

New Mexico Bureau of Mines and Mineral Resources
Open File Report No. OF 196

HYDROCARBON SOURCE-ROCK EVALUATION STUDY,
GUEST AND WOLFSON NO. 1 DIANA WELL
LUNA COUNTY, NEW MEXICO

by. L. Paul Tybor
GeoChem Laboratories, Inc.
Houston, Texas
April 15, 1982



GEOCHEMICAL ANALYSES
SOURCE ROCK EVALUATION

CRUDE OIL—SOURCE ROCK CORRELATION

CRUDE OIL CHARACTERIZATION
GEOCHEMICAL PROSPECTING

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April 15, 1982

Mr. Clayton S. Valder
Marshall R. Young Oil Co.
750 West Fifth Street
Fort Worth, Texas 76102

Dear Mr. Valder:

Enclosed please find the results of the organic geochemical analyses performed on well cuttings samples from the Guest & Wolfson No. 1 Diana, located in Sec. 16-23S-11W, Luna County, New Mexico.

Upon arrival at GeoChem the samples were assigned the GeoChem Job Number 2261, followed by the sample numbers -001 to -038.

These samples were submitted to the following analytical program:

<u>Type of Analysis</u>	<u>Table</u>
% total organic carbon determination & brief lithological description.....	I
Pyrolysis analysis.....	II
Visual kerogen assessment.....	III
Vitrinite reflectance.....	IV

DISCUSSION OF THE RESULTS

A. Thermal Maturity of Sediments

Based on kerogen coloration (Table III), the thermal maturity of the sediments ranges from an immature Maturation Index Stage 1+ at 1840+ feet, within the Tertiary tuff and agglomerate, to a moderately mature Maturation Index Stage 2 to 2+ at 7870+ feet, within the Cambrian Bliss Sandstone.

April 15, 1982

The rocks from 1840 feet to 2060 feet are too immature, to have generated any hydrocarbon other than biogenic methane (C₁) gas. Between well depths 2370 feet to 6620 feet, the rocks are too organic-lean to assess their levels of thermal maturity. This interval is comprised of red shale, sandstone and volcanics, which is Cretaceous in age. The Lower Paleozoic sediments from 6720 feet to 7870 feet have attained moderately mature maturation levels, which is considered well within the oil window. These moderately mature rocks have experienced sufficient time and temperature to have generated and expelled large quantities of hydrocarbon, provided these sediments are organically rich.

Vitrinite reflectance analysis was performed on three (3) samples (Table IV), however, due to the very organic-lean nature of these rocks, no reflectance results were obtained.

B. Hydrocarbon Source Characterizations

All the sediments analyzed from the Tertiary, Cretaceous, Silurian, Ordovician and Cambrian-age rock units are deficient in organic matter (% TOC; Table I) with poor hydrocarbon generating potential. The very poor free hydrocarbon yields (S₁; Table II) and hydrocarbon generating potential yields (S₂; Table III) obtained from the pyrolysis analysis substantiate the nonhydrocarbon characteristics of these rocks.

Should you have any questions concerning this data, or if we can be of further assistance to you, please feel free to contact us.

Yours truly,

Paul Tybor
Project Coordinator
GEOCHEM LABORATORIES, INC.

