EMPACT

EXTENDED NATURAL GAS ANALYSIS (*DHA)

MAIN PAGE

PRIMARY DB KEY:	**05-103-10690**	NAME/DESCRIP :	**FREEDOM UNIT 297-28A5**
LEASE #:	**120193068**		**PRODUCTION CASING**
FIELD/AREA:	**PICEANCE CREEK - #68800**		

PROJECT NO. :	**202405126**	ANALYSIS NO. :	**01**
COMPANY NAME :	**CAERUS OIL & GAS LLC**	ANALYSIS DATE:	MAY 31, 2024 07:29
OFFICE / BRANCH:	PARACHUTE, CO	SAMPLE DATE :	MAY 15, 2024 12:45
CUSTOMER REF:		TO:	MAY 15, 2024 12:48
PRODUCER :	CAERUS PICEANCE LLC	EFFECTIVE DATE:	

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

SAMPLE CYCLE:			SAMPLE TYPE:	SPOT
SAMPLE PRES. :	140	psig	PROBE :	
FLOW PRES. :		psig	CYLINDER NO. :	ECA-817
LAB PRES:		psig	SAMPLED BY :	PAUL HACKING
SAMPLE TEMP. :	66	ºf	SAMPLING COMPANY:	CAERUS OIL & GAS
AMBIENT TEMP.:		ºf	H2S BY STAIN TUBE:	ppm mol
H2O BY STAIN TUBE:		#/mmcf	CO2 BY STAIN TUBE:	Mol %

FIELD COMMENTS:

LAB COMMENTS: ***Possible moisture in sample; possible trace of Olefins in sample.***

COMPONENT	MOLE %	MASS %	GPM @ 14.65	GPM @ 14.73
ALCOHOLS	0.0397	0.0698	0.0050	0.0050
HELIUM	0.01	0.00	---	---
HYDROGEN	0.01	0.00	---	---
OXYGEN/ARGON	0.00	0.00	---	---
NITROGEN	0.06	0.09	---	---
CARBON DIOXIDE	7.09	16.41	---	---
METHANE	87.9488	74.2156	---	---
ETHANE	4.0900	6.4690	1.0901	1.0961
PROPANE	0.3393	0.7870	0.0929	0.0934
I-BUTANE	0.1115	0.3409	0.0360	0.0362
N-BUTANE	0.0358	0.1095	0.0110	0.0111
I-PENTANE	0.0246	0.0932	0.0080	0.0080
N-PENTANE	0.0070	0.0266	0.0030	0.0030
HEXANES PLUS	0.2333	1.3884	0.0990	0.0991
TOTALS	100.00000	100.00000	1.3450	1.3519

BTEX COMPONENTS	MOLE%	WT%
BENZENE	0.0180	0.0740
TOLUENE	0.0260	0.1260
ETHYLBENZENE	0.0014	0.0078
XYLENES	0.0152	0.0849
TOTAL BTEX	0.0606	0.2927

**(DETAILED HYDROCARBON ANALYSIS/NJ 1993)*
Mod ASTM D6730,GPA 2261 & GPA 2286.

***(CALC: GPA 2172, GPA 2145 & TP-17 @14.696 & 60 F)*

CALCULATED VALUES**

	BTU @	14.65	14.73
LHV	NET DRY REAL :	891.1 /scf	895.9 /scf
	NET WET REAL :	875.5 /scf	880.3 /scf
HHV	GROSS DRY REAL :	987.9 /scf	993.3 /scf
	GROSS WET REAL :	970.6 /scf	976.0 /scf

NET HEATING VALUE (60 °F ideal reaction):	17823.2	**Btu/lbm**
GROSS HEATING VALUE (60°F ideal reaction):	19755.9	**Btu/lbm**
RELATIVE DENSITY (AIR=1):	0.6550	
DENSITY	0.05010	**lbm/scf**
COMPRESSIBILITY FACTOR :	0.9977	
REGULAR WOBBE INDEX	1221.6	

EMPACT

EXTENDED NATURAL GAS ANALYSIS (*DHA)

