New Mexico Bureau of Mines and Mineral Resources
Open File Report No. OF-202

PETROLEUM SOURCE-ROCK STUDY OF SELECTED WELLS IN THE RIO GRANDE RIFT AREA, NEW MEXICO

by Alan H. Leutloff and David J. Curry
Conoco, Inc.
Golden, Colorado
December 14, 1982

Wells selected:

1.) Conoco No. 3 St. Louis Rocky Mountain (Colfax County)
2.) Shell No. 1 Santa Fe (Sandoval County)
3.) Shell No. 1 Laguna Wilson (Bernalillo County)
4.) Sun No. 1 Victorio Land and Cattle Co. (Sierra County)
5.) Sunray Mid-Continent No. 1 Federal M (Sierra County)
6.) Cities Service No. 1 Corralitos Federal A (Doña Ana County)
7.) Sinclair No. 1 Doña Ana Federal 18 (Doña Ana County)

Denver West Exploration

Conoco Inc.
13949 West Colfax Ave., Suite 100
P.O. Box 1219
Golden, CO 80402
(303) 232-0727

December 14, 1982

Sam Thompson
New Mexico Bureau of Mines and Mineral Resources
New Mexico Tech.
Socorro, New Mexico 87801

Dear Sam,

I am enclosing a copy of the report on our source bed study from selected wells in the Rio Grande Rift. Thank you for allowing us to collect samples from your log library. I hope this report is beneficial to you and your endeavors.

Sincerely,

Alan Leutloff

AHL/mn

cc: W. E. Zabriskie
M. L. Johnson
Robert Bieberman

SUMMARY

Core samples [cuttings] from seven wells in the Rio Grande Rift system of New Mexico were evaluated for source potential. The Sinclair No. 1 Dona Ana was very low in organic carbon content and not analyzed further. The other six wells ranged from poor to good in potential richness. Maturity levels varied from moderately mature in some Cretaceous sections to overmature in some Pennsylvanian and older sediments. The Conoco No. 3 St. Louis Rocky Mountain and Shell Santa Fe No. 1 both showed source potential (in terms of maturity and richness) in the Cretaceous and possibly in the Triassic sections. The presence of lignite made it difficult to evaluate the richness of the Cretaceous age sections in the Shell Laguna Wilson No. 1, Sun Victoria No. 1, and Sunray Midcontinent No. 1, but maturities were within the oil generation phase. In these last four wells the older sections are probably poor sources due to overmaturity, lack of organic carbon, or both. The Cities No. 1 Corralitos had only one interval of fair richness; this interval was very mature.

INTRODUCTION

The organic geochemistry of core samples from seven wells in the Rio Grande Rift system was analyzed to evaluate the source potential of Mesozoic and Paleozoic formations in this area. The wells analyzed are located in or adjacent to the basins which form a part of the Rio Grande Rift. These basins are generally oriented with north-to-south long axes and are roughly parallel to the course of the Rio Grande River from southern Colorado to west Texas. The basins show evidence of complex faulting and uplift in places. Well locations are shown in Figure 1.

SAMPLE AND ANALYTICAL DESCRIPTION

Samples were obtained by Conoco North American Exploration from cores [cuttings] in the core [samples] library of the New Mexico Bureau of Mines and Mineral Resources. The sample suite consisted of 114 sets of core chips [cuttings] from the stored cores [samples]. Quantities of samples were, in general, small.

The size and nature of the samples limited the organic geochemical techniques which could be used. No light hydrocarbon data were possible, and the small sample size precluded solvent extraction and the isolation of kerogen for pyrolysis. The samples were analyzed for total organic carbon (TOC) content, kerogen type and visual maturity estimation, some vitrinite reflectance data (again limited by sample size), and whole rock pyrolysis. Pyrolysis showed many of the samples to have been contaminated, possibly during storage, since some of the contaminants are very similar from well to well. In addition, some samples, especially from the Cretaceous formations, contained appreciable amounts of coal, which interfered with evaluation of source richness.

INDIVIDUAL WELL EVALUATIONS

1. Conoco No. 3 St. Louis Rocky Mountain (Colfax County)

The three Cretaceous age samples (1,550, 3,400, and 4,360 feet) in this well are of fair-to-good richness and are mature to very mature. Kerogen is chiefly woody and herbaceous; this and the pyrolysis results indicate that the expected production type is gas and oil. These samples have large amounts of P_1 pyrolyzates (thermally extractable material), which resemble an oil which has lost its light ends rather than a refined product (see Figure 2). It cannot be determined if this is a native (i.e., in situ generated) or migrated bitumen. The Triassic age sample (5,330 feet) is fair in richness (TOC) and probably gas-prone. Maturity (based only on pyrolysis data) appears to be high.

2. Shell No. 1 Santa Fe (Albuquerque Basin, Sandoval County)

This well appears to have the best potential. The Cretaceous age samples (4,000 to 6,800 feet) are fair to good in richness (two contain lignite) and are moderately mature to mature (i.e., within the oil generation stage). Kerogen type is principally amorphous, and pyrolysis data indicate these samples to be oil or oil- and gas-prone. The Jurassic age sample at 7,050 feet is fair in richness and mature. The intervals from 7,400 to 10,500 feet are all low in organic carbon and of poor potential (most samples contain less than 0.3 percent organic carbon). The Pennsylvanian age sample at 10,700 feet has a fair potential according to TOC content. However, a large proportion of the kerogen is coaly, which is likely to be inert (i.e., dead carbon). Pyrolysis also shows little active carbon left in the sample, implying that the kerogen has already generated its hydrocarbons, and so the presence of gas or oil in these sediments is dependent on geologic factors.

3. Shell No. 1 Laguna Wilson (Albuquerque Basin, Bernalillo County)

The Cretaceous age samples (2,640 to 3,850 feet) all contain lignite, which makes it impossible to assess richness by TOC and restricts pyrolysis data. Limited optical kerogen data show the 3,420-foot sample to be moderately mature and contain chiefly amorphous kerogen. The same Cretaceous formations in other wells (e.g., the Shell Santa Fe No. 1), generally show fair-to-good richness and moderate maturity; it is uncertain, however, if these data can be extrapolated to this well. Similarly, the Jurassic sample at 3,950 feet is lignite-contaminated, but the same formation (Morrison) in the nearby Shell Santa Fe No. 1 is fair in potential. From 4,560 to 8,400 feet, the richness is generally very poor. From 8,450 feet to the bottom, the richness is poor to generally fair (especially from 9,750 feet to the bottom).

Maturity data are somewhat contradictory, but the kerogen is probably extremely mature (condensate- and wet-gas-prone) at the top of this interval and overmature and dry-gas-prone at the bottom (as indicated by pyrolysis). The samples at 9,750 feet and below all contain significant amount of coaly kerogen, and pyrolysis indicates very little generating capacity. In addition, these samples all showed contamination by what appears to be a distillate. The presence of a significant proportion of inert carbon in the kerogen and the presence of contamination imply that the source potential of these samples may be less than that indicated by the TOC values. As with the adjacent Santa Fe No. 1, the kerogen in the bottom of this well has probably been buried more deeply than at present and has already generated its hydrocarbons; hence the preservation of any gas depends on structural and tectonic factors.