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Enclosures



Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2261-001	1820-1840	Composite: volcanic rock and agglomerate.	0.08
2261-002	2040-2060	Composite: volcanic rock and agglomerate.	0.08
2261-003	2200-2230	Composite: volcanic rock and agglomerate.	0.11
2261-004	2350-2370	Composite: volcanic rock and agglomerate.	0.06
2261-005	2500-2520	Composite: volcanic rock and agglomerate.	0.06/0.06
2261-006	2640-2670	Composite: volcanic rock and agglomerate.	0.07
2261-007	2850-2870	Composite: volcanic rock, red shale and agglomerate.	0.06
2261-008	3000-3020	Composite: volcanic rock, red shale and agglomerate.	0.07
2261-009	3150	Composite: volcanic rock, red shale and agglomerate.	0.10
2261-010	3300-3320	Composite: volcanic rock, red shale and agglomerate.	0.06
2261-011	3450-3460	Composite: red shale (85), volcanic rock (15).	0.07
2261-012	3600-3620	Composite: red shale and volcanic rock.	0.08
2261-013	3800-3810	Composite: red shale and volcanic rock.	0.08/0.08
2261-014	3950-3960	Composite: red shale and volcanic rock.	0.06
2261-015	4100-4120	Composite: red shale and volcanic rock.	0.08
2261-016	4250-4270	Composite: red shale and volcanic rock.	0.10
2261-017	4400-4420	Composite: red shale and volcanic rock.	0.10
2261-018	4550-4570	Composite: red shale and volcanic rock.	0.05
2261-019	4650-4670	Composite: red shale and volcanic rock.	0.05
2261-020	4800-4820	Composite: red shale and volcanic rock.	0.08
2261-021	4950-4970	Composite: red shale and igneous rock.	0.05/0.05

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2261-022	5050-5070	Composite: Red shale and sandstone.	0.05
2261-023	5250-5270	Composite: Red shale and sandstone.	0.06
2261-024	5400-5420	Composite: Red shale and sandstone.	0.08
2261-025	5600-5620	Composite: Red shale, sandstone, and limestone.	0.09
2261-026	5850-5870	Composite: Red shale, sandstone, and limestone.	0.08
2261-027	6000-6020	Composite: Shale, red (80), sandstone (20).	0.09
2261-028	6600-6620	Composite: Dolomite, red (80), shale, red (20).	0.08
2261-029	6700-6720	Dolomite, pinkish gray.	0.05/0.05
2261-030	6800-6820	Limestone, light brownish gray.	0.04
2261-031	6950-6970	Limestone, light brownish gray.	0.06
2261-032	7080-7100	Limestone, light brownish gray.	0.09
2261-033	7150-7170	Limestone, light brownish gray.	0.09
2261-034	7320-7340	Dolomite, light brownish gray.	0.06
2261-035	7550-7570	Dolomite, light brownish gray.	0.06
2261-036	7700-7720	Dolomite, light brownish gray.	0.08/0.08
2261-037	7800-7820	Dolomite, light brownish gray.	0.08
2261-038	7850-7870	Composite: Quartzite and dolomite.	0.07

T.O.C. = Total organic carbon, wt. %
 S1 = Free hydrocarbons, mg HC/g of rock
 S2 = Residual hydrocarbon potential
 (mg HC/g of rock)
 S3 = CO₂ produced from kerogen pyrolysis
 (mg CO₂/g of rock)
 PC* = 0.083 (S1 + S2)

Hydrogen
 Index = mg HC/g organic carbon
 Oxygen
 Index = mg CO₂/g organic carbon
 PI = S1/S1+S2
 Tmax = Temperature Index, degrees C.

