New Mexico Bureau of Mines and Mineral Resources
Open File Report No. OF-327

BIOSTRATIGRAPHY AND PETROLEUM SOURCE-ROCK POTENTIAL, PHILLIPS PETROLEUM CO. NO. 1 SUNLAND PARK UNIT WELL, DOÑA ANA COUNTY, NEW MEXICO

by B.W. Bordine, E.B. Robertson,
and C.R. Young

Phillips Petroleum Company
Research and Services Division
Bartlesville, Oklahoma

February, 1986

BIOSTRATIGRAPHY AND SOURCE ROCK POTENTIAL
#1 SUNLAND PARK UNIT
DONA ANA, CO., NEW MEXICO
JOB NO. XNKH44

R&S REPORT NO. 2805A

B. W. BORDINE, MICROPALEONTOLOGY
E. B. ROBERTSON, PALYNOLOGY AND SOURCE ROCK
C. R. YOUNG, NANNOPLANKTON

PHILLIPS PETROLEUM COMPANY
RESEARCH AND SERVICES DIVISION
GEOLOGICAL RESEARCH AND SERVICES BRANCH
BARTLESVILLE, OKLAHOMA
FEBRUARY, 1986

Biostratigraphy and Source Rock Analysis of the #1 Sunland Park Unit Well, Dona Ana Co., New Mexico

EPS Report No. 2805A

INTRODUCTION

In an attempt to age-date the sediments penetrated by the #1 Sunland Park Unit well, Dona Ana Co., New Mexico, palynology, foraminifers and coccolithophores were utilized. The plant microfossils encountered are either those consisting of long-ranging taxa or they are so badly thermally altered that identification is not possible.

Microfaunal examination of samples from this well yielded Inoceramus prisms suggesting a Cretaceous age for the 18,090 to 18,200 foot interval. In addition, the presence of smooth-valved ostracods occurring together with molluscan and echinoderm fragments indicates a marginal to shallow-water depositional environment.

The occurrence of nannofossils in this well between 15,350 and 18,220 feet permits the age-dating of these deposits. Five distinct zones, ranging in age from middle Eocene to Cretaceous are recognized.

Source rock analysis reveals that there are three maturity levels present in the studied interval. A thermally mature unit, with TAI values hovering around 2+ is found between 11,050 and 12,200 feet. The deposits between 12,200 and 13,000 feet are fully mature with TAI values ranging between 3- and 4-. These latter sediments are predominantly gas-prone. Those deposits found between 13,000 and 18,220 feet are thermally overmature with TAI values between 4- and 4, and with Ro's ranging from 3.54 to 5.18. No commercial gas deposits are known to exist with Ro values above 3.2 and therefore the lower interval of this well is much too hot for the preservation of significant quantities of gas.

Micropaleontology of the #1 Sunland Park Unit Well, Dona Ana Co., New Mexico EPS Report No. 2805A

SUMMARY

The rare presence of Inoceramus prisms suggests a Cretaceous age for the 18,090 to 18,200 foot interval. The unit between 15,750 and 18,090 feet was examined only in thin section and it was barren of any age-diagnostic fossils.

DISCUSSION

The microfaunal evaluation of the subject well was based on the examination of washed residues from the interval 18,090-18,210 ft. (6 samples), and rock thin sections between 15,850-18,210 ft. (46 samples).

Washed Residue Examination:

Three major faunal elements were noted in the washed residue; the most significant being the occurrence of Inoceramus prisms between 18,090-18,190 ft. Additionally, echinoid spines, ostracods, and agglutinated foram fragments were observed.

Thin Section Examination:

The most prominent faunal components noted in the thin sections were echinoderm fragments (probably broken echinoid plates), Echinoid spines, and mollusc fragments. Inoceramus prisms were noted only in the sample taken at 18,200 ft. Rare, unidentifiable forams are sporadically distributed throughout the interval.

Conclusion:

Based on the occurrence of rare Inoceramus prisms, a Cretaceous age is suggested for the interval 18,090-18,200 ft. The remaining interval (15,750-18,090 ft.), that was examined from thin section only, did not contain age diagnostic fauna.

A marginal to shallow marine depositional environment is indicated by smooth surfaced ostracods, and supported by the molluscan-echinoderm assemblage.