GLYCALC INFORMATION

PROJECT NO. :	202405126	ANALYSIS NO. :	01
COMPANY NAME :	CAERUS OIL & GAS LLC	ANALYSIS DATE:	MAY 31, 2024 07:29
ACCOUNT NO. :		SAMPLE DATE :	MAY 15, 2024 12:45
PRODUCER :	CAERUS PICEANCE LLC	CYLINDER NO. :	ECA-817
LEASE NO. :	120193068	SAMPLED BY :	PAUL HACKING
NAME/DESCRIP :	FREEDOM UNIT 297-28A5 PRODUCTION CASING		
FIELD DATA		SAMPLE TEMP. :	66
SAMPLE PRES. :	140	AMBIENT TEMP.:	
H2S BY STAIN TUBE:	_ *ppm mol*		
COMMENTS :	***SPOT*** ***Possible moisture in sample; possible trace of Olefins in sample.***		

Componet	Mole %	Wt %
Helium	0.01	0.00
Hydrogen	0.01	0.00
Carbon Dioxide	7.09	16.41
Nitrogen	0.06	0.09
Methane	87.9488	74.2156
Ethane	4.0900	6.4690
Propane	0.3393	0.7870
Isobutane	0.1115	0.3409
n-Butane	0.0358	0.1095
Isopentane	0.0237	0.0899
n-Pentane	0.0070	0.0266
Cyclopentane	0.0009	0.0033
n-Hexane	0.0043	0.0195
Cyclohexane	0.0057	0.0253
Other Hexanes	0.0189	0.0852
Heptanes	0.0185	0.0975
Methylcyclohexane	0.0125	0.0645
2,2,4 Trimethylpentane	0.0000	0.0000
Benzene	0.0180	0.0740
Toluene	0.0260	0.1260
Ethylbenzene	0.0014	0.0078
Xylenes	0.0152	0.0849
C8+ Heavies	0.1128	0.8037
Subtotal	99.96030	99.93020
Oxygen/Argon	0.00	0.00
Alcohols	0.0397	0.0698
Total	100.00000	100.00000

Calculated Values BTU @ **14.65**	**Total Sample**	**C6+ Fraction**	**C8+ Fraction**	**C10+ Fraction**	
LHV Net Dry Real:	891.1	5592.4	6550.4	7322.1	**Btu/scf**
Net Wet Real:	875.5	5494.6	6435.9	7194.1	**Btu/scf**
HHV Gross Dry Real:	987.9	6003.0	7061.4	7935.5	**Btu/scf**
Gross Wet Real:	970.6	5898.1	6938.0	7796.8	**Btu/scf**
Other Calculated Values					
Regualr Wobbe Index*	1221.6	3038.8	3319.3	3547.4	**Btu/scf**
Net Heating Value (60 °F ideal reaction):	17823.2	18861.2	19016.1	19088.7	**Btu/lbm**
Gross Heating Value (60°F ideal reaction):	19755.9	20243.6	20497.4	20682.9	**Btu/lbm**
Molar Mass (MW):	19.01181	113.119	131.699	145.761	**g/mol**
Relative Density (AIR=1):	0.6550	3.9058	4.5467	5.0325	**SG**
Density:	0.05010	0.29807	0.34703	0.38411	**lbm/scf**
Compressiblity Factor:	0.9977	0.9973	0.9992	0.9997	**Z**
Liquid Volume real gas @: **14.65**	17.3794	0.0987	0.0628	0.0369	**gal/1000 scf**

**** The Wobbe pressure base in the number considered is based upon the given Pb of the HHV above.***

#DIV/0 or 0 (zero) will appear in the Calculated Value Section when there is no C6+, C8+ or C10+ in the sample to calculate these factors.

BDL - Below Detection Limit. The H2S LOS has a detection limit of 0.25 ppm. A _ (an uderscore) indicates there was no tube pulled for H2S.

