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UNITED STATES DEPARTMENT OF INTERIOR  
GEOLOGICAL SURVEY

Lithologic Descriptions, Core and Cutting Samples,  
Mariano Lake-Lake Valley Drilling Project,  
McKinley County, New Mexico, Hole Number 1

by

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1981

This report is preliminary and has not been reviewed  
for conformity with USGS editorial standards and  
stratigraphic nomenclature.

## Table of Contents

	Page
Introduction.....	1
Purpose.....	1
Acknowledgements.....	1
General Drilling Plan.....	1
Drill Hole Number 1.....	4
References Cited.....	6

## Tables

Table 1. Description of cuttings samples from Mariano Lake-Lake Valley Drilling Project Hole No. 1, New Mexico.....	7
Table 2. Description of core from Mariano Lake-Lake Valley Drilling Project, Hole No. 1, New Mexico.....	12

## Illustrations

Figure 1. Location of U.S.G.S. Drill Holes, Gallup 1° x 2° Quadrangle.....	3
Figure 2. Location of U.S.G.S. Drill Hole no. 1, Mariano Lake 7 1/2' Quadrangle, T.16N., R.14W.....	5

## INTRODUCTION

In the fall of 1980, the U.S. Geological Survey contracted with Longman Drilling Company of Albuquerque, New Mexico to rotary drill and core twelve holes along a north-south line from Mariano Lake to the vicinity of Lake Valley, New Mexico. This report contains the lithologic descriptions of core and cutting samples from drill hole no. 1.

The drilling project was funded under a reimbursable interagency agreement between the U.S. Bureau of Indian Affairs (BIA) and the U.S. Geological Survey (USGS). The program was designed by representatives of the BIA, USGS, and the Minerals Department of the Navajo Tribe.

## PURPOSE

The principal objective of this project was to provide core samples and geophysical logs for petrologic, sedimentologic, geophysical, and geochemical studies of the Upper Jurassic Morrison Formation. Other objectives included the following: stratigraphic and coal studies of Upper Cretaceous rocks; hydrologic and water monitoring of well no. 2; control for a proposed seismic study of the same geographic area; and development of water wells by the Navajo Tribal Water and Sanitation Department.

## ACKNOWLEDGEMENTS

The USGS wishes to acknowledge the cooperation of Teton Exploration Drilling, Inc., and New Mexico and Arizona Land Corporation for permission to drill hole no. 1 on their mineral lease.

## GENERAL DRILLING PLAN

The locations of all twelve drill holes are shown on figure 1, which is a portion of the Gallup 1° x 2° Quadrangle. The general drilling plan called for most holes to be rotary drilled into the Upper Cretaceous Dakota Sandstone and then cored into or through the Recapture Member of the Morrison

Formation. The interval to be cored in each hole was about 600 ft.

Exceptions to the general drilling plan were as follows: Hole no. 2, rotary drilled, surface to Jurassic Entrada Sandstone; Hole no. 4A, cored 21-218 ft, to test an observed near surface I.P. anomaly; Hole no. 6, deepened after coring by rotary drilling into the Jurassic Entrada Sandstone; Hole no. 7A, cored only the Westwater Canyon Member of the Morrison Formation; Hole no. 8, abandoned in lower part of Westwater Canyon Member of the Morrison Formation; and Hole nos. 9 and 10, abandoned in Upper Cretaceous rocks.

Chip samples were collected at 10-ft or 20-ft intervals throughout each hole and sludge samples collected at 20-ft intervals throughout the cored interval.

The following suite of geophysical logs were included in the general drilling project: natural gamma, self potential, neutron-neutron porosity, resistance, resistivity, temperature, deviation, gamma-gamma density, caliper, magnetic susceptibility, gamma ray spectrometer (KUT), sonic, induced polarization, conductivity, and high-resolution 4-arm digital dipmeter.

