

New Mexico Bureau of Mines and Mineral Resources
Open-file Report No. 362

Organic geochemical analyses,

Yates No. 1 One Tree Unit well, sec. 18, T18S, R16E,
Chaves County, New Mexico

Yates No. 1 Little Cuervo Unit well, sec. 20, T17S, R18E,
Chaves County, New Mexico

Yates No. 1 Dog Canyon Federal Well, sec. 15, T18S, R15E,
Otero County, New Mexico

by Mobil Exploration and Producing U.S. Inc. and Core
Laboratories

Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

January 13, 1989

Dr. Ron Broadhead
New Mexico Bureau of Mines
Socorro, New Mexico 87801

Subject: Geochemical Reports for Three
Wells in South-Central, New Mexico

Dear Ron:

Enclosed is a copy of the geochemical report run by Core Lab in Dallas for Mobil Exploration & Producing U.S. Inc., in November, 1988. The cutting samples used were those furnished by the Bureau's Sample Library in Socorro from the following three wells:

<u>Well</u>	<u>Location</u>	<u>County</u>
Yates #1 One Tree Unit	18-T18S-R16E	Chaves
Yates #1 Little Cuervo Unit	20-T17S-R18E	Chaves
Yates #1 Dog Canyon Federal	15-T18S-R15E	Otero

We deeply appreciate your generosity in allowing us to use your samples. The results from our analysis have shed much light on the source rock potential and thermal history of south-central New Mexico. As we had previously agreed to, the report should remain confidential for a period of one year before becoming public. Thanks again.

Sincerely,

Manuel Berumen Jr.

Manuel Berumen Jr.

MB:rm
Enclosure

TOTAL ORGANIC CARON & ROCK-EVAL PYROLYSIS
OF CUTTINGS SAMPLES FROM 3
NEW MEXICO WELLS

Yates #1 One Tree Unit
Yates #1 Little Cuervo Unit
Yates #1 Dog Canyon Unit

Performed for
Mobil Exploration & Producing Services, Inc.
by
The Geological Sciences Department
of Core Laboratories
November 1988

Table 1

Lithology and Total Organic Carbon (TOC)

One Tree Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
2260-2360	ctgs	70% SILTSTONE- m to dk red-brn, brn, lt to m gry, buff, mod soft to mod hd, sli plty, brtl, abdt clay, sli calc 10% SANDSTONE- wh, clr, orng, yel, tn, gry, ang to sub rndd, m to crs gr, unconsol 15% CLAYSTONE- m red-brn, orng, v soft 5% LIMESTONE- wh, buff, gry, mod soft, micrte	0.24
2480-2530	ctgs	80% DOLOMITIC LIMESTONE- m to dk gry, wh, micrte, mod hd, occ xtln, suc 10% SANDSTONE- wh, clr, orng, yel, tn, gry, ang to sub rndd, m to crs gr, unconsol 10% SILTSTONE- m red-brn, mod soft, abdt clay, fri	0.36
2530-2580	ctgs	85% DOLOMITIC LIMESTONE- m to dk gry, wh, mod hd, micrte, suc, occ xtln 10% SILTSTONE- m to dk rd-brn, m gry, mod soft to hd, britl, abdt clay 5% SANDSTONE- wh, clr, orng, yel, tn, gry, ang to sub rndd, m to crs gr, unconsol	0.40
2750-2810	ctgs	55% DOLOMITIC LIMESTONE- m to dk gry, wh, mod hd, micrte, suc 40% SILTSTONE- m to dk rd-brn, m gry, mod soft to hd, britl, abdt clay 5% CLAYSTONE- m red-brn, orng, v soft Tr- SANDSTONE	0.38
2810-2860	ctgs	80% DOLOMITIC LIMESTONE- m to dk gry, wh, mod hd, micrte, suc, occ xtln 20% SILTSTONE- m to dk rd-brn, m gry, mod soft, britl, abdt clay Tr- SANDSTONE, CLAYSTONE	0.46

