Geochemical analyses performed on two cutting samples (4650'-4,710') from the Tenneco OCS Y-0338-1 (Phoenix No. 1) well.

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Geochemical Analyses Performed on Two Cutting Samples from The OCS 338 Phoenix #1 Well

(Project No. 07-4558)

Prepared for:

ENI Petroleum Company Inc.

By: Hossein Alimi

December, 2007

EXECUTIVE SUMMARY

Geochemical analyses have been performed on two cutting samples collected from the 4650-4710 feet interval of the OSC 338 Phoenix #1 well. Based on the results obtained, following conclusions have been drawn:

- Both samples investigated show maturity levels within the oil window.
- The argillaceous lithologies studied are organically rich, yielding an average TOC of 2.30 %.
- Both cuttings analyzed show relatively high HI values characteristic of mixed (Type II and III) kerogen with a fairly good remaining hydrocarbon generating potential.
- GC-fingerprints of bitumen analyzed show very similar hydrocarbon distribution pattern typical of hydrocarbons generated within the oil window maturation mainly from sapropelic (Type II) kerogen.
- Hydrocarbons present in the rock samples investigated appear to be biodegraded and also contaminated by synthetic mud additive.

1. INTRODUCTION

Two cutting samples collected from the 4650-4710 feet interval of the OSC 338 Phoenix #1 well were submitted to Humble Geochemical Services (HGS) by ENI Petroleum Company Inc. for an organic geochemical investigation. The objectives of this study were to evaluate the hydrocarbon source potential of the rock samples, as well as to evaluate the soluble organic matter present in these samples.

Analytical program

Samples were analyzed by various techniques to meet the objectives of the evaluation:

Sample Preparation: The core samples were grounded to pass through a 60 mesh (250 micron) sieve. An aliquot of 100-200 milligrams of powdered rock is used for TOC and Rock-Eval analysis.

TOC is completed using LECO analyzer. Leco TOC analysis uses acid-decarbonized aliquots of the rock, which are then combusted at high temperature (about 1200^{o}C)

Rock-Eval analysis involves thermally distilling (300 ^{o}C) free hydrocarbons (any remaining oil and gas) out of rock followed by heating to high temperature (600 ^{o}C) to

crack the remaining organic matter, often referred to as kerogen. Pyrolysis also decarbonizes the sample, at least to this temperature, for subsequent Rock-Eval TOC analysis. Kerogen is organic matter that is insoluble in organic solvents and acids. It represents the remaining potential of the rock to generate hydrocarbons should it be exposed to higher temperatures than it was exposed to at any time in the past. If a source rock is highly mature, this remaining potential will be very low compared to its original potential due to hydrocarbon generation. Rock-Eval analysis provides the following data:

* S1: free oil and gas content in mg HC/g rock
* S2: remaining hydrocarbon potential in mg HC/g rock
* Tmax: the pyrolysis temperature at which the maximum yield of S2 hydrocarbons occurs; an indication of thermal maturity-correlated to vitrinite reflectance
* S3: organic carbon dioxide in mg CO_2/g rock; used for kerogen type assessment

Various ratios and values are also computed from TOC and Rock-Eval data (Table 2) to further characterize the maturity, kerogen type, and residual oil content (i.e., Tmax, HI, OI, S1/TOC and PI).

Vitrinite reflectance is an indication of the thermal maturity of the sediments or indirectly, an indicator of the maximum temperature to which a rock has been exposed. The measurements have been done on isolated kerogen under microscope.

Thermal alteration index (TAI): The maturity of the oil-prone organic matter is assessed by visual examination of indigenous sporomorphs. With increasing of thermal maturation, the color of spores and pollen will change from yellow, through orange and brown to black.

Visual kerogen analysis: The kerogen concentrates were examined in transmitted white and ultra violet lights and the abundances of vitrinite, inertinite and sapropel (liptinite and exinite) estimated.

Solvent extraction and bitumen fractionation: The bitumen, water and selected rock samples were solvent extracted to isolate the soluble organic matter (extract or bitumen). The isolated bitumens were fractionated (by column chromatography) into saturated hydrocarbon, aromatic hydrocarbon and polar fractions (resin and asphaltene). The type and amount of oil fractions depend largely upon the nature of the contained organic matter and its level of maturity.

Gas chromatography (GC) of C $_{4+}$-alkanes: The whole oil was further analyzed by high resolution GC to determine its alkane distribution (fingerprint). The interpretation of alkane distribution, including CPI, pristane/phytane, pristane/n-C_{17}, and phytane/n-C_{18} ratios can yield much confirmatory information in source rock evaluation.

2. RESULTS AND DISCUSSION:

Thermal Maturity Evaluation

Vitrinite Reflectance

The level of thermal maturity of the organic matter dispersed in the selected cuttings samples was determined by vitrinite reflectance (VR) measurements, thermal alteration index (TAI), and Rock-Eval Tmax values. The position of the oil, wet gas, and dry gas windows can be determined from these data. Below are the thermal maturation ranges for oil-prone kerogen. However, it should be noted that these ranges show a dependency on kerogen type:

0.20 to 0.60% Ro	Immature
0.60 to 1.10% Ro	Oil window (peak oil generation at around 0.85 % Ro)
1.10 to 1.40% Ro	Condensate and /or wet-gas window (the floor of wet-gas zone 1.40% Ro)
> 1.40% Ro	Dry gas window, it ceases at about 3.0% to 4.0% Ro level

Both cutting samples (4650-4680 ft. and 4680-4710 ft.) were analyzed for vitrinite reflectance (%Ro), visual kerogen, and thermal alteration index determination (TAI). The results of microscopic study are presented in Tables 1-3 and Appendix 1. There was good organic recovery for visual study in both samples. Virtrinite reflectance values of 0.80 %Ro and 0.79 %Ro recorded for samples 4650-4680 ft. and 4680-4710 ft , respectively (Table 1) indicate that these samples are thermally in the "middle oil window maturity" zone. TAI values recorded are consistent with the Ro and fluorescence data (Table 2).

Table 1
Dispersed Organic Matter Thermal Alteration, Kerogen Type and Total Compositional Analysis

ENI Petroleum Co. Inc.

							% Source Material							Preservation				Recovery			% Kerogen Comp.						Vitrinite				
HGS ID	Well Name	Depth 1 (ft.)	Depth 2 (ft.)	Type	Color	TAI	Amorphous Debris	Finely Dissem. OM	Herb. Plant Debris (Vit.)	Woody Plant Debris	Coaly Fragments	Algal Debris	Palynomorphs	Good	Fair	Poor	Very poor	Good	Very Poor	Barren	Indigenous Vitrinite	Caved Vitrinite	Recycled/Oxidized Vitrinite	Inertinite	Solid Bitumen	Drilling Additive/Contamination	Amorphous Kerogen	# of Readings	Total Sample Ro (%)	# of Indigenous Readings	Indigenous Ro (%)	Comments
07-4558-191430	OCS 338 Phoenix #1	4650	4680	cuttings	OB	2.7	61	tr	39	minor			tr	X				X			7	30	2	1		?	60	40	0.71	26	0.80	spores, lignite (cavings?, additive?)
07-4558-191431	OCS 338 Phoenix #1	4680	4710	cuttings	OB	2.7	71	1	28	minor			tr	X				X			5	20	3	2		?	70	40	0.75	27	0.79	spores, bisaccate pollen, lignite (cavings?, additive?)

tr = trace

TAI Scale: 1=Unaltered 3+ or 3.5
1+ or 1.5 4=Strong alteration
2=Slight alteration 4+ or 4.5
2+ or 2.5 5=Severe alteration
3=Moderate alteration

Color Abrbreviations:

GLY	Green-Light Yellow	B	Brown
Y	Yellow	DBDG	Dark Brown-Dark Gray
YO	Yellow-Orange	DGBL	Dark Gray-Black
OB	Orange-Brown	BLK	Black
LB	Light Brown		

Table 2. Kerogen Fluorescence colors and brightness intensities (subjective determinations)

ENI Petroleum Co. Inc.

0 = No fluorescence noted
1 = very low intensity
2 = low intensity
3 = medium intensity
4 = high intensity
5 = very high intensity

G = Green
Y = Yellow
O = Orange
B = Brown

HGS ID	Well Name	Depth 1 ft.	Depth 2 ft.	Type	Pollen/Spores				Amorphous				Mounting Medium			
					G	Y	O	B	G	Y	O	B	G	Y	O	B
07-4558-191430	OCS 338 Phoenix #1	4650	4680	cuttings		3	2			3			1			
07-4558-191431	OCS 338 Phoenix #1	4680	4710	cuttings		3	2			3			1			

Table 3. Pyrite types and abundance in kerogen

ENI Petroleum Co. Inc.

1 = very rare
2 = rare
3 = common
4 = abundant
5 = very abundant

HGS ID	Well Name	Depth 1 ft.	Depth 2 ft.	Type	Pyrite types		
					Finely Disseminated	Euhedral	Framboidal
07-4558-191430	OCS 338 Phoenix #1	4650	4680	cuttings	3	3	3
07-4558-191431	OCS 338 Phoenix #1	4680	4710	cuttings	3	2	2

Pyrolysis Tmax

Due to the presence of drilling additives in the samples analyzed {indicated by both wide S2 peak with a shoulder and reatively high production index (PI)}the low Tmax values recorded for these two samples are not reliable and should be interpreted with caution (Table 4).