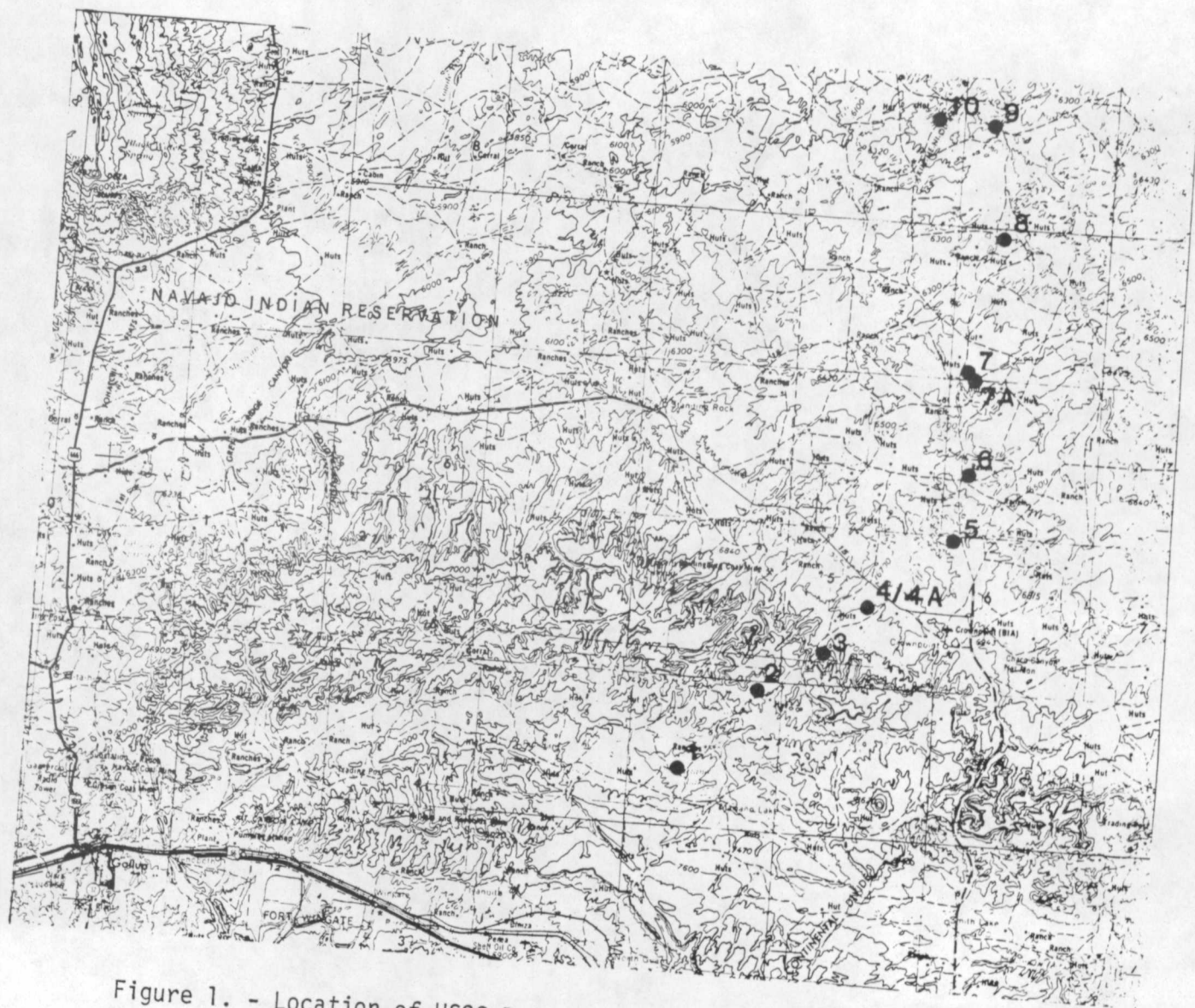


Figure 1. - Location of USGS Drill Holes, Gallup 1° x 2° Quadrangle.

DRILL HOLE NO. 1

The location of this well is shown on figure 2.

The vital statistics on this well include the following:

Spud date: October 21, 1980

Location: T. 16 N., R. 14 W., NE/4 sec. 29; Lat.  $35^{\circ}35'30''$ , Long.  $108^{\circ}22'12''$

Collar Elevation: 7238 ft (top) Mancos Shale (Cretaceous)

Core Point Top: 477 ft (depth) Dakota Sandstone (Cretaceous)

Bottom Cored Interval: 1076 ft (depth) Cow Springs Sandstone (Jurassic)

Total Depth: 1076 ft (depth) Cow Springs Sandstone (Jurassic)

Core Recovery: 70 percent

Status of well: Abandoned, October 29, 1980.

The following suite of geophysical logs were run on this hole and have been published by the U.S. Geological Survey (1981): natural gamma, self potential, neutron-neutron porosity, resistance, resistivity, deviation, gamma-gamma density, caliper, KUT, conductivity, and magnetic susceptibility.

Cutting samples from rotary drilling were collected and described on ten (10) foot intervals to the core point at 477 ft (see Table #1). Cutting samples were collected through the cored interval 477-1076 ft but were not described.

