

**NEW MEXICO BUREAU OF
MINES & MINERAL RESOURCES**

A. G. Hill No. 1 Federal A Well

GeoChem Job Number 4414

**Geotechnical
Information Center**



GEOCHEMICAL ANALYSES
SOURCE ROCK EVALUATION
MODELLING-PETROLEUM SYSTEMS

CRUDE OIL CHARACTERIZATION
GEOCHEMICAL PROSPECTING

CRUDE OIL-SOURCE ROCK CORRELATION

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August 14, 1998

NEW MEXICO BUREAU OF MINES
AND MINERALS
801 Leroy Place
Socorro, New Mexico 87801-4796

Re: GeoChem Job Number 4414
A. G. Hill No. 1 Federal A Well
Guadalupe County, New Mexico
Sec. 27; T9N; R19E

Attention: Mr. Ron Broadhead

Dear Ron:

Please find enclosed the results of the geochemical analyses, requested by you in your letter of July 30, 1998, made on one (1) sample of cuttings material collected at a depth of 4320-4450± feet in the A. G. Hill No. 1 Federal A Well, Guadalupe County, New Mexico at Sec. 27; T9N; R19E.

The sample was received August 3, 1998 and was logged in under GeoChem Job and sample number 4414-001.

The requested analyses involved measurement of total organic carbon content (TOC), Rock-Eval (R-E) pyrolysis and visual kerogen isolation and assessment of organic matter type (OMT) and determination of thermal alteration index (TAI).

The data for this sample is recorded in Tables I, II-A, II-B, III-A and III-B with the pyrogram reproduced in Appendix I.

I have plotted the TOC and R-E data on GeoChem's Hydrocarbon Source Richness diagram (Figure 1-A) for your review. Based on this plot, one would consider that this sample represents at its current state a possibly fair oil and associated gas source based on the S₁ volatile and S₂ generatable hydrocarbon content. The Rock-Eval (R-E) data for the S₂ generatable hydrocarbon yield would indicate a good remaining potential should this rock be buried deeper and have undergone a higher degree of thermal diagenesis elsewhere in this basin.

However, the organic carbon content is poor to marginally fair (0.57%; Table I), the contained organic matter is dominantly gas-prone terrestrially derived Herbaceous, Woody structured and Inertinitic (H;W;I) materials which have currently attained a Stage 2 to 2± maturation rank (TAI=2.5) which is within the oil and associated gas generation window. The Rock-Eval (R-E) data also confirms a gas-prone character based on the S₂/S₃ ratio (0.37) and on the very low Hydrogen Index (51) and comparably high Oxygen Index (139).

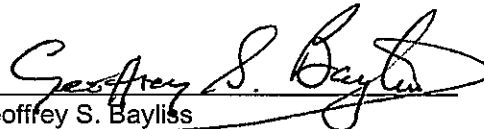
It is my conclusion that this sample has a moderately mature to mature poor to very poor oil liquids source character with a fair gas source character.

The visual kerogen organic matter type (OMT) assessment indicated that well preserved herbaceous (H) and woody (W) structured plant remains were dominant with some inertinitic (I) content (which possibly could be reworked material). The particle size of these kerogens was very fine and it is likely this shale and contained organic material accumulated in greater water depths than would apply to an inner neritic environment which is usually characterized by this type of kerogen.

Should you have any questions about this work please call at your convenience.

Thank you for using GeoChem for this work.

Sincerely Yours,


Geoffrey S. Bayliss
President
GEOCHEM LABORATORIES, INC.