Table 1

Lithology and Total Organic Carbon (TOC)

One Tree Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
2900-2960	ctgs	90% DOLOMITIC LIMESTONE- m to dk gry, wh, mod hd, micrte, sucr, occ xtln, occ slty 10% SILTSTONE- m to dk rd-brn, m gry, mod soft, britl, abdt clay Tr- CLAYSTONE	0.50
2910-2980	ctgs	70% DOLOMITIC LIMESTONE- m to dk gry, wh, mod hd, micrte, sucr, occ xtln, occ slty 30% SILTSTONE- m to dk rd-brn, m gry, mod soft, britl, abdt clay Tr- CLAYSTONE	0.48
2980-3080	ctgs	95% LIMESTONE- m to dk gry, lt gry-tn, wh, mod hd, micrte, sucr, occ xtln, occ slty 5% SILTSTONE- m to dk rd-brn, m gry, mod soft, britl, abdt clay Tr- DOLOMITE, CLAYSTONE CONTAM- fibers	0.52
3110-3150	ctgs	100% LIMESTONE- lt to dk gry, buff, wh, mod hd, micrte, sucr, occ xtln, occ slty Tr- DOLOMITE, CLAYSTONE, coal	1.53
3150-3200	ctgs	100% LIMESTONE- lt to dk gry, wh, tn, mod hd to hd, micrte, sucr, occ xtln, CONTAM- metal	0.59
3200-3270	ctgs	100% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, sucr, CONTAM- metal	0.85

Table 1

Lithology and Total Organic Carbon (TOC)

One Tree Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
3310-3400	ctgs	70% SHALE- m to dk gry, mod soft, slty, plty, sli calc 30% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, sucr, Tr- coal CONTAM- metal	1.36
3400-3440	ctgs	70% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc 30% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, sucr, Tr- coal CONTAM- metal	2.07
3440-3490	ctgs	50% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc 50% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, sucr, CONTAM- metal	1.15
3490-3580	ctgs	80% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc, rndd 20% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, sucr CONTAM- metal	0.86
3510-3600	ctgs	70% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc, rndd 30% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, sucr Tr- pyrite	0.49
3670-3740	ctgs	70% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc, rndd 30% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, sucr Tr- pyrite	0.42

Table 1

Lithology and Total Organic Carbon (TOC)

One Tree Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
3740-3780	ctgs	70% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc, rndd 30% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, sucr	0.49
3800-3850	ctgs	70% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty 30% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc, rndd CONTAM- metal	0.34
3850-3900	ctgs	90% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtlm 10% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc, rndd	0.38
3920	ctgs	90% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtlm 10% SHALE- m to dk gry, lt grn, mod soft, slty, plty, sli calc, rndd	0.69
3990-4080	ctgs	100% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtlm, abdt clay Tr- CLAYSTONE	0.60
4080-4150	ctgs	85% DOLOMITIC LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtlm, 15% SHALE- lt to m grn-gry, gry, mod hd, slty	0.89
4150-4230	ctgs	60% DOLOMITIC LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtlm, 40% SHALE- lt to m grn-gry, gry, mod hd, slty	0.66

Table 1

Lithology and Total Organic Carbon (TOC)

One Tree Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
4230-4280	ctgs	70% SHALE- lt to m grn-gry, gry, mod hd, slty 30% DOLOMITIC LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln, Tr- pyrite	0.49
4310-4370	ctgs	75% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty 25% SHALE- lt to m grn-gry, gry, mod hd, slty Tr- DOLOMITE	0.66
4370-4440	ctgs	75% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty 25% SHALE- lt to m grn-gry, gry, mod hd, slty Tr- DOLOMITE	0.84
4440-4530	ctgs	55% SHALE- lt to m grn-gry, gry, mod hd, slty 45% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln Tr- DOLOMITE	0.59
4530-4590	ctgs	75% SHALE- lt to m grn-gry, gry, mod hd, slty 25% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln Tr- DOLOMITE	0.60
4590-4640	ctgs	75% SHALE- lt to m grn-gry, gry, mod hd, slty 25% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln	0.59

