SUPPLEMENT NO. 1
TO THE
GEOLOGIC REPORT ON THE LOGAN NEW MEXICO AREA
LAKE MEREDITH SALINITY STUDY
TEXAS AND NEW MEXICO

Lovell Parish
January 1995

United States
Department of the Interior
Bureau of Reclamation
Great Plains Region

TABLE OF CONTENTS

PURPOSE OF THIS REPORT

The purpose of this report is to document the geologic investigations that were completed during November of 1994 near Logan, New Mexico for the Lake Meredith Salinity Study. It has been prepared as Supplement No. 1 to the report by Glenn Taucher dated August 1994 (revised January 1995) and titled "Geologic Report on the Logan, New Mexico Area, Lake Meredith Salinity Study - Texas and New Mexico." This report will not repeat the background material and geology data that is included in Taucher's report.

LOCATION

The latest investigations were completed at two sites south of the Canadian River downstream from Ute Dam. Both sites are about a mile from the city of Logan. One site is in the SW1/4 sec. 15, T. 13 N., R. 33 E. The other is in the south 1/2 sec. 14, T. 13 N., R. 33 E. Locations are shown on Drawing 1253-600-22.

INVESTIGATIONS

Four drill holes were completed during the November investigations. Three (TW 4, OW 7, and OW 8) were drilled in the bottom of the Canadian River canyon in the southern part of section 14 near previously drilled TW 2. The other hole (OW 9) is on the canyon rim above the river in the southwest part of section 15.

Drill hole TW 4 was installed with 5-Inch PVC casing and screen for use as a pump test well in the Trujillo Formation. Holes OW 7 and OW 8 were completed

with 2-inch PVC casing and screen so they could be utilized as observation wells to determine aquifer characteristics as TW 4 was being pumped.

OW 9 was drilled to measure conductivities and verify the presence of salty water in the Trujillo Formation. It was completed with 2-inch PVC casing and screen for use as an observation well.

Each hole was drilled using air as a medium for bringing cuttings to the surface. All brine wastewater was pumped to the Canadian River and diluted with fresh water released from Ute Reservoir.

Geologic logs were prepared using descriptions based on the characteristics of the cuttings. Groundwater samples were collected at approximate 5-foot intervals for conductivity measurements, and estimates of the quantity of water being produced during drilling were also made at 5-foot intervals. The conductivity measurements and water production estimates are shown on geologic logs included in the appendix. These holes were not geophysically logged.

Also included in the appendix are Figures 1 through 4, which are diagrams showing how each hole was completed; Table 1, which shows drill hole data in a tabular form; and Table 2, which is an information sheet displaying pertinent geologic and water analyses data for TW 4.

SITE GEOLOGY

Detailed descriptions of the regional geology of part of northeastern New Mexico, and the site geology of the Logan area, are presented in the January 1995 report by Taucher. Only units encountered in the four holes drilled during November 1994 will be described in this supplemental report.

Stratigraphy

Of the four holes completed during November 1994, three (OW 7 through OW 9) were bottomed in the Trujillo Formation, and the other (TW 4) was finished slightly deeper in the upper shale unit of the Tecovas Formation. Units encountered vary in age from Triassic to Quaternary. A brief description of each follows.

TECOVAS FORMATION - TRIASSIC (TRdt) - The Tecovas Formation is the oldest unit encountered during the November investigations. TW 4 penetrated 11.5 feet into the upper shales of the formation. They were soft and clayey and varied in color from blue-gray to dark red.

TRUJILLO FORMATION - TRIASSIC (TRdj) - The Trujillo Formation conformably overlies the Tecovas Formation. All four holes drilled during the recent investigation penetrated portions of the unit. Most of the material is moderately cemented sandstone varying from fine grained to conglomeritic. Thin layers of shale, claystone, and shaley sandstone are scattered throughout the formation. Color of the fresh cuttings usually varies from light to dark gray.

ALLUVIUM - QUATERNARY (Qal) - Alluvial material deposited by the Canadian River was encountered immediately above the Trujillo Formation in drill holes TW 4, OW 7, and OW 8. Composition varies from fine, clean or silty sand to clean gravel with very little sand or silt. Color varies from brown to gray.

DUNE SAND - QUATERNARY (Qe) - Fine grained, silty dune sand was logged in the upper three feet of TW 4. It is tan in color and mantles scattered areas of

the Canadian River valley floor. On the surrounding uplands, dune sand is often intermixed with colluvium and varies to red in color.

COLLUVIUM/RESIDUAL SOIL (Qac) - Material identified as undifferentiated colluvium/residual soil was encountered in the top two feet of OW 9. It is mostly fine to coarse sand with minor amounts of fine gravel and silt. Color varies from tan to gray.

