

EXTENDED NATURAL GAS ANALYSIS (*DHA)

MAIN PAGE

LEASE #:		NAME/DESCRIP :	JOHN CRAIG 2-2 SALES GAS
PROJECT NO. :	201701040	ANALYSIS NO. :	02
COMPANY NAME :	NIGHTHAWK PRODUCTION CO	ANALYSIS DATE:	JANUARY 19, 2017 11:43
OFFICE / BRANCH:	HIGHLANDS RANCH, CO	SAMPLE DATE :	JANUARY 10, 2017 13:45
CUSTOMER REF:		TO:	
PRODUCER :		EFFECTIVE DATE:	

*****FIELD DATA*****

SAMPLE CYCLE:		SAMPLE TYPE:	SPOT
SAMPLE PRES. :	20 psig	CYLINDER NO. :	1382
LAB PRES:	psig	SAMPLED BY :	GALE MCENDREE
SAMPLE TEMP. :	67 °f	SAMPLING COMPANY:	EMPACT
AMBIENT TEMP.:	°f	H2S BY STAIN TUBE:	23 ppm
H2O BY STAIN TUBE:	- #/mmcf	CO2 BY STAIN TUBE:	- Mol %
FIELD COMMENTS:	NO PROBE		
LAB COMMENTS:			

<u>COMPONENT</u>	<u>MOLE %</u>	<u>MASS %</u>	<u>GPM @ 14.730</u>	<u>GPM @ 14.650</u>
HELIUM	0.38	0.05	---	---
HYDROGEN	0.05	0.00	---	---
OXYGEN/ARGON	0.41	0.47	---	---
NITROGEN	16.6300	16.7100	---	---
CARBON DIOXIDE	1.09	1.72	---	---
HYDROGEN SULFIDE	0.00247	0.00301	---	---
TOTAL OTHER SULFURS	0.00004	0.00008	---	---
METHANE	47.18689	27.14881	---	---
ETHANE	13.6254	14.6934	3.6605	3.6406
PROPANE	12.1033	19.1405	3.3493	3.3311
I-BUTANE	1.5398	3.2097	0.5065	0.5038
N-BUTANE	3.8914	8.1115	1.2326	1.2259
I-PENTANE	1.0225	2.6401	0.3706	0.3685
N-PENTANE	0.9515	2.4620	0.3464	0.3445
HEXANES PLUS	1.1167	3.6409	0.4445	0.4424
TOTALS	100.00000	100.00000	9.9104	9.8568

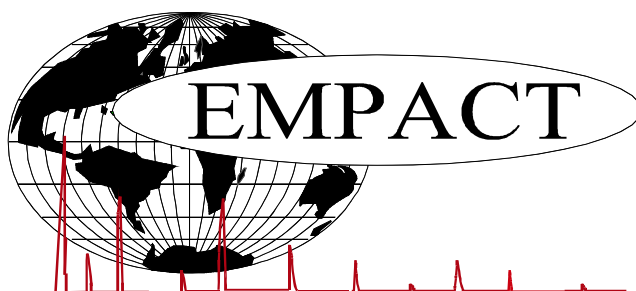
<u>BTEX COMPONENTS</u>	<u>MOLE%</u>	<u>WT%</u>	<u>BTU @</u>	<u>14.730</u>	<u>14.650</u>
BENZENE	0.0669	0.1874	LOW NET DRY REAL :	1224.9 /scf	1218.3 /scf
TOLUENE	0.0335	0.1107	NET WET REAL :	1203.6 /scf	1197.0 /scf
ETHYLBENZENE	0.0042	0.0160	HIGH GROSS DRY REAL :	1340.9 /scf	1333.7 /scf
XYLENES	0.0043	0.0164	GROSS WET REAL :	1317.6 /scf	1310.3 /scf
TOTAL BTEX	0.1089	0.3305	NET DRY REAL :	16690.5 /lb	16599.9 /lb
			GROSS DRY REAL :	18278.1 /lb	18178.8 /lb

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

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

RELATIVE DENSITY (AIR=1): 0.9623
COMPRESSIBILITY FACTOR : 0.99534

The data presented herein has been acquired by means of current analytical techniques and represents the judicious conclusion EMPACT Analytical Systems, Inc. Results of the analysis can be affected by the sampling conditions, therefore, are only warranted through proper lab protocol. EMPACT assumes no responsibility for interpretation or any consequences from application of the reported information and is the sole liability of the user. The reproduction in any media of this reported information may not be made, in portion or as a whole, without the written permission of EMPACT Analytical Systems, Inc.