Table 4: TOC and Rock-Eval results obtained

ENI Petroleum Co. Inc., OCS 338 Phoenix #1

HGS No.	Well Name	Top Depth (ft)	Bottom Depth (ft)	Median Depth (ft)	Sample Type	Leco TOC	**	S1	S2	S3	Tmax (°C)	Calc. %Ro	Meas. %Ro	HI	OI	S2/S3	S1/TOC	PI	Notes Checks	Notes Pyrogram
07-4558-191430	OCS 338 Phoenix #1	4650	4680	4665	cuttings	2.37		2.28	6.14	1.16	390*		0.80	259	49	5	96	0.27	c, lc	ltS2p
07-4558-191431	OCS 338 Phoenix #1	4680	4710	4695	cuttings	2.24		1.70	4.37	1.30	$01*		0.79	195	58	3	76	0.28	c, lc	ltS2p

Note: "-1" indicates not measured or meaningless ratio

* Tmax data not reliable due to poor S2 peak

TOC = weight percent organic carbon in rock
S1, S2 = mg hydrocarbons per gram of rock
S3 = mg carbon dioxide per gram of rock
Tmax = °C

HI = hydrogen index = S2 x 100 / TOC
OI = oxygen index = S3 x 100 / TOC
S1/TOC = normalized oil content = S1 x 100 / TOC
PI = production index = S1 / (S1+S2)
Calculcated%VRo = 0.0180 x Tmax - 7.16 (Jarvie et al., 2001)
Measured %Ro = measured vitrinite reflectance

Notes:
c = Rock-Eval analysis checked and confirmed
lc = Leco TOC analysis checked and confirmed

Pyrogram:
n=normal
ltS2sh = low temperature S2 shoulder
ltS2p = low temperature S2 peak
htS2p = high temperature S2 peak
f = flat S2 peak
na = printer malfunction pyrogram not available

Source Rock Evaluation

Both argillaceous lithologies investigated in this study are organically rich, yielding TOC values of 2.37 % and 2.24 %, respectively (Table 4 and Figure 1).The cutting samples analyzed show fairly high hydrogen index (HI) values in the 195 to 259 mg HC/g TOC range (Table 4), characteristic of mixed (sapropelic, Type II and vitrinitic, Type III) kerogen with a fairly good remaining hydrocarbon generating potential (Figures 2 and 3). Framboidal pyrite is common in the upper sample (Table 3). This may be indicative of some marine influence. **In summary**, based on TOC and Rock-Eval results the lithologies studied are considered as being a potential source rock.

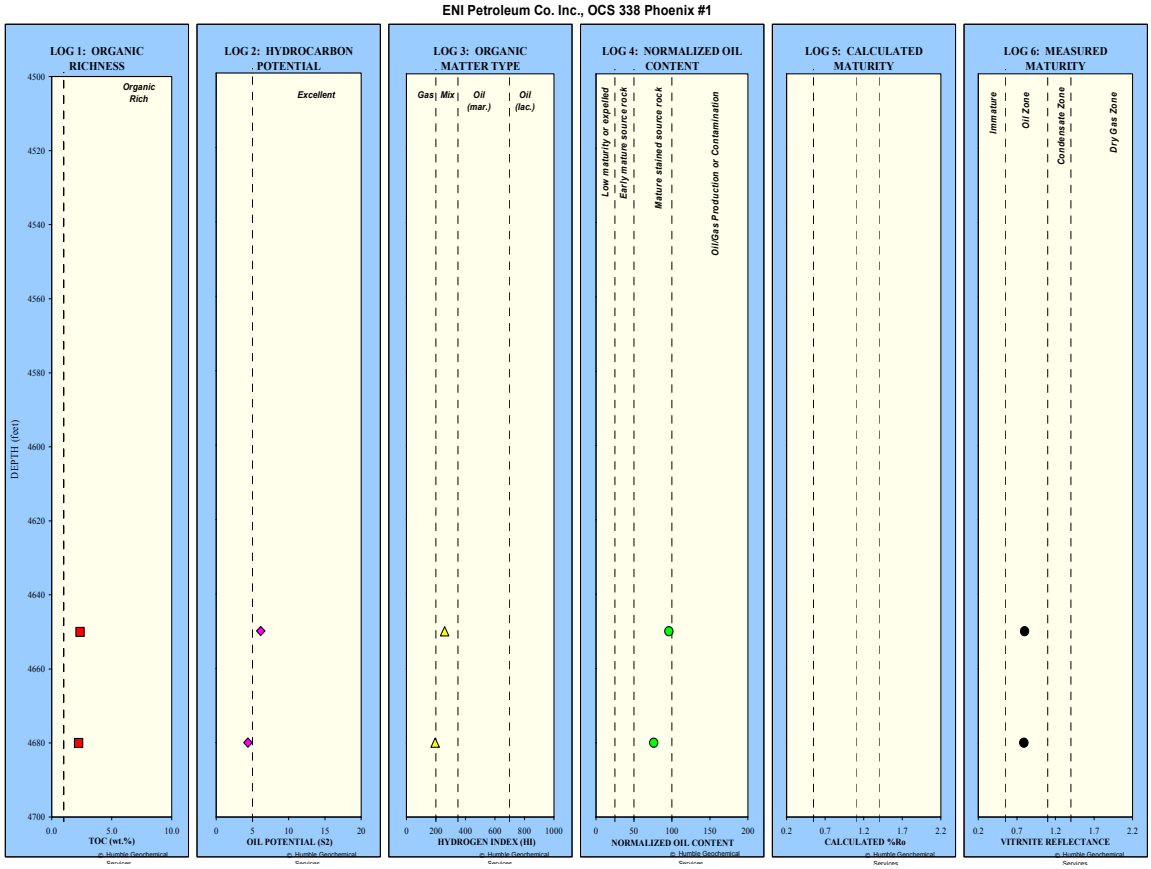

Figure 1. Geochemical log of TOC, remaining potential (S2), kerogen type (HI), normalized oil content, and calculated and measured vitrinite reflectance.

ENI Petroleum Co. Inc., OCS 338 Phoenix #1

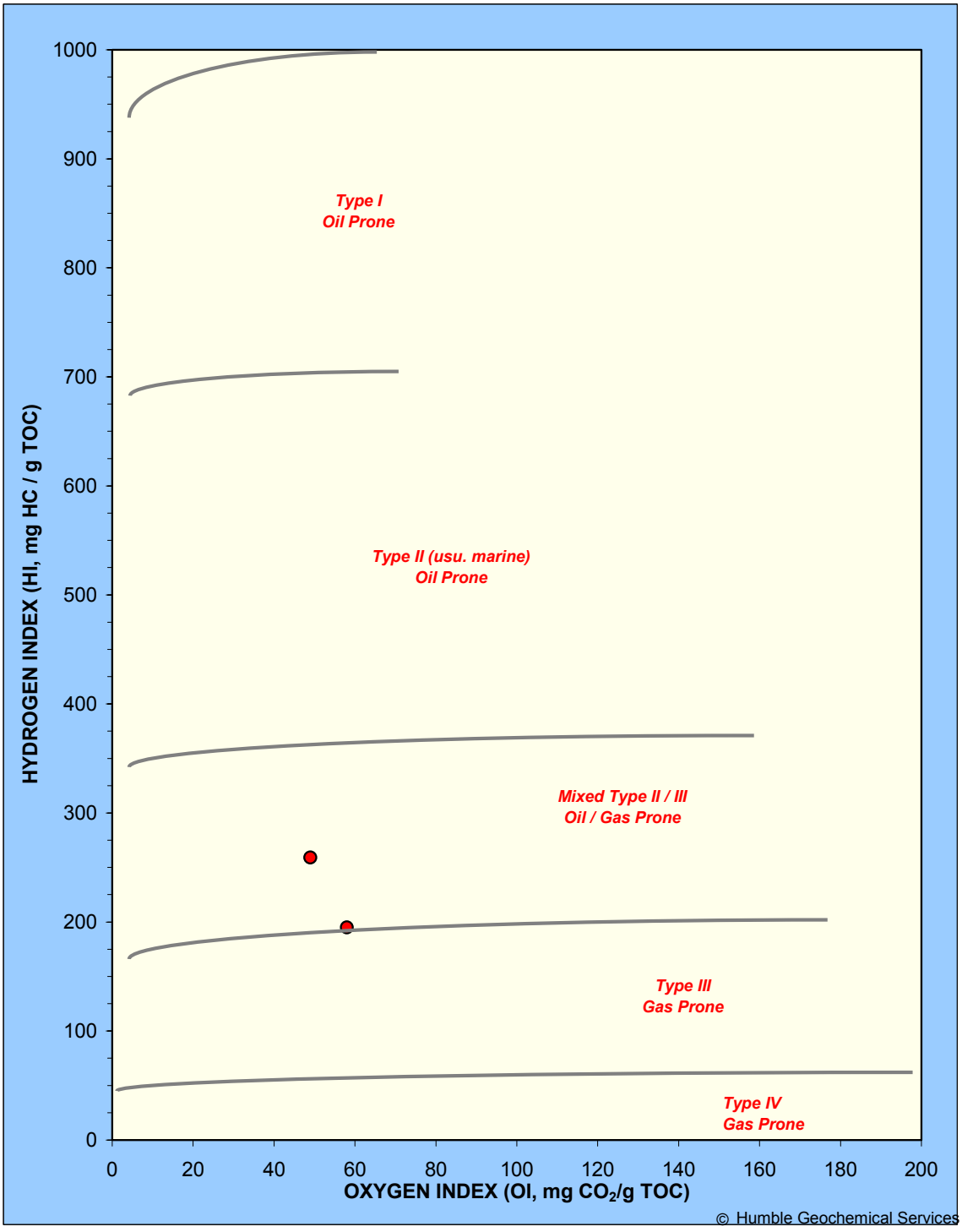

Figure 2 Kerogen type

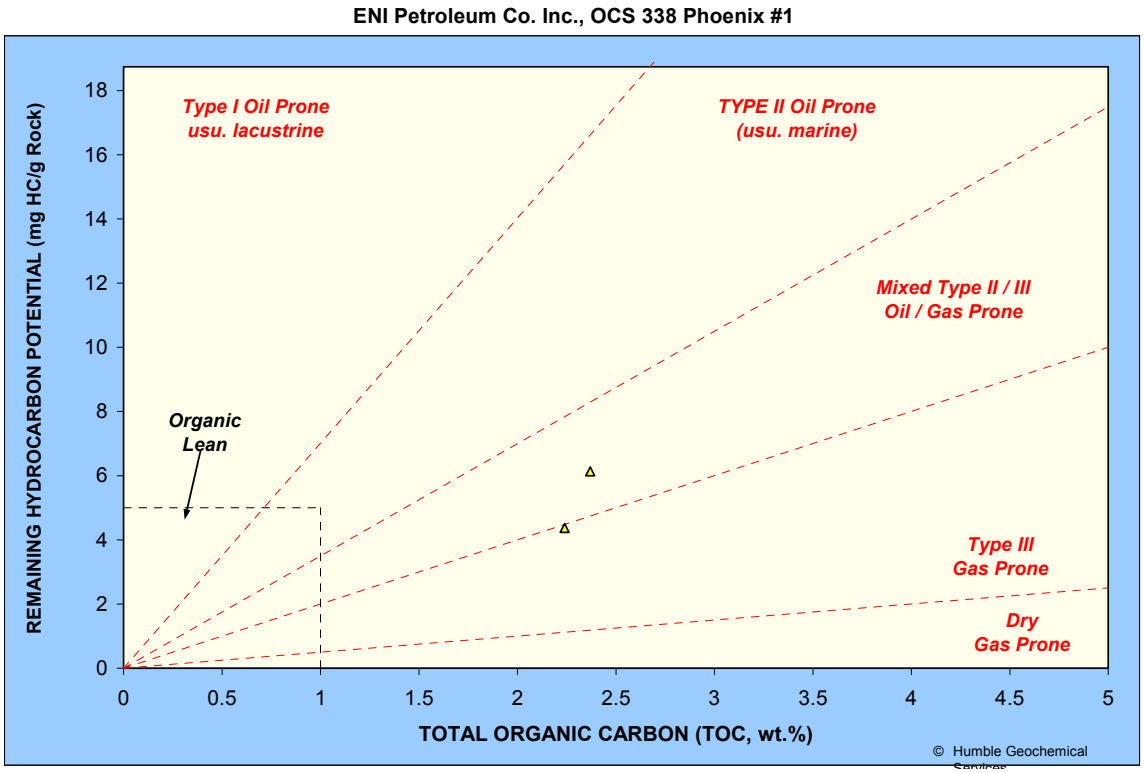

Figure 3. Kerogen Quality

Gas Chromatography Results

To isolate the soluble organic matter (SOM or bitumen) from the rock samples submitted, they were solvent extracted (qualitatively) using carbon disulfide (CS2).