B. W. Bordine

Approved: E. A. Stanley

E. A. Stanley

Nannoplankton Biostratigraphy
#1 Sunland Park Unit Well
Dona Ana Co., New Mexico
EPS Report No. 2805A

SUMMARY

Biostratigraphy:

Based on the examination of ditch samples (approximately every 200 ft.) from the 15,350 ft. to 18,220 ft. interval of the Phillips #1 Sunland Park Unit well, the following ages are established:

Depth (Ft.)	Age	Martini Zone (NP)
15,350 - 15,560	Middle Eocene	NP 16-17
15,620 - 16,650	Early-Middle Eocene	NP 13-15
16,680 - 17,360	Early Eocene	NP 10-12
17,360 - 18,200	Late Paleocene	NP 9
18,200 - 18,220	Cretaceous	

Based on nannoplankton data, the #1 Sunland Park Unit well penetrated marine sediments through the interval 15,350 ft. to 18,220 ft.

Included in this report are: range charts ordered on first and last species occurrence (Figures 1 and 2), a chart illustrating the Standard Nannoplankton Zonation (Martini, 1971) with their respective geologic ages, and a complete listing of nannoplankton taxa (Appendix).

DISCUSSION

BIOSTRATIGRAPHY

Calcareous nannoplankton (planktonic marine organisms) were found in all samples examined through the 15,350 ft.-18,200 ft. interval from the #1 Sunland Park Unit well. The preservation of the nannoliths ranges from excellent to poor, with the majority of the specimens falling in the poor to fair range. This less than optimal preservation results from calcite overgrowths, probably caused by diagenesis. The nannoplankton zonation of this well is less precise than that which is ordinarily possible because of the poor preservation.

The sediments penetrated in the specified interval were deposited under prevailing marine conditions. This conclusion is in accord with the presence of foraminifera recorded in thin-sections from this interval.

Middle Eocene NP16-17 (15,350-15,560 ft.)

The association of Sphenolithus furcatulithoides, S. obtusus, S. radians, and Zygolithus bijugatus suggests an NP 16-17 age for this interval.

Early to Middle Eocene NP 13-15 (15,620-16,650 ft.)

This section is designated NP 13-15, based upon the following assemblage: Discoaster kuepperi, Helicopontosphaera lophata, Nannotetrina cristatus, Sphenolithus furcatulithoides, S. obtusus, S. radians, Toweis occulatus, and Tribrachiatus orthostylus.

Early Eocene, NP 10-12 (16,680-17,360 ft.)

This interval is defined by an association consisting of Discoaster diastypus, D. lodoensis, D. multiradiatus, Fasciculithus tympaniformis, Sphenolithus primus, S. radians,

Tribrachiatus contortus, and T. orthostylus.

Late Paleocene NP9-8 (17,360-18,200 ft.)

The following assemblage strongly indicates a late Paleocene NP 9-8 age assignment: Discoaster falcatus, D. mediosus, D. megastypus, D. multiradiatus, Fasciculithus involutus, F. lillianae, F. tonii, F. tympaniformis, Heliolithus riedeli, H. spp., Rhombaster calcitrapa, Sphenolithus anarrhopus, and S. primus.

Cretaceous (probably Maastrichtian) (18,200-18,220 ft.)

Although Cretaceous nannoliths are recorded uphole (intermittently), they are interpreted as being reworked. The sediments penetrated in the 18,200 to 18,220 ft. interval, however, are considered to be of Cretaceous age. Even though the Cretaceous nannoliths encountered range in age from Albian to Maastrichtian, the association of Arkhangelskiella cymbaeformis, Ceratolithoides kamptneri, Lithraphidites quadratus, and Micula spp. indicates a probable Maastrichtian age for this section.

C. R. Young

Approved: E. A. Stanley

References

Martini, E., 1971: Standard Tertiary and Quaternary Calcareous Nannoplankton Zonation. Proc. 2nd Conf. Planktonic Microfossils, 2; pp. 739-786.

Perch-Nielsen, K., 1979: Calcareous Nannofossils from the Cretaceous between the North Sea and the Mediterranean. Aspekte der Kreide Europas. IUGS Series A, No. 6, pp. 223-272.

Sissingh, W., 1977: Biostratigraphy of Cretaceous Calcareous Nannoplankton. Geol. Mijnbouw, 56, pp. 37-65.

COPY OF COPIES

FIGURE 2

PHILLIPS PETROLEUM COMPANY

#1 SUNLAND PARK UNIT
DONA ANA CO., N.M., U.S.A.