Core samples were collected in 40 ft core runs and are 3 in. in diameter. The core samples were described in the field (Table #2), taped, boxed, and shipped to the USGS Core Library in Denver where they were frozen, split, photographed, and sampled (for petrography, geochemistry, heavy-mineral-suite, clay-mineralogy, and paleomagnetic studies). A split of the core has been archived for reference and future study.

The following core and cutting sample descriptions were described in the field. The abbreviations and graphic symbols used in the core description are defined in Reynolds and others (1975).

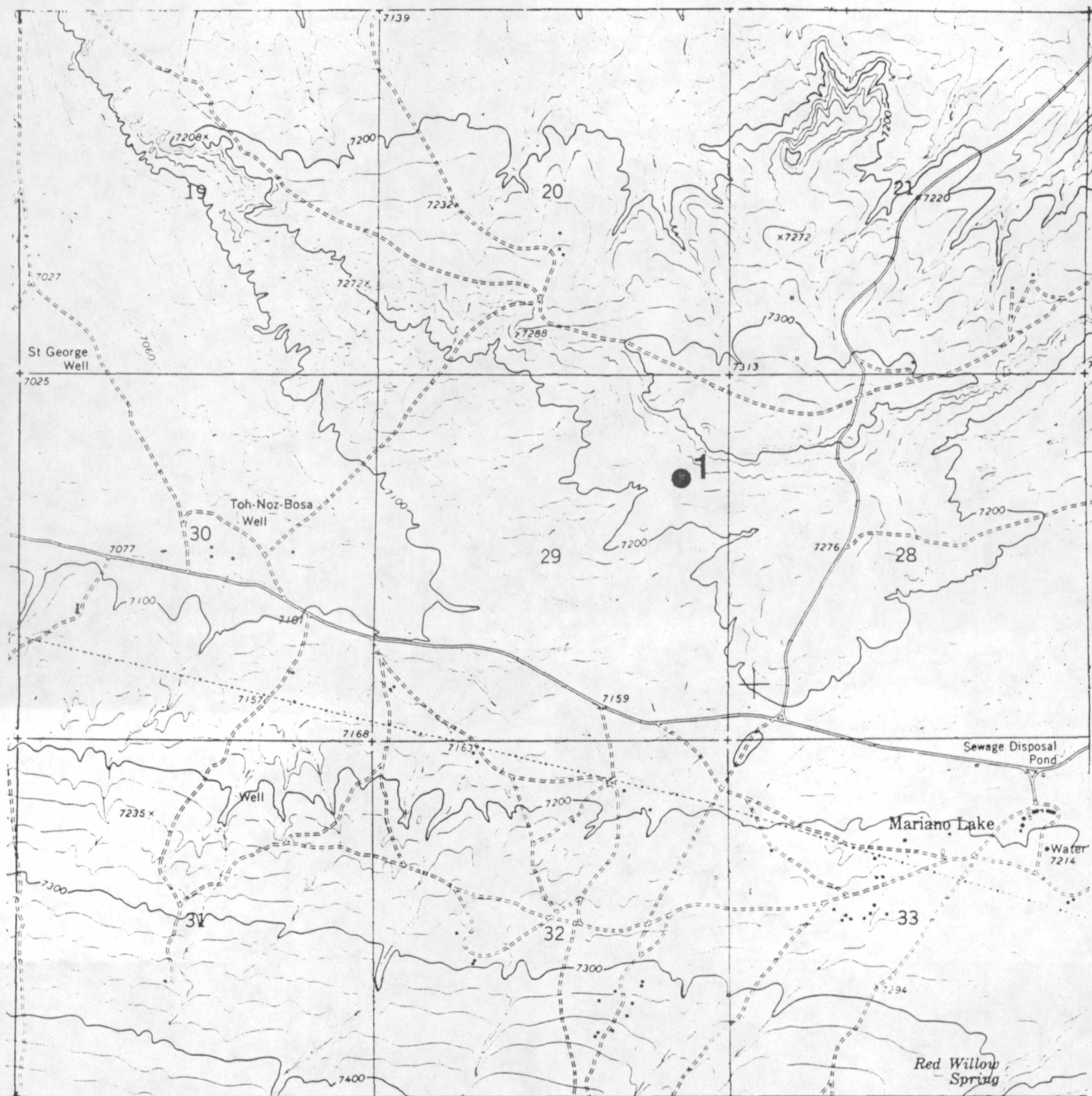


Figure 2. - Location of USGS Drill Hole 1, Mariano Lake 7 1/2' Quadrangle, T 16 N, R 14 W.