The chromatographic fingerprints of both extracted bitumen (Figures 4 and 5) are very similar to each other, showing a wide hydrocarbon distribution pattern up to n-C_{30} and with a large unresolved complex mixture (UCM or hump) appearing within 40-60 minutes retention time (RT). Such GC fingerprint is characteristic of liquid hydrocarbons (or oil) generated within the oil window maturation mainly from Type II kerogen deposited under light oxidizing environment. This conclusion is further supported by the inferred source rock kerogen and depositional environment plot presented in Figure 8. Total removal of hydrocarbons below n-C_{11} and partial depletion of those below n-C_{20} suggest that hydrocarbons present in these rock samples have been undergone chemical and biological degradation. This finding is further supported by the presence of three large and unidentified peaks appearing within the 40 and 48 minutes RT which typical of synthetic mud additive which have been also affected the Tmax values. .

Figure 4: GC-fingerprint of rock-extract sample 4650-4680 ft.

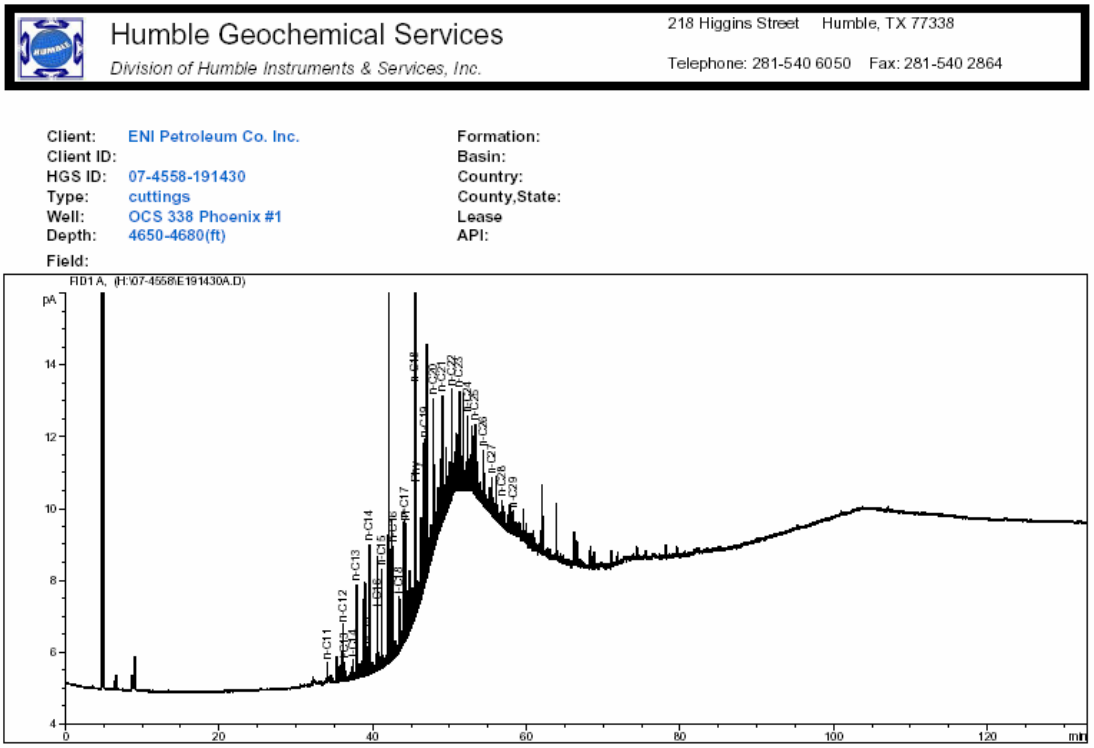

Figure 5: GC-fingerprint of rock-extract sample 4680-4710 ft.

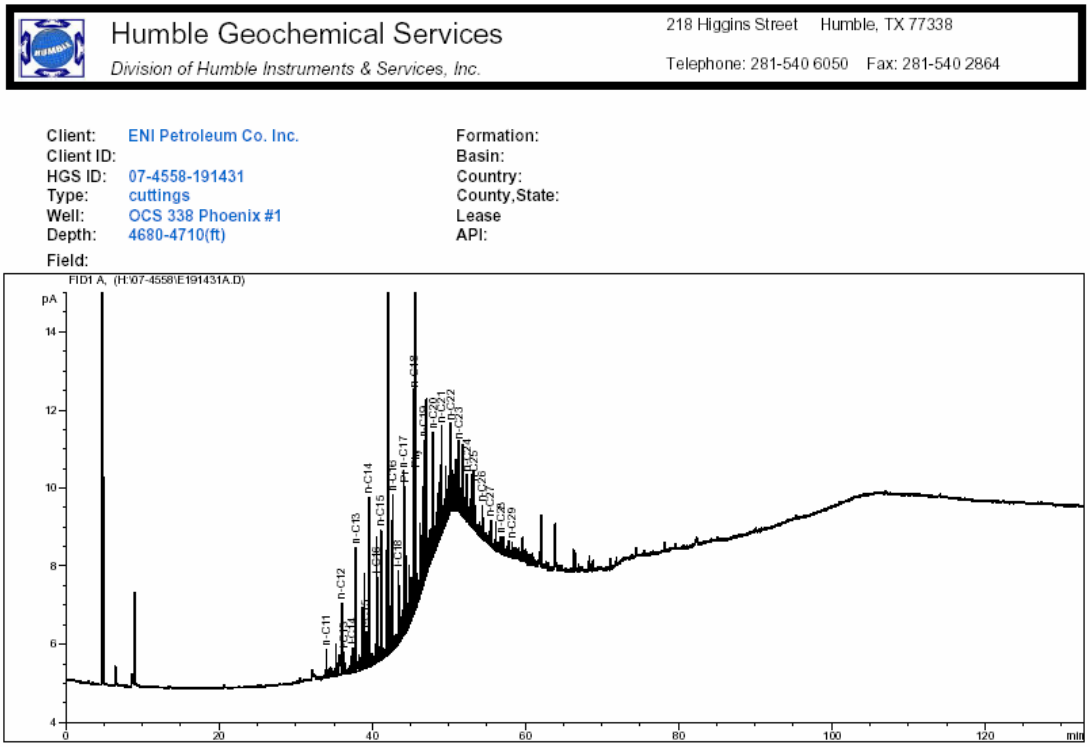

Figure 6:Inferred Source Rock Kerogen and Depositional Environment for two selected OCS 338 Phoenix #1 Rock Extracts

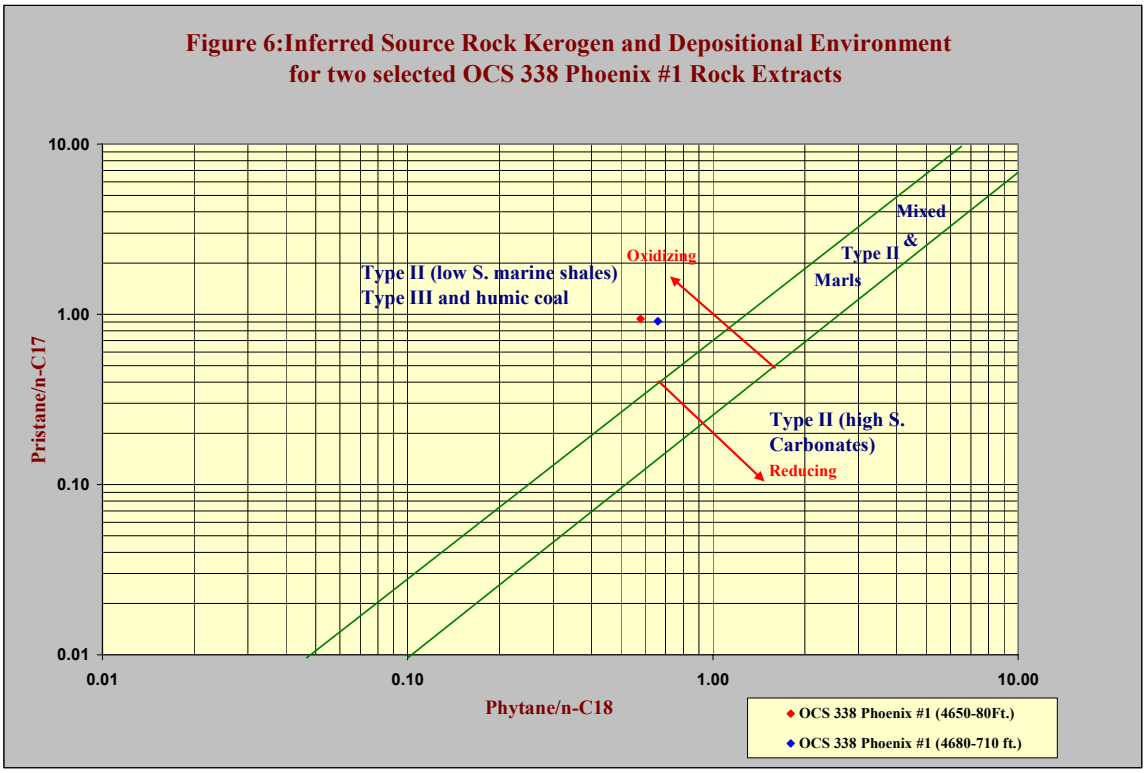

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TABLE 4: TOC and ROCK-EVAL DATA REPORT