4. Sun Victoria No. 1 (Jornada del Muerto Basin, Sierra County)

This well shows evidence of uplift and erosion, since the Cretaceous age samples at less than a 1,000-foot depth are very mature to extremely mature (condensate to wet gas generation stage). Kerogen type is chiefly amorphous and coaly, and production type (from pyrolysis data) is wet gas and condensate. These samples also appear to be contaminated by a remnant bitumen (either native or migrated). The Triassic, Permian, and Pennsylvanian age samples from 1,140 to 5,300 feet are all of poor source potential (low TOC values). The samples from 5,600 to 5,970 feet are poor to generally fair in richness. However, these samples are all at very high levels of maturity ($\sim$ 2 percent vitrinite reflectance) and show very little generating capability, being at the phase-out of dry gas generation. As with the other wells, the presence of gas will depend on lithology and trapping.

5. Sunray Midcontient No. 1 (Sierra County)

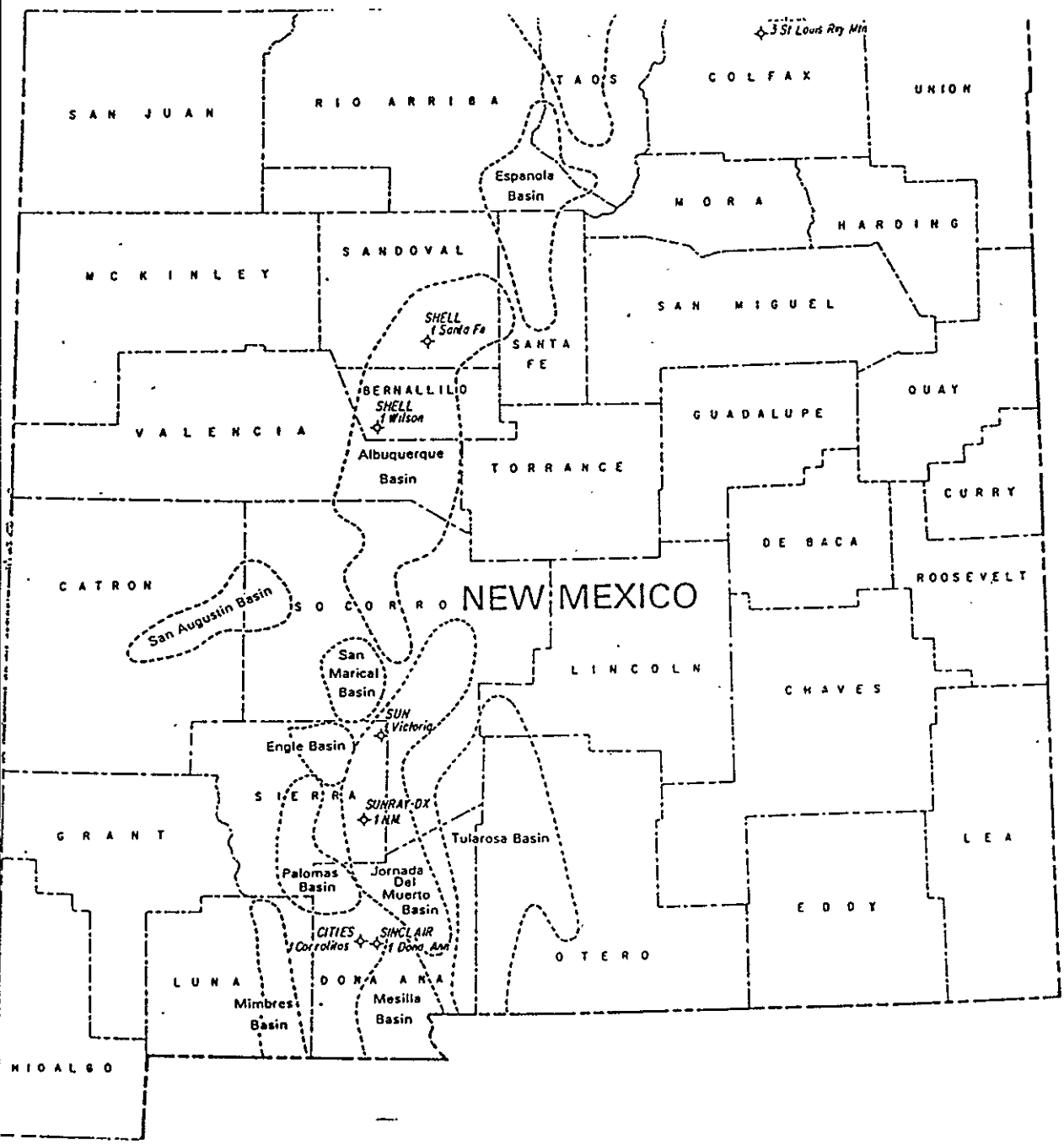
The Cretaceous and the Permian San Andres (3,690 feet) and Glorietta (4,040 feet) samples are poor to fair in richness (two are lignite-contaminated) and are mature to very mature (late stage generation). The kerogen type in these samples is woody and herbaceous in the 2,280-foot sample and generally amorphous in the other samples. The samples at 7,030 and 7,070 feet (Pennsylvanian) are of fair richness (by TOC content) but are overmature (vitrinite reflectance of 2.73 percent) and, as in the previously discussed wells, past the generation stage. The other samples in this well are poor in richness and overmature.

6. Cities No. 1 Corralitos (Dona Ana County)

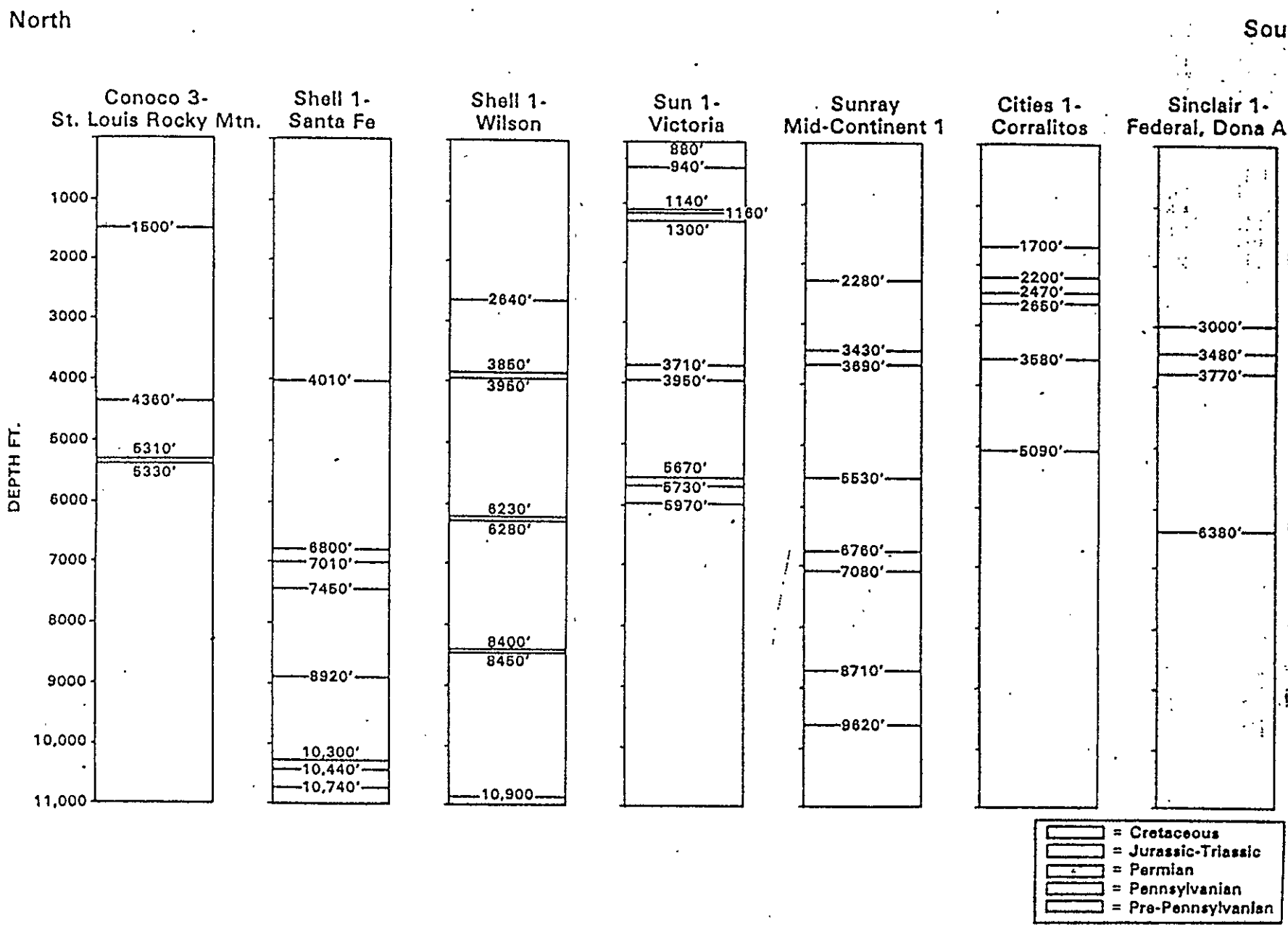
This well contains only Permian and older strata and is, in general, low in organic carbon. The samples at 2,120 and 2,740 feet are of poor potential, very mature to extremely mature, and probably wet-gas-prone. The 2,630-foot (Pennsylvanian) interval is of fair richness, possibly oil- and gas-prone, and extremely mature (condensate to wet gas stage).