REFERENCES CITED

- Reynolds, M. W., Ahlbrandt, T. S., Fox, J. E., and Lambert, P. W., 1975,  
Description of selected drill cores from Paleozoic rocks, Lost Soldier Oil  
Field, South Central Wyoming, Part 1: U.S. Geological Survey Open-File  
Report 75-662, 34 p.
- USGS, 1981, Geophysical log suite from drill hole nos. 1 and 2, Mariano Lake-  
Lake Valley drilling project, McKinley County, New Mexico, USGS Open-File  
Report 81-172, p.

CHIP SAMPLE 106  
FORM 1

Location: \_\_\_\_\_ Sec. 29 T. 16N R. 14W Quadrangle (7.5') MARIANO LAKE  
 Hole No: S-1 State: N.M. Date: 10/21/80  
 Company: U.S.G.S County: McKinley Geologist: Kirk HAMMOND, LARSON  
 Lat/Long: 35° 35' 30" N Sheet 1 of 5  
108° 22' 12" W

Table 1. Descriptions of cuttings samples from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

Depth to base of Sample Interval	Sample Number	Core/Loss	Estimated % of Lithologies								Sandstones							Form thin / marker	COMMENTS
			Congl.	Sandst.	Siltst.	Shale	Shale Color	Coal	Limestone	Grain etc	Sorting	Roundness	Feldspar	Carbonates	Pelite	Floccs.	Sandstone Color		
10	80-S1-10	130/110				100	N2 WET N4 DRY											Km	Approximately 5 feet Quaternary alluvium Silty sandstones & sandy siltstones 10YR 5/4
20	80-S1-20	120/110				100	N4											Km	lower Magcos Shale
30	80-S1-30	120/110				100	N4											Km	
40	80-S1-40	110/110				100	N4											Km	
50	80-S1-50	110/110				100	N4											Km	
60	80-S1-60	120/110				100	N4											Km	
70	80-S1-70	110/110				100	N4											Km	
80	80-S1-80	120/110				100	N4											Km	
90	80-S1-90	110/120				100	N4											Km	
100	80-S1-100	120/110				100	N4											Km	

CHIP SAMPLE 106  
FORM 2

Location: \_\_\_\_\_ Sec. 29 T. 16N R. 14W Quadrangle (7.5') Mariano Lake  
Hole No: S-1 State: N.M. Date: 10/21/80  
Company: U.S.G.S County: McKinley Geologist: Kirk, Hammond, Larson  
Lat/Long: 35° 35' 30" N Sheet 2 of 5  
108° 22' 12" W

Table 1. Descriptions of cuttings samples from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

Lake valley Drilling Project, note no. 1, new Mexico																				
Depth to base of Sample Interval	Sample Number	Grain Size	Estimated % of Lithologies						Sandstones								Formation / member	COMMENTS		
			Congl.	Sandst.	Siltst.	Shale	Shale Color	Coal	Limestone	Grain Size	Sorting	Rounded	Feldspar	Carbonates	Pyrite	Fluores.			Sandstone Color	
110	80-SI-110	120/110						N2 WET N4 DRY											Km lower Mancos Shale	
120	80-SI-120	120/110						N-4											Km	
130	80-SI-130	120/110						N-4											Km	
140	80-SI-140	110/110						N-4											Km	
150	80-SI-150	110/110						N-4											Km	
160	80-SI-160	110/110						N-4											Km	
170	80-SI-170	110/110						N-4											Km	
180	80-SI-180	110/110						N-4											Km	
190	80-SI-190	110/110						N-4											Km	thin white bentonite (?) flakes
200	80-SI-200	120/110						N-4											Km	

CHIP SAMPLE 106  
FORM

Location: \_\_\_\_\_ Sec. 29 T. 16N R. 14W Quadrangle (7.5') Mariano Lake  
Hole No: S-1 State: N.M. Date: 10/21/80  
Company: U.S.G.S. County: McKinley Geologist: Kirk, Hammond, Larson  
Lat/Long: 35° 35' 30" N 108° 22' 12" W Sheet 3 of 5

Table 1. Descriptions of cuttings samples from Mariano Lake - Lake Valley Drilling Project, Hole No: 1, New Mexico