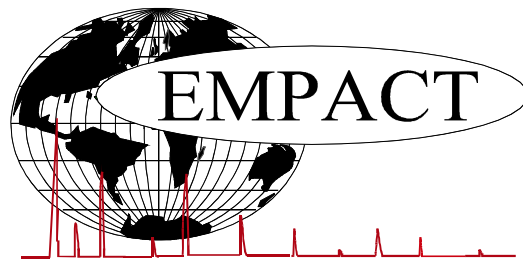
EXTENDED NATURAL GAS ANALYSIS (*DHA)

GLYCALC INFORMATION

PROJECT NO. :	201701040	ANALYSIS NO. :	02
COMPANY NAME :	NIGHTHAWK PRODUCTION CO	ANALYSIS DATE:	JANUARY 19, 2017 11:43
ACCOUNT NO. :		SAMPLE DATE :	JANUARY 10, 2017 13:45
PRODUCER :		CYLINDER NO. :	1382
LEASE NO. :		SAMPLED BY :	GALE MCENDREE
NAME/DESCRIP :	JOHN CRAIG 2-2 SALES GAS		
FIELD DATA		SAMPLE TEMP. :	67
SAMPLE PRES. :	20	AMBIENT TEMP.:	
COMMENTS :	NO PROBE SPOT		

Componet	Mole %	Wt %
Hydrogen Sulfide	0.00247	0.00301
Total Other Sulfurs	0.00004	0.00008
Helium	0.38	0.05
Hydrogen	0.05	0.00
Carbon Dioxide	1.09	1.72
Nitrogen	16.63	16.71
Methane	47.18689	27.14881
Ethane	13.6254	14.6934
Propane	12.1033	19.1405
Isobutane	1.5398	3.2097
n-Butane	3.8914	8.1115
Isopentane	0.9448	2.4447
n-Pentane	0.9515	2.4620
Cyclopentane	0.0777	0.1954
n-Hexane	0.1750	0.5409
Cyclohexane	0.0601	0.1814
Other Hexanes	0.4595	1.4112
Heptanes	0.1827	0.6525
Methycyclohexane	0.0383	0.1349
2,2,4 Trimethylpentane	0.0053	0.0217
Benzene	0.0669	0.1874
Toluene	0.0335	0.1107
Ethylbenzene	0.0042	0.0160
Xylenes	0.0043	0.0164
C8+ Heavies	0.0869	0.3678
Subtotal	99.59000	99.53000
Oxygen/Argon	0.41	0.47
Total	100.00000	100.00000

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EXTENDED NATURAL GAS ANALYSIS (*DHA)

DHA COMPONENT LIST

PROJECT NO. : 201701040
 COMPANY NAME : NIGHTHAWK PRODUCTION CO
 ACCOUNT NO. :
 PRODUCER :
 LEASE NO. :
 NAME/DESCRIP : JOHN CRAIG 2-2
 SALES GAS

ANALYSIS NO. : 02
 ANALYSIS DATE: JANUARY 19, 2017 11:43
 SAMPLE DATE : JANUARY 10, 2017 13:45
 CYLINDER NO. : 1382
 SAMPLED BY : GALE MCENDREE

FIELD DATA

SAMPLE PRES. : 20
 COMMENTS : NO PROBE
 SPOT

SAMPLE TEMP. : 67
 AMBIENT TEMP.:

COMPONENT	PIANO #	MOLE %	MASS %	GPM @ 14.730	GPM @ 14.650
Helium	---	0.38	0.05	---	---
Hydrogen	---	0.05	0.00	---	---
Oxygen/Argon	---	0.41	0.47	---	---
Nitrogen	---	16.63	16.71	---	---
Carbon Dioxide	---	1.09	1.72	---	---
Hydrogen Sulfide (H2S)	---	0.00247	0.00301	---	---
Total Other Sulfurs	---	0.00004	0.00008	---	---
Methane	P1	47.18689	27.14881	---	---
Ethane	P2	13.6254	14.6934	3.661	3.641
Propane	P3	12.1033	19.1405	3.349	3.331
i-Butane	I4	1.5398	3.2097	0.507	0.504
n-Butane	P4	3.8914	8.1115	1.233	1.226
2,2-Dimethylpropane	I5	0.0051	0.0132	0.002	0.002
i-Pentane	I5	0.9397	2.4315	0.345	0.344
n-Pentane	P5	0.9515	2.4620	0.346	0.345
2,2-Dimethylbutane	I6	0.0025	0.0077	0.001	0.001
Cyclopentane	N5	0.0777	0.1954	0.023	0.023
2,3-Dimethylbutane	I6	0.0140	0.0433	0.006	0.006
2-Methylpentane	I6	0.2037	0.6296	0.085	0.084
3-Methylpentane	I6	0.1149	0.3551	0.047	0.047
n-Hexane	P6	0.1750	0.5409	0.073	0.072
2,2-Dimethylpentane	I7	0.0003	0.0011	0.000	0.000
Methylcyclopentane	N6	0.1243	0.3752	0.044	0.044
2,4-Dimethylpentane	I7	0.0026	0.0094	0.001	0.001
2,2,3-Trimethylbutane	I7	0.0005	0.0018	0.000	0.000
Benzene	A6	0.0669	0.1874	0.019	0.019
3,3-Dimethylpentane	I7	0.0003	0.0011	0.000	0.000
Cyclohexane	N6	0.0601	0.1814	0.020	0.020
2-Methylhexane	I7	0.0104	0.0374	0.005	0.005
2,3-Dimethylpentane	I7	0.0195	0.0701	0.009	0.009
1,1-Dimethylcyclopentane	N7	0.0034	0.0120	0.001	0.001
3-Methylhexane	I7	0.0278	0.0999	0.013	0.013
1c,3-Dimethylcyclopentane	N7	0.0095	0.0335	0.004	0.004
1t,3-Dimethylcyclopentane	N7	0.0116	0.0409	0.005	0.005
3-Ethylpentane	I7	0.0019	0.0068	0.001	0.001
1t,2-Dimethylcyclopentane	N7	0.0292	0.1028	0.013	0.013