GSB/kbm

Enclosures Data Report
 Transmittal
 Sample material

cc: Mr. Charles Reynolds, Ibis Petroleum

TABLE I
SAMPLE IDENTIFICATION
AND
TOTAL ORGANIC CARBON RESULTS

GeoChem Sample Number	Depth (feet)	Total Organic Carbon (% of Rock)
4414-001	4320-4450	0.57

FIGURE 1-A
HYDROCARBON SOURCE RICHNESS – SHALES & MUDSTONES

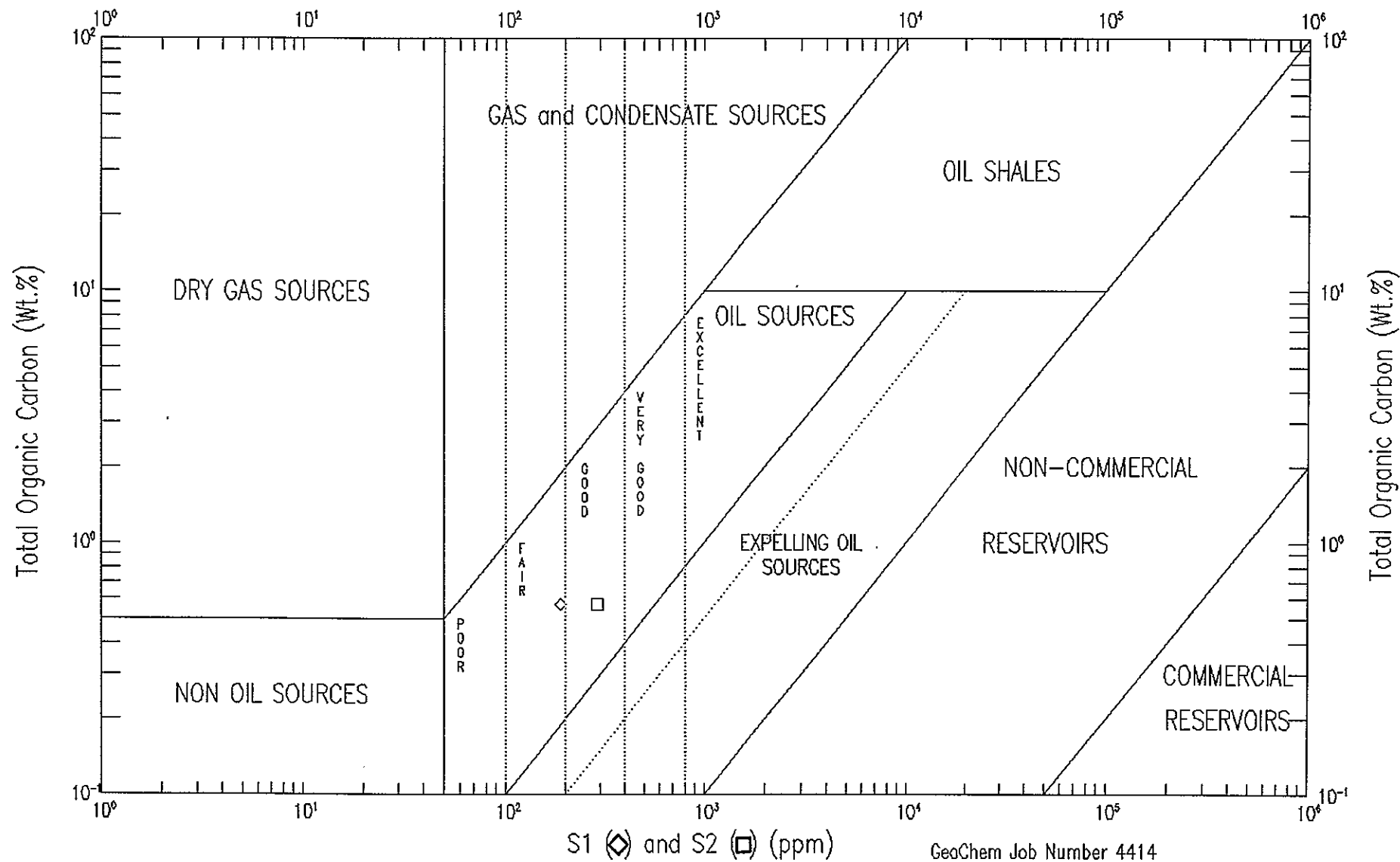


TABLE II-A

RESULTS OF ROCK-EVAL PYROLYSIS (mg/g)