Lake Valley Drilling Project, Hole No: 1, New Mexico			Estimated % of Lithologies						Sandstones							Fossils / number	COMMENTS			
Depth to base of sample interval	Sample Number	Core / feet	Congl.	Sandst.	Siltst.	Shale	Shale Color	Bed	Limestone	Grain size	Sorting	Rounded	Feldspar	Carbonates	Polyh.			Access.	Sandstone Color	
210	80-S1-210	120/110				100	N2 WET N4 DRY												Km Lower Mancos Shale	
220		120/110				100	N4												Km	
230		120/110				99	N-4		1										Km/Kmg Greenhorn Ls. Member, lower Mancos Sh	begin Fine granule size ls. chips (NT)
240		125/110				95	N-4		5										Km/Kmg	fine granule size ls. chips (NT)
250		120/110				90	N-4		10										Km/Kmg	"
260		120/110				98	N-4		2										Km/Kmg True Greenhorn Ls Member	"
270		120/110				98	N-4		2										Km/Kmg True Greenhorn Ls Member	"
280		110/110		2		97	N-4		1	LF									Kmg/Kdt/Km Lower Mancos Sh True Greenhorn Ls True Mancos ls Member	minor ls chips First True fine-grained Sandstone. Top of Kdt
290	80-S1-290	115/110		65		35	N-4			LF	MW SR	0	0	0	0		5Y3/2 Olive Gy		Kdt True Mancos ls at Caprice Sh	calcareous

Table 1. Descriptions of cuttings samples from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

Lake Valley Drilling Project, Hole No. 1, New Mexico	Sample Number	Core size	Estimated % of Lithologies						Sandstones							Form. thin / marker	COMMENTS		
			Congl.	Sandst.	Siltst	Shale	Shale color	Coal	Limestone	Grain size	Sorting	Rounded	Feldspar	Carbonates	Pyrite			Alveol.	Sandstone color
300	81-51-300	110/110		90		10	N-4			UF	M	SR	O	O	O	Trace of Lt. green chert	5Y3/2 olive gy	Kdt Tongue of Dakota Ss.	slightly calcareous
310		110/110		90		10	N-4			UF	M	SR	O	O	O	"	"	Kdt	"
320		115/110		60		40	N-4			LF	MW	SR	O	O	O	"	"	Kdt	moderately calcareous light red grain
330		115/110		75		25	N-4			LF	MW	SR	O	O	O	"	"	Kdt	moderately calcareous white fragments (shell?)
340		110/110		60		40	N-4			LF	P	SR	O	O	O	black chert	"	Kdt	"
350		110/110		10		90	N-4									Gyp.		Known white water Arroyo Tongue Mancos Shale	white fragments (shell?)
360		110/110		0		100	N-4											Known	white fragments (shell?) hard shale chunks
370		115/110		10		90	N-4			uvf								Known	Large white fragments (shell?)
380		115/110		0		100	N-4											Known	sparse white fragments some large
390	81-51-390	115/110		0		100	N-4											Known	"

CHIP SAMPLE 106  
FORM 4

Location: \_\_\_\_\_ Sec. 29 T. 16N R. 14W Quadrangle (7.5') Mariano Lake  
Hole No: S-1 State: N.M. Date: 10/22/80  
Company: U.S.G.S. County: McKinley Geologist: Huffman, Larson  
Lat/Long: 35° 35' 30" N Sheet 4 of 5  
108° 22' 12" W

CHIP SAMPLE 106  
FORM

Location: \_\_\_\_\_ Sec. 29 T. 16N R. 14W Quadrangle (7.5') Mariano Lake  
Hole No: S-1 State: N.M. Date: 10/22/80  
Company: U.S.G.S. County: McKinley Geologist: Huffman, Larson  
Lat/Long: 35° 35' 30" N Sheet 5 of 5  
108° 22' 12" W

Table 1. Descriptions of cuttings samples from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

Exp. to base of sampled interval	Sample Number	Grain Size	Estimated % of Lithologies						Sandstones							Fossils / remarks	COMMENTS		
			Congl.	Sandst.	Siltst.	Shale	Shale Color	Coal	Limestone	Grain Size	Sorting	Rounded	Fid. par.	Carbonac.	Pyrite			Flintst.	Sandstone Color
400	80-S1-400	120/100		0		100	N-4											Kmw white water away from Montes Sh	white fragments
410		110/110		10		90	N-4		LF	MW	SR							Kmw	white fragments hard shale chunks
420		115/110		50		50	N-4		LF	MW	SR						5Y3/2	Kd Dakota Sandstone	white fragments bleached spots
430		115/110		50		50	N-4		LF	MW	SR			✓			"	Kd	white fragments bleached spots, black grains, carbonaceous
440		115/110		70		70	N-5		LF	MW	SR			✓			N-5 Med. gy	Kd	calcareous white fragments, black grains, carbonaceous
450		115/110		60		40	N-5		LF	MW	SR			✓			N-5	Kd	white accessory gypsum? dark carbonaceous fragments
460		115/110		80		20	N-5		LF	MW	SR			✓			N-5	Kd	"
470	80-S1-470	115/110		70		30	N-6		LF	MW	SR			✓			N-5	Kd	"

Samples were collected through cored interval to 1075' but were not described.