DISTRIBUTION OF NANNOPLANKTON SPECIES

EPS REPORT # 2805A

INTERPRETATION BY: C.M. YOUNG
DATE: 8/85

LEGEND

- SIDEWALL CORE
- CORE
- CUTTINGS
- OUTCROP
- REWORKED
- QUESTIONABLE
- CAVINGS
- CLOSE AFFINITY
- MUD CONTAMINATE
- VERY ABUNDANT
- ABUNDANT
- COMMON
- RARE
- VERY RARE

FIGURE 2

DEPTH-FT	TOTAL SPECIES
15950-15960	28
15980-15400	2
15430-15440	11
15550-15560	11
15620-15650	13
15710-15740	14
15820-15850	8
16220-16250	13
16480-16520	4
16620-16650	2
16680-16700	16
16820-16850	9
17150-17180	21
17930-17960	8
17960-17990	15
17450-17480	10
17800-17830	8
17890-17860	11
17860-17890	25
17880-18020	7
18050-18080	16
18170-18200	22
18200-18210	15
18210-18220	16
18210-18220	16

GEOLOGIC AGE		
MIDDLE EOCENE	NP16-17	TERTIARY
E. TO M. EOCENE	NP15-15	
EARLY EOCENE	NP10-12	
LATE PALEOCENE	NP 9	
MAASTRICHTIAN	CRET	CRET

COPY OF COPIES

FIGURE 1

PHILLIPS PETROLEUM COMPANY

#1 SUNLAND PARK UNIT
DONA ANA CO., N.M., U.S.A.

DISTRIBUTION OF NANNOPLANKTON SPECIES

EPS REPORT # 2805A

INTERPRETATION BY: C.A. YOUNG
DATE: 8/85

LEGEND

- ◆ SIDEWALL CORE
- CORE
- CUTTINGS
- OUTCROP
- REWORKED
- ? QUESTIONABLE
- CAVINGS
- CLOSE AFFINITY
- MUD CONTAMINATE
- VERY ABUNDANT
- ABUNDANT
- COMMON
- RARE
- VERY RARE

FIGURE 1

No.	Species
1	ARKHANGELSKIELLA CYMBIFORMIS
2	CERATOLITHOIDES ACULEUS
3	CYCLAGELOSPHAERA REINHARDTII
4	NANNOCONUS SPP.
5	QUADRUM GARTNERI
6	TRIBRACHIATUS ORTHOSTYLUS
7	ZYGOLITHUS BIJUGATUS
8	DISCOASTER SPP.
9	RHABDOSPHAERA SPP.
10	SPHENOLITHUS SPP.
11	MICRANTHOLITHUS SPP
12	SPHENOLITHUS ANARHOPUS
13	SPHENOLITHUS OBTUSUS
14	QUADRUM GOTHICUM
15	RHABDOSPHAERA VITREA
16	BRAARUDOSPHAERA SPP.
17	DISCOASTER CRUCIFORMIS
18	SPHENOLITHUS FURCATOLITHOIDES
19	KAMPTNERIUS MAGNIFICUS
20	SPHENOLITHUS BELEMNOS
21	SPHENOLITHUS ELONGATUS
22	MICULA SPP.
23	PLAGIOCLASE (MINNED FELD.)
24	TRIQUETRORHABDULUS SPP.
25	BRAARUDOSPHAERA BIGELOWII
26	RHABDOSPHAERA MORIONUM
27	QUADRUM TRIFIDUM
28	GONGYLIS SPP.
29	SPHENOLITHUS INTERCALARIS
30	ZYGRHABLITHUS SIMPLEX
31	DISCOASTER DEFLANDREI
32	SPHENOLITHUS RADIANS
33	RHABDOSPHAERA SEMIFORMIS
34	SPHENOLITHUS MORIFORMIS
35	CALCISPHAERULIDAE
36	MARTHASTERITES FURCATUS
37	SPHENOLITHUS ORPHANKNOLLI
38	RHABDOSPHAERA INFLATA
39	CONUSPHAERA MEXICANA
40	HELICOPONTOSPHAERA LOPHATA
41	RHABDOSPHAERA RUDIS
42	SPHENOLITHUS PSEUDORADIANS
43	FASCICULITHUS SPP.
44	DISCOASTER KUEPPERI
45	SPHENOLITHUS CONSPICUUS
46	RHOMBASTER CUSPIS
47	NANNOTETRINA CRISTATUS
48	TOWEIUS EMINENS
49	LITHOSTROMATION PERDURUM
50	QUINQUERHABDUS COLOSSICUS
51	CERATOLITHOIDES ARCUATUS
52	MARTHASTERITES SIMPLEX
53	HELICOPONTOSPHAERA SPP
54	BRAMLETTEIUS VARIABILIS
55	HELIOLITHUS SP.
56	CERATOLITHOIDES KAMPTNERI
57	DISCOASTER DIASTYPUS
58	TRIQUETRORHABDULUS INVERSUS
59	DISCOASTER LODOENSIS
60	FASCICULITHUS MAYI
61	EIFFELLITHUS SPP.
62	DISCOASTER MULTIRADIATUS
63	SPHENOLITHUS PRIMUS
64	CHIASMOLITHUS SPECIES
65	SPHENOLITHUS DELPHIX
66	TRIBRACHIATUS CONTORTUS
67	FASCICULITHUS TYMPANIFORMIS
68	BIANTHOLITHUS SPARSUS
69	LITHOSTROMATION OPEROSUM
70	DISCOASTER FALCATUS
71	DISCOASTER MEGASTYPUS
72	RHOMBASTER CALCITRAPA
73	FASCICULITHUS LILLIANAE
74	FASCICULITHUS TONII
75	LITHRAPHIDITES ACUTUM
76	COCCOLITHUS GAMMATION
77	THORACOSPHAERA SPECIES
78	SYRACOSPHAERA SPP. PLATLETS
79	COCCOLITHUS MIOPELAGICUS
80	PHANULITHUS OVALIS
81	THORACOSPHAERA OPERCULATA
82	FASCICULITHUS INVOLUTUS
83	FASCICULITHUS MAGNUS
84	BONETOCARDIELLA CF. CONOIDEA
85	DISCOASTER MEDIOSUS
86	HELIOLITHUS RIEDELI
87	SCAMPENELLA SPECIES
88	RHOMBASTER BITRIFIDA
89	CALCICALATHINA ALTA
90	CERATOLITHOIDES HANAI
91	LITHASTRINUS GRILLII
92	PHANULITHUS ADDITUS
93	PREDISCOSPHAERA CRETACEA
94	QUADRUM NITIDUM
95	RUCINOLITHUS MAYII
96	ZYGOLITHUS DIPLOGRAMMUS
97	BRAARUDOSPHAERA AFRICANA
98	LITHRAPHIDITES QUADRATUS