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Geochemical Log

ENI Petroleum Co. Inc., OCS 338 Phoenix #1

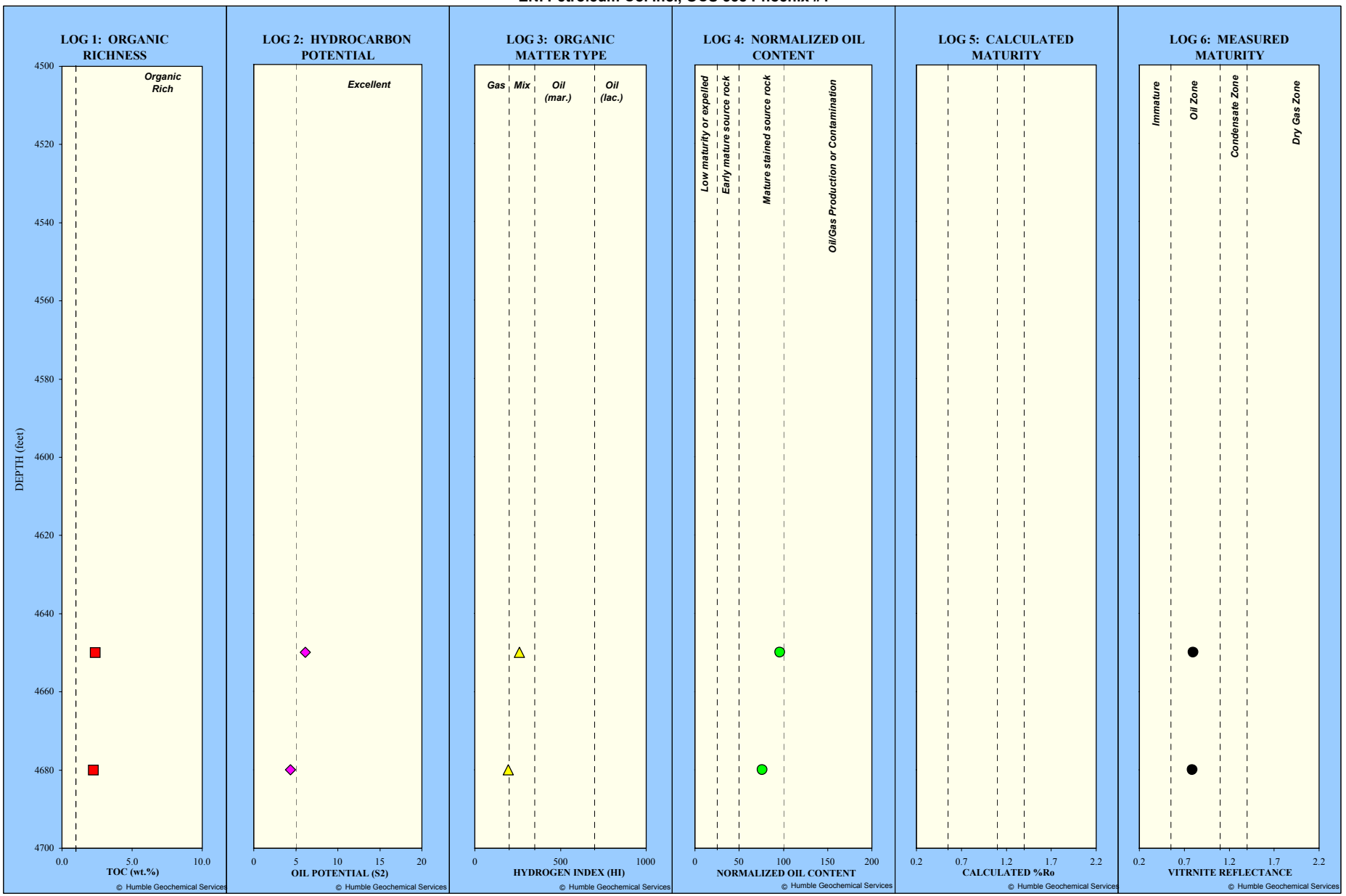

Figure 1. Geochemical log of TOC, remaining potential (S2), kerogen type (HI), normalized oil content, and calculated and measured vitrinite reflectance.