2,2,4-Trimethylpentane	I8	0.0053	0.0217	0.003	0.003
UnknownC6s	U6	0.0001	0.0003	0.000	0.000
n-Heptane	P7	0.0423	0.1520	0.019	0.019
1c,2-Dimethylcyclopentane	N7	0.0020	0.0070	0.001	0.001
Methylcyclohexane	N7	0.0383	0.1349	0.015	0.015
2,2-Dimethylhexane	I8	0.0019	0.0078	0.001	0.001
1,1,3-Trimethylcyclopentane	N7	0.0008	0.0032	0.000	0.000
Ethylcyclopentane	N7	0.0071	0.0250	0.003	0.003
2,5-Dimethylhexane	I8	0.0006	0.0025	0.000	0.000
2,2,3-Trimethylpentane	I8	0.0004	0.0017	0.000	0.000
2,4-Dimethylhexane	I8	0.0015	0.0061	0.001	0.001
1c,2t,4-Trimethylcyclopentane	N8	0.0030	0.0121	0.001	0.001
3,3-Dimethylhexane	I8	0.0003	0.0012	0.000	0.000
1t,2c,4-Trimethylcyclopentane	N8	0.0042	0.0169	0.002	0.002
2,3,4-Trimethylpentane	I8	0.0011	0.0045	0.001	0.001
2,3,3-Trimethylpentane	I8	0.0003	0.0012	0.000	0.000
Toluene	A7	0.0335	0.1107	0.011	0.011
2,3-Dimethylhexane	I8	0.0011	0.0045	0.001	0.001
2-Methyl-3-ethylpentane	I8	0.0007	0.0029	0.000	0.000
1,1,2-Trimethylcyclopentane	N8	0.0002	0.0008	0.000	0.000
2-Methylheptane	I8	0.0095	0.0389	0.005	0.005
4-Methylheptane	I8	0.0028	0.0115	0.001	0.001
3-Methyl-3-ethylpentane	I8	0.0009	0.0037	0.000	0.000
3,4-Dimethylhexane	I8	0.0004	0.0017	0.000	0.000
1c,2c,4-Trimethylcyclopentane	N8	0.0001	0.0004	0.000	0.000
1c,3-Dimethylcyclohexane	N8	0.0001	0.0004	0.000	0.000
3-Methylheptane	I8	0.0003	0.0012	0.000	0.000
1c,2t,3-Trimethylcyclopentane	N8	0.0067	0.0270	0.003	0.003
1t,4-Dimethylcyclohexane	N8	0.0014	0.0056	0.001	0.001
1,1-Dimethylcyclohexane	N8	0.0005	0.0020	0.000	0.000
2,2,5-Trimethylhexane	I9	0.0002	0.0009	0.000	0.000
3t-Ethylmethylcyclopentane	N8	0.0015	0.0060	0.001	0.001
2t-Ethylmethylcyclopentane	N8	0.0009	0.0036	0.000	0.000
1,1-Methylethylcyclopentane	N8	0.0034	0.0137	0.002	0.002
1t,2-Dimethylcyclohexane	N8	0.0018	0.0072	0.001	0.001
1c,2c,3-Trimethylcyclopentane	N8	0.0005	0.0020	0.000	0.000
1t,3-Dimethylcyclohexane	N8	0.0001	0.0004	0.000	0.000
UnknownC7s	U7	0.0135	0.0485	0.006	0.006
n-Octane	P8	0.0088	0.0360	0.004	0.004
1c,4-Dimethylcyclohexane	N8	0.0007	0.0028	0.000	0.000
i-Propylcyclopentane	I8	0.0002	0.0008	0.000	0.000
2,4,4-Trimethylhexane	I9	0.0002	0.0009	0.000	0.000
2,3,5-Trimethylhexane	I9	0.0001	0.0005	0.000	0.000
2,3,4-Trimethylhexane	I9	0.0003	0.0014	0.000	0.000
1c,2-Dimethylcyclohexane	N8	0.0002	0.0008	0.000	0.000
1,1,4-Trimethylcyclohexane	N9	0.0036	0.0163	0.002	0.002
2,2,3-Trimethylhexane	I9	0.0006	0.0028	0.000	0.000
2,4-Dimethylheptane	I9	0.0001	0.0005	0.000	0.000
4,4-Dimethylheptane	I9	0.0005	0.0023	0.000	0.000
Ethylcyclohexane	N8	0.0029	0.0117	0.001	0.001
n-Propylcyclopentane	N8	0.0003	0.0012	0.000	0.000
1c,3c,5-Trimethylcyclohexane	N9	0.0003	0.0014	0.000	0.000
2,5-Dimethylheptane	I9	0.0001	0.0005	0.000	0.000
3,3-Dimethylheptane	I9	0.0001	0.0005	0.000	0.000
3,5-Dimethylheptane	I9	0.0001	0.0005	0.000	0.000
Ethylbenzene	I8	0.0042	0.0160	0.002	0.002
1c,2t,4t-Trimethylcyclohexane	N9	0.0015	0.0068	0.001	0.001
2,3-Dimethylheptane	I9	0.0005	0.0023	0.000	0.000
1,3-Dimethylbenzene (m-Xylene)	A8	0.0017	0.0065	0.001	0.001