Groundwater

Water levels measured in previously completed drill hole TW 2 indicated that artesian heads would likely rise above ground level in nearby drill holes completed in the Canadian River valley floor. Steel casing was grouted through the surficial materials and into the top of the underlying bedrock in order to prevent leakage should this occur. It did not happen. Water levels in the Trujillo Formation in drill holes OW 7 and OW 8, and in the combined Trujillo and upper Tecovas Formations in TW 4 stabilized at approximately the same level as the water in the alluvium and the river (about two feet below the ground surface at the drill holes).

The water level in OW 9, completed on the hillside above the valley floor, was initially measured at 58.4 feet below ground surface. This appears to be approximately the river level in the adjacent valley.

Conductivity measurements of water samples collected during drilling indicate that salt water is present in all water-bearing units in the four drill holes recently completed. Readings of alluvial water increase with depth, but average less than readings of water from the underlying bedrock units. Conductivity values indicate that the finer grained alluvial layers retard the

upward movement of saline water from the underlying bedrock. Higher conductivitys usually occur in water samples from within and below the fine sand layers.

Comparison of conductivities from holes near the south canyon wall (TW 4, and OW 7) with those from the hole near the river (OW 8) indicate little difference in the conductivities of alluvial water, but a significant decrease in bedrock water conductivities toward the river. Conductivities of bedrock water from OW 9 are the lowest of all the holes.

Little saline water was originally expected to occur in the Trujillo Formation south of the Canadian River. However, high conductivities in Trujillo water samples from drill holes OW 6c, TW 4, OW 7, and OW 8 indicated that the salty water extended farther than expected. Brines in the Trujillo can now be traced south of the Canadian River from the vicinity of Ute Dam (where it was encountered in a private housing development well) eastward to near Revuelto Creek.

Previous pump out tests were all conducted in the Tecovas Formation. A change in the initial remediation plan from Tecovas production wells to Trujillo production wells made it necessary to determine aquifer characteristics of the Trujillo Formation. Two pump out tests were conducted on TW 4 between December 5 and December 9, 1994 to determine those aquifer characteristics. The results of these tests are presented in a separate report dated January 1995 and titled "Data and Analyses of TW 4 Aquifer Pumping Tests and Water Quality Sampling near Logan, New Mexico - Lake Meredith Salinity Study - Texas and New Mexico."

APPENDIX

GEOLOGIC LOG OF DRILL HOLE NO. TW 4

FEATURE: Test Well
LOCATION: South Side Canadian River
BEGUN: 11/4/94 FINISHED: 11/12/94
DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED: 2.2 (3661.20) 11/5/94

PROJECT: Lake Meredith Salinity
COORDINATES: N 1583178.32 E 776680.01
TOTAL DEPTH: 117.0
DEPTH TO BEDROCK: 50.7

STATE: New Mexico
GROUND ELEVATION: 3663.4
ANGLE FROM HORIZONTAL: 90 AZIMUTH:
HOLE LOGGED BY: Taucher & Parish
REVIEWED BY:

NOTES

NOTES:
All measurements are from ground surface and in feet unless noted otherwise.

Logging was done by G. Taucher from 0 to 56.6 ft. and by L. Parish from 56.6 to 117.0 ft. using rockbit cuttings.

PURPOSE OF HOLE:
For use as a pump test hole to determine aquifer characteristics.

DRILL RIG:
Truck-mounted SIMCO 5000 rotary drill.

DRILLER:
Mike Kocian

DRILLING METHOD:
0.0-56.6' drilled with 9 3/4" rockbit. 56.6 to 117.0' drilled with a 5 7/8" rockbit. Air used to return cuttings.

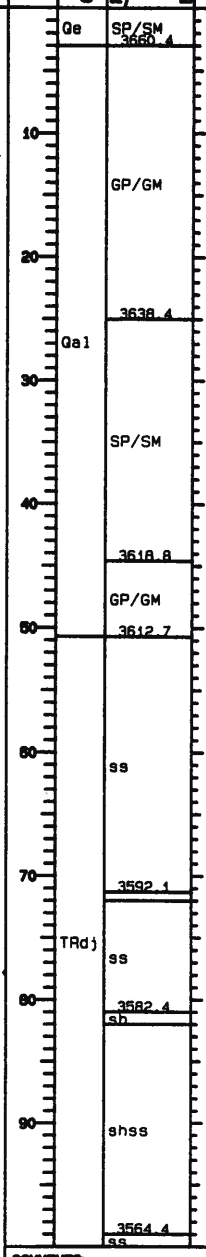
CASING RECORD:
Drove 10" steel casing to 53.1'. Tried to pull 10" casing but it broke off at weld. Left 10" casing from 1.0 to 50.0'. Set and grouted 6" steel casing from 0 to 54.0'.