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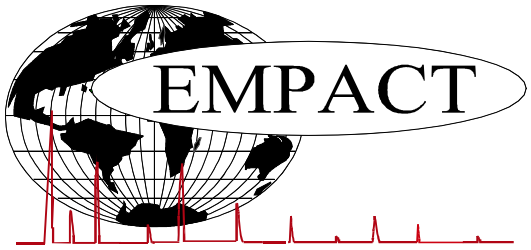

EXTENDED NATURAL GAS ANALYSIS (*DHA)

DHA COMPONENT LIST

PRIMARY DB KEY:	**05-103-10690**	NAME/DESCRIP :	**FREEDOM UNIT 297-28A5**
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FIELD/AREA:	**PICEANCE CREEK - #68800**		

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AMBIENT TEMP.:	ºf	H2S BY STAIN TUBE:	_ ppm mol
H2O BY STAIN TUBE:	- #/mmcf	CO2 BY STAIN TUBE:	- Mol %
FIELD COMMENTS:			
LAB COMMENTS:	***Possible moisture in sample; possible trace of Olefins in sample.***		

COMPONENT	PIANO #	MOLE %	MASS %	GPM @ **14.65**	GPM @ **14.73**
Helium	---	0.01	0.00	---	---
Hydrogen	---	0.01	0.00	---	---
Oxygen/Argon	---	0.00	0.00	---	---
Nitrogen	---	0.06	0.09	---	---
Carbon Dioxide	---	7.09	16.41	---	---
Methane	P1	87.9488	74.2156	---	---
Ethane	P2	4.0900	6.4690	1.090	1.096
Propane	P3	0.3393	0.7870	0.093	0.093
i-Butane	I4	0.1115	0.3409	0.036	0.036
Methanol	X1	0.0376	0.0634	0.005	0.005
n-Butane	P4	0.0358	0.1095	0.011	0.011
2,2-Dimethylpropane	I5	0.0038	0.0144	0.001	0.001
Ethanol	X2	0.0002	0.0005	0.000	0.000
i-Pentane	I5	0.0199	0.0755	0.007	0.007
Acetone	X3	0.0009	0.0027	0.000	0.000
i-Propanol	X3	0.0010	0.0032	0.000	0.000
n-Pentane	P5	0.0070	0.0266	0.003	0.003
2,2-Dimethylbutane	I6	0.0042	0.0190	0.002	0.002
Cyclopentane	N5	0.0009	0.0033	0.000	0.000
2,3-Dimethylbutane	I6	0.0018	0.0082	0.001	0.001
2-Methylpentane	I6	0.0059	0.0267	0.002	0.002
3-Methylpentane	I6	0.0033	0.0149	0.001	0.001
n-Hexane	P6	0.0043	0.0195	0.002	0.002
2,2-Dimethylpentane	I7	0.0007	0.0037	0.000	0.000
Methylcyclopentane	N6	0.0037	0.0164	0.001	0.001
2,4-Dimethylpentane	I7	0.0007	0.0037	0.000	0.000
2,2,3-Trimethylbutane	I7	0.0004	0.0021	0.000	0.000
Benzene	A6	0.0180	0.0740	0.005	0.005
3,3-Dimethylpentane	I7	0.0006	0.0032	0.000	0.000
Cyclohexane	N6	0.0057	0.0253	0.002	0.002