Sample	DEPTH-FT	TOTAL SPECIES	GEOLOGIC AGE	Zone	
▲	15950-15960	21	MIDDLE EOCENE	NP16-17	TERTIARY
▲	15990-15400	2	MIDDLE EOCENE	NP16-17	TERTIARY
▲	15430-15440	11	MIDDLE EOCENE	NP16-17	TERTIARY
▲	15530-15560	11	MIDDLE EOCENE	NP16-17	TERTIARY
▲	15620-15650	15	E. TO M. EOCENE	NP13-15	TERTIARY
▲	15710-15740	14	E. TO M. EOCENE	NP13-15	TERTIARY
▲	15820-15850	6	E. TO M. EOCENE	NP13-15	TERTIARY
▲	16220-16250	15	E. TO M. EOCENE	NP13-15	TERTIARY
▲	16480-16520	4	E. TO M. EOCENE	NP13-15	TERTIARY
▲	16620-16650	2	E. TO M. EOCENE	NP13-15	TERTIARY
▲	16680-16700	16	EARLY EOCENE	NP10-12	TERTIARY
▲	16820-16850	6	EARLY EOCENE	NP10-12	TERTIARY
▲	17150-17180	21	EARLY EOCENE	NP10-12	TERTIARY
▲	17330-17360	6	EARLY EOCENE	NP10-12	TERTIARY
▲	17360-17380	15	LATE PALEOCENE	NP 9	TERTIARY
▲	17450-17480	10	LATE PALEOCENE	NP 9	TERTIARY
▲	17600-17630	8	LATE PALEOCENE	NP 9	TERTIARY
▲	17830-17860	11	LATE PALEOCENE	NP 9	TERTIARY
▲	17860-17880	23	LATE PALEOCENE	NP 9	TERTIARY
▲	17880-18020	7	LATE PALEOCENE	NP 9	TERTIARY
▲	18050-18080	14	LATE PALEOCENE	NP 9	TERTIARY
▲	18170-18200	22	LATE PALEOCENE	NP 9	TERTIARY
▲	18200-18210	15	MAASTRICHTIAN	[illegible]	[illegible]
▲	18210-18220	19	MAASTRICHTIAN	[illegible]	[illegible]
◆	18210-18220	16	MAASTRICHTIAN	[illegible]	[illegible]