GeoChem Sample No.	Client Identification	Qty.	Tmax (°C)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PI	PC*	T.O.C. (wt%)	Hydrogen Index	Oxygen Index
4414-001	4320-4450	99.6	387	0.19	0.29	0.79	0.40	0.04	0.57	51	139
T.O.C. = Total organic carbon, wt. %				S3 = CO ₂ produced from kerogen pyrolysis (mg CO ₂ /g of rock)				Oxygen Index = mg CO ₂ /g organic carbon			
S1 = Free Hydrocarbons, mg HC/g of rock				PC* = 0.083 (S1 + S2)				PI = S1/(S1+S2)			
S2 = Residual hydrocarbon potential (mg HC/g of rock)				Hydrogen index = mg HC/g organic carbon				Tmax = Temperature Index, °C.			

TABLE II-B

RESULTS OF ROCK-EVAL PYROLYSIS (ppm)

GeoChem Sample No.	Client Identification	Qty.	Tmax (°C)	S1 (ppm)	S2 (ppm)	S3 (ppm)	PI	PC*	T.O.C. (wt%)	Hydrogen Index	Oxygen Index
4414-001	4320-4450	99.6	387	190	290	790	0.40	0.04	0.57	51	139
T.O.C. = Total organic carbon, wt. %				S3 = CO ₂ produced from kerogen pyrolysis (mg CO ₂ /g of rock)				Oxygen Index = mg CO ₂ /g organic carbon			
S1 = Free Hydrocarbons, mg HC/g of rock				PC* = 0.083 (S1 + S2)				PI = S1/(S1+S2)			
S2 = Residual hydrocarbon potential (mg HC/g of rock)				Hydrogen index = mg HC/g organic carbon				Tmax = Temperature Index, °C.			

TABLE III - A
SUMMARY OF ORGANIC CARBON AND VISUAL KEROGEN DATA

GEOCHEM SAMPLE NUMBER	DEPTH (FEET)	TOTAL ORGANIC CARBON	ORGANIC MATTER TYPE	VISUAL ABUNDANCE NORMALIZED PERCENT					ALTERATION STAGE	THERMAL ALTERATION INDEX
				AL	AM	H	W	I		
4414-001	4320-4450	0.57	H;W;I	0	0	55	27	18	2 to 2+	2.5

LEGEND:

KEROGEN KEY

Predominant; 60-100%	Secondary; 20-40%	Trace 0-20%
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Al	=	Algal
Am	=	Amorphous-Sapropel
Am**	=	Relic Amorphous-Sapropel
H	=	Herbaceous-Spore/Pollen
H*	=	Degraded Herbaceous

W	=	Woody-Structured
U	=	Unidentified Material
I	=	Inertinite
C	=	Coaly

TABLE III-B
VISUAL KEROGEN ASSESSMENT WORKSHEET

[illegible]

APPENDIX I

Rock-Eval Pyrograms

DATE: 08-07-98

ANALYSIS

CYCLE : 4

SCALE = 1/32

INIT TEMP = 250 ISO TIME = 5 TEMP GRADIENT=25 TRAP STOP T = 390

DEPTH	QTY	TMAX	S 1	S 2	S 3	P 1	S2/S3	P C	TOC	H I	O I
1414-001	99.6	397	0.19	0.29	0.79	0.40	0.36	0.04	0.57	51	139

DATE: 08-07-98

ANALYSIS

CYCLE : 4

SCALE = 1/32

INIT TEMP = 250 ISO TIME = 5 TEMP GRADIENT=25 TRAP STOP T = 390

DEPTH	QTY	TMAX	S 1	S 2	S 3	P 1	S2/S3	P C	TOC	H I	O I
1111-100.0	429	0.44	2.90	1.62	0.13	1.79	0.27	2.89	100	56	