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2-Methylhexane	I7	0.0034	0.0179	0.002	0.002
2,3-Dimethylpentane	I7	0.0009	0.0047	0.000	0.000
1,1-Dimethylcyclopentane	N7	0.0006	0.0031	0.000	0.000
3-Methylhexane	I7	0.0031	0.0164	0.001	0.001
1c,3-Dimethylcyclopentane	N7	0.0008	0.0042	0.000	0.000
1t,3-Dimethylcyclopentane	N7	0.0008	0.0042	0.000	0.000
3-Ethylpentane	I7	0.0002	0.0011	0.000	0.000
1t,2-Dimethylcyclopentane	N7	0.0011	0.0057	0.001	0.001
n-Heptane	P7	0.0045	0.0237	0.002	0.002
1c,2-Dimethylcyclopentane	N7	0.0002	0.0011	0.000	0.000
Methylcyclohexane	N7	0.0125	0.0645	0.005	0.005
2,2-Dimethylhexane	I8	0.0005	0.0030	0.000	0.000
1,1,3-Trimethylcyclopentane	N7	0.0001	0.0006	0.000	0.000
Ethylcyclopentane	N7	0.0004	0.0021	0.000	0.000
2,5-Dimethylhexane	I8	0.0007	0.0042	0.000	0.000
2,2,3-Trimethylpentane	I8	0.0006	0.0036	0.000	0.000
2,4-Dimethylhexane	I8	0.0001	0.0006	0.000	0.000
1c,2t,4-Trimethylcyclopentane	N8	0.0002	0.0012	0.000	0.000
3,3-Dimethylhexane	I8	0.0002	0.0012	0.000	0.000
Toluene	A7	0.0260	0.1260	0.009	0.009
2,3-Dimethylhexane	I8	0.0004	0.0024	0.000	0.000
2-Methyl-3-ethylpentane	I8	0.0001	0.0006	0.000	0.000
2-Methylheptane	I8	0.0026	0.0156	0.001	0.001
4-Methylheptane	I8	0.0009	0.0054	0.000	0.000
3-Methyl-3-ethylpentane	I8	0.0001	0.0006	0.000	0.000
3,4-Dimethylhexane	I8	0.0001	0.0006	0.000	0.000
1c,2c,4-Trimethylcyclopentane	N8	0.0001	0.0006	0.000	0.000
1c,3-Dimethylcyclohexane	N8	0.0001	0.0006	0.000	0.000
3-Methylheptane	I8	0.0024	0.0144	0.001	0.001
1c,2t,3-Trimethylcyclopentane	N8	0.0021	0.0124	0.001	0.001
3-Ethylhexane	I8	0.0001	0.0006	0.000	0.000
1t,4-Dimethylcyclohexane	N8	0.0008	0.0047	0.000	0.000
1,1-Dimethylcyclohexane	N8	0.0005	0.0030	0.000	0.000
2,2,5-Trimethylhexane	I9	0.0001	0.0007	0.000	0.000
3c-Ethylmethylcyclopentane	N8	0.0001	0.0006	0.000	0.000
3t-Ethylmethylcyclopentane	N8	0.0001	0.0006	0.000	0.000
2t-Ethylmethylcyclopentane	N8	0.0001	0.0006	0.000	0.000
1t,2-Dimethylcyclohexane	N8	0.0007	0.0042	0.000	0.000
1t,3-Dimethylcyclohexane	N8	0.0001	0.0006	0.000	0.000
n-Octane	P8	0.0043	0.0258	0.002	0.002
1c,4-Dimethylcyclohexane	N8	0.0011	0.0065	0.001	0.001
2,3,5-Trimethylhexane	I9	0.0002	0.0014	0.000	0.000
2,2-Dimethylheptane	I9	0.0004	0.0027	0.000	0.000
1,1,4-Trimethylcyclohexane	N9	0.0010	0.0066	0.001	0.001
2,2,3-Trimethylhexane	I9	0.0002	0.0014	0.000	0.000
2,4-Dimethylheptane	I9	0.0001	0.0007	0.000	0.000
Ethylcyclohexane	N8	0.0008	0.0047	0.000	0.000
n-Propylcyclopentane	N8	0.0003	0.0018	0.000	0.000
1c,3c,5-Trimethylcyclohexane	N9	0.0001	0.0007	0.000	0.000
2,5-Dimethylheptane	I9	0.0010	0.0067	0.001	0.001
3,3-Dimethylheptane	I9	0.0002	0.0014	0.000	0.000
1,1,3-Trimethylcyclohexane	N9	0.0001	0.0007	0.000	0.000
Ethylbenzene	I8	0.0014	0.0078	0.001	0.001
1,3-Dimethylbenzene (m-Xylene)	A8	0.0104	0.0581	0.004	0.004
1,4-Dimethylbenzene (p-Xylene)	A8	0.0032	0.0179	0.001	0.001
3,4-Dimethylheptane (2)	I9	0.0001	0.0007	0.000	0.000
4-Ethylheptane	I9	0.0002	0.0014	0.000	0.000
4-Methyloctane	I9	0.0013	0.0088	0.001	0.001
2-Methyloctane	I9	0.0019	0.0128	0.001	0.001
1c,2t,3-Trimethylcyclohexane	N9	0.0001	0.0007	0.000	0.000
3-Methyloctane	I9	0.0003	0.0020	0.000	0.000
1c,2t,4c-Trimethylcyclohexane	I9	0.0018	0.0119	0.001	0.001
1,2-Dimethylbenzene (o-Xylene)	A8	0.0016	0.0089	0.001	0.001