TABLE II
 RESULTS OF ROCK-EVAL PYROLYSIS

GeoChem Sample No.	Depth Interval (Ft.)	Tmax (C)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PI	PC*	T.O.C. (wt. %)	Hydrogen Index	Oxygen Index
2261-001	1820-1840	332	0.01	0.04	0.45	0.25	0.00	0.08	50	562
2261-002	2040-2060	234	0.01	0.04	0.75	0.25	0.00	0.08	50	937
2261-004	2350-2370	424	0.01	0.05	0.21	0.17	0.00	0.06	83	350
2261-007	2850-2870	302	0.03	0.06	0.19	0.37	0.00	0.06	100	316
2261-010	3300-3320	271	0.03	0.09	0.24	0.25	0.01	0.06	150	400
2261-013	3800-3810	271	0.04	0.10	0.33	0.29	0.01	0.08	125	412
2261-016	4250-4270	271	0.04	0.09	0.44	0.33	0.01	0.10	90	440
2261-019	4650-4670	443	0.02	0.05	0.33	0.33	0.00	0.05	100	660
2261-023	5250-5270	375	0.03	0.07	0.33	0.30	0.00	0.06	116	550
2261-025	5600-5620	301	0.02	0.09	0.33	0.20	0.00	0.09	100	366
2261-027	6000-6020	312	0.02	0.11	0.30	0.17	0.01	0.09	122	333
2261-028	6600-6620	317	0.02	0.11	0.39	0.17	0.01	0.08	137	487
2261-029	6700-6720	292	0.02	0.09	0.35	0.20	0.00	0.05	180	700
2261-030	6800-6820	297	0.01	0.06	0.26	0.17	0.00	0.04	150	650
2261-031	6950-6970	306	0.01	0.06	0.23	0.17	0.00	0.06	100	383
2261-032	7080-7100	271	0.02	0.04	0.25	0.33	0.00	0.09	44	277
2261-033	7150-7170	443	0.00	0.00	0.17	0.00	0.00	0.09	0	188
2261-034	7320-7340	444	0.01	0.00	0.24	0.01	0.00	0.06	0	400
2261-035	7550-7570	255	0.00	0.01	0.28	0.00	0.00	0.06	16	466
2261-036	7700-7720	269	0.00	0.00	0.30	0.00	0.00	0.08	0	375
2261-037	7800-7820	270	0.00	0.00	0.22	0.00	0.00	0.08	0	275
2261-038	7850-7870	271	0.00	0.00	0.26	0.00	0.00	0.07	0	371

TABLE III
VISUAL KEROGEN ASSESSMENT WORKSHEET

GEOCHEM No.	DEPTH	INDIGENOUS POPULATION (INTERPRETED)					GENERAL CHARACTERISTICS					CAVED AND/OR REWORKED POPULATION(S)					SUMMARY ORGANIC MATTER TYPE			
		TYPE OF ORGANIC MATTER		MATURATION INDEX			COLOR OF ORGANIC MATTER		STATE OF ORGANIC MATTER		%	TYPE OF ORGANIC MATTER		MATURATION INDEX						
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
		REMARKS					REMARKS					REMARKS								
2261-001	1840																		W;Am-H;-	VLOM
2261-002	2060																		I;W;-	VLOM
2261-004	2370																		No kerogen	VLOM
2261-007	2870																		No kerogen	VLOM
2261-010	3320																		No kerogen	VLOM
2261-013	3810																		No kerogen	VLOM
2261-016	4270																		? Resins	VLOM
2261-019	4670																		Am;-;-	VLOM
2261-023	5270																		No kerogen	VLOM
2261-025	5620																		mud contam.	VLOM
2261-027	6020																		mud contam.	VLOM
2261-028	6620																		mud contam.	VLOM
2261-029	6720																		Am;-;-	VLOM
2261-030	6820																		Am;-;-I	VLOM
2261-031	6970																		Am;-;-	VLOM
2261-032	7100																		Am;-;-	VLOM
2261-033	7170																		Am(AT);-;-	VLOM
2261-034	7340																		Am;-;-	VLOM
2261-035	7570																		Am;-;-	VLOM
2261-036	7720																		Am;-;-	VLOM

 drilling mud contaminants.

VLOM = very little organic material.
In 016 the resin-like drops may be a mud additive.
There are some bacteria in samples 029 and 038.

Table IV

VITRINITE REFLECTANCE SUMMARY

GEOCHEM SAMPLE NUMBER	DEPTH (feet)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE (% Ro)	MAXIMUM REFLECTANCE (% Ro)	MEAN REFLECTANCE (% Ro)	STD. DEV. (% Ro)	REMARKS
2261-007	2870	CTG	INSUFFICIENT KEROGEN FLOAT						
2261-016	4270	CTG	NO VITRINITE						
2261-025	5620	CTG	NO VITRINITE						