HOLE COMPLETION:
Set 5" schedule 40 PVC from 44.6 to 113.4'. The screened area extends from 54.4 to 112.9'. It is 50 slot (0.050 inch) with 16 sq. inches of openings per linear foot of screen.

LOCATION:
Approximately 550' north and 2750' east of the southwest corner of Section 14, T. 13 N., R. 33 E.

CONDUCTIVITY AND ESTIMATED WATER PRODUCTION:
The conductivity of the river water on 11/12/94 was 4.7 mS/cm.

Depth	mS/cm	Estimated water production (gpm)
11.0	29.0*	--
16.0	29.6*	--
20.0	30.8*	--
24.0	33.6*	--
25.0	--	5
32.1	75.6*	--
35.0	--	1
37.1	81.6*	--
42.0	70.0*	--
47.0	72.0*	15
51.0	71.4*	--



CLASSIFICATION AND PHYSICAL CONDITION

0.0-3.0' QUATERNARY DUNE SAND (Qe):

0.0-3.0' POORLY GRADED SAND WITH SILT (SP/SM). About 90% predominantly fine sand; about 10% nonplastic fines; tan; dry to wet.

3.0-50.7' QUATERNARY ALLUVIUM (Qal):

3.0-25.0' POORLY GRADED GRAVEL WITH SILT AND SAND (GP/GM). About 50% fine to medium, flat to subrounded, hard gravel; about 40% fine to coarse sand; about 10% nonplastic fines; gray-brown; wet.

25.0-44.6' POORLY GRADED SAND WITH SILT (SP/SM). About 90% fine sand; about 10% nonplastic fines; trace of fine, hard gravel; gray-brown; wet.

44.6-50.7' POORLY GRADED GRAVEL WITH SILT AND SAND (GP/GM). About 50% fine to medium, subrounded, hard gravel; about 40% fine to coarse sand; about 10% nonplastic fines; gray-brown; wet.

50.7-105.5' TRIASSIC TRUJILLO FORMATION (TRdj):

50.7-71.3' SANDSTONE. Gray; conglomeritic; mostly fine to coarse sand with fine gravel; moderately cemented.

71.3-72.0' SHALE. Dark gray; carbonaceous; moderately hard; brittle.

72.0-81.0' SANDSTONE. Gray; conglomeritic; mostly fine to coarse sand with fine gravel; moderately cemented.

81.0-82.0' SHALE. Dark gray; moderately hard; brittle.

82.0-99.0' SHALEY SANDSTONE. Gray; conglomeritic; mostly fine to coarse sand with fine gravel; moderately cemented. Probably contains a few thin, gray shale layers.

99.0-104.0' SANDSTONE. Light gray; mostly fine sand with a trace of fine gravel; moderately cemented.

104.0-105.5' SANDSTONE. Gray; conglomeritic; mostly fine to coarse sand with fine gravel; moderately cemented.

105.5-117.0' TRIASSIC TECOVAS FORMATION (TRdt):

105.5-114.0' SHALE. Blue-gray; clayey; soft.

114.0-117.0' SHALE. Dark red; clayey; soft.

COMMENTS:

ss = sandstone
shss = shaley sandstone
sh = shale

Unconsolidated material logged according to the Unified Soil Classification System.

GEOLOGIC LOG OF DRILL HOLE NO. TW 4

FEATURE: Test Well
LOCATION: South Side Canadian River
BEGUN: 11/4/94 FINISHED: 11/12/94
DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED: 2.2 (3661.20) 1/9/95

PROJECT: Lake Meredith Salinity
COORDINATES: N 1583178.32 E 776680.01
TOTAL DEPTH: 117.0
DEPTH TO BEDROCK: 50.7

STATE: New Mexico
GROUND ELEVATION: 3663.4
ANGLE FROM HORIZONTAL: 90 AZIMUTH:
HOLE LOGGED BY: Teucher & Parish
REVIEWED BY:

NOTES

52.0	72.0*	--
56.6	69.0*	5
60.0	109.8	10
65.0	99.0	10
70.0	94.2	20
75.0	90.0	25
80.0	93.6	30
85.0	102.0	30
90.0	95.4	30
95.0	99.6	30
100.0	93.6	30
105.0	100.8	30
110.0	100.2	30
115.0	94.2	30

*Original measurement doubled because of testing method.

Temperature corrected to 25 degrees centigrade.