Table 1

Lithology and Total Organic Carbon (TOC)

One Tree Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
4640-4700	ctgs	60% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln 40% SHALE- lt to m grn-gry, gry, mod hd, slty	0.62
4700-4760	ctgs	85% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln 15% SHALE- lt to m grn-gry, gry, mod hd, slty	0.52
4760-4800	ctgs	90% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln 10% SHALE- lt to m grn-gry, gry, mod hd, slty	0.34
4800-4830	ctgs	95% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln 5% SHALE- lt to m grn-gry, gry, mod hd, slty	0.60
4830-4910	ctgs	100% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln Tr- clay	0.88
4910-4970	ctgs	90% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln 10% SHALE- dk gry, dk brn-grn, mod hd, slty Tr- pyrite	0.54

Table 1

Lithology and Total Organic Carbon (TOC)

			One Tree Unit
Depth (ft)	Sample Type	Lithology	TOC (wt%)
5000-5060	ctgs	85% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, micrte, slty, occ xtln, abdt clay 15% SHALE- dk gry, dk brn-grn, mod hd, slty Tr- CLAYSTONE	0.60
5060-5110	ctgs	65% SHALE- dk gry, dk brn-grn, mod soft, slty, micac 35% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, xtln, slty, occ micrtc, abdt clay Tr- pyrite	0.97
5120-5180	ctgs	60% SHALE- dk gry, dk brn-grn, mod soft to mod hd, slty, occ micac 40% LIMESTONE- dk gry, lt to m gry, wh, tn, mod hd to hd, xtln, slty, occ micrtc, abdt clay	0.47
5180-5230	ctgs	80% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 20% SHALE- dk gry, mod hd, slty, occ sli calc	0.39
5230-5360	ctgs	80% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 20% SHALE- dk gry, mod hd, slty, occ sli calc CONTAM- fibers	0.54
5400-5460	ctgs	90% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 10% SHALE- dk gry, mod hd, slty, occ sli calc	0.67

Table 1

Lithology and Total Organic Carbon (TOC)

One Tree Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
5490-5560	ctgs	80% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 20% SHALE- dk gry, grn, mod hd, slty, occ sli calc Tr- pyrite	0.65
5560-5620	ctgs	75% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 25% SHALE- dk gry, grn, mod hd, slty, occ sli calc Tr- pyrite	0.51
5620-5700	ctgs	60% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 40% SHALE- dk gry, grn, mod hd, slty, occ sli calc Tr- pyrite	1.03
5700-5750	ctgs	50% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 50% SHALE- dk gry, brn, grn, mod soft to mod hd, slty, occ sli calc	0.64
5750-5840	ctgs	70% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 30% SHALE- dk gry, brn, grn, mod soft to mod hd, slty, occ sli calc Tr- pyrite	0.73
5850-5910	ctgs	75% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 25% SHALE- dk gry, brn, grn, mod soft to mod hd, slty, occ sli calc Tr- pyrite	0.51

Table 1

Lithology and Total Organic Carbon (TOC)

One Tree Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
5910-5980	ctgs	85% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 15% SHALE- dk gry, brn, grn, mod soft to mod hd, slty, occ sli calc Tr- pyrite	0.47
5980-6020	ctgs	75% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 25% SHALE- dk gry, brn, grn, mod soft to mod hd, slty, occ sli calc Tr- pyrite	0.42
6020-6090	ctgs	80% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc 20% SHALE- dk gry, brn, grn, mod soft to mod hd, slty, occ sli calc Tr- pyrite	0.41
6090-6100	ctgs	70% SHALE- dk gry, brn, grn, mod soft to mod hd, slty, occ calc 30% DOLOMITIC LIMESTONE- m to dk gry, dk brn-gry, wh, tn, mod hd to hd, sucr, xtln, slty, occ mcrtc	1.22