7. Sinclair No. 1 Dona Ana (Dona Ana County)

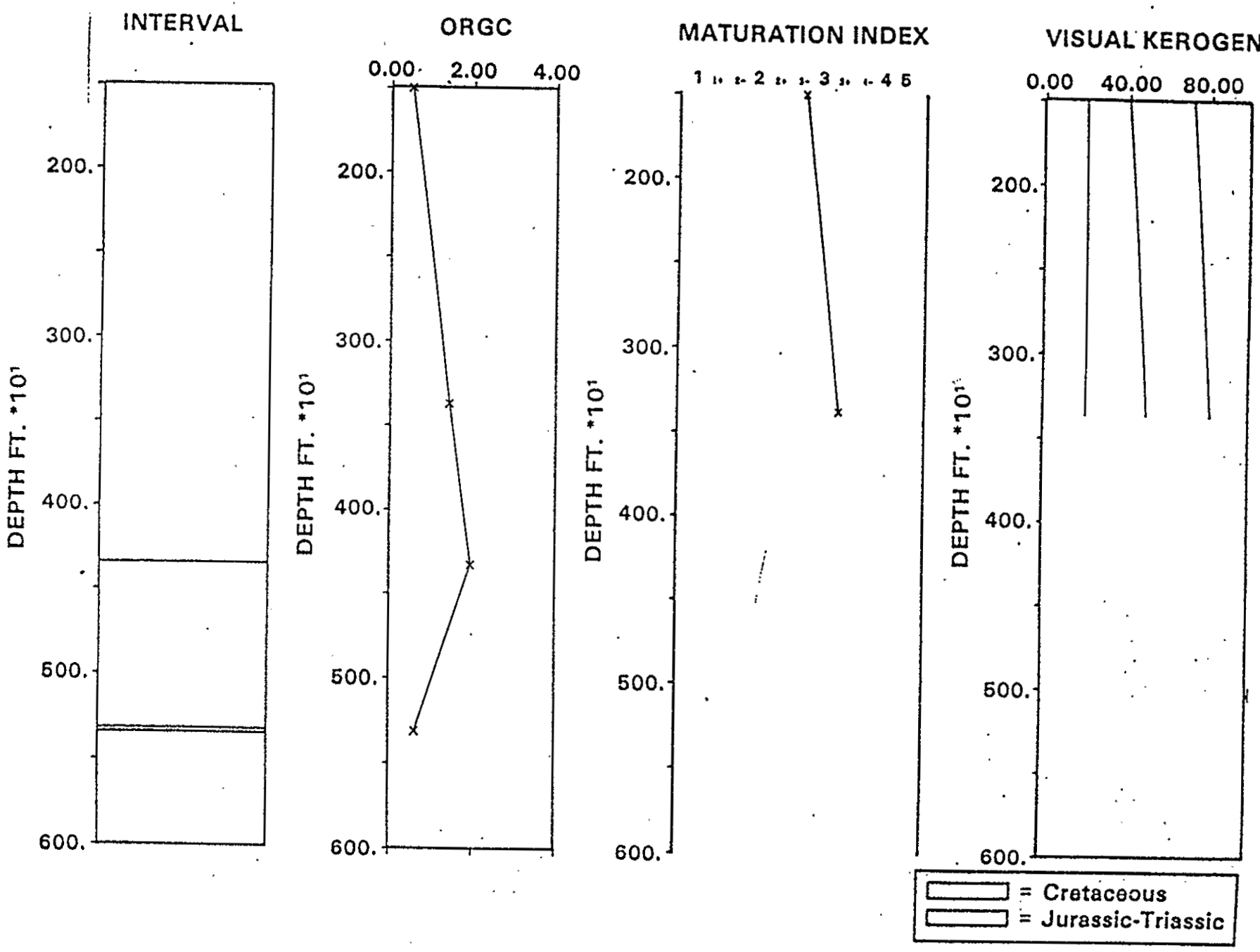
This well contains only Permian and older strata, and no potential source rocks were found in any of the sampled intervals (TOC never exceeded 0.29 percent).


3 St Louis Rky Mtn
SAN JUAN
RIO ARRIBA
TAOS
COLFAX
UNION
Espanola Basin
MORA
HARDING
MCKINLEY
SANDOVAL
SAN MIGUEL
SHELL 1 Santa Fe
SANTA FE
BERNALLILO
SHELL 1 Wilson
QUAY
VALENCIA
GUADALUPE
Albuquerque Basin
TORRANCE
CURRY
DE BACA
CATRON
ROOSEVELT
San Augustin Basin
SOCORRO
NEW MEXICO
San Marical Basin
LINCOLN
CHAVES
SUN 1 Victorio
Engle Basin
SIERRA
SUNRAY-DX 1 NM
GRANT
Tularosa Basin
LEA
Palomas Basin
Jornada Del Muerto Basin
EDDY
CITIES 1 Corralitos
SINCLAIR 1 Dona Ana
OTERO
LUNA
DONA ANA
Mimbres Basin
Mesilla Basin
HIDALGO