1,4-Dimethylbenzene (p-Xylene)	A8	0.0006	0.0023	0.000	0.000
3,4-Dimethylheptane	I9	0.0003	0.0014	0.000	0.000
3,4-Dimethylheptane (2)	I9	0.0003	0.0014	0.000	0.000
4-Ethylheptane	I9	0.0002	0.0009	0.000	0.000
4-Methyloctane	I9	0.0006	0.0028	0.000	0.000
2-Methyloctane	I9	0.0006	0.0028	0.000	0.000
1c,2t,3-Trimethylcyclohexane	N9	0.0002	0.0009	0.000	0.000
3-Ethylheptane	I9	0.0002	0.0009	0.000	0.000
3-Methyloctane	I9	0.0007	0.0032	0.000	0.000
1c,2t,4c-Trimethylcyclohexane	I9	0.0002	0.0009	0.000	0.000
3,3-Diethylpentane	I9	0.0002	0.0009	0.000	0.000
1,2-Dimethylbenzene (o-Xylene)	A8	0.0020	0.0076	0.001	0.001
i-Butylcyclopentane	N9	0.0003	0.0014	0.000	0.000
UnknownC8s	U8	0.0035	0.0143	0.002	0.002
n-Nonane	P9	0.0019	0.0088	0.001	0.001
1,1-Methylethylcyclohexane	N9	0.0003	0.0014	0.000	0.000
i-Propylbenzene	A9	0.0006	0.0026	0.000	0.000
i-Propylcyclohexane	N9	0.0001	0.0005	0.000	0.000
2,2-Dimethyloctane	I10	0.0002	0.0010	0.000	0.000
2,4-Dimethyloctane	I10	0.0001	0.0005	0.000	0.000
n-Butylcyclopentane	N9	0.0003	0.0014	0.000	0.000
3,3-Dimethyloctane	I10	0.0001	0.0005	0.000	0.000
n-Propylbenzene	A9	0.0003	0.0013	0.000	0.000
3,6-Dimethyloctane	I10	0.0004	0.0020	0.000	0.000
3-Methyl-5-ethylheptane	I10	0.0002	0.0010	0.000	0.000
1,3-Methylethylbenzene	A9	0.0001	0.0004	0.000	0.000
1,3,5-Trimethylbenzene	A9	0.0001	0.0004	0.000	0.000
5-Methylnonane	I10	0.0004	0.0020	0.000	0.000
1,2-Methylethylbenzene	A9	0.0001	0.0004	0.000	0.000
3-Methylnonane	I10	0.0002	0.0010	0.000	0.000
t-Butylbenzene	A10	0.0004	0.0019	0.000	0.000
sec-Butylbenzene	A10	0.0001	0.0005	0.000	0.000
UnknownC9s	U9	0.0034	0.0156	0.002	0.002
n-Decane	P10	0.0004	0.0020	0.000	0.000
1,2,3-Trimethylbenzene	A9	0.0002	0.0009	0.000	0.000
Sec-Butylcyclohexane	A10	0.0002	0.0010	0.000	0.000
3-Ethylnonane	I10	0.0001	0.0006	0.000	0.000
1,3-Methyl-n-propylbenzene	A10	0.0001	0.0005	0.000	0.000
UnknownC10s	U10	0.0015	0.0076	0.001	0.001
n-Undecane	P11	0.0001	0.0006	0.000	0.000
1,3-Di-i-propylbenzene	A11	0.0001	0.0006	0.000	0.000
UnknownC11s	U11	0.0001	0.0006	0.000	0.000
TOTAL		100.00000	100.00000	9.9104	9.8568

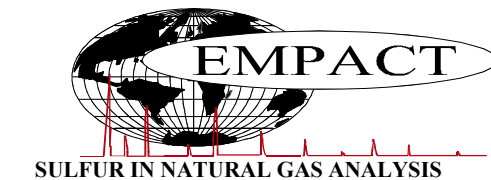
BTEX COMPONENTS	MOLE%	WT%	BTU @	14.730	14.650
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ETHYLBENZENE	0.0042	0.0160	HIGH GROSS DRY REAL :	1340.9 /scf	1333.7 /scf
XYLENES	0.0043	0.0164	GROSS WET REAL :	1317.6 /scf	1310.3 /scf
TOTAL BTEX	0.1089	0.3305	NET DRY REAL :	16690.5 /lb	16599.9 /lb
			GROSS DRY REAL :	18278.1 /lb	18178.8 /lb