Table 2

Lithology and Total Organic Carbon (TOC)

Little Cuervo Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
4280-4340	ctgs	50% LIMESTONE- lt to m gry, wh, tn, dk gry, grn, sucr, slty, abdt clay, mod hd 50% SHALE- orng, brn, dk gry, soft to mod soft, abdt clay, slty, sli calc	0.24
4440-4530	ctgs	65% SHALE- m red-brn, dk gry, soft to mod soft, abdt clay, slty, sli calc 35% LIMESTONE- lt to m gry, wh, tn, dk gry, grn, sucr, slty, abdt clay, mod hd	0.16
4530-4610	ctgs	80% LIMESTONE- lt to m gry, wh, tn, dk gry, grn, sucr, slty, abdt clay, mod hd, both micrtc and xtln 20% SHALE- m red-brn, dk gry, soft to mod soft, abdt clay, slty, sli calc	0.30
4740-4810	ctgs	70% SHALE- red-brn, dk gry, soft to mod soft, abdt clay, slty, sli calc 30% LIMESTONE- lt to m gry, wh, tn, dk gry, grn, sucr, slty, mod hd, both micrtc and xtln	0.35
4880-4990	ctgs	60% SHALE- red-brn, dk gry, soft to mod soft, abdt clay, slty, sli calc 40% LIMESTONE- lt to m gry, wh, tn, dk gry, grn, sucr, slty, mod hd, both micrtc and xtln	0.21

Table 3

Lithology and Total Organic Carbon (TOC)

Dog Canyon Unit

Depth (ft)	Sample Type	Lithology	TOC (wt%)
6160-6220	ctgs	100% SHALE- m gry, mod soft, slty, plty, sli lam, v sli calc	5.16
6600-6660	ctgs	80% LIMESTONE- lt to m gry, tn, wh, clr, mod hd, occ slty, occ xtln, sucr 20% SHALE- m to dk gry, dk red-brn, mod soft, plty, slty, sli calc	0.43
6670-6720	ctgs	60% SHALE- m to dk gry, dk red-brn, mod soft, plty, slty, sli calc 40% LIMESTONE- lt to m gry, tn, wh, clr, mod hd, occ slty, occ xtln, sucr	0.57
6850-6900	ctgs	75% LIMESTONE- lt to m grybrn, tn, wh, clr, lt grn, mod hd, occ slty, occ xtln, sucr 25% SHALE- m to dk gry, dk red-brn, mod soft, plty, slty, sli calc	0.34
7000-7040	ctgs	60% SHALE- m to dk gry, dk red-brn, mod soft, plty, slty, sli calc 40% LIMESTONE- lt to m grybrn, tn, wh, clr, lt grn, mod hd, occ slty, occ xtln, sucr Tr- CLAYSTONE	0.98
7080-7120	ctgs	75% SHALE- m to dk gry, dk red-brn, mod soft, plty, slty, sli calc 25% LIMESTONE- lt to m grybrn, tn, wh, clr, mod hd, occ slty, occ xtln, sucr	0.47

Table 4

Rock-Eval Pyrolysis

Depth (ft)							One Tree Unit			
	TOC	S1	mg/g rock S2	S3	Hydrogen Index	Oxygen Index	Oil Shows	or Gas Potential	Trans Ratio	Tmax (deg C)
3110-3150	1.53	0.33	0.96	1.19	63	78	0.33	1.29	0.26	438
3310-3400	1.36	0.26	0.98	0.79	72	58	0.26	1.24	0.21	439
3400-3440	2.07	0.40	1.88	0.55	91	27	0.40	2.28	0.18	444
3440-3490	1.15	0.19	0.63	0.67	55	58	0.19	0.82	0.23	437
5620-5700	1.03	0.21	0.48	0.38	47	37	0.21	0.69	0.30	445
6090-6100	1.22	0.57	0.91	0.27	75	22	0.57	1.48	0.39	440