AGE	ZONE		SUBZONE		Martini (1971) Zone
Quaternary	CN15	*Emiliania huxleyi*			NN21
	CN14	*Gephyrocapsa oceanica*	CN14b	*Ceratolithus cristatus*	NN20
			CN14a	*Emiliania ovata*	NN19
	CN13	*Crenalithus doronicoides*	CN13b	*Gephyrocapsa caribbeanica*	
			CN13a	*Emiliania annula*	
Pliocene	CN12	*Discoaster brouweri*	CN12d	*Calcidiscus macintyrei*	NN18
			CN12c	*Discoaster pentaradiatus*	NN17
			CN12b	*Discoaster surculus*	NN16
			CN12a	*Discoaster tamalis*	
	CN11	*Reticulofenestra pseudoumbilica*	CN11b	*Discoaster asymmetricus*	NN15
			CN11a	*Sphenolithus neoabies*	
	CN10	*Amaurolithus tricorniculatus*	CN10d	*Amaurolithus delicatus*	NN14
			CN10c	*Ceratolithus rugosus*	NN13
			CN10b	*Ceratolithus acutus*	NN12
			CN10a	*Triquetrorhabdulus rugosus*	
Miocene	CN9	*Discoaster quinqueramus*	CN9b	*Amaurolithus primus*	NN11
			CN9a	*Discoaster berggrenii*	
	CN8	*Discoaster neohamatus*	CN8b	*Discoaster neorectus*	NN10
			CN8a	*Discoaster belus*	
	CN7	*Discoaster hamatus*	CN7b	*Catinaster calyculus*	NN9
			CN7a	*Helicosphaera carteri*	
	CN6	*Catinaster coalitus*			NN8
	CN5	*Discoaster exilis*	CN5b	*Discoaster kugleri*	NN7
			CN5a	*Coccolithus miopelagicus*	NN6
	CN4	*Sphenolithus heteromorphus*			NN2/NN5
	CN3	*Helicosphaera ampliaperta*			
	CN2	*Sphenolithus belemnos*			
	CN1	*Triquetrorhabdulus carinatus*	CN1c	*Discoaster druggii*	
			CN1b	*Discoaster deflandrei*	NP25/NN1
			CN1a	*Cyclicargolithus abisectus*	
Oligocene	CP19	*Sphenolithus ciperoensis*	CP19b	*Dictyococcites bisectus*	
			CP19a	*Cyclicargolithus floridanus*	NP24
	CP18	*Sphenolithus distentus*			NP23
	CP17	*Sphenolithus predistentus*			
	CP16	*Helicosphaera reticulata*	CP16c	*Reticulofenestra hillae*	NP22
			CP16b	*Coccolithus formosus*	NP21
			CP16a	*Coccolithus subdistichus*	
Eocene	CP15	*Discoaster barbadiensis*	CP15b	*Isthmolithus recurvus*	NP19/NP20
			CP15a	*Chiasmolithus oamaruensis*	NP18
	CP14	*Reticulofenestra umbilica*	CP14b	*Discoaster saipanensis*	NP17
			CP14a	*Discoaster bifax*	
	CP13	*Nannotetrina quadrata*	CP13c	*Coccolithus staurion*	NP15/NP16
			CP13b	*Chiasmolithus gigas*	
			CP13a	*Discoaster strictus*	
	CP12	*Discoaster sublodoensis*	CP12b	*Rhabdosphaera inflata*	NP14
			CP12a	*Discoasteroides kuepperi*	
	CP11	*Discoaster lodoensis*			NP12/NP13
	CP10	*Tribrachiatus orthostylus*			
	CP9	*Discoaster diastypus*	CP9b	*Discoaster binodosus*	NP11
			CP9a	*Tribrachiatus contortus*	NP10
Paleocene	CP8	*Discoaster multiradiatus*	CP8b	*Campylosphaera eodela*	NP9
			CP8a	*Chiasmolithus bidens*	
	CP7	*Discoaster nobilis*			NP7/NP8
	CP6	*Discoaster mohleri*			
	CP5	*Heliolithus kleinpellii*			NP6
	CP4	*Fasciculithus tympaniformis*			NP5
	CP3	*Ellipsolithus macellus*			NP4
	CP2	*Chiasmolithus danicus*			NP3
	CP1	*Zygodiscus sigmoides*	CP1b	*Cruciplacolithus tenuis*	NP2
			CP1a	*Cruciplacolithus primus*	NP1

FIGURE 3

APPENDIX B

15350.-15360.
ARKHANGELSKIELLA CYMBIFORMIS(1), BRAARUDOSPHAERA SPP.(1),
CERATOLITHOIDES ACULEUS(1), CYCLAGELOSPHAERA REINHARDTII(1),
DISCOASTER CRUCIFORMIS(1), D. SPP.(1),
KAMPTNERIUS MAGNIFICUS(1), MICRANTHOLITHUS SPP(1),
NANNOCONUS SPP.(1), QUADRUM GARTNERI(1),
Q. GOTHICUM(1), RHABDOSPHAERA SPP.(3),
R. VITREA(1), SPHENOLITHUS ANAHROPUS(1),
S. BELEMNOS(1), S. ELONGATUS(1),
S. FURCATULITHOIDES(1), S. OBTUSUS(1),
S. SPP.(4), TRIBRACHIATUS ORTHOSTYLUS(1),
ZYGOLITHUS BIJUGATUS(3),