RELATIVE DENSITY (AIR=1): 0.9623
COMPRESSIBILITY FACTOR : 0.99534

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

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LEASE #: NAME/DESCRIP : **JOHN CRAIG 2-2**
SALES GAS

PROJECT NO. : **201701040** ANALYSIS NO. : **02**
 COMPANY NAME : **NIGHTHAWK PRODUCTION CC** ANALYSIS DATE: **JANUARY 13, 2017 07:38**
 OFFICE / BRANCH: **HIGHLANDS RANCH, CC** SAMPLE DATE : **JANUARY 10, 2017 14:00**
 CUSTOMER REF: TO:
 PRODUCER : EFFECTIVE DATE:

*****FIELD DATA*****

SAMPLE CYCLE: SAMPLE TYPE: **SPOT**
 SAMPLE PRES. : 20 psig CYLINDER NO. : **1L TEDLAR**
 LAB PRES: psig SAMPLED BY : **GALE MCENDREE**
 SAMPLE TEMP. : 67 °f SAMPLING COMPANY: **EMPACT**
 AMBIENT TEMP.: °f H2S BY STAIN TUBE: **23** ppm
 H2O BY STAIN TUBE: - #/mmcf CO2 BY STAIN TUBE: - Mol %
 FIELD COMMENTS: **NO PROBE**
 LAB COMMENTS:

COMPONENT	SULFUR	
	ppm mole (ul/L)	ppm wt (ug/g)
Hydrogen Sulfide (H2S)	24.7	28.3
Carbonyl Sulfide (COS)/Sulfur Dioxide (SO2)	BDL	
Methanethiol (MeSH)	0.1	0.0
Ethanethiol (EtSH)	0.2	0.2
Dimethylsulfide (DMS)	BDL	
Carbon Disulfide (CS2)	BDL	
i-Propanethiol (i-PrSH)	0.1	0.2
t-Butanethiol (t-BuSH)	BDL	
n-Propanethiol (n-PrSH)	BDL	
Methylethylsulfide (MES)	BDL	
s-Butanethiol (s-BuSH)	BDL	
i-Butanethiol (i-BuSH)	BDL	
Thiophene (TP)	BDL	
Diethylsulfide (DES)	BDL	
n-Butanethiol (n-BuSH)	BDL	
Dimethyldisulfide (DMDS)	BDL	
Unidentified Sulfurs - Light Ends	BDL	
Methylthiophenes (MTP)	BDL	
2-Ethylthiophene (2-ETP)	BDL	
Methylethylsulfide (MEDS)	BDL	
Dimethylthiophenes (DMTP)	BDL	
Diethyldisulfide (DEDS)	BDL	
Benzothiophene (BzTP)	BDL	
Unidentified Sulfurs - Mid Range	BDL	
Methylbenzothiophenes (MBzTP)	BDL	
Dimethylbenzothiophenes (DMBzTP)	BDL	
Trimethylbenzothiophenes (TMBzTP)	BDL	
Dibenzothiophenes (DBzTP)	BDL	
Methyldibenzothiophenes (MDBzTP)	BDL	
<u>Unidentified Sulfurs - Heavy Ends</u>	<u>BDL</u>	<u>BDL</u>
TOTAL SULFUR	25.1	28.7

GRAINS OF H2S	1.5556 / 100 scf	TOTAL GRAINS OF SULFUR	1.4833 / 100 scf
POUNDS OF H2S	0.0022 / 1000 scf	TOTAL POUNDS OF SULFUR	0.0021 / 1000 scf
WT% OF H2S	0.00283 / 1000 scf	TOTAL WT% OF SULFUR	0.00287 / 1000 scf

* ASTM D5504 ** DETECTION LIMIT DETERMINED TO BE 0.1 ppm (ul/L) Sulfur - BDL (BELOW DETECTION LIMIT)

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