KEROGEN TYPE
ENI Petroleum Co. Inc., OCS 338 Phoenix #1

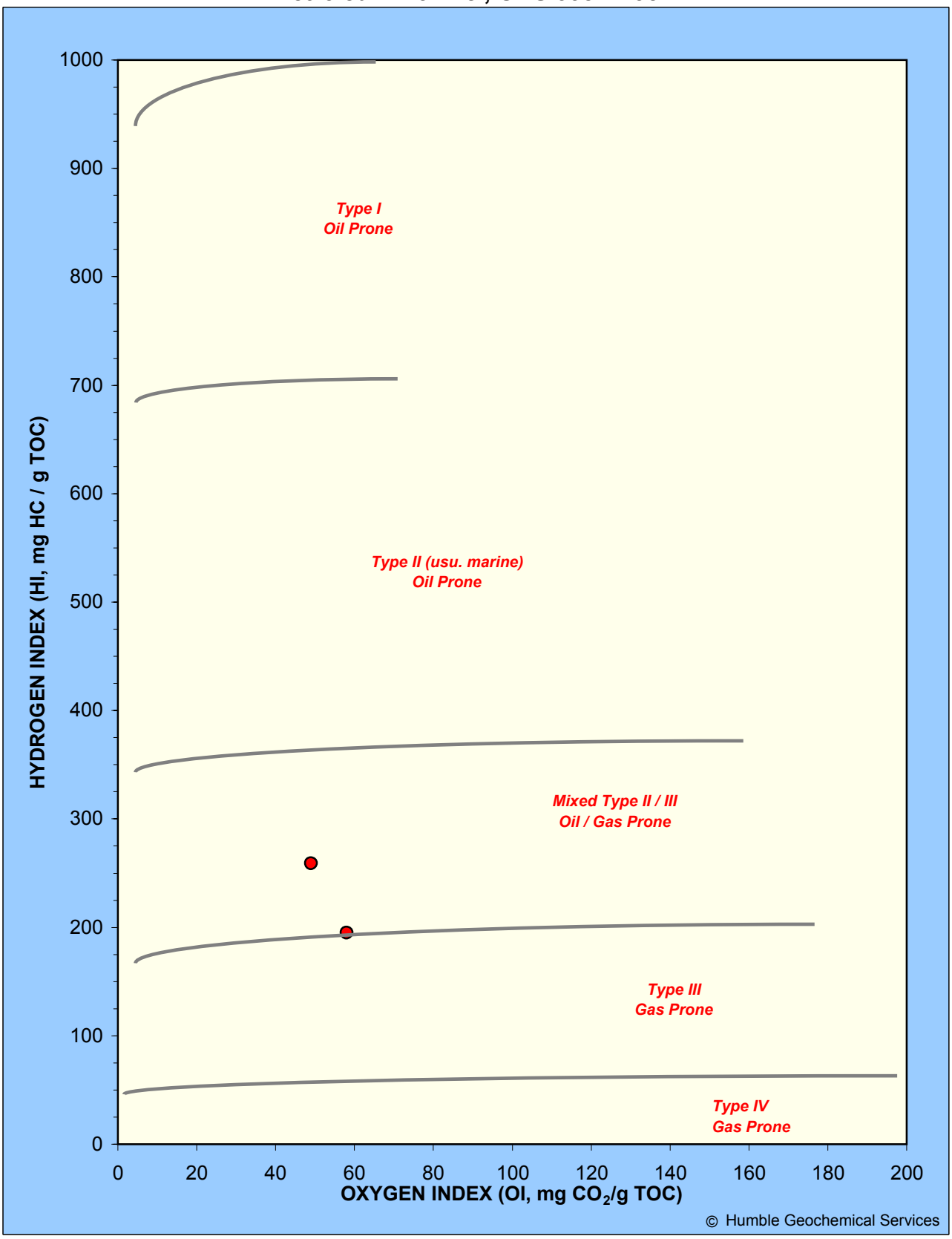

Figure 2 Kerogen type

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KEROGEN QUALITY

ENI Petroleum Co. Inc., OCS 338 Phoenix #1

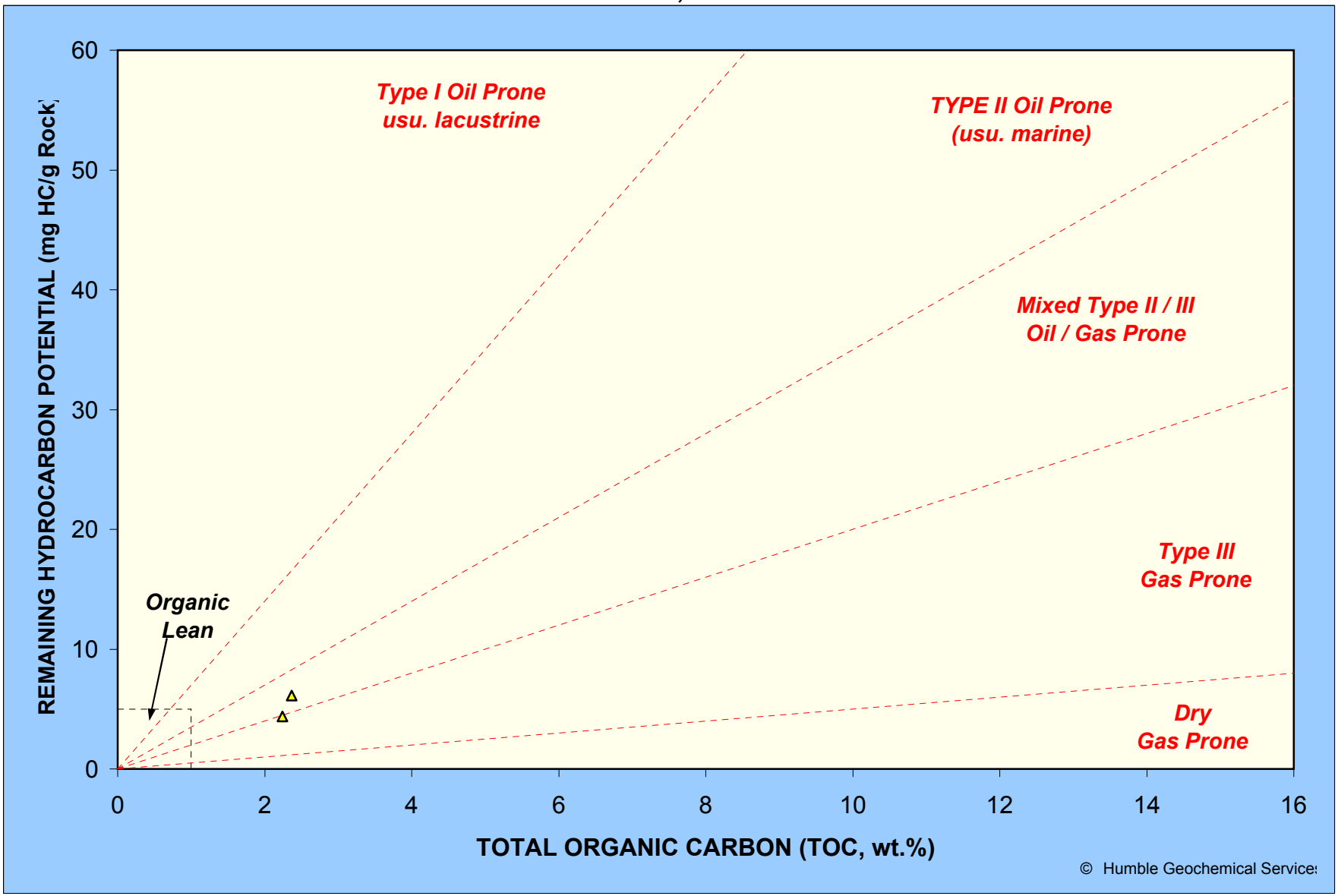


Figure 3 Kerogen Quality

Humble Geochemical Services

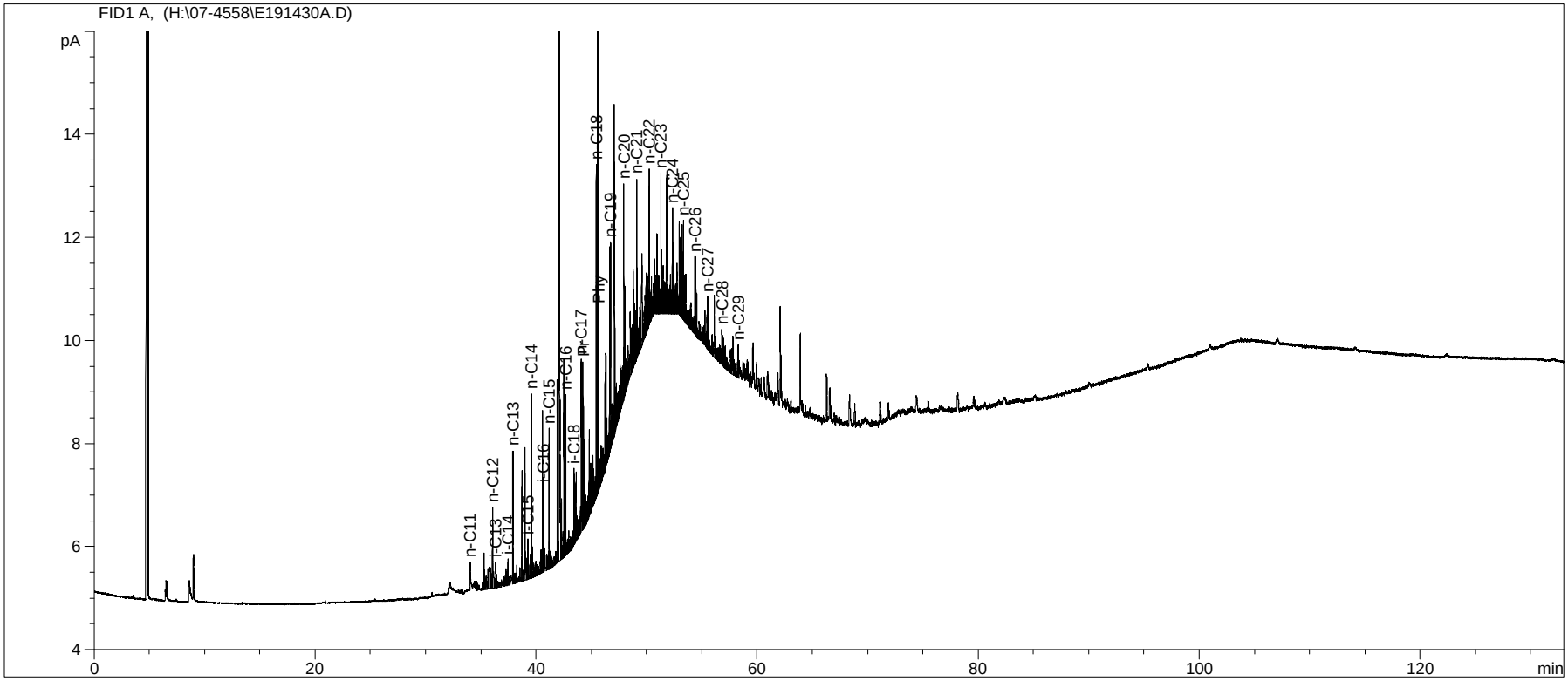
Division of Humble Instruments & Services, Inc.

218 Higgins Street Humble, TX 77338

Telephone: 281-540 6050 Fax: 281-540 2864

Client:	**ENI Petroleum Co. Inc.**	**Formation:**	
Client ID:		**Basin:**	
HGS ID:	**07-4558-191430**	**Country:**	
Type:	**cuttings**	**County,State:**	
Well:	**OCS 338 Phoenix #1**	**Lease**	
Depth:	**4650-4680(ft)**	**API:**	

Field:



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Well:	**OCS 338 Phoenix #1**	**Lease**	
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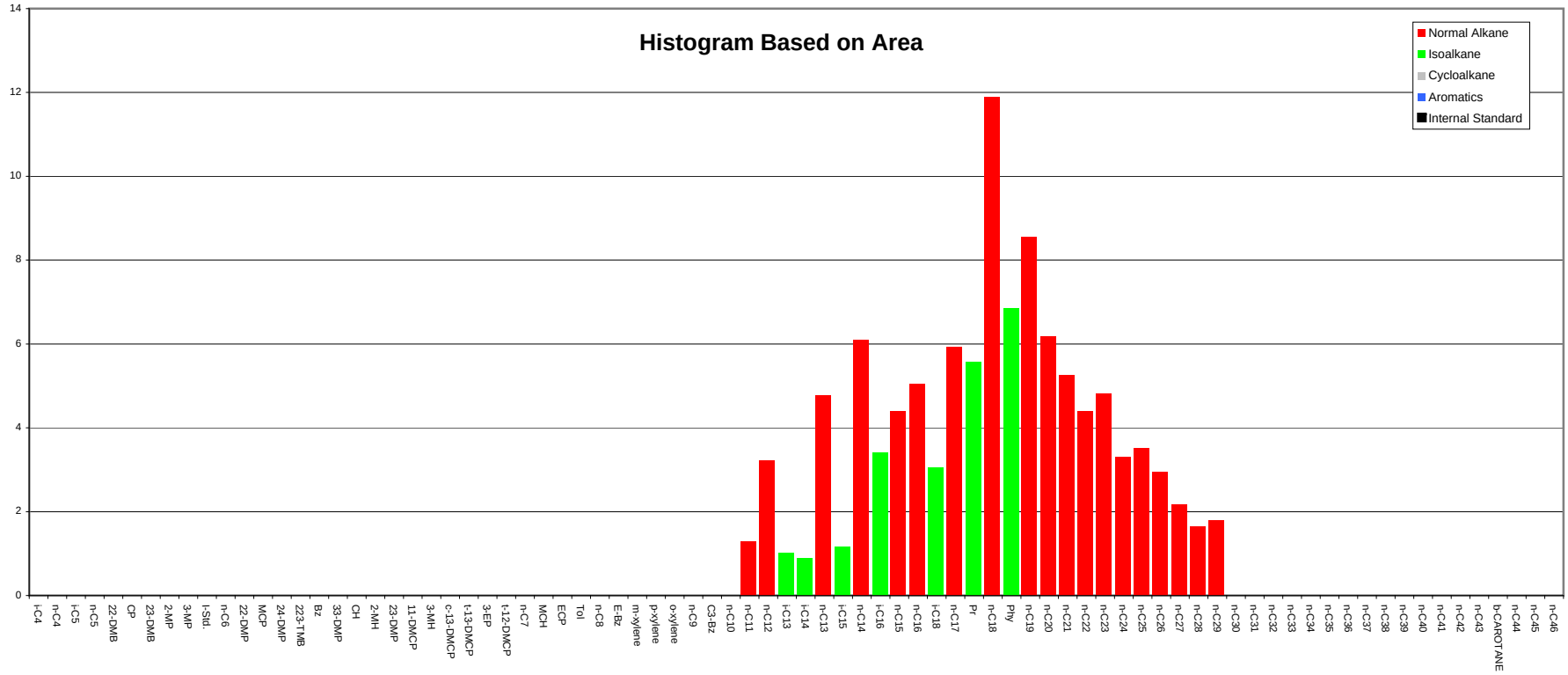
Field:			



Humble Geochemical Services
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Telephone: 281-540 6050 Fax: 281-540 2864

Client: ENI Petroleum Co. Inc.
Client ID:
HGS ID: 07-4558-191430
Type: cuttings
Well: OCS 338 Phoenix #1
Depth: 4650-4680(ft)
Field:
Formation:
Basin:
Country:

API:
County,State:
Lease

Gas Chromatography Integration Results

Peak Label	Compound Name	R.Time (min.)	Peak Height	Peak Area
i-C4	iso-butane	0.00	0	0
n-C4	butane	0.00	0	0
i-C5	iso-pentane	0.00	0	0
n-C5	pentane	0.00	0	0
22-DMB	2,2-dimethylbutane	0.00	0	0
CP	cyclopentane	0.00	0	0
23-DMB	2,3-dimethylbutane	0.00	0	0
2-MP	2-methylpentane	0.00	0	0
3-MP	3-methylpentane	0.00	0	0
I-Std.	Internal Standard	0.00	0	0
n-C6	hexane	0.00	0	0
22-DMP	2,2-dimethylpentane	0.00	0	0
MCP	methylcyclopentane	0.00	0	0
24-DMP	methylcyclopentane	0.00	0	0
223-TMB	2,2,3-trimethylbutane	0.00	0	0
Bz	benzene	0.00	0	0
33-DMP	3,3-dimethylpentane	0.00	0	0
CH	cyclohexane	0.00	0	0
2-MH	2-methylhexane	0.00	0	0
23-DMP	2,3-dimethylpentane	0.00	0	0
11-DMCP	1,1-dimethylcyclopentane	0.00	0	0
3-MH	3-methylhexane	0.00	0	0
c-13-DMCP	cis-1,3-dimethylcyclopentane	0.00	0	0
t-13-DMCP	trans-1,3-dimethylcyclopentane	0.00	0	0
3-EP	3-ethylpentane	0.00	0	0
t-12-DMCP	trans-1,2-dimethylcyclopentane	0.00	0	0
n-C7	heptane	0.00	0	0
MCH	methylcyclohexane	0.00	0	0
ECP	ethylcyclopentane	0.00	0	0
Tol	toluene	0.00	0	0
n-C8	octane	0.00	0	0
E-Bz	ethylbenzene	0.00	0	0
m-xylene	meta-xylene	0.00	0	0
p-xylene	para-xylene	0.00	0	0
o-xylene	ortho-xylene	0.00	0	0
n-C9	nonane	0.00	0	0
C3-Bz	propylbenzene	0.00	0	0
n-C10	decane	0.00	0	0
n-C11	undecane	34.02	1	1
n-C12	dodecane	36.06	2	3
i-C13	C13 isoprenoid	36.36	1	1
i-C14	C14 isoprenoid	37.46	1	1
n-C13	tridecane	37.90	3	5
i-C15	farnesane (C15 isoprenoid)	39.26	1	1
n-C14	tetradecane	39.59	4	6
i-C16	C16 isoprenoid	40.64	2	3
n-C15	pentadecane	41.18	3	4
n-C16	hexadecane	42.68	3	5
i-C18	norpristane (C18 isoprenoid)	43.43	1	3
n-C17	heptadecane	44.09	3	6
Pr	pristane (C19 isoprenoid)	44.24	3	6
n-C18	octadecane	45.44	6	12
Phy	phytane (C20 isoprenoid)	45.64	4	7
n-C19	nonadecane	46.72	4	9
n-C20	eicosane	47.94	4	6
n-C21	heneicosane	49.11	4	5
n-C22	docosane	50.23	3	4
n-C23	tricosane	51.31	3	5
n-C24	tetracosane	52.34	2	3
n-C25	pentacosane	53.33	2	4
n-C26	hexacosane	54.37	2	3
n-C27	heptacosane	55.52	1	2
n-C28	octacosane	56.81	1	2
n-C29	nonacosane	58.28	1	2
n-C30	triacontane	0.00	0	0
n-C31	hentriacontane	0.00	0	0
n-C32	dotriacontane	0.00	0	0
n-C33	tritriacontane	0.00	0	0
n-C34	tetratriacontane	0.00	0	0
n-C35	pentatriacontane	0.00	0	0
n-C36	hexatriacontane	0.00	0	0
n-C37	heptatriacontane	0.00	0	0
n-C38	octatriacontane	0.00	0	0
n-C39	nonatriacontane	0.00	0	0
n-C40	tetracontane	0.00	0	0
n-C41	henetetracontane	0.00	0	0
n-C42	dotetracontane	0.00	0	0
n-C43	tritetracontane	0.00	0	0
b-CAROTANE	beta-carotane	0.00	0	0
n-C44	tetratetracontane	0.00	0	0
n-C45	pentatetracontane	0.00	0	0
n-C46	hexatetracontane	0.00	0	0

Humble Geochemical Services
Division of Humble Instruments & Services, Inc.
218 Higgins Street Humble, TX 77338
Telephone: 281-540 6050 Fax: 281-540 2864

Client: ENI Petroleum Co. Inc.
Client ID:
HGS ID: 07-4558-191430
Type: cuttings
Well: OCS 338 Phoenix #1
Depth: 4650-4680(ft)
Field:
Formation:
Basin:
Country:

API:
County,State:
Lease

Gas Chromatography Interpretive Ratios

Interpretive Ratios		Interpretive Ratios	
Ratios by Area		**Mango Ratios[2]**	
Pristane / Phytane	0.81	P1	not available
Pristane / nC17	0.94	P2	not available
Phytane / nC18	0.58	P3	not available
nC18 / (nC18 + nC19)	0.58	5N1	not available
nC17 / (nC17 + nC27)	0.73	6N1	not available
Carbon Preference Index	1.25	N2	not available
Totals by Weight %		**Invariant Ratios**	
Normal Alkanes	not available	K1	not available
Isoalkanes	not available	K2	not available
Branched Alkanes	not available	***Ring Preference Ratios***	
Cycloalkanes	not available	5N1 / 6N1	not available
Aromatics	not available	P3 / N2	not available
Halpern Ratios[1]		**Thompson Ratios[3]**	
Tr1	#DIV/0!	Bz / nC6	#DIV/0!
Tr2	#DIV/0!	Tol / nC7	#DIV/0!
Tr3	#DIV/0!	(nC6 + nC7) / (CH + MCH)	#DIV/0!
Tr4	#DIV/0!	Isoheptane Value	#DIV/0!
Tr5	#DIV/0!	nC7 / MCH	#DIV/0!
Tr6	not available	CH / MCP	#DIV/0!
Tr7	#DIV/0!	nC7 / 2-MH	#DIV/0!
Tr8	#DIV/0!	nC6 / 2,2-DMB	#DIV/0!
C1	#DIV/0!	Heptane Value	#DIV/0!
C2	#DIV/0!		
C3	#DIV/0!		
C4	#DIV/0!		
C5	#DIV/0!		

1 Halpern, H.I., 1995. APPG Bull.: v.79, p801-815
2 Mango, F.D., 1994. GCS: V.58, p.895-901
3 Thompson, K.F.M., 1983. GCA: v.47, p303-316

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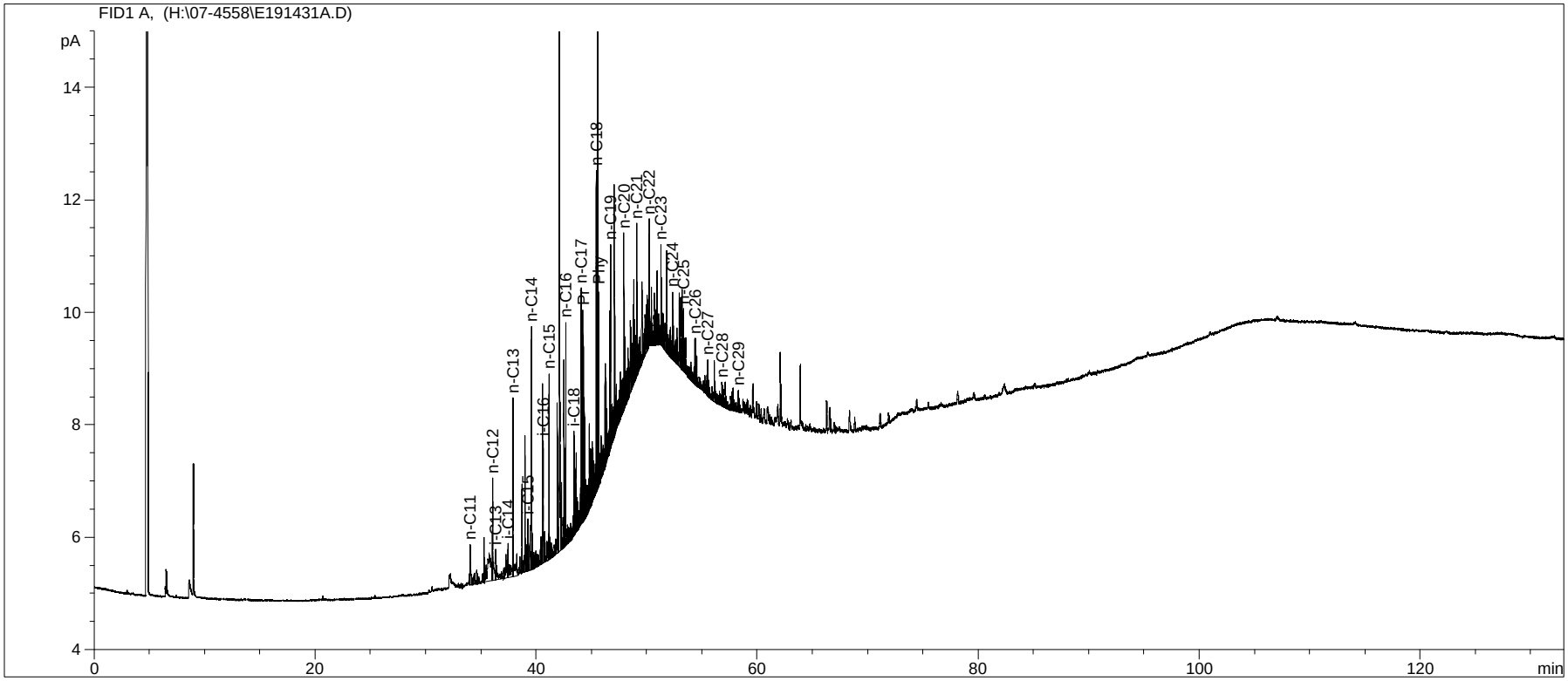
218 Higgins Street Humble, TX 77338

Telephone: 281-540 6050 Fax: 281-540 2864

Client:	**ENI Petroleum Co. Inc.**	**Formation:**	
Client ID:		**Basin:**	
HGS ID:	**07-4558-191431**	**Country:**	
Type:	**cuttings**	**County,State:**	
Well:	**OCS 338 Phoenix #1**	**Lease**	
Depth:	**4680-4710(ft)**	**API:**	

Field:



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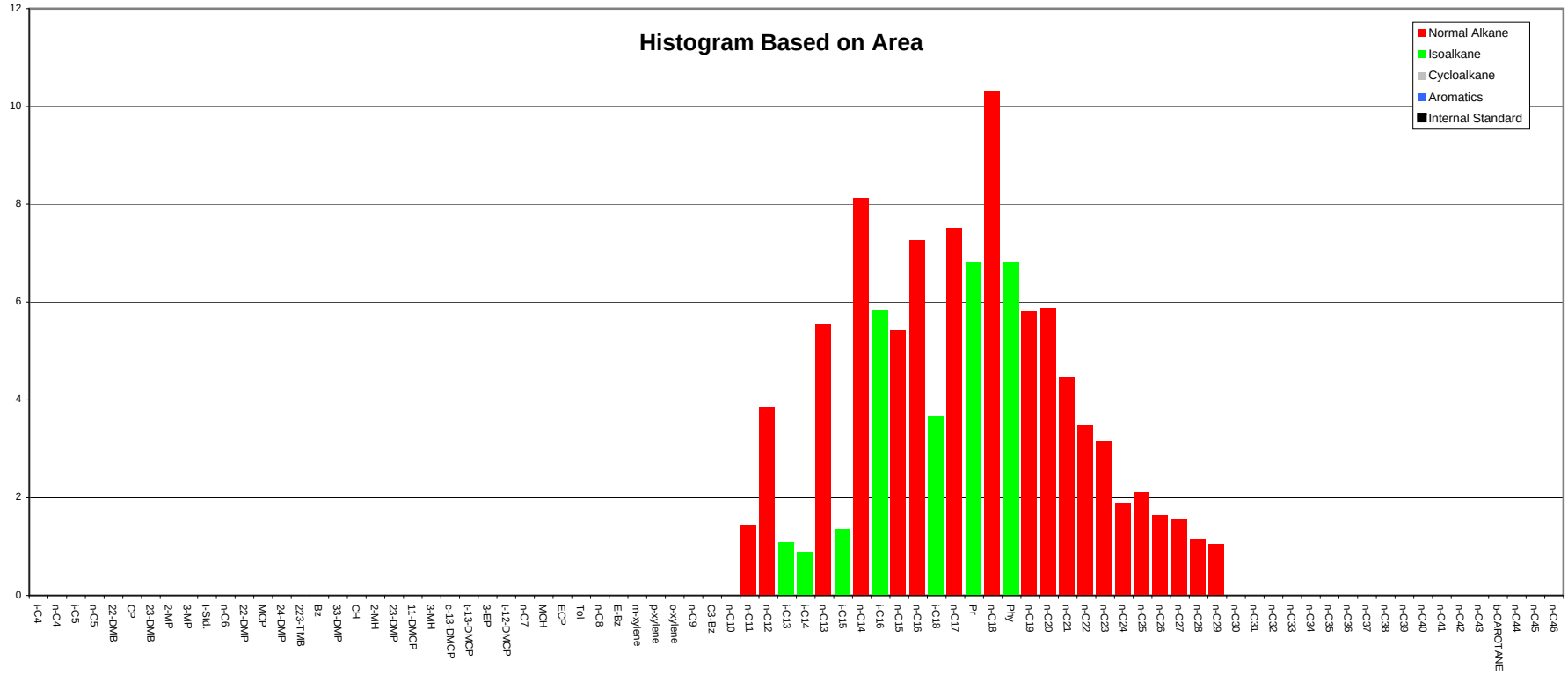
Telephone: 281-540 6050 Fax: 281-540 2864

Client:	**ENI Petroleum Co. Inc.**	**Formation:**	
Client ID:		**Basin:**	
HGS ID:	**07-4558-191431**	**Country:**	
Type:	**cuttings**	**County,State:**	
Well:	**OCS 338 Phoenix #1**	**Lease**	
Depth:	**4680-4710(ft)**	**API:**	
Field:			



Humble Geochemical Services
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218 Higgins Street Humble, TX 77338
Telephone: 281-540 6050 Fax: 281-540 2864

Client: ENI Petroleum Co. Inc.
Client ID:
HGS ID: 07-4558-191431
Type: cuttings
Well: OCS 338 Phoenix #1
Depth: 4680-4710(ft)
Field:
Formation:
Basin:
Country:

API:
County,State:
Lease

Gas Chromatography Integration Results

Peak Label	Compound Name	R.Time (min.)	Peak Height	Peak Area
i-C4	iso-butane	0.00	0	0
n-C4	butane	0.00	0	0
i-C5	iso-pentane	0.00	0	0
n-C5	pentane	0.00	0	0
22-DMB	2,2-dimethylbutane	0.00	0	0
CP	cyclopentane	0.00	0	0
23-DMB	2,3-dimethylbutane	0.00	0	0
2-MP	2-methylpentane	0.00	0	0
3-MP	3-methylpentane	0.00	0	0
I-Std.	Internal Standard	0.00	0	0
n-C6	hexane	0.00	0	0
22-DMP	2,2-dimethylpentane	0.00	0	0
MCP	methylcyclopentane	0.00	0	0
24-DMP	methylcyclopentane	0.00	0	0
223-TMB	2,2,3-trimethylbutane	0.00	0	0
Bz	benzene	0.00	0	0
33-DMP	3,3-dimethylpentane	0.00	0	0
CH	cyclohexane	0.00	0	0
2-MH	2-methylhexane	0.00	0	0
23-DMP	2,3-dimethylpentane	0.00	0	0
11-DMCP	1,1-dimethylcyclopentane	0.00	0	0
3-MH	3-methylhexane	0.00	0	0
c-13-DMCP	cis-1,3-dimethylcyclopentane	0.00	0	0
t-13-DMCP	trans-1,3-dimethylcyclopentane	0.00	0	0
3-EP	3-ethylpentane	0.00	0	0
t-12-DMCP	trans-1,2-dimethylcyclopentane	0.00	0	0
n-C7	heptane	0.00	0	0
MCH	methylcyclohexane	0.00	0	0
ECP	ethylcyclopentane	0.00	0	0
Tol	toluene	0.00	0	0
n-C8	octane	0.00	0	0
E-Bz	ethylbenzene	0.00	0	0
m-xylene	meta-xylene	0.00	0	0
p-xylene	para-xylene	0.00	0	0
o-xylene	ortho-xylene	0.00	0	0
n-C9	nonane	0.00	0	0
C3-Bz	propylbenzene	0.00	0	0
n-C10	decane	0.00	0	0
n-C11	undecane	34.02	1	1
n-C12	dodecane	36.06	2	4
i-C13	C13 isoprenoid	36.36	1	1
i-C14	C14 isoprenoid	37.46	1	1
n-C13	tridecane	37.90	3	6
i-C15	farnesane (C15 isoprenoid)	39.26	1	1
n-C14	tetradecane	39.59	4	8
i-C16	C16 isoprenoid	40.64	2	6
n-C15	pentadecane	41.18	3	5
n-C16	hexadecane	42.68	4	7
i-C18	norpristane (C18 isoprenoid)	43.43	2	4
n-C17	heptadecane	44.09	4	8
Pr	pristane (C19 isoprenoid)	44.24	4	7
n-C18	octadecane	45.44	6	10
Phy	phytane (C20 isoprenoid)	45.64	4	7
n-C19	nonadecane	46.72	4	6
n-C20	eicosane	47.95	3	6
n-C21	heneicosane	49.11	3	4
n-C22	docosane	50.23	2	3
n-C23	tricosane	51.31	2	3
n-C24	tetracosane	52.34	1	2
n-C25	pentacosane	53.33	1	2
n-C26	hexacosane	54.37	1	2
n-C27	heptacosane	55.52	1	2
n-C28	octacosane	56.81	0	1
n-C29	nonacosane	58.28	0	1
n-C30	triacontane	0.00	0	0
n-C31	hentriacontane	0.00	0	0
n-C32	dotriacontane	0.00	0	0
n-C33	tritriacontane	0.00	0	0
n-C34	tetratriacontane	0.00	0	0
n-C35	pentatriacontane	0.00	0	0
n-C36	hexatriacontane	0.00	0	0
n-C37	heptatriacontane	0.00	0	0
n-C38	octatriacontane	0.00	0	0
n-C39	nonatriacontane	0.00	0	0
n-C40	tetracontane	0.00	0	0
n-C41	henetetracontane	0.00	0	0
n-C42	dotetracontane	0.00	0	0
n-C43	tritetracontane	0.00	0	0
b-CAROTANE	beta-carotane	0.00	0	0
n-C44	tetratetracontane	0.00	0	0
n-C45	pentatetracontane	0.00	0	0
n-C46	hexatetracontane	0.00	0	0

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Client: ENI Petroleum Co. Inc.
Client ID:
HGS ID: 07-4558-191431
Type: cuttings
Well: OCS 338 Phoenix #1
Depth: 4680-4710(ft)
Field:
Formation:
Basin:
Country:

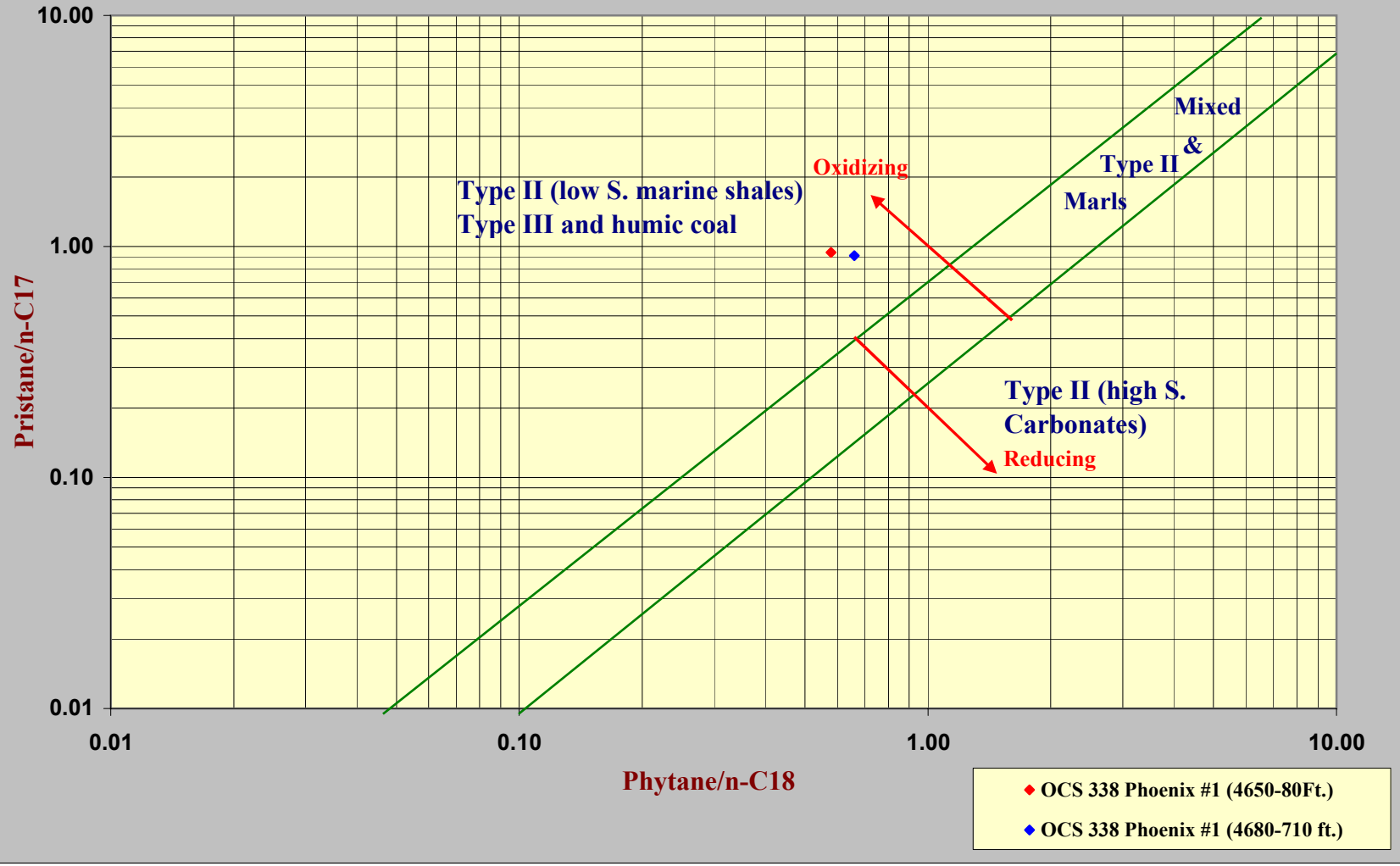
API:
County,State:
Lease

Gas Chromatography Interpretive Ratios

Interpretive Ratios		Interpretive Ratios	
Ratios by Area		**Mango Ratios[2]**	
Pristane / Phytane	1.00	P1	not available
Pristane / nC17	0.91	P2	not available
Phytane / nC18	0.66	P3	not available
nC18 / (nC18 + nC19)	0.64	5N1	not available
nC17 / (nC17 + nC27)	0.83	6N1	not available
Carbon Preference Index	1.35	N2	not available
Totals by Weight %		**Invariant Ratios**	
Normal Alkanes	not available	K1	not available
Isoalkanes	not available	K2	not available
Branched Alkanes	not available	***Ring Preference Ratios***	
Cycloalkanes	not available	5N1 / 6N1	not available
Aromatics	not available	P3 / N2	not available
Halpern Ratios[1]		**Thompson Ratios[3]**	
Tr1	#DIV/0!	Bz / nC6	#DIV/0!
Tr2	#DIV/0!	Tol / nC7	#DIV/0!
Tr3	#DIV/0!	(nC6 + nC7) / (CH + MCH)	#DIV/0!
Tr4	#DIV/0!	Isoheptane Value	#DIV/0!
Tr5	#DIV/0!	nC7 / MCH	#DIV/0!
Tr6	not available	CH / MCP	#DIV/0!
Tr7	#DIV/0!	nC7 / 2-MH	#DIV/0!
Tr8	#DIV/0!	nC6 / 2,2-DMB	#DIV/0!
C1	#DIV/0!	Heptane Value	#DIV/0!
C2	#DIV/0!		
C3	#DIV/0!		
C4	#DIV/0!		
C5	#DIV/0!		

1 Halpern, H.I., 1995. APPG Bull.: v.79, p801-815
2 Mango, F.D., 1994. GCS: V.58, p.895-901
3 Thompson, K.F.M., 1983. GCA: v.47, p303-316

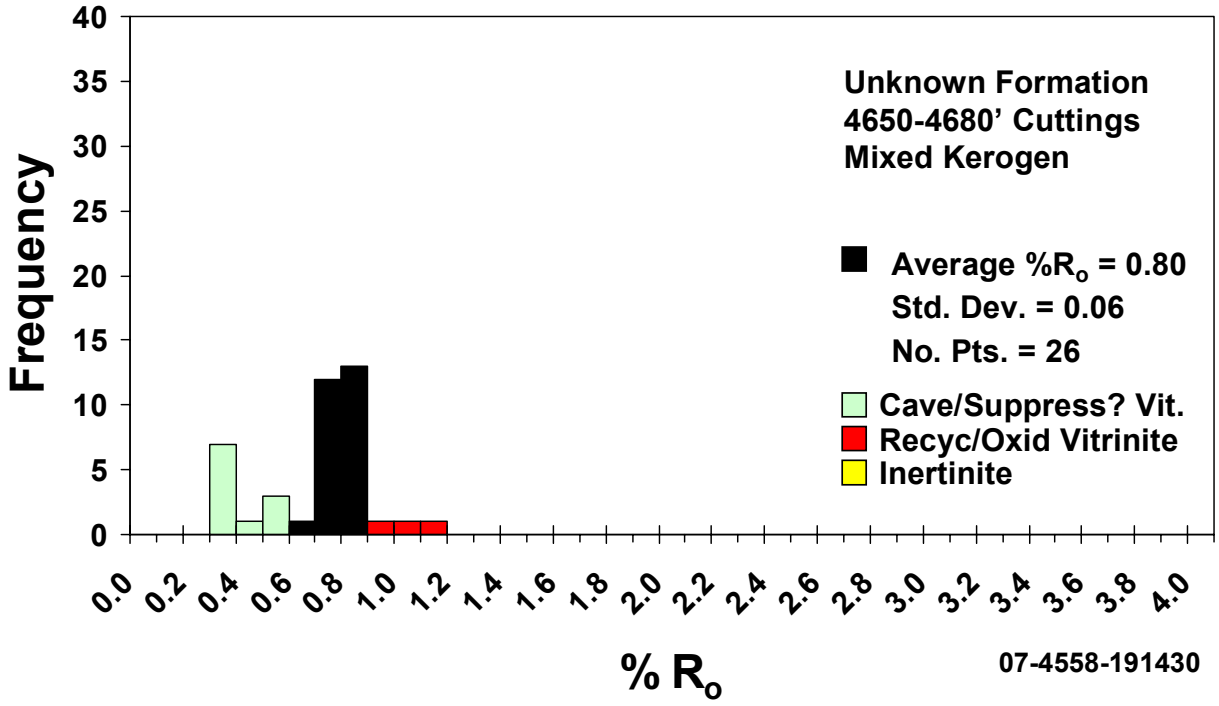
Figure 6:Inferred Source Rock Kerogen and Depositional Environment for two selected OCS 338 Phoenix #1 Rock Extracts



Appendix1 . Individual Reflectance Readings

HGS ID	07-4558-191430		07-4558-191431	
Well Name	OCS 338 Phoenix #1		OCS 338 Phoenix #1	
Depth 1 (ft.)	4650		4680	
	All Data	Indigenous Data	All Data	Indigenous Data
	0.32	0.68	0.34	0.67
	0.32	0.7	0.35	0.68
	0.33	0.71	0.35	0.7
	0.34	0.72	0.39	0.7
	0.35	0.72	0.42	0.73
	0.35	0.74	0.52	0.74
	0.36	0.74	0.58	0.74
	0.48	0.75	0.67	0.75
	0.5	0.75	0.68	0.75
	0.58	0.76	0.7	0.75
	0.59	0.78	0.7	0.77
	0.68	0.78	0.73	0.77
	0.7	0.79	0.74	0.77
	0.71	0.8	0.74	0.77
	0.72	0.8	0.75	0.8
	0.72	0.81	0.75	0.81
	0.74	0.83	0.75	0.81
	0.74	0.85	0.77	0.81
	0.75	0.85	0.77	0.82
	0.75	0.85	0.77	0.82
	0.76	0.87	0.77	0.84
	0.78	0.87	0.8	0.85
	0.78	0.87	0.81	0.85
	0.79	0.88	0.81	0.88
	0.8	0.89	0.81	0.88
	0.8	0.89	0.82	0.88
	0.81		0.82	0.88
	0.83		0.84	
	0.85		0.85	
	0.85		0.85	
	0.85		0.88	
	0.87		0.88	
	0.87		0.88	
	0.87		0.88	
	0.88		0.93	
	0.89		0.94	
	0.89		0.94	
	0.95		1	
	1.03		1.04	
	1.15		1.14	
Average %R_o	**0.71**	**0.80**	**0.75**	**0.79**
Standard Dev.		**0.06**		**0.06**
# of Points	**40**	**26**	**40**	**27**

OCS 338 Phoenix #1



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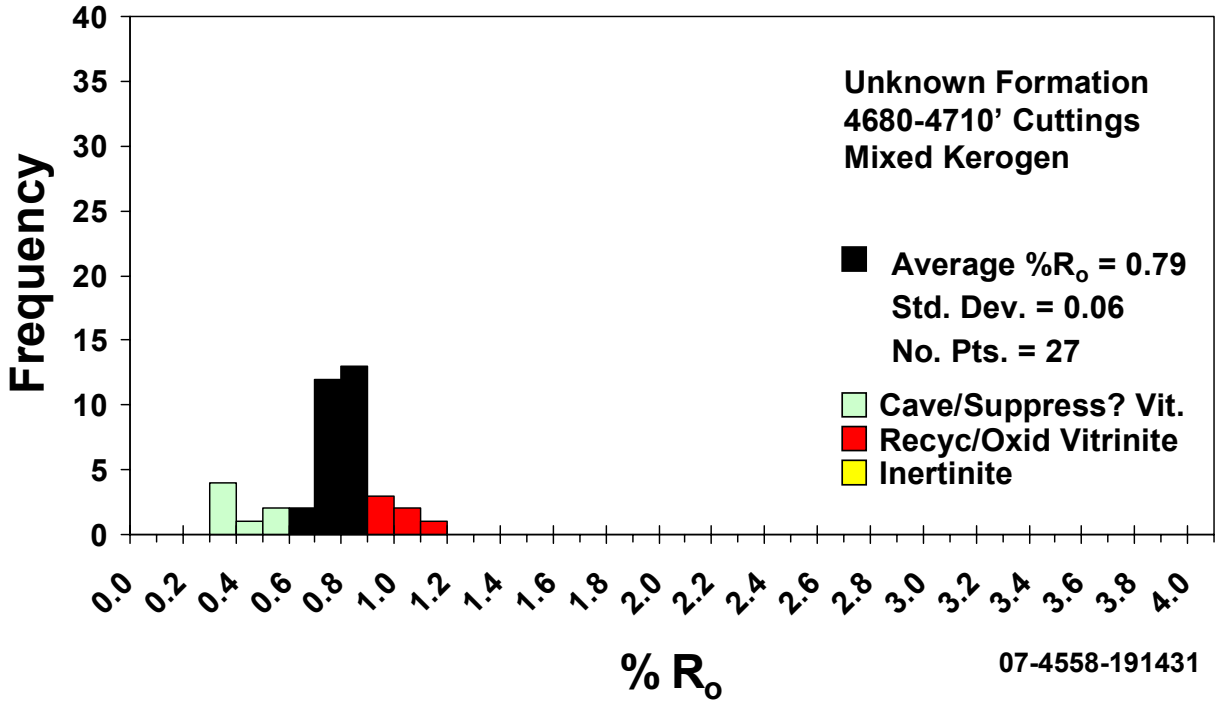
OCS 338 Phoenix #1



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