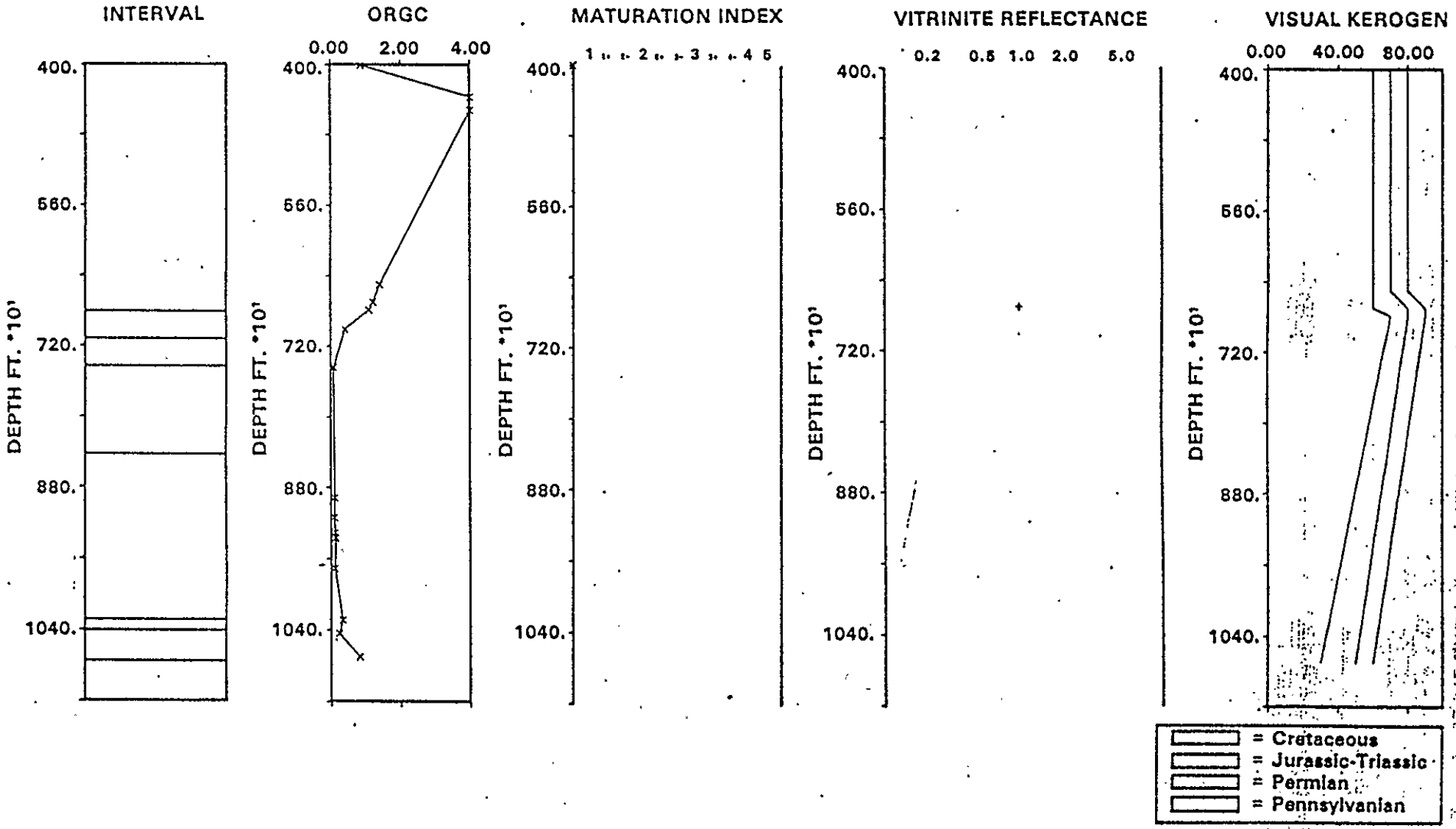
Rio Grande Rift - Sampled Intervals



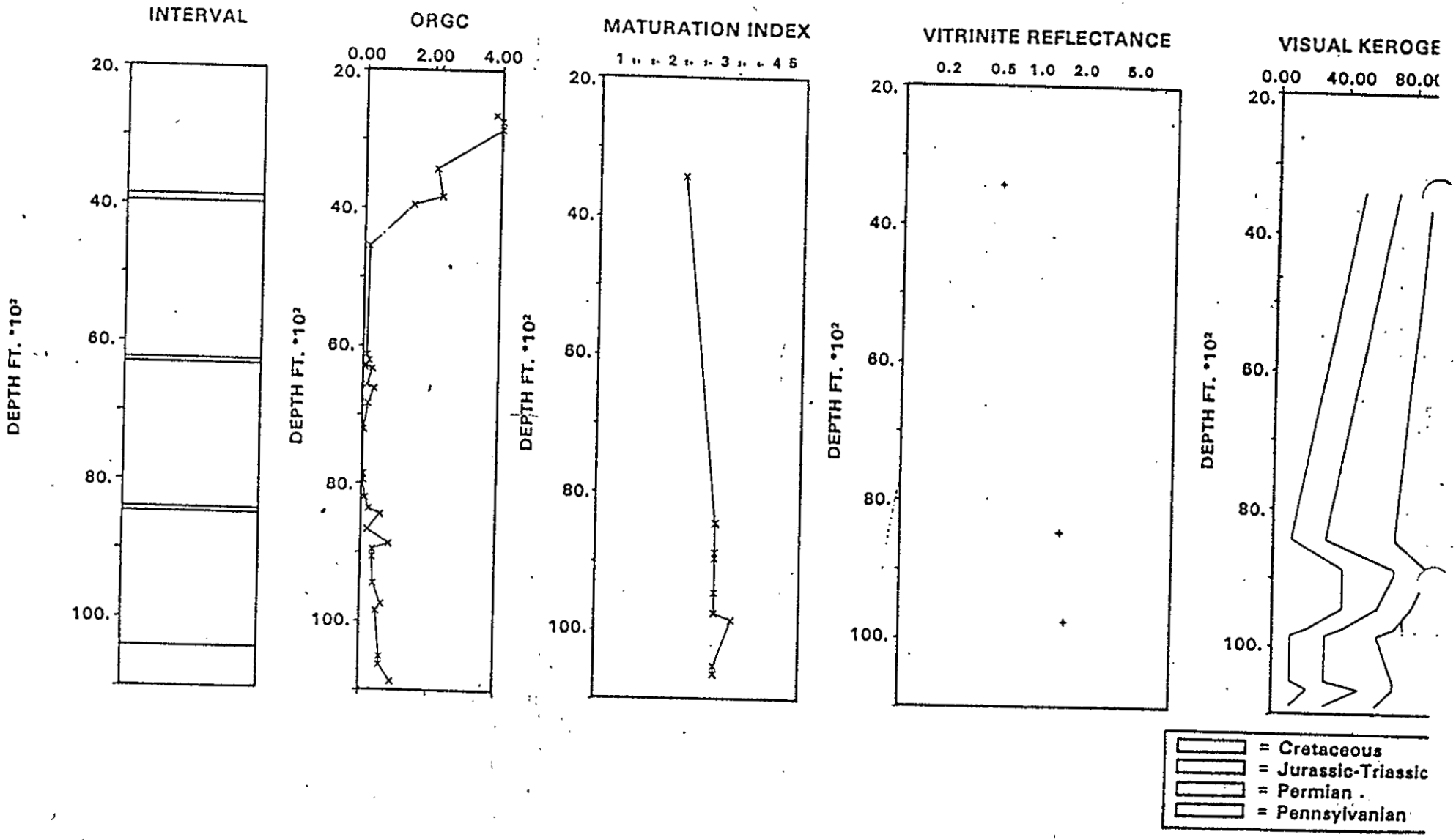
Conoco St. Louis Rocky Mtn. Colfax Co., NM