It should be noted that the conductivity values are based on meter readings of diluted samples. Laboratory data suggest that the values may be approximately 15% too high.

WATER LEVELS:

Depth	Date
2.3	11/13/94
2.2	1/9/95

SURVEY DATA:

Feature	Elevation
Ground surface	3663.4
Top of 10" cs.	3662.4
Top of 6" cs.	3665.6

DEPTH | GEOL UNIT SYMBL | FLD CLASS/LITH | ELEVATION

110
TRd) ss 3559.4
ss
TRdt sh 3549.4
sh 3546.4
BOTTOM OF HOLE
120

CLASSIFICATION AND PHYSICAL CONDITION

COMMENTS:

GEOLOGIC LOG OF DRILL HOLE NO. OW 7

FEATURE: Observation Well
LOCATION: South Side Canadian River
BEGUN: 11/7/94 FINISHED: 11/14/94
DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED: 1.9 (3660.60) 11/9/94

PROJECT: Lake Meredith Salinity
COORDINATES: N 1583213.69 E 776836.07
TOTAL DEPTH: 104.5
DEPTH TO BEDROCK: 50.0

STATE: New Mexico
GROUND ELEVATION: 3662.5
ANGLE FROM HORIZONTAL: 90 AZIMUTH:
HOLE LOGGED BY: Taucher & Parish
REVIEWED BY:

NOTES

NOTES:
All measurements are from ground surface and in feet unless noted otherwise.

Logging was done by G. Taucher from 0 to 55.5 ft. and by L. Parish from 55.5 to 104.5 ft. using rockbit cuttings.

PURPOSE OF HOLE:
For use as an observation well during pump tests to determine aquifer characteristics.

DRILL RIG:
Truck-mounted SIMCO 5000 rotary drill.

DRILLER:
Mike Kocian

DRILLING METHOD:
0.0-55.5' drilled with 5 7/8" rockbit. 55.5 to 104.5' drilled with a 3 7/8" rockbit. Air used to return cuttings.

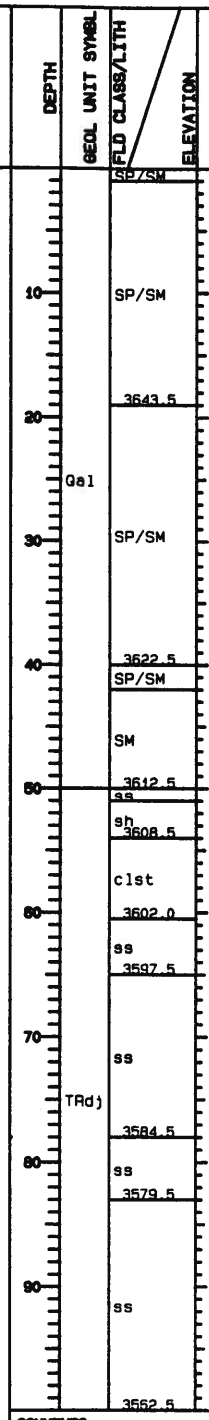
CASING RECORD:
Set and grouted 4" steel casing from 0 to 55.5'.

HOLE COMPLETION:
Set 2" schedule 40 PVC from 44.0 to 104.5'. The screened area extends from 54.0 to 104.0'. It is 20 slot (0.020 inch).

LOCATION:
Approximately 575' north and 2900' east of the southwest corner of Section 14, T. 13 N., R. 33 E.

CONDUCTIVITY AND ESTIMATED WATER PRODUCTION:
The conductivity of the river water on 11/11/94 was 4.6 mS/cm, and it was 4.8 mS/cm on 11/14/94.

Depth	mS/cm	Estimated water production (gpm)
10.0	43.6*	--
15.0	52.4*	--
18.0	--	8
21.0	64.0*	--
26.0	60.4*	--
30.0	--	5
31.0	68.4*	--
36.0	70.4*	--
41.0	65.2*	--
45.0	--	1
46.0	66.0*	--
50.0	94.8*	--
52.0	83.4*	--
55.0	--	5
60.0	100.8	5
64.7	99.6	5
70.0	100.2	10



CLASSIFICATION AND PHYSICAL CONDITION

0.0-50.0' QUATERNARY ALLUVIUM (Qal):

0.0-1.0' POORLY GRADED SAND WITH SILT (SP/SM). About 90% fine sand; about 10% nonplastic fines; tan; dry.

1.0-19.0' POORLY GRADED SAND WITH SILT AND GRAVEL (SP/SM). About 50% fine to coarse sand; about 40% fine to medium, subrounded, hard gravel; about 10% nonplastic fines; gray-brown; moist to wet.