Table 2. Descriptions of core from Mariano Lake - Lake Valley  
Drilling Project, Hole No. 1, New Mexico

LOCATION <u>Hole # S-1 Core</u> Sec. <u>23</u> T. <u>14</u> R. <u>14</u> QUADRANGLE (75') <u>Mariano Lake</u>	
STATE <u>New Mexico</u> COUNTY <u>Lincoln</u> DATE <u>10/22/80</u>	
LAT.-LONG. <u>35°35'30"N 108°22'12"W</u> GEOL. <u>Kirk/Luffman/Hammond/Larson</u>	

THICKNESS	SAMPLE NO.	UNIT NO.	FM/MBR.	RADIOACT. CPS	Est. VISUAL POROSITY	Core ESTIMATE	ROCK TYPE	FOOTNOTES	COLOR	Dominant Grain Size	BEDDING	SEDIMENTARY STRUCTURES	BIOLOGY/ORGANICS	SORTING/ROUNDNESS	CEMENT	PERCENT FELDSPAR	ACCESSORY MINERALS OR FRAGMENTS	NOTES: (ALTERATION, ATTITUDE, CLASTS, MINERALIZATION, & MISC. INFO.)	INFERRED ENVIRONMENT OF DEPOSITION	TRANSPORT DIRECTION	(NO. OF MEASUREMENTS)
417																					
182																					
492																					
502																					
512																					
522																					
532																					
542																					

Table 2. Descriptions of core from Mariano Lake - Lake Valley  
Drilling Project, Hole No. 1, New Mexico

LOCATION S-1 Core Sec. 29 T. 10N R. 14W  
STATE New Mexico COUNTY Santa Fe  
U.S.G.S. CORE LIBRARY NUMBER API WELL NUMBER

Depth (ft)	Core Description	Grain Size	Color	Texture	Notes	Remarks
552	Thin (2-3") sandier horizon	ELL	ELL			
562	pyrite + black material thin black nodules - (pyrite) 80-51-354 P Quartz grains - black, unknown origin Washout in core barrel at this depth	ELL	ELL			
572	80-51-559 RG Clay chert, or a mixture of clay and chert 80-51-558 P CLAYEY SS, 2" BLUNT LAYER, BL. CLC.	ELL	ELL			
582	CL. CLC. THIN VENECS (CLAYEY VENECS?) RED, BLK, LT. GRAY, CH. GR.	ELL	ELL			
592	80-51-594 P FLUVIAL	ELL	ELL			
602	THIN SLTST. HORIZON	ELL	ELL			
612	80-51-608 N CLAYEY SS MOTTLED RED AND GREEN MUDST.	ELL	ELL			
622	80-51-615 P CLAYEY SS MOTTLED RED AND GREEN MUDST.	ELL	ELL			
632	80-51-615 P CLAYEY SS MOTTLED RED AND GREEN MUDST.	ELL	ELL			
642	80-51-615 P CLAYEY SS MOTTLED RED AND GREEN MUDST.	ELL	ELL			
652	80-51-615 P CLAYEY SS MOTTLED RED AND GREEN MUDST.	ELL	ELL			
662	80-51-615 P CLAYEY SS MOTTLED RED AND GREEN MUDST.	ELL	ELL			
672	80-51-615 P CLAYEY SS MOTTLED RED AND GREEN MUDST.	ELL	ELL			

LOCATION S-1 Core Sec. 29 T. 16N R. 14W  
STATE N. Mex COUNTY McKinley  
U.S.G.S. CORE LIBRARY NUMBER \_\_\_\_\_ API WELL NUMBER \_\_\_\_\_

Table 2. Descriptions of core from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

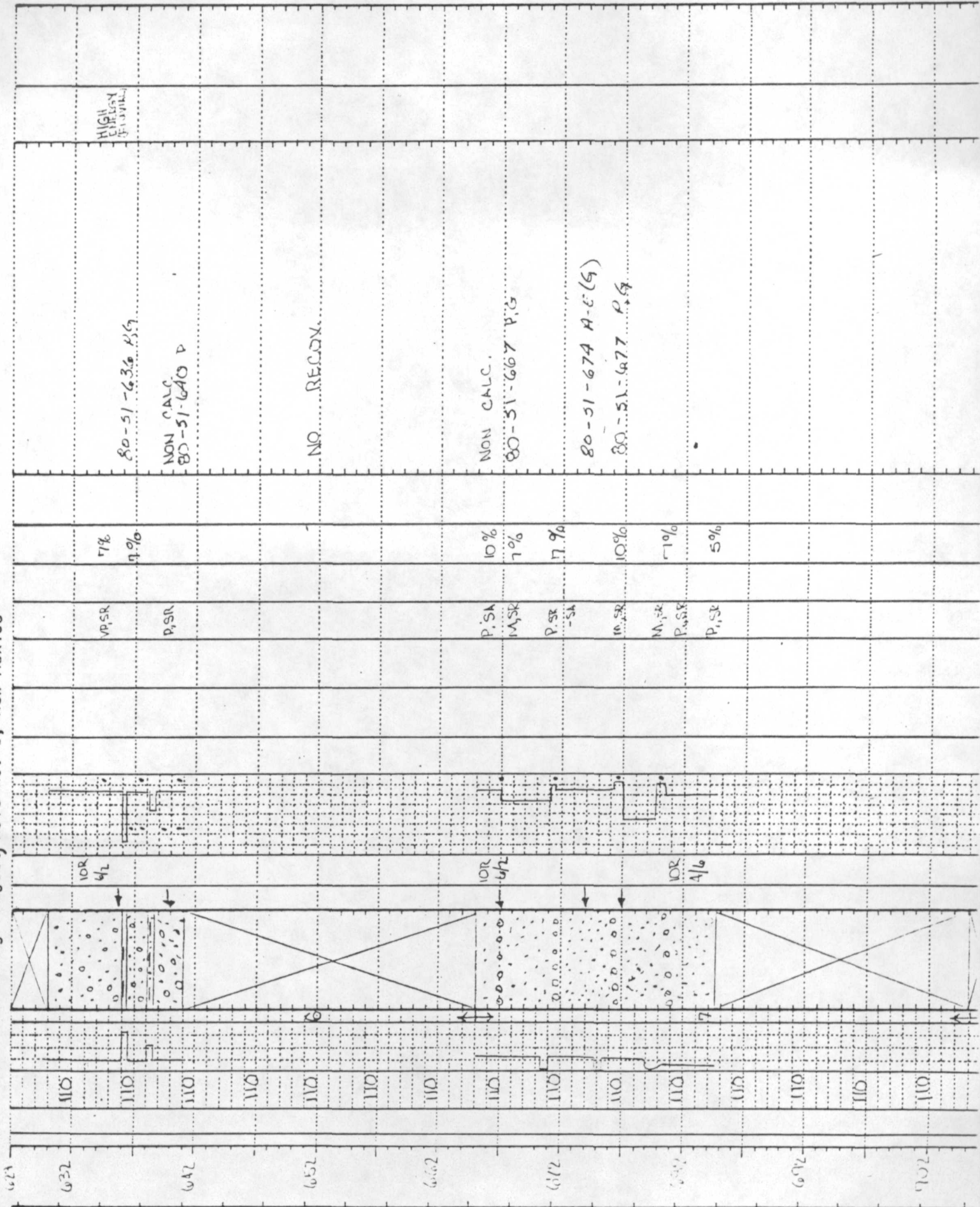


Table 2. Descriptions of core from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

LOCATION S-1 CORE HOLE Sec. 29 T. 16 N R. 14 W  
 STATE NEW MEXICO COUNTY MCKINLEY  
 U.S.G.S. CORE LIBRARY NUMBER \_\_\_\_\_ API WELL NUMBER \_\_\_\_\_

Depth (ft)	Core Description	Grain Size	Color	Texture	Notes
107					PROBABLY MISSING CORE HERE
112					
115					
118					WHITE CLAY NESTS
122					80-51-726 P.G
125					WHITE CLAY NESTS
132					80-51-731 P
135					80-51-734 P
142					80-51-738 P
145					80-51-740 G
152					MOTT GRY & REDDISH GRY
155					80-51-747 P.G
162					FRAGILE
172					
175					MUD CHIPS, DARK GRAYS, BROWN GRAY
178					CLAY GLASTS
182					VERY CLAYEY, INTERBEDDED MUD & SAND
185					FRAGILE CLAY NESTS, FILL (HARD)
188					80-51-752 P.G
192					80-51-754 P

Table 2. Descriptions of core from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

LOCATION S-1 CORE HOLE Sec. 29 T. 16 N R. 14 W  
 STATE NEW MEXICO COUNTY MCKINLEY  
 U.S.G.S. CORE LIBRARY NUMBER \_\_\_\_\_ API WELL NUMBER \_\_\_\_\_

Depth (ft)	Core Description	Grain Size	Texture	Color	Notes
816.4					
817.2					
802					CLAY CHIPS ARE RED & GRAY; SANDY MATRIX
					SANDY ZONE; CLAY CHIPS
					80-51-809 P
					80-51-810 P, S
					LITHIC FRAGMENTS
812					MOD. 30 CM THICK FINING UPWARD SEQUENCES - PURPLE AND GREEN MOTTLING, TOWARDS TOP OF SEQUENCES
					80-51-818 P
					BLACK OPAQUE WHITE CLAY NESTS
822					80-51-820 G
832					
842					CLAY NESTS & KAOLINITE?
					CLAYSTONE
					CLAYEN SS
852					MOTTLED, RED & GRAY MUD ST, MOTTLED, RED & GRAY, CLAY CLAST, X-BED?
					CLAY NESTS
					CLAY NESTS
					80-51-861 P, G
862					MOTT. RED & GRAY GRN. MUD ST
					NO CLAY BREAK

LOCATION S-1 CORE HOLE Sec. 29 T. 16 N. R. 14 W.  
 STATE NEW MEXICO COUNTY McKINLEY  
 U.S.G.S. CORE LIBRARY NUMBER API WELL NUMBER

Table 2. Descriptions of core from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

Depth (ft)	Core Description	Grain Size	Texture	Color	Notes	API Well Number
85.0	VERY CLAYEY SAND	MS/ SR	LAM e ll	7%	NON CA	
86.0	80-51-881 P	MS/ SR	LAM w ll	2-3%	NON CA	
87.0	SOAKING WET - WATER WET	MS/ SR	LAM e ll	2-3%	NON CA	
88.0	80-51-891 P	MS/ SR	LAM e ll	5-10%	SL CA	
89.0	POSSIBLE 1' OVERMEASURE ERROR	MS/ SR	LAM e ll	2-3%	NON CA	
90.0	CLAYEY SANDSTONE	MS/ SR	LAM e ll	2-3%	NON CA	
91.0	THIN CONGLOMERATE	MS/ SR	LAM e ll	2-3%	NON CA	
92.0	CLAYEY LOWER PARTS	MS/ SR	LAM e ll	2-3%	NON CA	
93.0	MOTTLED W/ DRED MUDSTONE	MS/ SR	LAM e ll	2-3%	NON CA	
94.0	80-51-918 P	MS/ SR	LAM e ll	2-3%	NON CA	
95.0	MOTTLED RED & GREEN	MS/ SR	LAM e ll	2-3%	NON CA	
96.0	MOTTLED RED & GREEN	MS/ SR	LAM e ll	2-3%	NON CA	
97.0	MOTTLED RED & GREEN	MS/ SR	LAM e ll	2-3%	NON CA	
98.0	80-51-930 P	MS/ SR	LAM e ll	2-3%	NON CA	
99.0	QUARTZ & CHERT PEbbLES	MS/ SR	LAM e ll	2-3%	NON CA	
100.0	HIGH ENERGY FLUVIAL	MS/ SR	LAM e ll	2-3%	NON CA	

Table 2. Descriptions of core from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

LOCATION S-1 Sec. 29 T. 16N R. 14W  
 STATE New Mexico COUNTY McKinley CO.  
 U.S.G.S. CORE LIBRARY NUMBER API WELL NUMBER

952	5' 8 1/2	ELL	W. SR	CA. TR	80-21-950 P	MOTTLED RED & GREEN MUDSTONE & SILTSTONE	MARS. LACUSEL
962	5' 8 1/2	LAM DWX	W. SR	CA.		MOTTLED RED & GREEN MUDSTONE	
972	5' 8 1/2	ELL	W. SR	CA.			
982	5' 8 1/2	LAM W X	W. SR	CA.			
992	5' 8 1/2	ELL	W. SR	CA.			
1002	5' 8 1/2	ELL	W. SR	CA.			
1012	5' 8 1/2	ELL	W. SR	CA.			
1022	5' 8 1/2	ELL	W. SR	CA.			

Table 2. Descriptions of core from Mariano Lake - Lake Valley Drilling Project, Hole No. 1, New Mexico

LOCATION S-1 Sec. 29 T. 16N R. 14W  
STATE New Mexico COUNTY McKinley Co.  
U.S.G.S. CORE LIBRARY NUMBER API WELL NUMBER