15390.-15400.
RHABDOSPHAERA SPP.(1), SPHENOLITHUS SPP.(1),

15430.-15440.
BRAARUDOSPHAERA BIGELOWII(1), GONGYLIS SPP.(1),
MICULA SPP.(1), PLAGIOCLASE (TWINNED FELD.)(1),
QUADRUM TRIFIDUM(1), RHABDOSPHAERA MORIONUM(1),
SPHENOLITHUS INTERCALARIS(1), S. OBTUSUS(1),
S. SPP.(1), TRIQUETRORHABDULUS SPP.(1),
ZYGRHABLITHUS SIMPLEX(1),

15530.-15560.
DISCOASTER DEFLANDREI(1), D. SPP.(1), NANNOCONUS SPP.(1),
RHABDOSPHAERA MORIONUM(1), R. SEMIFORMIS(1),
SPHENOLITHUS MORIFORMIS(1), S. OBTUSUS(1),
S. RADIANS(1), S. SPP.(1), TRIBRACHIATUS ORTHOSTYLUS(2),
TRIQUETRORHABDULUS SPP.(1),

15620.-15650.
CALCISPHAERULIDAE(1), CERATOLITHOIDES ACULEUS(1),
CONUSPHAERA MEXICANA(1), HELICOPONTOSPHAERA LOPHATA(1),
MARTHASTERITES FURCATUS(1), PLAGIOCLASE (TWINNED FELD.)(1),
QUADRUM GARTNERI(1), RHABDOSPHAERA INFLATA(1),
R. MORIONUM(1), R. RUDIS(1), SPHENOLITHUS OBTUSUS(2),
S. ORPHANKNOLLI(2), S. PSEUDORADIANS(1),
S. SPP.(2), TRIBRACHIATUS ORTHOSTYLUS(4),

15710.-15740.
CERATOLITHOIDES ACULEUS(1), DISCOASTER DEFLANDREI(1),
D. KUEPPERI(1), FASCICULITHUS SPP.(1), GONGYLIS SPP.(1),
MICRANTHOLITHUS SPP(1), NANNOTETRINA CRISTATUS(1),
RHOMBASTER CUSPIS(1), SPHENOLITHUS CONSPICUUS(1),
S. RADIANS(1), S. SPP.(1), TOWESIS EMINENS(1),
TRIBRACHIATUS ORTHOSTYLUS(1), ZYGOLITHUS BIJUGATUS(1),

15920.-15950.
BRAARUDOSPHAERA BIGELOWII(1), FASCICULITHUS SPP.(1),
LITHOSTROMATION PERDURUM(1), PLAGIOCLASE (TWINNED FELD.)(1),
QUINQUERHABDUS COLOSSICUS(1),
SPHENOLITHUS FURCATULITHOIDES(1), S. SPP.(1),
TRIBRACHIATUS ORTHOSTYLUS(1),

16220.-16250.
CALCISPHAERULIDAE(1), CERATOLITHOIDES ACULEUS(1),
C. ARCUATUS(1), HELICOPONTOSPHAERA SPP(1),
MARTHASTERITES SIMPLEX(1), QUADRUM GOTHICUM(1),
RHABDOSPHAERA SPP.(1), RHOMBASTER CUSPIS(1),
SPHENOLITHUS OBTUSUS(1), S. ORPHANKNOLLI(1),
S. RADIANS(2), TRIBRACHIATUS ORTHOSTYLUS(1),
ZYGOLITHUS BIJUGATUS(1),

16490.-16520.
BRAMLETTEIUS VARIABILIS(1), SPHENOLITHUS MORIFORMIS(1),
S. SPP.(1), ZYGOLITHUS BIJUGATUS(1),

16620.-16650.
HELIOLITHUS SP.(1), ZYGOLITHUS BIJUGATUS(1),

16680.-16700.
BRAARUDOSPHAERA BIGELOWII(1), CALCISPHAERULIDAE(1),
CERATOLITHOIDES ARCUATUS(2), C. KAMPTNERI(1),
DISCOASTER DIASTYPUS(2), D. LODOENSIS(1),
FASCICULITHUS HAYI(1), F. SPP.(1), MICRANTHOLITHUS SPP(1),
QUADRUM GOTHICUM(1), Q. TRIFIDUM(1), RHABDOSPHAERA SPP.(1),
SPHENOLITHUS FURCATULITHOIDES(1),
S. ORPHANKNOLLI(1), S. RADIANS(2), S. SPP.(1),
TRIBRACHIATUS ORTHOSTYLUS(2),
TRIQUETRORHABDULUS INVERSUS(1),

16820.-16850.
CERATOLITHOIDES KAMPTNERI(2), EIFFELLITHUS SPP.(1),
QUADRUM GOTHICUM(2), RHABDOSPHAERA INFLATA(2),
R. MORIONUM(2), R. VITREA(1), SPHENOLITHUS SPP.(2),
TRIBRACHIATUS ORTHOSTYLUS(3), ZYGOLITHUS BIJUGATUS(1),

17150.-17180.
ARKHANGELSKIELLA CYMBIFORMIS(1), CERATOLITHOIDES ACULEUS(1),
CHIASMOLITHUS SPECIES(1), DISCOASTER CRUCIFORMIS(1),
D. DIASTYPUS(2), D. MULTIRADIATUS(1),
PLAGIOCLASE (TWINNED FELD.)(1), QUADRUM GOTHICUM(1),
RHABDOSPHAERA INFLATA(2), R. MORIONUM(1),
R. SEMIFORMIS(2), SPHENOLITHUS ANAHROPUS(1),
S. CONSPICUUS(1), S. DELPHIX(1), S. PRIMUS(2),

S. RADIANS(1), S. SPP.(1), TRIBRACHIATUS CONTORTUS(1),
T. ORTHOSTYLUS(3), TRIQUETRORHABDULUS INVERSUS(2),
ZYGOLITHUS BIJUGATUS(6),

17330.-17360.
BIANTHOLITHUS SPARSUS(1), DISCOASTER DIASTYPUS(1),
FASCICULITHUS TYMPANIFORMIS(3), LITHOSTROMATION OPEROSUM(1),
RHABDOSPHAERA MORIONUM(1), SPHENOLITHUS ANAHROPUS(1),
S. PRIMUS(1), S. SPP.(1), TRIBRACHIATUS ORTHOSTYLUS(3),

17360.-17390.
BRAARUDOSPHAERA SPP.(1), CERATOLITHOIDES ACULEUS(1),
DISCOASTER DEFLANDREI(1), D. FALCATUS(1),
D. KUEPPERI(1), D. MEGASTYPUS(1), FASCICULITHUS SPP.(2),
F. TYMPANIFORMIS(2), NANNOCONUS SPP.(1),
RHABDOSPHAERA SPP.(2), RHOMBASTER CALCITRAPA(3),
SPHENOLITHUS ANAHROPUS(3), S. SPP.(1),
TRIBRACHIATUS ORTHOSTYLUS(4), ZYGOLITHUS BIJUGATUS(1),

17450.-17480.
CERATOLITHOIDES KAMPTNERI(1), DISCOASTER MULTIRADIATUS(1),
PLAGIOCLASE (TWINNED FELD.)(1), RHABDOSPHAERA SPP.(4),
R. VITREA(1), SPHENOLITHUS CONSPICUUS(1),
S. RADIANS(1), TRIBRACHIATUS ORTHOSTYLUS(1),
TRIQUETRORHABDULUS SPP.(2), ZYGOLITHUS BIJUGATUS(2),

17600.-17630.
CALCISPHAERULIDAE(1), CERATOLITHOIDES ARCUATUS(1),
DISCOASTER MEGASTYPUS(1), FASCICULITHUS LILLIANAE(1),
F. TONII(1), SPHENOLITHUS ANAHROPUS(1),

17930.-17960.
COCCOLITHUS GAMMATION(1), DISCOASTER DEFLANDREI(1),
FASCICULITHUS SPP.(1), F. TYMPANIFORMIS(2),
LITHRAPHIDITES ACUTUM(1), SPHENOLITHUS ANAHROPUS(2),
S. CONSPICUUS(1), S. SPP.(1), TRIBRACHIATUS ORTHOSTYLUS(1),
TRIQUETRORHABDULUS SPP.(1), ZYGOLITHUS BIJUGATUS(1),

17960.-17990.
ARKHANGELSKIELLA CYMBIFORMIS(3),
BRAARUDOSPHAERA BIGELOWII(1),
BRAAURDOSPHAERA SPP. PLATLETS(1), CALCISPHAERULIDAE(6),
CERATOLITHOIDES ACULEUS(2), C. KAMPTNERI(2),
COCCOLITHUS MIOPELAGICUS(1), DISCOASTER FALCATUS(1),
D. MEGASTYPUS(1), FASCICULITHUS SPP.(3),
F. TYMPANIFORMIS(4), HELIOLITHUS SP.(2),
MARTHASTERITES FURCATUS(1), MICULA SPP.(1),
PLAGIOCLASE (TWINNED FELD.)(1), QUADRUM GOTHICUM(1),
RHABDOSPHAERA SPP.(2), SPHENOLITHUS ANAHROPUS(1),

S. CONSPICUUS(1), S. SPP.(1), THORACOSPHAERA SPECIES(3),
TRIBRACHIATUS ORTHOSTYLUS(5), ZYGOLITHUS BIJUGATUS(2),

17990.-18020.
CALCISPHAERULIDAE(2), CERATOLITHOIDES ACULEUS(1),
C. KAMPTNERI(1), SPHENOLITHUS ANAHROPUS(3),
THORACOSPHAERA SPECIES(1), TRIBRACHIATUS ORTHOSTYLUS(1),
ZYGOLITHUS BIJUGATUS(1),

18050.-18080.
ARKHANGELSKIELLA CYMBIFORMIS(2), EIFFELLITHUS SPP.(1),
FASCICULITHUS TYMPANIFORMIS(2), MARTHASTERITES FURCATUS(1),
MICRANTHOLITHUS SPP(1), PHANULITHUS OVALIS(1),
QUADRUM GARTNERI(1), SPHENOLITHUS ANAHROPUS(1),
S. OBTUSUS(1), S. PRIMUS(1), S. SPP.(1),
THORACOSPHAERA OPERCULATA(1), T. SPECIES(1),
ZYGOLITHUS BIJUGATUS(2),

18170.-18200.
BONETOCARDIELLA CF. CONOIDEA(1), CALCISPHAERULIDAE(1),
CERATOLITHOIDES KAMPTNERI(2), DISCOASTER DEFLANDREI(1),
D. FALCATUS(1), D. KUEPPERI(1), D. MEDIOSUS(1),
D. MULTIRADIATUS(2), FASCICULITHUS INVOLUTUS(1),
F. LILLIANAE(1), F. MAGNUS(1), F. SPP.(4),
F. TYMPANIFORMIS(2), HELIOLITHUS RIEDELI(1),
H. SP.(3), RHABDOSPHAERA SPP.(2), SCAMPENELLA SPECIES(1),
SPHENOLITHUS ORPHANKNOLLI(1), S. SPP.(3),
THORACOSPHAERA SPECIES(3), TRIBRACHIATUS ORTHOSTYLUS(1),
ZYGOLITHUS BIJUGATUS(4),

18200.-18210.
ARKHANGELSKIELLA CYMBIFORMIS(2), CALCISPHAERULIDAE(1),
DISCOASTER SPP.(1), FASCICULITHUS INVOLUTUS(1),
F. MAGNUS(1), F. SPP.(1), NANNOCONUS SPP.(2),
PLAGIOCLASE (TWINNED FELD.)(2), RHABDOSPHAERA SPP.(1),
RHOMBASTER BITRIFIDA(1), THORACOSPHAERA OPERCULATA(2),
T. SPECIES(5), TRIBRACHIATUS ORTHOSTYLUS(1),

18210.-18220.
ARKHANGELSKIELLA CYMBIFORMIS(1), CALCICALATINA ALTA(1),
CERATOLITHOIDES HANAI(1), C. KAMPTNERI(2),
CYCLAGELOSPHAERA REINHARDTII(1), EIFFELLITHUS SPP.(2),
LITHASTRINUS GRILLII(2), LITHRAPHIDITES ACUTUM(2),
MICULA SPP.(1), NANNOCONUS SPP.(4), PHANULITHUS ADDITUS(1),
P. OVALIS(1), PREDISCOSPHAERA CRETACEA(1),
QUADRUM NITIDUM(1), RUCINOLITHUS HAYII(1),
THORACOSPHAERA SPECIES(4), TRIBRACHIATUS ORTHOSTYLUS(1),
TRIQUETRORHABDULUS SPP.(1), ZYGOLITHUS DIPLOGRAMUS(1),

18210.-18220.

ARKHANGELSKIELLA CYMBIFORMIS(2),
BRAARUDOSPHAERA AFRICANA(1), CALCISPHAERULIDAE(2),
CERATOLITHOIDES ACULEUS(1), C. ARCUATUS(1),
LITHASTRINUS GRILLII(1), LITHRAPHIDITES ACUTUM(1),
L. QUADRATUS(1), MARTHASTERITES FURCATUS(1),
M. SIMPLEX(1), NANNOCONUS SPP.(1),
PLAGIOCLASE (TWINNED FELD.)(1), QUADRUM GARTNERI(1),
THORACOSPHAERA SPECIES(3), TRIBRACHIATUS ORTHOSTYLUS(1),
ZYGOLITHUS BIJUGATUS(2),

LEGEND:

(VA)	= VERY ABUNDANT	(RW)	= REWORKED
(A)	= ABUNDANT	(?)	= QUESTIONABLE
(C)	= COMMON	(CV)	= CAVINGS
(R)	= RARE	(CF)	= CLOSE AFFINITY
(VR)	= VERY RARE		

CHART #1
09/23/85

CORE
CUTTINGS

SUNLAND PARK UNIT #1, DONA ANA COUNTY, NEW MEXICO

SOURCE ROCK GEOCHEMICAL AND VISUAL KEROGEN DATA