19.0-40.0' POORLY GRADED SAND WITH SILT (SP/SM). About 90% fine sand; about 10% nonplastic fines; trace of fine, subrounded, hard gravel; light to medium gray; wet.

40.0-42.0' POORLY GRADED SAND WITH SILT AND GRAVEL (SP/SM). About 55% fine to coarse sand; about 35% fine to medium, flat to subrounded, hard gravel; about 10% nonplastic fines; gray; wet.

42.0-50.0' SILTY SAND (SM). About 80% very fine sand; about 20% nonplastic fines; gray; wet.

50.0-104.5' TRIASSIC TRUJILLO FORMATION (TRdj):

50.0-51.0' SANDSTONE. Brown; conglomeritic; mostly fine to coarse sand with fine gravel; oxidized; moderately cemented.

51.0-54.0' SHALE. Blue-gray; moderately hard; brittle.

54.0-60.5' CLAYSTONE. Gray; hard; brittle.

60.5-65.0' SANDSTONE. Gray; mostly fine to coarse sand with fine gravel; moderately cemented.

65.0-78.0' SANDSTONE. Light gray; mostly fine sand with a small amount of fine gravel; moderately cemented.

78.0-83.0' SANDSTONE. Gray. mostly fine to coarse sand with fine gravel; moderately cemented.

83.0-101.0' SANDSTONE. Light gray; mostly fine sand with a small amount of fine gravel; moderately cemented. Hard, thin, gray claystone at 98.0'.

101.0-102.5' CLAYSTONE. Dark gray; moderately hard; brittle. Thin blue-gray, soft shale layer at 102.0'.

102.5-104.5' SANDSTONE. Light gray; very fine; hard; well cemented.

COMMENTS:

ss = sandstone
sh = shale
clst = claystone

Unconsolidated material logged according to the Unified Soil Classification System.

GEOLOGIC LOG OF DRILL HOLE NO. OW 7

FEATURE: Observation Well
LOCATION: South Side Canadian River
BEGUN: 11/7/94 FINISHED: 11/14/94
DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED: 1.9 (3660.60) 1/9/95

PROJECT: Lake Meredith Salinity
COORDINATES: N 1683213.69 E 776836.07
TOTAL DEPTH: 104.5
DEPTH TO BEDROCK: 50.0

STATE: New Mexico
GROUND ELEVATION: 3662.5
ANGLE FROM HORIZONTAL: 90 AZIMUTH:
HOLE LOGGED BY: Teucher & Parish
REVIEWED BY:

NOTES

75.0	109.2	10
80.0	102.0	10
85.0	112.2	12
90.0	107.4	15
95.0	107.4	10
100.0	108.0	10
104.5	102.6	15

*Original measurement doubled because of testing method.

Temperature corrected to 25 degrees centigrade.

It should be noted that the conductivity values are based on meter readings of diluted samples. Laboratory data suggest that the values may be approximately 15% too high.

WATER LEVELS:

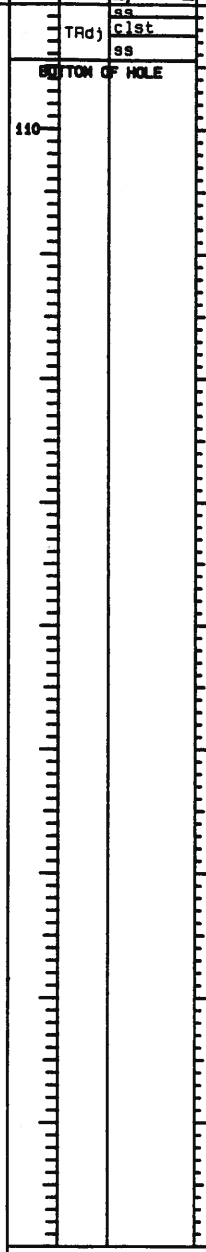
Depth	Date
1.9	11/15/94
1.9	1/9/95

SURVEY DATA:

Feature	Elevation
Ground surface	3662.5
Top of 4" cs.	3664.8

DEPTH | GEOL UNIT SYMBL | FLD CLASS/LITH | ELEVATION

CLASSIFICATION AND PHYSICAL CONDITION



COMMENTS:

GEOLOGIC LOG OF DRILL HOLE NO. OW 8

FEATURE: Observation Well
LOCATION: South Side Canadian River
BEGUN: 11/9/94 FINISHED: 11/15/94
DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED: 2.8 (3661.00) 11/9/94

PROJECT: Lake Meredith Salinity
COORDINATES: N 1583368.55 E 776673.39
TOTAL DEPTH: 104.7
DEPTH TO BEDROCK: 56.6

STATE: New Mexico
GROUND ELEVATION: 3663.8
ANGLE FROM HORIZONTAL: 90 AZIMUTH:
HOLE LOGGED BY: Parish & Shadix
REVIEWED BY:

NOTES

NOTES:
All measurements are from ground surface and in feet unless noted otherwise.