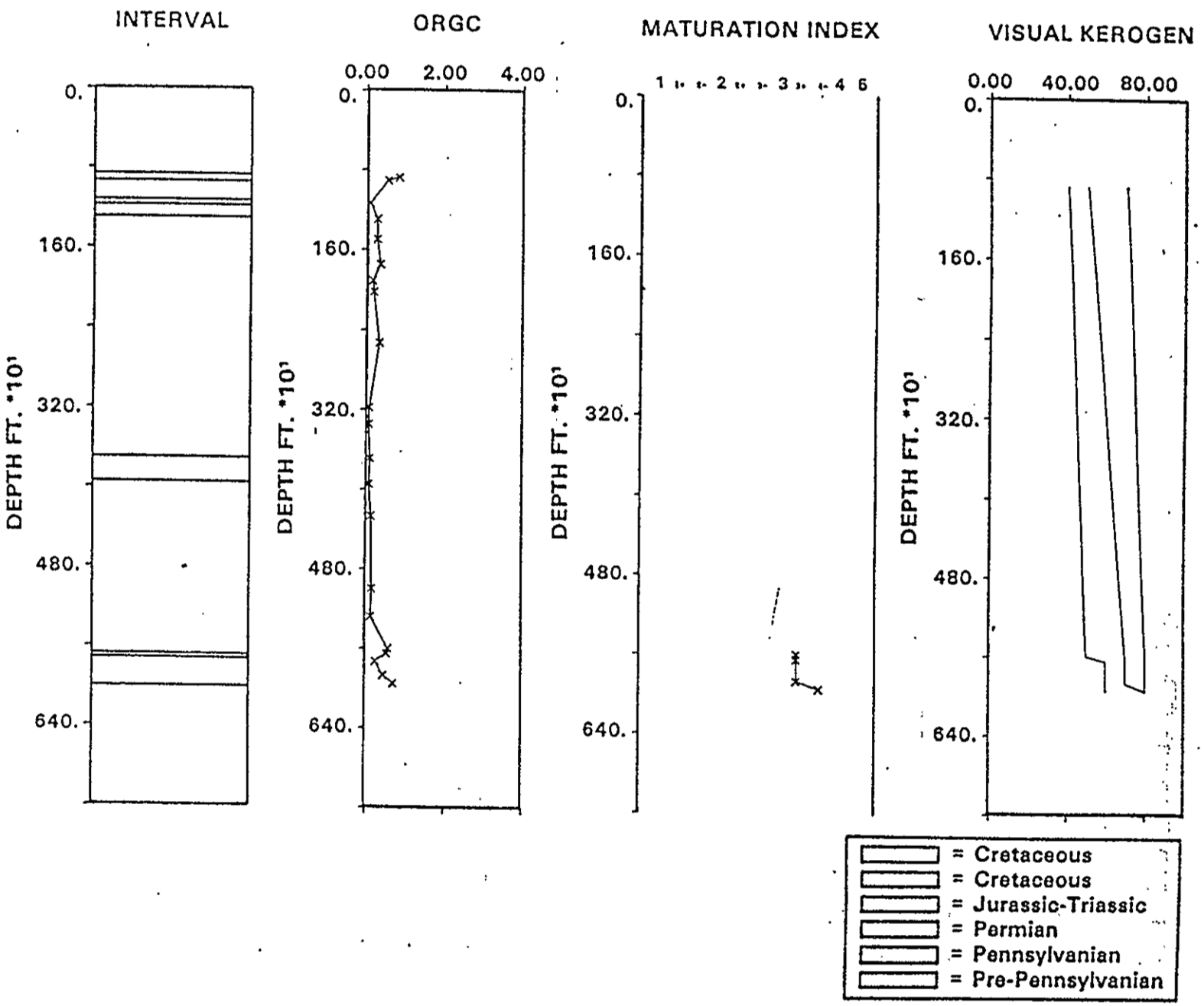
Shell Santa Fe No. 1 Sandoval Co., NM



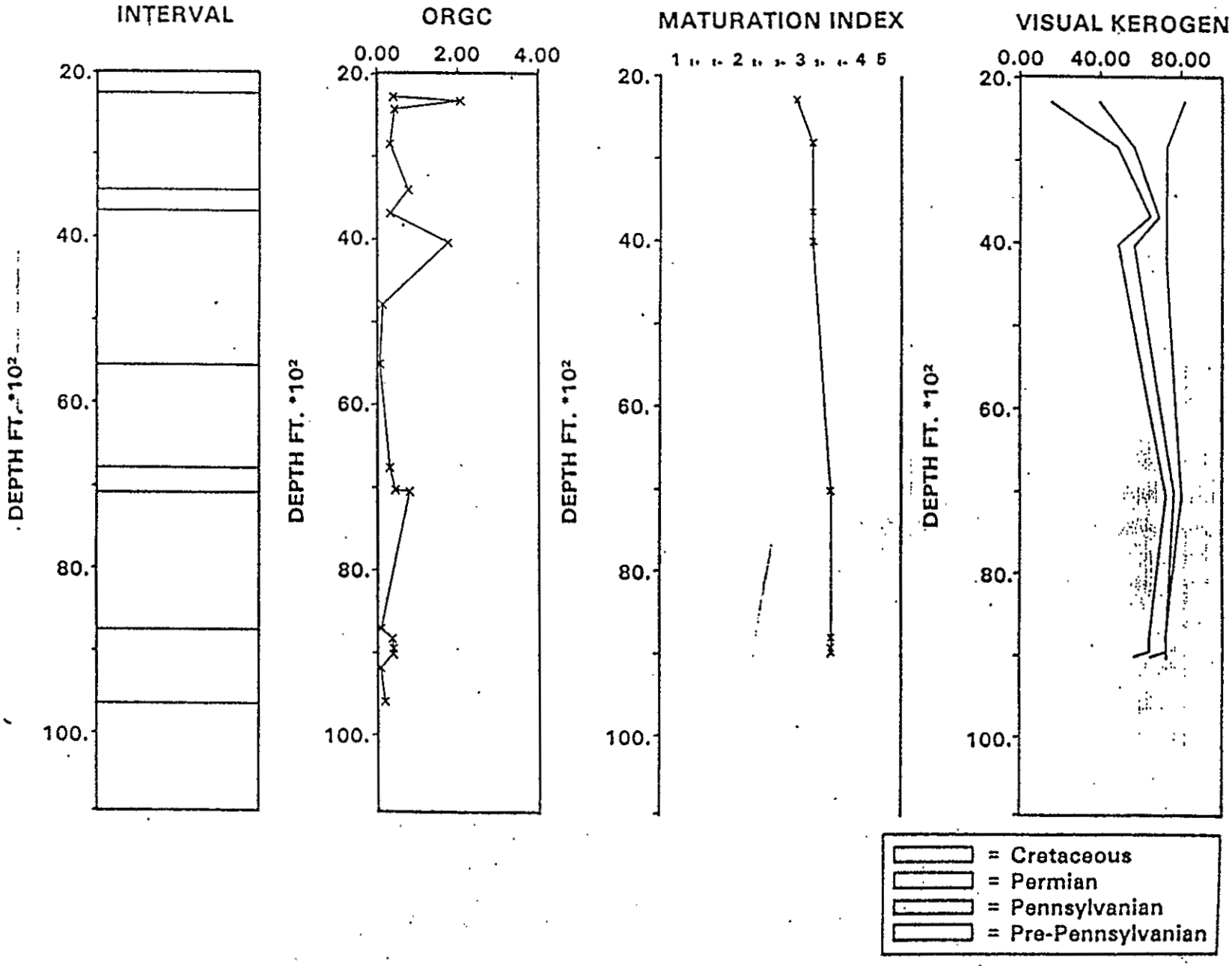
Shell Wilson No. 1 Bernalillo Co., NM



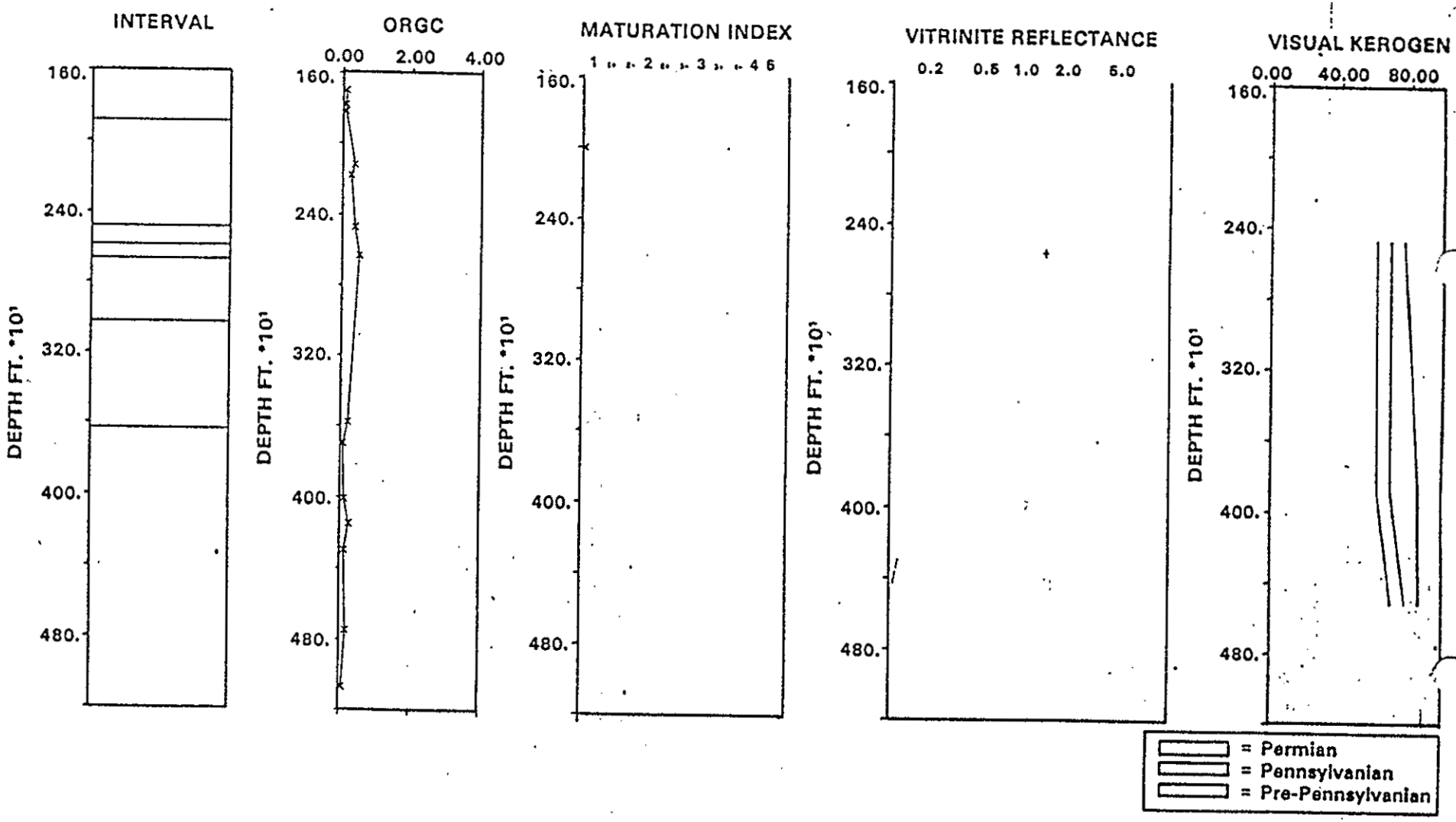
Sun Victoria No. 1 Sierra Co., NM



Sunray Midcontinent No. 1 Sierra Co., NM



Cities Corralitos Dona Ana Co., NM



Denver West Exploration

Conoco Inc.
13949 West Colfax Ave., Suite 100
P.O. Box 1219
Golden, CO 80402
(303) 232-0727

October 25, 1982

Sam Thompson
New Mexico Bureau of Mines
and Mineral Resources
New Mexico Tech.
Socorro, NM 87801

Dear Mr. Thompson,

Enclosed are the raw data results of the geochemical analysis from wells in the Rio Grande Rift, NM. I have been informed by our researcher in Ponca City, that a formal report should be presented to me sometime in late December. Thank you so much for allowing us to collect these well samples.

If I can be of any further help to you, now or any time in the future, please feel free to contact me.

Sincerely,

Alan Leutloff
Geologist

pdr
cc: W. E. Zabriskie
M. L. Johnson
R. A. Bieberman

C15+ HYDROCARBON DATA SHEET

CONOCO ST. LOUIS ROCKY MTN COLFAX CO., NM

SAMPLE NUMBER	DEPTH FT	ORGC %	TE PPM	EPOC %	HC PPM	HC/OC %	SAT %	ARO %	RASP %	HC/TE %
1287 91 1	1500	.50	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 91 2	3370	1.42	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 91 3	4330	1.95	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 91 4	5310	.62	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00

ORGC % = PERCENT ORGANIC CARBON
TE PPM = PPM OF EXTRACT IN ROCK
EPOC = EXTRACT AS A PERCENT OF ORGANIC CARBON
HC PPM = PPM OF HYDROCARBONS IN ROCK BY TLC
HC/OC % = HYDROCARBONS AS A PERCENT OF ORGANIC CARBON
SAT % = PERCENT SATURATES IN EXTRACT BY TLC
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RASP % = PERCENT RESINS AND ASPHALTENES IN EXTRACT BY TLC
HC/TE % = HYDROCARBONS AS A PERCENT OF EXTRACT BY TLC

C15+ HYDROCARBON DATA SHEET

SHELL SANTA FE-1 SAN DAUAL CO., NM

SAMPLE NUMBER	DEPTH FT	ORGC %	TE PPM	EPOC %	HC PPM	HC/CC %	SAT %	ARO %	RASP %	HC/TE %
1287 88 1	4010	.87	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 2	4370	10.10	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 3	4520	9.90	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 4	6500	1.39	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 5	6700	1.20	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 6	6790	1.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 7	7010	.40	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 8	7440	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 9	8920	.10	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 10	9140	.09	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 11	9310	.11	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 12	9370	.12	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 13	9710	.10	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 14	10290	.32	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 15	10440	.22	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 88 16	10700	.81	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00