i-Butylcyclopentane	N9	0.0005	0.0033	0.000	0.000
n-Nonane	P9	0.0063	0.0425	0.004	0.004
1,1-Methylethylcyclohexane	N9	0.0003	0.0020	0.000	0.000
i-Propylbenzene	A9	0.0001	0.0006	0.000	0.000
i-Propylcyclohexane	N9	0.0001	0.0007	0.000	0.000
2,2-Dimethyloctane	I10	0.0001	0.0007	0.000	0.000
2,4-Dimethyloctane	I10	0.0003	0.0023	0.000	0.000
2,6-Dimethyloctane	I10	0.0001	0.0007	0.000	0.000
2,5-Dimethyloctane	I10	0.0001	0.0007	0.000	0.000
n-Butylcyclopentane	N9	0.0004	0.0026	0.000	0.000
3,3-Dimethyloctane	I10	0.0006	0.0045	0.000	0.000
n-Propylbenzene	A9	0.0011	0.0069	0.000	0.000
3,6-Dimethyloctane	I10	0.0007	0.0053	0.000	0.000
3-Methyl-5-ethylheptane	I10	0.0001	0.0007	0.000	0.000
1,3-Methylethylbenzene	A9	0.0017	0.0107	0.001	0.001
1,4-Methylethylbenzene	A9	0.0006	0.0038	0.000	0.000
1,3,5-Trimethylbenzene	A9	0.0027	0.0171	0.001	0.001
2,3-Dimethyloctane	I10	0.0008	0.0060	0.000	0.000
5-Methylnonane	I10	0.0018	0.0135	0.001	0.001
1,2-Methylethylbenzene	A9	0.0009	0.0057	0.001	0.001
2-Methylnonane	I10	0.0022	0.0165	0.001	0.001
3-Ethyloctane	I10	0.0005	0.0037	0.000	0.000
3-Methylnonane	I10	0.0025	0.0187	0.002	0.002
t-Butylbenzene	A10	0.0027	0.0190	0.001	0.001
i-Butylcyclohexane	N10	0.0003	0.0022	0.000	0.000
1t-Methyl-2-n-propylcyclohexane	I10	0.0001	0.0007	0.000	0.000
i-Butylbenzene	A10	0.0001	0.0007	0.000	0.000
sec-Butylbenzene	A10	0.0001	0.0007	0.000	0.000
UnknownC9s	U9	0.0009	0.0061	0.001	0.001
n-Decane	P10	0.0139	0.1040	0.009	0.009
1,2,3-Trimethylbenzene	A9	0.0006	0.0038	0.000	0.000
1,3-Methyl-i-propylbenzene	A10	0.0003	0.0021	0.000	0.000
1,4-Methyl-i-propylbenzene	A10	0.0009	0.0064	0.001	0.001
Sec-Butylcyclohexane	A10	0.0007	0.0052	0.000	0.000
1,2-Methyl-i-propylbenzene	A10	0.0004	0.0028	0.000	0.000
3-Ethylnonane	I10	0.0002	0.0016	0.000	0.000
1,3-Diethylbenzene	A10	0.0008	0.0056	0.000	0.000
1,3-Methyl-n-propylbenzene	A10	0.0005	0.0035	0.000	0.000
1,4-Diethylbenzene	A10	0.0002	0.0014	0.000	0.000
1,4-Methyl-n-propylbenzene	A10	0.0002	0.0014	0.000	0.000
n-Butylbenzene	A10	0.0006	0.0043	0.000	0.000
1,3-Dimethyl-5-ethylbenzene	A10	0.0001	0.0007	0.000	0.000
1,2-Diethylbenzene	A10	0.0004	0.0028	0.000	0.000
t-Decahydronaphthalene	A9	0.0002	0.0016	0.000	0.000
1,2-Methyl-n-propylbenzene	A10	0.0010	0.0071	0.001	0.001
1,3-Dimethyl-4-ethylbenzene	A10	0.0020	0.0141	0.001	0.001
1,2-Dimethyl-4-ethylbenzene	A10	0.0002	0.0014	0.000	0.000
1,3-Dimethyl-2-ethylbenzene	A10	0.0016	0.0113	0.001	0.001
1,2-Dimethyl-3-ethylbenzene	A10	0.0002	0.0014	0.000	0.000
1,2-Ethyl-i-propylbenzene	A10	0.0008	0.0063	0.001	0.001
1,4-Methyl-t-butylbenzene	A11	0.0004	0.0031	0.000	0.000
UnknownC10s	U10	0.0034	0.0255	0.002	0.002
n-Undecane	P11	0.0161	0.1324	0.011	0.011
1,4-Ethyl-i-propylbenzene	A11	0.0002	0.0016	0.000	0.000
1,2,4,5-Tetramethylbenzene	A11	0.0005	0.0035	0.000	0.000
1,2-Methyl-n-butylbenzene	A11	0.0001	0.0008	0.000	0.000
1,2,3,5-Tetramethylbenzene	A11	0.0004	0.0028	0.000	0.000
1,2-Methyl-t-butylbenzene	A11	0.0004	0.0031	0.000	0.000
4-Methylindan	A11	0.0001	0.0007	0.000	0.000
2-Methylindan	A11	0.0001	0.0007	0.000	0.000
1,3-Methyl-n-butylbenzene	A11	0.0001	0.0008	0.000	0.000
n-Pentylbenzene	A11	0.0001	0.0008	0.000	0.000
1,2-Di-n-propylbenzene	A11	0.0001	0.0008	0.000	0.000
UnknownC11s	U11	0.0029	0.0238	0.002	0.002