Logging was done by L. Parish from 0 to 63.0 ft. and by S. Shadix from 63.0 to 104.7' using rockbit cuttings.

PURPOSE OF HOLE:
For use as an observation well during pump tests to determine aquifer characteristics.

DRILL RIG:
Truck-mounted SIMCO 5000 rotary drill.

DRILLER:
Mike Kocian

DRILLING METHOD:
0.0-63.0' drilled with 5 7/8" rockbit. 63.0 to 104.7' drilled with a 3 7/8" rockbit. Air used to return cuttings.

CASING RECORD:
Set and grouted 4" steel casing from 0 to 63.0'.

HOLE COMPLETION:
Set 2" schedule 40 PVC from 54.2 to 104.7'. The screened area extends from 64.2 to 104.2'. It is 20 slot (0.020 inch).

LOCATION:
Approximately 700' north and 2750' east of the southwest corner of Section 14, T. 13 N., R. 33 E.

CONDUCTIVITY AND ESTIMATED WATER PRODUCTION:
The conductivity of the river water on 11/9/94 was 4.8 mS/cm, and it was 4.7 mS/cm on 11/15/94.

Depth	mS/cm	Estimated water production (gpm)
5.0	2.8	5
15.0	58.2	5
25.0	31.4	5
30.0	67.2	5
35.0	77.6	10
40.0	74.4	15
45.0	87.0	60
50.0	94.5	30
55.0	85.5	30
60.0	89.0	10
62.8	87.5	10
65.0	115.2	<1
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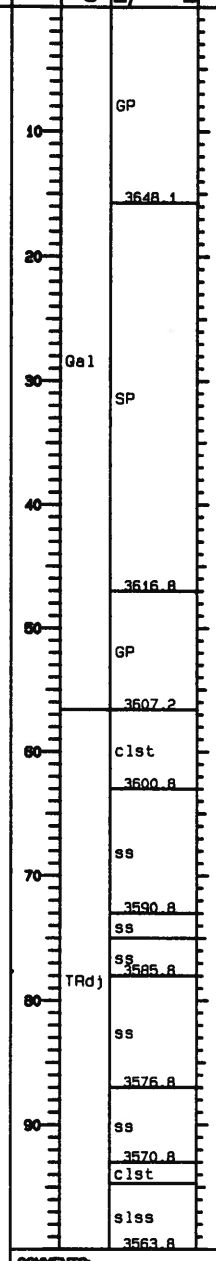
75.0	84.0	3
80.0	64.5	5
85.0	65.5	7
90.0	67.5	7



CLASSIFICATION AND PHYSICAL CONDITION

0.0-56.6' QUATERNARY ALLUVIUM (Qal):

0.0-15.7' POORLY GRADED GRAVEL WITH SAND (GP). About 55% fine to coarse, subrounded, hard gravel; about 40% fine to coarse sand; about 5% nonplastic fines; brown; dry to wet.

15.7-47.0' POORLY GRADED SAND (SP). About 95% predominantly fine to medium sand; about 5% nonplastic fines; trace of fine, subrounded, hard gravel; brown; wet.

47.0-56.6' POORLY GRADED GRAVEL WITH SAND (GP). About 80% predominantly medium to coarse, subrounded gravel; about 20% fine to coarse sand; brown; wet; rusty zone from 48.0 to 49.0'. Unit is a prolific water producer.

56.6-104.7' TRIASSIC TRUJILLO FORMATION (TRdj):

56.6-63.0' CLAYSTONE. Light gray; moderately hard; brittle.

63.0-73.0' SANDSTONE. Dark gray; fine; moderately cemented.

73.0-75.0' SANDSTONE. Dark gray; conglomeritic; mostly fine to coarse sand with fine gravel; moderately cemented.

75.0-78.0' SANDSTONE. Medium gray; fine to medium sand; moderately cemented.

78.0-87.0' SANDSTONE. Light gray; conglomeritic; fine to coarse sand with fine gravel; moderately hard.

87.0-93.0' SANDSTONE. Light gray; predominantly fine to medium sand; moderately cemented.

93.0-94.7' CLAYSTONE. Dark gray; moderately hard; brittle.

94.7-102.5' SILTY SANDSTONE. Gray; fine to medium sand; moderately cemented.