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HC/TE % = HYDROCARBONS AS A PERCENT OF EXTRACT BY TLC

C15+ HYDROCARBON DATA SHEET

SHELL 1-LAGUNA WILSON BERNALILLO CO., NM

SAMPLE NUMBER	DEPTH FT	ORGC %	TE PPM	EPOC %	HC PPM	HC/OC %	SAT %	ARO %	RASP %	HC/TE %
1287 85 1	2640	3.81	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 2	2730	8.92	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 3	2850	13.40	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 4	3420	2.11	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 5	3830	2.27	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 6	3950	1.43	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 7	4560	.15	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 8	6130	.12	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 9	6210	.19	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 10	6280	.11	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 11	6310	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 12	6330	.29	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 13	6570	.14	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 14	6620	.35	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 15	6840	.17	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 16	7210	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 17	7860	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 18	7950	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 19	8210	.13	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 20	8370	.23	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 21	8450	.57	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00

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HC/TE % = HYDROCARBONS AS A PERCENT OF EXTRACT BY TLC

C15+ HYDROCARBON DATA SHEET

SAMPLE NUMBER	DEPTH FT	ORGC %	TE PPM	EPOC %	HC PPM	HC/OC %	SAT %	ARO %	RASP %	HC/TE %
1287 85 22	8670	.21	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 23	8870	.84	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 24	8950	.36	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 25	9060	.36	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 26	9450	.40	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 27	9750	.63	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 28	9850	.49	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 29	10510	.61	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 30	10630	.60	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 85 31	10870	.94	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00

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RASP % = PERCENT RESINS AND ASPHALTENES IN EXTRACT BY TLC
HC/TE % = HYDROCARBONS AS A PERCENT OF EXTRACT BY TLC

C15+ HYDROCARBON DATA SHEET

SUN OIL CO. 1-VICTORIA SIERRA CO., NM

SAMPLE NUMBER	DEPTH FT	ORGC %	TE PPM	EPOC %	HC PPM	HC/OC %	SAT %	ARO %	RASP %	HC/TE %
1287 86 1	880	.81	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 2	910	.53	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 3	1140	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 4	1300	.26	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 5	1500	.26	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 6	1750	.34	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 7	1910	.15	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 8	2020	.18	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 9	2530	.33	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 10	3180	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 11	3350	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 12	3690	.10	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 13	3950	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 14	4270	.13	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 15	5000	.16	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 16	5280	.14	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 17	5600	.58	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 18	5650	.54	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 19	5730	.26	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 20	5870	.46	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 86 21	5950	.72	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00

ORGC % = PERCENT ORGANIC CARBON
TE PPM = PPM OF EXTRACT IN ROCK
EPOC = EXTRACT AS A PERCENT OF ORGANIC CARBON
HC PPM = PPM OF HYDROCARBONS IN ROCK BY TLC
HC/OC % = HYDROCARBONS AS A PERCENT OF ORGANIC CARBON
SAT % = PERCENT SATURATES IN EXTRACT BY TLC
ARO % = PERCENT AROMATICS IN EXTRACT BY TLC
RASP % = PERCENT RESINS AND ASPHALTENES IN EXTRACT BY TLC
HC/TE % = HYDROCARBONS AS A PERCENT OF EXTRACT BY TLC

C15+ HYDROCARBON DATA SHEET

SUNRAY MIDCONTINENT-1 SIERRA CO., NM

SAMPLE NUMBER	DEPTH FT	ORGC %	TE PPM	EPOC %	HC PPM	HC/OC %	SAT %	ARO %	RASP %	HC/TE %
1287 87 1	2280	.41	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 2	2330	2.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 3	2430	.44	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 4	2850	.33	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 5	3410	.78	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 6	3690	.33	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 7	4040	1.76	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 8	4790	.14	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 9	5510	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 10	6760	.31	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 11	7030	.44	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 12	7050	.79	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 13	8710	.09	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 14	8830	.36	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 15	8950	.39	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 16	9020	.38	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 17	9190	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 87 18	9600	.18	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00

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HC PPM = PPM OF HYDROCARBONS IN ROCK BY TLC
HC/OC % = HYDROCARBONS AS A PERCENT OF ORGANIC CARBON
SAT % = PERCENT SATURATES IN EXTRACT BY TLC
ARO % = PERCENT AROMATICS IN EXTRACT BY TLC
RASP % = PERCENT RESINS AND ASPHALTENES IN EXTRACT BY TLC
HC/TE % = HYDROCARBONS AS A PERCENT OF EXTRACT BY TLC

C15+ HYDROCARBON DATA SHEET

CITIES 1-CORRALITOS DONA ANNA CO., NM

SAMPLE NUMBER	DEPTH FT	ORGC %	TE PPM	EPOC %	HC PPM	HC/OC %	SAT %	ARO %	RASP %	HC/TE %
1287 89 1	1700	.09	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 2	1780	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 3	1820	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 4	2120	.34	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 5	2180	.24	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 6	2470	.36	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 7	2630	.49	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 8	3580	.20	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 9	3700	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 10	4010	.11	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 11	4150	.25	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 12	4300	.12	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 13	5070	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 89 14	4750	.16	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00

ORGC % = PERCENT ORGANIC CARBON
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EPOC = EXTRACT AS A PERCENT OF ORGANIC CARBON
HC PPM = PPM OF HYDROCARBONS IN ROCK BY TLC
HC/OC % = HYDROCARBONS AS A PERCENT OF ORGANIC CARBON
SAT % = PERCENT SATURATES IN EXTRACT BY TLC
ARO % = PERCENT AROMATICS IN EXTRACT BY TLC
RASP % = PERCENT RESINS AND ASPHALTENES IN EXTRACT BY TLC
HC/TE % = HYDROCARBONS AS A PERCENT OF EXTRACT BY TLC

D.C.

C15+ HYDROCARBON DATA SHEET

SINCLAIR FEDERAL-1 DONA ANA CO., NM

SAMPLE NUMBER	DEPTH FT	ORGC %	TE PPM	EPOC %	HC PPM	HC/OC %	SAT %	ARO %	RASP %	HC/TE %
1287 90 1	3000	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 2	3140	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 3	3460	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 4	3770	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 5	3950	.11	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 6	4160	.29	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 7	4610	.15	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 8	5410	.08	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 9	5650	.12	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00
1287 90 10	6360	.07	0.	0.00	0.	0.00	0.00	0.00	0.00	0.00

ORGC % = PERCENT ORGANIC CARBON
TE PPM = PPM OF EXTRACT IN ROCK
EPOC = EXTRACT AS A PERCENT OF ORGANIC CARBON
HC PPM = PPM OF HYDROCARBONS IN ROCK BY TLC
HC/OC % = HYDROCARBONS AS A PERCENT OF ORGANIC CARBON
SAT % = PERCENT SATURATES IN EXTRACT BY TLC
ARO % = PERCENT AROMATICS IN EXTRACT BY TLC
RASP % = PERCENT RESINS AND ASPHALTENES IN EXTRACT BY TLC
HC/TE % = HYDROCARBONS AS A PERCENT OF EXTRACT BY TLC

WELL NAME AND LOCATION		TYPE ORGANIC MATTER								MATURATION																STATE OF ORGANIC MATTER				MATURATION	
Shell Santa Fe #1										INDEX																Particle Size				Preservation	INDICATOR
Lab Book No.	Field No. or Depth (F-M)	Non Recognizable Debris	Amorphous - Sapropel	Herbaceous	Woody - Structured Debris	Opaque (± Coaly)	Inertinite	Vitrinite	Pyrobitumen	1	2	3	1+	2-	2	2+	3-	3	3+	4 to 5	Dark Brown	Black	Transparent	Predominant Index	Confidence Factor	Fine	Medium	Coarse	Excellent	Good	Fair	Poor	Spore Pollen	Cuticle	Fluorescence	Vitrinite Reflectance	Remarks
1287-88-1	4010 - 4020	60	10	10	20				P		✓									✓	?	?		✓				✓	✓		?	S				resinite ?
4	6500 - 20	60	10	10	20				P					?						✓	?	?	✓	✓				✓	✓	?		S				acritarchs | yellow-brn
5	6700-6730	60	20	11	10				P						?					✓	?	?	✓	✓				✓	✓	?		W	.55 .93			} TWO, populations "
6	6790 - 6800	70	10	10	10				P						?					✓	?	?	✓	✓					✓	?		W				
16	10,700 - 10740	30	20	10	40				P								✓	✓		✓	?	?		✓					✓	?		?				