n-Dodecane		P12	0.0002	0.0018	0.000	0.000
UnknownC12s		U12	0.0039	0.0321	0.003	0.003
TOTAL			100.00000	100.00000	1.3450	1.3519

BTEX COMPONENTS	MOLE%	WT%
BENZENE	0.0180	0.0740
TOLUENE	0.0260	0.1260
ETHYLBENZENE	0.0014	0.0078
XYLENES	0.0152	0.0849
TOTAL BTEX	0.0606	0.2927

**(DETAILED HYDROCARBON ANALYSIS/NJ 1993)*
Mod ASTM D6730,GPA 2261 & GPA 2286.

***(CALC: GPA 2172, GPA 2145 & TP-17 @14.696 & 60 F)*

CALCULATED VALUES**

	BTU @	14.65	14.73
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NET HEATING VALUE (60 °F ideal reaction):	17823.2	Btu/lbm
GROSS HEATING VALUE (60°F ideal reaction):	19755.9	Btu/lbm
RELATIVE DENSITY (AIR=1):	0.6550	
DENSITY	0.05010	lb/scf
COMPRESSIBILITY FACTOR :	0.9977	
REGULAR WOBBE INDEX	1221.6	

C6+ Fraction of DHA Gas Analysis @60°F, 14.696 psia

Net Dry Ideal BTU	5594.8 /scf	Relative Density - SG (Air=1)	3.9058	***C6+factors***
Gross Dry Ideal BTU	6005.6 /scf	**Z** Compressiblity Factor	0.9973	0.99635
Net Dry Ideal BTU	18861.2 /lb	Density Factor	298.069 lbm/1000 ft3	
Gross Dry Ideal BTU	20243.6 /lb	Molar Mass or MW	113.119 g/mol	
		Volume Liquid Ideal gas	0.099 scf/gal	21.9

This hexanes plus fraction may be applied in place of published C6+ factors. The Z & GPM need additional calc for C6+ factors.
#DIV/0 or 0 (zero) will appear in this section when there is no hexanes plus in the sample to calculate C6+ factors.