102.5-104.7' CLAYSTONE. Light blue-gray.

COMMENTS:

ss = sandstone
slss = silty sandstone
clst = claystone

Unconsolidated material logged according to the Unified Soil Classification System.

GEOLOGIC LOG OF DRILL HOLE NO. OW 8

FEATURE: Observation Well
LOCATION: South Side Canadian River
BEGUN: 11/9/94 FINISHED: 11/15/94
DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED: 2.8 (3661.00) 1/9/95

PROJECT: Lake Meredith Salinity
COORDINATES: N 1583388.55 E 776673.39
TOTAL DEPTH: 104.7
DEPTH TO BEDROCK: 56.6

STATE: New Mexico
GROUND ELEVATION: 3663.8
ANGLE FROM HORIZONTAL: 90 AZIMUTH:
HOLE LOGGED BY: Parish & Shedix
REVIEWED BY:

NOTES

95.0	66.5	5
100.0	66.5	5
104.7	71.5	2

Temperature corrected to 25 degrees centigrade.

It should be noted that the conductivity values are based on meter readings of diluted samples. Laboratory data suggest that the values may be approximately 15% too high.

WATER LEVELS:

Depth	Date
2.3	11/16/94
2.8	1/9/95

SURVEY DATA:

Feature	Elevation
Ground surface	3663.8
Top of 4" cs.	3666.0

DEPTH	GEOL UNIT SYMBL	FLD CLASS/LITH	ELEVATION	CLASSIFICATION AND PHYSICAL CONDITION
	TRdj	slsa	3661.3	
		clst		
60		BOTTOM OF HOLE		
110				

COMMENTS:

GEOLOGIC LOG OF DRILL HOLE NO. OW 9

FEATURE: Observation Well
LOCATION: South Side Canadian River
BEGUN: 11/16/94 FINISHED: 11/17/94
DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED: 88.1 (3676.80) 1/6/95

PROJECT: Lake Meredith Salinity
COORDINATES: N 1582813.86 E 768849.19
TOTAL DEPTH: 143.4
DEPTH TO BEDROCK: 2.0

STATE: New Mexico
GROUND ELEVATION: 3733.9
ANGLE FROM HORIZONTAL: 90 AZIMUTH:
HOLE LOGGED BY: Shirley Shadix
REVIEWED BY:

NOTES

NOTES:
All measurements are from ground surface and in feet unless noted otherwise.

Logging was done from rockbit cuttings.

PURPOSE OF HOLE:
To verify salinity of water in the Trujillo Formation and for use as an observation well.

DRILL RIG:
Truck-mounted SIMCO 5000 rotary drill.

DRILLER:
Mike Kocian

DRILLING METHOD:
0.0-143.4' drilled with 5 7\8" rockbit. Air used to return cuttings.

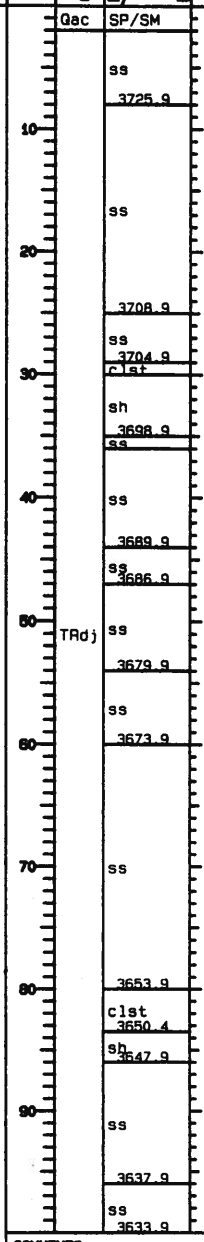
CASING RECORD:
None used.

HOLE COMPLETION:
Set 2" schedule 40 PVC from 0.0 to 143.4'. The screened area extends from 82.9 to 142.9'. It is 20 slot (0.020 inch). Sandpacked hole from 143.4 to 80.4'. Backfilled with bentonite from 80.4 to 42.0'. Set 4" steel protective pipe to 7.7' with 2.3' stickup. Grouted hole from 42.0' to the ground surface.

LOCATION:
Approximately 450' north and 350' east of the southwest corner of Section 15, T. 13 N., R. 33 E.

CONDUCTIVITY AND ESTIMATED WATER PRODUCTION:
The conductivity of the river water on 11/16/94 was 3.2 mS/cm.

