.01	0.01	---	---
NITROGEN	0.8900	0.7600	---	---
CARBON DIOXIDE	2.81	3.79	---	---
METHANE	51.98590	25.56600	---	---
ETHANE	8.8165	8.1271	2.3763	2.3634
PROPANE	15.6397	21.1421	4.3424	4.3188
I-BUTANE	2.3702	4.2233	0.7820	0.7778
N-BUTANE	9.1840	16.3643	2.9178	2.9020
I-PENTANE	2.5079	5.5336	0.9083	0.9033
N-PENTANE	2.6185	5.7917	0.9568	0.9516
HEXANES PLUS	3.0773	8.6919	1.2767	1.2697
TOTALS	100.00000	100.00000	13.5603	13.4866

BTEX COMPONENTS	MOLE%	WT%
BENZENE	0.0574	0.1375
TOLUENE	0.0407	0.1150
ETHYLBENZENE	0.0055	0.0179
XYLENES	0.0124	0.0404
TOTAL BTEX	0.1160	0.3108

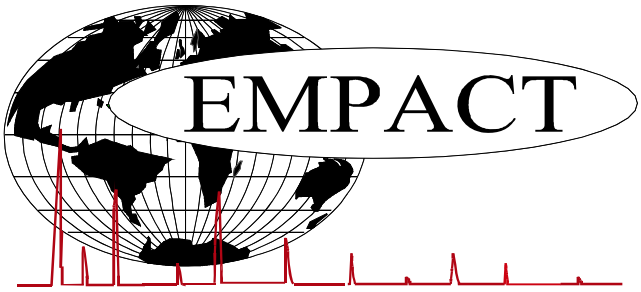
BTU @		14.730	14.650
LOW	NET DRY REAL :	1674.0 /scf	1664.9 /scf
	NET WET REAL :	1644.9 /scf	1635.8 /scf
HIGH	GROSS DRY REAL :	1827.7 /scf	1817.8 /scf
	GROSS WET REAL :	1795.9 /scf	1786.0 /scf
	NET DRY REAL :	19509.3 /lb	19403.3 /lb
	GROSS DRY REAL :	21303.0 /lb	21187.3 /lb

(CALC: GPA STD 2145 & TP-17 @14.696 & 60 F)

**(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730*

RELATIVE DENSITY (AIR=1): 1.1246

COMPRESSIBILITY FACTOR : 0.99206

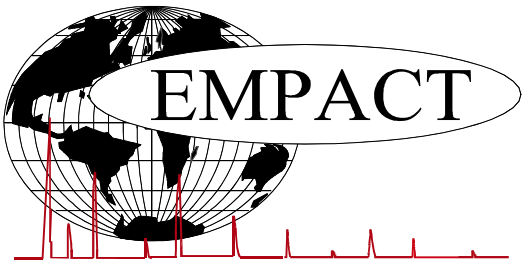


EXTENDED NATURAL GAS ANALYSIS (*DHA)

GLYCALC INFORMATION

PROJECT NO. :	201708042	ANALYSIS NO. :	07
COMPANY NAME :	IRONHORSE RESOURCES	ANALYSIS DATE:	AUGUST 15, 2017 13:35
ACCOUNT NO. :		SAMPLE DATE :	AUGUST 12, 2017
PRODUCER :		CYLINDER NO. :	1943
LEASE NO. :		SAMPLED BY :	PETER LAUER
NAME/DESCRIP :	STATE 16-3-61 1H TREATER		
FIELD DATA		SAMPLE TEMP. :	70
SAMPLE PRES. :	20	AMBIENT TEMP.:	
COMMENTS :	PROBE SPOT		

Componet	Mole %	Wt %
Helium	0.02	0.00
Hydrogen	0.07	0.00
Carbon Dioxide	2.81	3.79
Nitrogen	0.89	0.76
Methane	51.98590	25.56600
Ethane	8.8165	8.1271
Propane	15.6397	21.1421
Isobutane	2.3702	4.2233
n-Butane	9.1840	16.3643
Isopentane	2.2896	5.0642
n-Pentane	2.6185	5.7917
Cyclopentane	0.2183	0.4694
n-Hexane	0.5706	1.5074
Cyclohexane	0.1356	0.3499
Other Hexanes	1.2241	3.2074
Heptanes	0.6030	1.8395
Methycyclohexane	0.1335	0.4018
2,2,4 Trimethylpentane	0.0109	0.0382
Benzene	0.0574	0.1375
Toluene	0.0407	0.1150
Ethylbenzene	0.0055	0.0179
Xylenes	0.0124	0.0404
C8+ Heavies	0.2836	1.0369
Subtotal	99.99000	99.99000
Oxygen/Argon	0.01	0.01
Total	100.00000	100.00000



EXTENDED NATURAL GAS ANALYSIS (*DHA)

DHA COMPONENT LIST

PROJECT NO. :	201708042	ANALYSIS NO. :	07
COMPANY NAME :	IRONHORSE RESOURCES	ANALYSIS DATE:	AUGUST 15, 2017 13:35
ACCOUNT NO. :		SAMPLE DATE :	AUGUST 12, 2017
PRODUCER :		CYLINDER NO. :	1943
LEASE NO. :		SAMPLED BY :	PETER LAUER
NAME/DESCRIP :	STATE 16-3-61 1H TREATER		
FIELD DATA		SAMPLE TEMP. :	70
SAMPLE PRES. :	20	AMBIENT TEMP.:	
COMMENTS :	PROBE SPOT		

COMPONENT	PIANO #	MOLE %	MASS %	GPM @ 14.730	GPM @ 14.650
Helium	---	0.02	0.00	---	---
Hydrogen	---	0.07	0.00	---	---
Oxygen/Argon	---	0.01	0.01	---	---
Nitrogen	---	0.89	0.76	---	---
Carbon Dioxide	---	2.81	3.79	---	---
Methane	P1	51.98590	25.56600	---	---
Ethane	P2	8.8165	8.1271	2.376	2.363
Propane	P3	15.6397	21.1421	4.342	4.319
i-Butane	I4	2.3702	4.2233	0.782	0.778
n-Butane	P4	9.1840	16.3643	2.918	2.902
2,2-Dimethylpropane	I5	0.0055	0.0122	0.002	0.002
i-Pentane	I5	2.2841	5.0520	0.842	0.837
n-Pentane	P5	2.6184	5.7915	0.957	0.952
2,2-Dimethylbutane	I6	0.0052	0.0137	0.002	0.002
Cyclopentane	N5	0.2183	0.4694	0.065	0.064
2,3-Dimethylbutane	I6	0.0367	0.0970	0.015	0.015
2-Methylpentane	I6	0.2849	0.7527	0.119	0.119
3-Methylpentane	I6	0.4615	1.2192	0.190	0.189
UnknownC5s	U5	0.0001	0.0002	0.000	0.000
n-Hexane	P6	0.5706	1.5074	0.236	0.235
2,2-Dimethylpentane	I7	0.0010	0.0031	0.000	0.000
Methylcyclopentane	N6	0.4288	1.1063	0.153	0.152
2,4-Dimethylpentane	I7	0.0126	0.0387	0.006	0.006
2,2,3-Trimethylbutane	I7	0.0006	0.0018	0.000	0.000
Benzene	A6	0.0574	0.1375	0.016	0.016
3,3-Dimethylpentane	I7	0.0010	0.0031	0.000	0.000
Cyclohexane	N6	0.1356	0.3499	0.047	0.046
2-Methylhexane	I7	0.0387	0.1189	0.018	0.018
2,3-Dimethylpentane	I7	0.0319	0.0980	0.014	0.014
1,1-Dimethylcyclopentane	N7	0.0197	0.0593	0.008	0.008
3-Methylhexane	I7	0.0737	0.2264	0.034	0.034
1c,3-Dimethylcyclopentane	N7	0.0492	0.1481	0.023	0.023
1t,3-Dimethylcyclopentane	N7	0.0360	0.1084	0.017	0.017
3-Ethylpentane	I7	0.0234	0.0719	0.011	0.011
1t,2-Dimethylcyclopentane	N7	0.0975	0.2935	0.046	0.045

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2,2,4-Trimethylpentane	I8	0.0109	0.0382	0.006	0.006
UnknownC6s	U6	0.0070	0.0185	0.003	0.003
n-Heptane	P7	0.1336	0.4104	0.062	0.061
1c,2-Dimethylcyclopentane	N7	0.0074	0.0223	0.003	0.003
Methylcyclohexane	N7	0.1335	0.4018	0.055	0.054
2,2-Dimethylhexane	I8	0.0183	0.0641	0.008	0.008
1,1,3-Trimethylcyclopentane	N7	0.0022	0.0076	0.001	0.001
Ethylcyclopentane	N7	0.0145	0.0437	0.006	0.006
2,5-Dimethylhexane	I8	0.0025	0.0088	0.001	0.001
2,2,3-Trimethylpentane	I8	0.0007	0.0025	0.000	0.000
2,4-Dimethylhexane	I8	0.0047	0.0165	0.002	0.002
1c,2t,4-Trimethylcyclopentane	N8	0.0186	0.0640	0.009	0.009
3,3-Dimethylhexane	I8	0.0006	0.0021	0.000	0.000
1t,2c,4-Trimethylcyclopentane	N8	0.0141	0.0485	0.006	0.006
2,3,4-Trimethylpentane	I8	0.0019	0.0067	0.001	0.001
Toluene	A7	0.0407	0.1150	0.014	0.014
2,3-Dimethylhexane	I8	0.0025	0.0088	0.001	0.001
2-Methyl-3-ethylpentane	I8	0.0028	0.0098	0.001	0.001
1,1,2-Trimethylcyclopentane	N8	0.0009	0.0031	0.000	0.000
2-Methylheptane	I8	0.0221	0.0774	0.011	0.011
4-Methylheptane	I8	0.0032	0.0112	0.002	0.002
3-Methyl-3-ethylpentane	I8	0.0033	0.0116	0.002	0.002
3,4-Dimethylhexane	I8	0.0007	0.0025	0.000	0.000
1c,2c,4-Trimethylcyclopentane	N8	0.0004	0.0014	0.000	0.000
1c,3-Dimethylcyclohexane	N8	0.0010	0.0034	0.001	0.001
3-Methylheptane	I8	0.0034	0.0119	0.002	0.002
1c,2t,3-Trimethylcyclopentane	N8	0.0232	0.0798	0.012	0.012
3-Ethylhexane	I8	0.0049	0.0172	0.003	0.003
1t,4-Dimethylcyclohexane	N8	0.0072	0.0248	0.004	0.004
1,1-Dimethylcyclohexane	N8	0.0018	0.0062	0.001	0.001
2,2,5-Trimethylhexane	I9	0.0002	0.0008	0.000	0.000
3t-Ethylmethylcyclopentane	N8	0.0031	0.0107	0.002	0.002
2t-Ethylmethylcyclopentane	N8	0.0026	0.0090	0.001	0.001
1,1-Methylethylcyclopentane	N8	0.0081	0.0279	0.004	0.004
2,2,4-Trimethylhexane	I9	0.0008	0.0032	0.000	0.000
1t,2-Dimethylcyclohexane	N8	0.0097	0.0334	0.005	0.005
1c,2c,3-Trimethylcyclopentane	N8	0.0012	0.0041	0.001	0.001
UnknownC7s	U7	0.0600	0.1843	0.028	0.028
n-Octane	P8	0.0299	0.1047	0.015	0.015
1c,4-Dimethylcyclohexane	N8	0.0006	0.0021	0.000	0.000
i-Propylcyclopentane	I8	0.0006	0.0021	0.000	0.000
2,4,4-Trimethylhexane	I9	0.0003	0.0012	0.000	0.000
2,3,5-Trimethylhexane	I9	0.0005	0.0020	0.000	0.000
2,2,3,4-Tetramethylpentane	I9	0.0008	0.0032	0.000	0.000
2,3,4-Trimethylhexane	I9	0.0003	0.0012	0.000	0.000
1c,2-Dimethylcyclohexane	N8	0.0016	0.0055	0.001	0.001
2,2-Dimethylheptane	I9	0.0002	0.0008	0.000	0.000
1,1,4-Trimethylcyclohexane	N9	0.0096	0.0372	0.005	0.005
2,2,3-Trimethylhexane	I9	0.0023	0.0090	0.001	0.001
2,4-Dimethylheptane	I9	0.0004	0.0016	0.000	0.000
4,4-Dimethylheptane	I9	0.0007	0.0028	0.000	0.000
Ethylcyclohexane	N8	0.0045	0.0155	0.002	0.002
n-Propylcyclopentane	N8	0.0012	0.0041	0.001	0.001
1c,3c,5-Trimethylcyclohexane	N9	0.0005	0.0019	0.000	0.000
2,5-Dimethylheptane	I9	0.0008	0.0032	0.000	0.000
3,3-Dimethylheptane	I9	0.0009	0.0035	0.000	0.000
3,5-Dimethylheptane	I9	0.0005	0.0020	0.000	0.000
2,6-Dimethylheptane	I9	0.0005	0.0020	0.000	0.000
1,1,3-Trimethylcyclohexane	N9	0.0004	0.0015	0.000	0.000

Ethylbenzene	I8	0.0055	0.0179	0.002	0.002
1c,2t,4t-Trimethylcyclohexane	N9	0.0021	0.0081	0.001	0.001
2,3-Dimethylheptane	I9	0.0005	0.0020	0.000	0.000
1,3-Dimethylbenzene (m-Xylene)	A8	0.0046	0.0150	0.002	0.002
1,4-Dimethylbenzene (p-Xylene)	A8	0.0042	0.0137	0.002	0.002
3,4-Dimethylheptane	I9	0.0008	0.0032	0.000	0.000
3,4-Dimethylheptane (2)	I9	0.0012	0.0047	0.001	0.001
4-Ethylheptane	I9	0.0003	0.0012	0.000	0.000
4-Methyloctane	I9	0.0013	0.0051	0.001	0.001
2-Methyloctane	I9	0.0016	0.0063	0.001	0.001
1c,2t,3-Trimethylcyclohexane	N9	0.0004	0.0015	0.000	0.000
3-Ethylheptane	I9	0.0004	0.0016	0.000	0.000
3-Methyloctane	I9	0.0016	0.0063	0.001	0.001
1c,2t,4c-Trimethylcyclohexane	I9	0.0007	0.0027	0.000	0.000
1,1,2-Trimethylcyclohexane	N9	0.0002	0.0008	0.000	0.000
3,3-Diethylpentane	I9	0.0003	0.0012	0.000	0.000
1,2-Dimethylbenzene (o-Xylene)	A8	0.0036	0.0117	0.001	0.001
i-Butylcyclopentane	N9	0.0014	0.0054	0.001	0.001
UnknownC8s	U8	0.0046	0.0161	0.002	0.002
n-Nonane	P9	0.0064	0.0252	0.004	0.004
1,1-Methylethylcyclohexane	N9	0.0003	0.0012	0.000	0.000
i-Propylbenzene	A9	0.0018	0.0066	0.001	0.001
i-Propylcyclohexane	N9	0.0004	0.0015	0.000	0.000
2,2-Dimethyloctane	I10	0.0003	0.0013	0.000	0.000
2,4-Dimethyloctane	I10	0.0002	0.0009	0.000	0.000
2,6-Dimethyloctane	I10	0.0001	0.0004	0.000	0.000
n-Butylcyclopentane	N9	0.0011	0.0043	0.001	0.001
3,3-Dimethyloctane	I10	0.0002	0.0009	0.000	0.000
n-Propylbenzene	A9	0.0009	0.0033	0.000	0.000
3,6-Dimethyloctane	I10	0.0007	0.0031	0.000	0.000
3-Methyl-5-ethylheptane	I10	0.0002	0.0009	0.000	0.000
1,3-Methylethylbenzene	A9	0.0004	0.0015	0.000	0.000
1,4-Methylethylbenzene	A9	0.0002	0.0007	0.000	0.000
1,3,5-Trimethylbenzene	A9	0.0005	0.0018	0.000	0.000
2,3-Dimethyloctane	I10	0.0002	0.0009	0.000	0.000
5-Methylnonane	I10	0.0004	0.0018	0.000	0.000
1,2-Methylethylbenzene	A9	0.0005	0.0018	0.000	0.000
2-Methylnonane	I10	0.0001	0.0004	0.000	0.000
3-Ethyloctane	I10	0.0001	0.0004	0.000	0.000
3-Methylnonane	I10	0.0003	0.0013	0.000	0.000
1,2,4-Trimethylbenzene	A9	0.0002	0.0007	0.000	0.000
t-Butylbenzene	A10	0.0008	0.0033	0.000	0.000
i-Butylcyclohexane	N10	0.0003	0.0013	0.000	0.000
1t-Methyl-2-n-propylcyclohexane	I10	0.0001	0.0004	0.000	0.000
i-Butylbenzene	A10	0.0001	0.0004	0.000	0.000
sec-Butylbenzene	A10	0.0001	0.0004	0.000	0.000
UnknownC9s	U9	0.0088	0.0346	0.005	0.005
n-Decane	P10	0.0015	0.0065	0.001	0.001
1,2,3-Trimethylbenzene	A9	0.0004	0.0015	0.000	0.000
1,3-Methyl-i-propylbenzene	A10	0.0001	0.0004	0.000	0.000
1,4-Methyl-i-propylbenzene	A10	0.0001	0.0004	0.000	0.000
1,2-Methyl-i-propylbenzene	A10	0.0003	0.0012	0.000	0.000
3-Ethylnonane	I10	0.0002	0.0010	0.000	0.000
1,3-Diethylbenzene	A10	0.0001	0.0004	0.000	0.000
1,3-Methyl-n-propylbenzene	A10	0.0001	0.0004	0.000	0.000
1,4-Diethylbenzene	A10	0.0002	0.0008	0.000	0.000
1,4-Methyl-n-propylbenzene	A10	0.0001	0.0004	0.000	0.000
n-Butylbenzene	A10	0.0001	0.0004	0.000	0.000
1,3-Dimethyl-5-ethylbenzene	A10	0.0002	0.0008	0.000	0.000

t-Decahydronaphthalene	A9	0.0001	0.0005	0.000	0.000
1,4-Dimethyl-2-ethylbenzene	A10	0.0002	0.0008	0.000	0.000
1,2-Dimethyl-4-ethylbenzene	A10	0.0002	0.0008	0.000	0.000
1,3-Dimethyl-2-ethylbenzene	A10	0.0002	0.0008	0.000	0.000
1,2-Dimethyl-3-ethylbenzene	A10	0.0001	0.0004	0.000	0.000
1,4-Methyl-t-butylbenzene	A11	0.0002	0.0009	0.000	0.000
UnknownC10s	U10	0.0061	0.0266	0.004	0.004
n-Undecane	P11	0.0008	0.0038	0.001	0.001
1,4-Ethyl-i-propylbenzene	A11	0.0001	0.0005	0.000	0.000
1,2-Methyl-n-butylbenzene	A11	0.0001	0.0005	0.000	0.000
1,2,3,5-Tetramethylbenzene	A11	0.0002	0.0008	0.000	0.000
1,2-Methyl-t-butylbenzene	A11	0.0001	0.0005	0.000	0.000
4-Methylindan	A11	0.0001	0.0004	0.000	0.000
2-Methylindan	A11	0.0001	0.0004	0.000	0.000
1,3-Methyl-n-butylbenzene	A11	0.0001	0.0005	0.000	0.000
n-Pentylbenzene	A11	0.0001	0.0005	0.000	0.000
1,2-Di-n-propylbenzene	A11	0.0001	0.0005	0.000	0.000
1,4-Di-i-propylbenzene	A11	0.0001	0.0005	0.000	0.000
Tetrahydronaphthalene	A10	0.0001	0.0004	0.000	0.000
1-t-Butyl-3,5-dimethylbenzene	A12	0.0001	0.0005	0.000	0.000
1,4-Ethyl-t-butylbenzene	A11	0.0001	0.0005	0.000	0.000
UnknownC11s	U11	0.0009	0.0043	0.001	0.001
n-Dodecane	P12	0.0006	0.0031	0.000	0.000
1,3,5-Triethylbenzene	A12	0.0002	0.0010	0.000	0.000
1,2,3,4,5-Pentamethylbenzene	A13	0.0001	0.0005	0.000	0.000
2-Methylnaphthalene	A11	0.0001	0.0004	0.000	0.000
1-Methylnaphthalene	A11	0.0001	0.0004	0.000	0.000
UnknownC12s	U12	0.0004	0.0019	0.000	0.000
n-Tridecane	P13	0.0005	0.0028	0.000	0.000
UnknownC13s	U13	0.0002	0.0011	0.000	0.000
n-Tetradecane	P14	0.0007	0.0043	0.001	0.001
UnknownC14s	U14	0.0008	0.0049	0.001	0.001
n-Pentadecane	P15	0.0006	0.0039	0.001	0.001
UnknownC15s	U15	0.0006	0.0039	0.001	0.001
n-Hexadecane	P16	0.0001	0.0007	0.000	0.000
UnknownC16s	U16	0.0001	0.0007	0.000	0.000
UnknownC18s	U18	0.0001	0.0008	0.000	0.000
UnknownC20s	U20	0.0001	0.0009	0.000	0.000
TOTAL		100.00000	100.00000	13.5603	13.4866

BTEX COMPONENTS	MOLE%	WT%
BENZENE	0.0574	0.1375
TOLUENE	0.0407	0.1150
ETHYLBENZENE	0.0055	0.0179
XYLENES	0.0124	0.0404
TOTAL BTEX	0.1160	0.3108

	BTU @	14.730	14.650
LOW	NET DRY REAL :	1674.0 /scf	1664.9 /scf
	NET WET REAL :	1644.9 /scf	1635.8 /scf
HIGH	GROSS DRY REAL :	1827.7 /scf	1817.8 /scf
	GROSS WET REAL :	1795.9 /scf	1786.0 /scf
	NET DRY REAL :	19509.3 /lb	19403.3 /lb
	GROSS DRY REAL :	21303.0 /lb	21187.3 /lb
	RELATIVE DENSITY (AIR=1):		1.1246
	COMPRESSIBILITY FACTOR :		0.99206

(CALC: GPA STD 2145 & TP-17 @14.696 & 60 F)

**(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730*