TOC = Total Organic Carbon
 Hydrogen Index = $(S2/TOC) \times 100$

Oxygen Index = $(S3/TOC) \times 100$
 Oil or Gas Shows = S1

Oil or Gas Potential = $S1+S2$
 Transformation Ratio = $S1/(S1+S2)$

Rock-Eval Pyrolysis

One Tree Unit

Sample TD	TOC	S1	S2	S3	Tmax	HI	OI	Trans Ratio
2980-3080	0.52	0.07	0.26	1.15	438	50	221	0.21
3110-3150	1.53	0.33	0.96	1.19	438	63	78	0.26
3200-3270	0.85	0.12	0.50	1.03	425	59	121	0.19
3310-3400	1.36	0.26	0.98	0.79	439	72	58	0.21
3400-3440	2.07	0.40	1.88	0.55	444	91	27	0.18
3440-3490	1.15	0.19	0.63	0.67	437	55	58	0.23
3920	0.69	0.11	0.28	0.55	450	41	80	0.28
4080-4150	0.89	0.13	0.31	0.43	443	35	48	0.30
4310-4370	0.66	0.26	0.26	0.34	433	35	208	0.50
4370-4440	0.84	0.14	0.30	0.62	446	36	74	0.32
4530-4590	0.60	0.08	0.12	0.24	440	20	40	0.40
4640-4700	0.62	0.05	0.07	0.24	441	11	39	0.42
4830-4910	0.88	0.15	0.34	0.57	451	39	65	0.31
5000-5060	0.60	0.09	0.15	0.59	461	25	98	0.38
5400-5460	0.67	0.08	0.14	0.44	450	21	66	0.36
5490-5560	0.65	0.10	0.18	0.55	448	28	85	0.40
5620-5700	1.03	0.21	0.48	0.38	445	47	37	0.30
5780-5840	0.73	0.11	0.22	0.67	441	30	92	0.33

Table 5

Rock-Eval Pyrolysis

Depth (ft)	Dog Canyon Unit									
	TOC	S1	mg/g rock S2	S3	Hydrogen Index	Oxygen Index	Oil Shows	or Gas Potential	Trans Ratio	Tmax (deg C)
6160-6220	5.16	1.26	7.78	0.47	151	9	1.26	9.04	0.14	448
7000-7040	0.98	0.27	0.38	1.41	39	144	0.27	0.65	0.42	433

TOC = Total Organic Carbon

Hydrogen Index = $(S2/TOC) \times 100$ Oxygen Index = $(S3/TOC) \times 100$

Oil or Gas Shows = S1

Oil or Gas Potential = $S1+S2$ Transformation Ratio = $S1/(S1+S2)$

Tmax for sample 7000-7040ft is unreliable due to a broad & indistinct S2.

TABLE 6

Mean Vitrinite Reflectance Values (Ro)

Yates #1 One Tree Unit

depth	$\overline{R_o}$	depth	$\overline{R_o}$
2850'	0.66	4760'	0.85?
3390'	0.66	5360'	0.85
3850'	0.66	5840'	1.1
4400'	0.75	6090'	1.09

Yates #1 Little Cuervo Unit

depth	$\overline{R_o}$
4440'	0.75?
4610'	0.75?
4990'	0.80

Yates #1 Dog Canyon Unit

depth	$\overline{R_o}$
6220'	0.83
6580'	1.0
6950'	1.1
7960'	1.3

M-005
(Rev. 06-80)

1 = 1-10%	6 = 51-60%
2 = 11-20%	7 = 61-70%
3 = 21-30%	8 = 71-80%
4 = 31-40%	9 = 81-90%
5 = 41-50%	10 = 91-100%

PROJECT: New Mexico
wells

ANALYST: R. Enrico

DEPTH OR NO.

REMARKS

[illegible]