Analyzed by: A W Date: 4-23-82

WELL NAME AND LOCATION		TYPE ORGANIC MATTER								MATURATION																		STATE OF ORGANIC MATTER			MATURATION	
Conoco St Louis #1										INDEX																		Particle Size		Preservation	INDICATOR	
Lab Book No.	Field No. or Depth (F-M)	Non Recognizable Debris	Amorphous - Sapropel	Herbaceous	Woody - Structured Debris	Opaque (± Coaly)	Inertinite	Vitrinite	Pyrobitumen	Confidence Factor	Greenish Light Yellow	Yellow	Yellow - Orange	Orange Brown	Light Brown	Brown	Dark Brown	Black	Transparent	Predominant Index	Confidence Factor	Fine	Medium	Coarse	Excellent	Good	Fair	Poor	Spore Pollen	Cuticle	Fluorescence	Vitrinite Reflectance	Remarks
						1	2	3		1+	2-	2	2+	3-	3	3+	4 to 5															
1287-91-1	1500-1550	20	20	30	30				r					✓				3-	r		✓				✓			✓		N		
2	3370-3400	20	30	30	20				p						✓	✓		3+	?		✓					✓		?		N		
3	4830-4360	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lost Slide
4	5310-5310	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	" "

Analyzed by: KW Date: 4-28-82

WELL NAME AND LOCATION: Shell #1 Laguna Wilson

Lab Book No.	Field No. or Depth (F-M)	TYPE ORGANIC MATTER: Non Recognizable Debris	Amorphous - Sapropel	Herbaceous	Woody - Structured Debris	Opaque (≡ Coaly)	Inertinite	Vitrinite	Pyrobitumen	Confidence Factor	TYPE ORGANIC MATTER INDEX: Greenish Light Yellow	Yellow	Yellow - Orange	Orange Brown	Light Brown	Brown	Dark Brown	Black	Transparent	Predominant Index	Confidence Factor	STATE OF ORGANIC MATTER: Particle Size: Fine	Medium	Coarse	Preservation: Excellent	Good	Fair	Poor	MATURATION INDICATOR: Spore Pollen	Cuticle	Fluorescence	Vitrinite Reflectance	Remarks
1287-85-4	3420-80	50	20	10	10				P			✓	✓	✓				✓	2+	?	✓	✓				✓		?		S	.53		yel fl n. / Reworked Kerogen
21	8450-8500	10	20	40	30						?			✓	✓				3	F		✓		?		✓		✓	N	1.4		Probably more mature - 1.10 - 1.80 wide distribution
23	8870-90	40	30	20	10									✓	✓				3	F	✓	✓				✓		✓	N				
24	8950-8960	40	30	20	10								✓	✓					3	F	✓					✓	✓	✓	N				
26	9450-90	40	20	20	20									✓					3	F	✓	✓				✓	✓	✓	N				
27	9750-90	20	20	30	30									✓	✓				3	P	✓	✓				✓		✓	N	.63			wide distribution, 2 as pop overlap 1.80
28	9850-90	10	20	30	40									✓	✓				3+	F		✓			✓	✓	✓		N				
29	10510-60	10	20	40	30									✓	✓				3	P		✓				✓		✓	N				
30	10,630-70	20	30	20	30				↓					✓	✓				3	F		✓				✓		✓	N				
31	10,870-900	10	20	30	40				P					✓	✓				?	?		✓				✓		?	N				

Analyzed by: K W Date: 4-21-82

WELL NAME AND LOCATION: Sun Victoria #1

Lab Book No.	Field No. or Depth (F-M)	TYPE ORGANIC MATTER: Non Recognizable Debris	Amorphous - Sapropel	Herbaceous	Woody - Structured Debris	Opaque (≡ Coaly)	Inertinite	Vitrinite	Pyrobitumen	Confidence Factor	MATURATION INDEX: Greenish Light Yellow	Yellow	Yellow - Orange	Orange Brown	Light Brown	Brown	Dark Brown	4 to 5 Black	Transparent	Predominant Index	Confidence Factor	STATE OF ORGANIC MATTER: Particle Size: Fine	Medium	Coarse	Preservation: Excellent	Good	Fair	Poor	INDICATOR: Spore Pollen	Cuticle	Fluorescence	Vitrinite Reflectance	MATURATION	Remarks
1257-86-1	880-900	40	10	20	30			F					✓			✓	?	?	✓	✓				✓			?		N					
17	5600-5620	50	20	10	20			↓					✓	✓			3+	P	✓	✓				✓			✓		N					
18	5650-5670	60	10	10	20									✓			3+	P	✓	✓				✓			✓		N					
20	5870-5900	60	10	10	20			↓						✓			3+	P	✓	✓				✓			✓		N					
21	5950-5970	60	20		20			F						✓	✓		4-	P	✓	✓				✓			?		N					ivc material

Analyzed by: RW Date: 4-21-82

WELL NAME AND LOCATION		TYPE ORGANIC MATTER								MATURATION																STATE OF ORGANIC MATTER				MATURATION	
Seaway M. Greenhorn A										INDEX																Particle Size				Preservation	INDICATOR
Lab Book No.	Field No. or Depth (F-M)	Non Recognizable Debris	Amorphous - Sapropel	Herbaceous	Woody - Structured Debris	Opaque (≡ Coaly)	1	2	3	Inertinite	Vitrinite	Pyrobitumen	Confidence Factor	Greenish Light Yellow	Yellow	Yellow - Orange	Orange Brown	Light Brown	Brown	Dark Brown	4 to 5 Black	Transparent	Predominant Index	Confidence Factor	Fine	Medium	Coarse	Excellent	Good	Fair	Poor	Spore Pollen	Cuticle	Fluorescence	Vitrinite Reflectance	Remarks
1289-87-2	2330-50	10	30	50	10				F						✓					3	F		✓				✓		✓		N			
4	2850-70	50	10	20	20				F						✓					3+	P	✓	✓					✓		✓	N			
5	3410-30																																		
6	3690-3710	70	5	5	20				F						✓					3+	?	✓						✓		?	N			
7	4040-4050	50	10	20	20										✓					3+	?	✓	✓					✓		✓	N			
12	7050-7080	80	5	5	10										✓	✓				4-	P	✓						✓	?		N	2.27		Cooked
14	8830-50	70	10		20											✓				4-	P	✓						✓	?		N			
15	8950-70	90	10		20				V							✓				4-	P	✓						✓	?		N			
16	9020-30	60	10	10	20				F						✓	✓				4-	P	✓						✓	?		N			resinite ?

Analyzed by: RW Date: 4-22-82

WELL NAME AND LOCATION		TYPE ORGANIC MATTER				MATURATION																			STATE OF ORGANIC MATTER			MATURATION	
Cities Canalitos #1						INDEX																			Particle Size			Preservation	INDICATOR
Lab Book No.	Field No. or Depth (F-M)	Non Recognizable Debris	Amorphous - Sapropel	Herbaceous	Woody - Structured Debris	Opaque (≡ Coaly)	Inertinite	Vitrinite	Pyrobitumen	Confidence Factor	Greenish Light Yellow	Yellow	Yellow - Orange	Orange Brown	Light Brown	Brown	Dark Brown	4 to 5 Black	Transparent	Predominant Index	Confidence Factor	Fine	Medium	Coarse	Excellent	Good	Fair	Poor	Spore Pollen	Cuticle	Fluorescence	Vitrinite Reflectance	Remarks
		1	2	3					1+	2-	2	2+	3-	3	3+																	
15 & 7-89-4	2120-2140	60	10	10	20								✓			✓	✓	?	?	✓					✓		✓	?	1.35	wide scatter w/ 2nd Pop.
6	2470-2500	60	10	20	10								✓	✓			✓	?	?		✓				✓		✓	N		
7	2630-2650	70	10	10	10									?			?	?	?	✓					✓		?	N		

Analyzed by: KLW Date: 4-28-89