Depth	mS/cm	Estimated water production (gpm)
No water produced 0-65.0.		
67.5	8.0	<2
72.5	26.4	<5
77.5	21.2	<5
82.5	22.8	<5
87.5	23.2	<5
92.5	24.0	<5
97.5	24.4	<5
102.5	34.8	10
107.5	59.2	25
112.5	61.6	25
117.5	59.6	25
122.5	66.4	40-50
127.5	56.8	40
132.5	56.8	40
137.5	63.6	40



CLASSIFICATION AND PHYSICAL CONDITION

0.0-2.0' QUATERNARY COLLUVIUM/RESIDUAL SOIL (Qac):

0.0-2.0' POORLY GRADED SAND WITH SILT AND GRAVEL (SP/SM). Mostly fine to coarse sand with fine, subrounded, hard gravel and about 10% nonplastic fines; tan to gray; dry.

2.0-143.4' TRIASSIC TRUJILLO FORMATION (TRdj):

2.0-8.0' SANDSTONE. Tan; fine sand; abundant mica; dry.

8.0-25.0' SANDSTONE. Tan; conglomeritic; fine to coarse sand with fine gravel; iron-stained; dry.

25.0-29.0' SANDSTONE. Red; fine to medium sand; dry.

29.0-30.0' CLAYSTONE. Blue-gray; soft; dry.

30.0-35.0' SHALE. Red; moderately soft; dry.

35.0-36.0' SANDSTONE. Reddish-tan; fine sand; dry.

36.0-44.0' SANDSTONE. Tan to gray; fine sand; abundant mica; thin, gray clay layers from 39.0 to 40.5'.

44.0-47.0' SANDSTONE. Tan to reddish-tan; conglomeritic; fine to coarse sand with fine gravel; iron-stained; dry.

47.0-54.0' SANDSTONE. Yellow-tan; fine sand; thin shales from 50.0 to 54.0'; dry.

54.0-60.0' SANDSTONE. Yellow-tan; conglomeritic; fine to coarse sand with fine gravel; moist.

60.0-80.0' SANDSTONE. Tan; fine sand; thin clay layers at 64.0 and 67.0'.

80.0-83.5' CLAYSTONE. Gray; soft.

83.5-86.0' SHALE. Red; moderately brittle.

86.0-96.0' SANDSTONE. Tan; conglomeritic; fine to coarse sand with fine gravel; hard.

96.0-100.0' SANDSTONE. Tan; fine sand; moderately hard.

100.0-102.0' CLAYSTONE. Blue-gray; soft.

102.0-117.5' SANDSTONE. Gray; fine sand; soft; uncemented or weakly cemented.

117.5-122.5' CLAYSTONE. Blue-gray; soft.

122.5-127.5' SANDSTONE. Gray; conglomeritic; fine to coarse sand with fine gravel; a few thin, gray shale layers.

127.5-130.0' SANDSTONE. Gray; fine to medium sand; some coal fragments; hard.

130.0-140.0' SHALE. Blue-gray and soft, changing to moderately soft and red.

COMMENTS:

ss = sandstone
sh = shale
clst = claystone

Unconsolidated material logged according to the Unified Soil Classification System.

GEOLOGIC LOG OF DRILL HOLE NO. OW 9

FEATURE: Observation Well
LOCATION: South Side Canadian River
BEGUN: 11/16/94 FINISHED: 11/17/94
DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED: 58.1 (3675.80) 1/9/95

PROJECT: Lake Meredith Salinity
COORDINATES: N 1582813.65 E 768849.19
TOTAL DEPTH: 143.4
DEPTH TO BEDROCK: 2.0

STATE: New Mexico
GROUND ELEVATION: 3733.9
ANGLE FROM HORIZONTAL: 90 AZIMUTH:
HOLE LOGGED BY: Shirley Shadix
REVIEWED BY:

NOTES

142.5 63.2 40
143.4 63.6 40

Temperature corrected to 25 degrees centigrade.

It should be noted that the conductivity values are based on meter readings of diluted samples. Laboratory data suggest that the values may be approximately 15% too high.

WATER LEVELS:

Depth	Date
58.4	11/18/94
58.1	1/9/95

SURVEY DATA:

Feature	Elevation
Ground surface	3733.9
Top of steel cs.	3736.2
Top of 2" PVC	3736.0

DEPTH	GEOL UNIT SYMBL	FLD CLASS/LITH	ELEVATION
		clst	
110		ss	
			3616.4
120	TRdj	clst	
			3611.4
		ss	
			3606.4
		ss	3603.9
130		sh	
			3593.9
140		ss	3590.5
		BOTTOM OF HOLE	
150			

CLASSIFICATION AND PHYSICAL CONDITION

140.0-143.4' SANDSTONE. White; fine sand; sugar-like texture; hard.

COMMENTS: