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SUMMARY OF TEST DRILLING AND GROUND-WATER CONDITIONS  
IN THE MCGREGOR RANGE AREA, OTERO AND DOÑA ANA  
COUNTIES, NEW MEXICO, AND EL PASO COUNTY, TEXAS

By

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U. S. Geological Survey

Albuquerque

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INTRODUCTION

The McGregor Range area lies mainly in the extreme southwestern part of Otero County, New Mexico, but includes a strip 1 mile wide and about  $6\frac{1}{2}$  miles long in southeastern Doña Ana County, New Mexico and an area about 5 miles wide and 21 miles long in northern El Paso County, Texas. It encompasses an area of about 500 square miles. (See pl. 1.)

The purpose of the McGregor Range study, which was made at the request of the U. S. Army, Corps of Engineers, was to determine whether a supply of 100 gpm (gallons per minute) of potable water could be developed in the vicinity of the McGregor Range Camp, in sec. 1, T. 26 N., R. 7 E. The study consisted of two parts: (1) a hydrologic and geologic reconnaissance of the area and (2) a test-drilling program. During the initial reconnaissance all known wells in the area were visited and, where possible, depths to water and total depths of wells were measured. The reconnaissance was summarized, and sites for five test holes were suggested in the manuscript report by Hood (1956). Three test holes were drilled during the course of the test-drilling program. In conjunction with the drilling, additional data were collected on many of the existing wells and test holes in the area.

This report summarizes the data collected on all known wells and test holes in the New Mexico area and in the eastern two-thirds of the Texas area and on representative wells in the western part of the Texas area. Included are data on the three test holes drilled as the test-drilling phase of the study and the contractor's well which was drilled near the camp site. The basic data on the wells and test holes in the area are summarized in tables 1, 2, and 3.

The report by Hood (1956) stated that in the vicinity of the camp site the fresh-water zone probably is relatively thin (50 feet or less) and that there were slight possibilities of encountering one or more perched zones of fresh water. For these reasons, the use of a cable-tool drill for test drilling was recommended. This would permit detailed sampling and testing of the ground water, accurate sampling and determination of strata encountered, and close observation of the water level as drilling progressed. Sets of specifications requiring cable-tool drilling were twice advertised, but the bids received in both cases were considered excessively high. A third set of specifications in which rotary-drilling methods were specified was advertised, and an acceptable bid was received from the Collins Motor Company of Alamogordo, New Mexico.

At the request of the contracting officer for McGregor Range Camp, a conference, attended by personnel of the Project Engineer's office, the drilling contractor, two employees of the El Paso Water Department, and a representative of the U. S. Geological Survey, was held to determine a satisfactory method of collecting water samples. Pumping with air was not considered feasible because the necessary submergence of the air line would not be obtained. It was decided to shut off the interval to be

sampled with a cone packer mounted on the drill stem and bail through the drill stem with a bailer about  $2\frac{1}{2}$  inches in diameter and 30 feet long.

Test drilling in the McGregor Range area was begun September 7, 1956, and terminated January 5, 1957. Three test holes were drilled at pre-determined sites. Test hole T-1 was drilled at the McGregor Range Camp, and test hole T-2 was drilled on the alluvial fan about 4 miles east of T-1. As neither hole proved favorable the proposed sites of test holes T-3 and T-4, which were on the alluvial fan in the vicinity of T-2, were discarded. Test hole T-5 was drilled about  $8\frac{1}{2}$  miles southwest of T-1, in the vicinity of Hewan. Test hole T-1 was drilled to a depth of 500 feet in accordance with the drilling specifications. Test holes T-2 and T-5, completed at depths of 705 and 500 feet, respectively, were not drilled to their specified depths because chemically unsuitable water was encountered at shallower depths. The sample logs of the test holes are given in table 2 and the chemical analyses of water are given in table 3.

Collection of water samples from various strata in the test holes became quite tedious and laborious. The bailer, which had to be run inside the drill stem, was necessarily small and had a capacity of only about 5 gallons of fluid. This made it necessary to bail the hole for long periods of time to obtain a sample representative of the ground water. Also, the bailer was equipped with a small, rather delicate foot valve that was easily broken and easily jammed by sand, pebbles or clay fragments. At or near the water table, especially where the water-bearing materials were fine grained, a long period of bailing was required to obtain a water sample. With increased depth below the water table, a greater head resulted and,

the samples, therefore, were more easily obtained. The samples were analyzed in the field to establish that they were representative of the ground water in the area and to determine the approximate chemical quality of the ground water that was encountered. Chemical analysis in the field consisted of determining the chloride content and the specific conductance of the water samples. During the bailing operations samples of the bailed water were analyzed periodically for comparison with the water used for drilling and for thinning the mud. When consistent results were obtained from analysis of a series of samples, a final sample was collected for complete laboratory analysis to determine if the water was suitable for the proposed uses.

#### TEST HOLE T-1

Drilling of test hole T-1, in the NE $\frac{1}{4}$  sec. 1, T. 26 S., R. 7 E., was begun September 7, 1956, and on October 27 the hole was completed to a depth of 502 feet. The final test pumping of the developed test hole was completed December 10, 1956.

The depth to water at the site of test hole T-1 had been estimated to be about 400 feet below land surface, and it was decided that the first drill-stem sample should be collected from the interval between depths of 390 and 410 feet. No water sample could be obtained from that interval so the hole was drilled to a depth of 435 feet, and the packer was set at a depth of 400 feet. After 16 $\frac{1}{2}$  hours of bailing the drilling fluid had not thinned, so 70 gallons of water was added to the hole to thin the mud and to wash the sides of the hole. A water sample was collected after more than 150 gallons of fluid had been bailed from the hole. The sample was

determined to be acceptable and to represent ground water in the formation, on the basis of a comparison of field chemical analysis of the bailed water and the tank water that was used for drilling and for thinning the fluid in the hole during bailing. Laboratory analyses showed the tank water to contain 308 ppm chloride and to have a specific conductance of 1,960 micromhos at 25°C. and the formation water to contain 294 ppm chloride and to have a specific conductance of 1,930 micromhos (see table 3). The temperature of the water bailed from the hole was 116°F. After overnight recovery the water level was 406 feet below land surface. A water sample was collected after overnight recovery of water level in the test hole. The chemical quality of this sample differed noticeably from that of the water bailed at the end of the previous day in that the chloride content decreased from 294 to 280 ppm, the bicarbonate content increased from 133 to 234 ppm, and the specific conductance increased very slightly from 1,930 to 1,940 micromhos. The test hole then was deepened to 465 feet, and a sample was obtained from the interval between 435 to 465 feet using the same methods as for the previous sample. The temperature of the bailed water was 115°F. The water sample was found to contain 502 ppm chloride, 85 ppm sulfate and 1,070 ppm dissolved solids and to have a specific conductance of 1,980 micromhos. After overnight recovery the water level was 410.3 feet below land surface. The hole was then deepened to a total depth of 504 feet and a drill-stem sample was collected from the interval between 465 and 504 feet. The water sample was obtained for this interval without thinning the fluid in the hole. The temperature of the bailed water was 122°F. Chemical analysis showed the water to contain 550 ppm chloride,



155 ppm sulfate, and 1,120 ppm dissolved solids with a specific conductance of 2,050 micromhos. Overnight recovery of the water level was to 379.6 feet below land surface. On October 27 an electric log consisting of 32-inch limestone, lateral, short normal and spontaneous potential curves was run by Schlumberger Well Surveying Corporation. (The limestone device, consisting of two pairs of equally-spaced current electrodes with a measuring device in the center, was used because it detects thin beds that might not have been detected by the other devices used.)

On the basis of the drill cuttings, drilling and electric logs, and the difficulty encountered in obtaining water samples, the materials encountered in the test hole were determined to be mainly very fine grained and therefore were thought to have a low permeability. At the request of the contracting officer a concrete base 2 feet thick was set for casing support. Perforated sections of casing were installed opposite the more permeable zones which occurred at the following intervals: 190 to 200 feet, 210 to 220 feet, 253 to 263 feet, and 370 to 490 feet. The upper three sections were placed opposite zones which, although occurring above the water table, were relatively more permeable and might contain perched water.

The test hole was bailed to remove the heavy drilling fluid and sediment, and on the following day the hole was surged and bailed. In order to surge the upper perforated sections, approximately 2,200 gallons of water was added to raise the water level from the static level of 376.9 feet to about 176 feet. On the following day, after the water level had

nearly stabilized, 200 pounds of phosphate compound was added to the hole to break up the clay and make it more easily removed from the hole and adjacent water-bearing beds. The hole was surged gently every four hours until the pump was installed two days later. Owing to the relatively high temperature of the water (122°F.) which caused the rubber bearings to expand and bind on the shaft, the pump would not backwash properly so the well was surged with air. On November 20 the second of two pump shafts was broken while attempting to pump the test hole. On December 7, pumping equipment suitable for pumping the hot water was installed. Owing to the low yield of the test hole and the relatively high minimum pumping rate of the pump (5gpm), water was added to the hole during the pumping and surging operations. About 25,000 gallons of water was added to the hole during the 22 hours of pumping and surging.

As the apparent yield of the test hole was less than the minimum pumping rate of the pump, it was necessary to determine the yield of the test hole by pumping at short measured intervals. On December 6 the test hole was pumped for a period of almost 6 hours, and the yield was determined to be about 0.5 gpm. Near the end of the test pumping, a water sample was collected for chemical analysis. The sample contained 445 ppm chloride, 99 ppm sulfate, and 1,170 ppm dissolved solids and had a specific conductance of 2,030 micromhos. Because of the low yield and poor quality of the water, the test hole was abandoned and later plugged.

## TEST HOLE T-2

On November 22, 1956, drilling of test hole T-2, in the NW $\frac{1}{4}$  sec. 2, T. 26 S., R. 8 E. began, and on December 12 the hole was completed at a total depth of 705 feet.

On the basis of the general water levels and slope of the water table in the vicinity, it was estimated that the depth to water in T-2 should be approximately 550 feet below land surface. On December 6 a water sample was obtained from the interval between 547 to 597 feet. The sample was determined to be representative ground water on the basis of field chemical analysis, which showed the water from the test hole to contain 436 ppm chloride and to have a specific conductance of 2,800 micromhos compared with tank water which had a chloride content of 444 ppm and a specific conductance of 1,650 micromhos. The temperature of the bailed water was 69°F. Laboratory analysis showed the water sample contained 450 ppm chloride, 688 ppm sulfate, and 1,870 ppm dissolved solids, and had a specific conductance of 2,890 micromhos. The measured water level in the hole was 542.2 feet. The next water sample was collected from the interval between 635 and 705 feet after approximately 11 hours of bailing. By field chemical analysis the water was found to contain 435 ppm chloride and to have a specific conductance of 3,500 micromhos. The temperature of the bailed water was 69°F. The laboratory analysis of this water sample showed the water to contain 420 ppm chloride, 1,210 ppm sulfate, and 2,620 ppm dissolved solids, and to have a specific conductance of 3,590 micromhos. Both samples of water were considered nonpotable and the contracting officer instructed the contractor to cease operations and to condition the hole for electric logging. On December 14 an electric log consisting of 32-inch limestone, lateral,

short normal and spontaneous potential curves was run by Schlumberger Well Surveying Corporation. As the water was chemically unsatisfactory the test was plugged and abandoned.

#### TEST HOLE T-5

Drilling operations of test hole T-5 in the SW $\frac{1}{4}$  sec. 23, T. 26 S., R. 6 E. commenced December 27, 1956, and on January 4, 1957, the total depth of 380 feet was reached.

Data on wells in the area indicated that the water level at the test-hole site should be about 270 feet below land surface, so an attempt was made to obtain a water sample from the interval between 265 to 320 feet. When the level of the drilling fluid was bailed below 300 feet the packer settled and attempts to reset it failed. Consequently, when the level of the fluid was bailed below about 300 feet, leakage was so severe that the level of the fluid in the hole and the level of the fluid in the drill stem equalized, making bailing in the drill stem ineffective for the purpose of obtaining an uncontaminated sample of ground water. It was decided to deepen the hole and to collect a water sample from the interval between 310 feet and a depth to be determined by the characteristics of the materials encountered. The hole was drilled to a depth of 380 feet, and a water sample was obtained from the interval between 310 to 380 feet. By field chemical analysis, the water sample contained 560 ppm chloride and had a specific conductance of 2,200 micromhos. The tank water used for drilling contained 443 ppm chloride and had a specific conductance of 1,600 micromhos. As a check on the field chemical analyses, the Water Department Laboratory of the City of El Paso, Texas, obligingly analyzed

the water sample and found it to contain about 600 ppm chloride. On the basis of these analyses the water was declared unsatisfactory, and the contracting officer instructed the driller to cease drilling operations and to prepare the hole for electric logging. The measured water level after 2 hours recovery following bailing was 265.4 feet below land surface.

On January 5, an electric log consisting of 32-inch limestone, lateral, short normal and spontaneous potential curves was run by Schlumberger Well Surveying Corporation. The test hole was plugged and abandoned. A final laboratory analysis of the water sample was made with the following results: 550 ppm chloride, 215 ppm sulfate, 1,420 ppm dissolved solids, and a specific conductance of 2,310 micromhos. The maximum temperature of water obtained from the hole was 72°F.

#### CONTRACTOR'S WELL

During the course of the test-drilling program, a well was drilled to a total depth of 745 feet in the  $SW\frac{1}{4}$  sec. 32, T. 25 S., R. 8 E. to obtain a water supply for road construction purposes. The well was drilled by Morrison Brothers Drilling Company of Las Cruces, New Mexico, for Hugh McMillan, contractor. The well penetrated approximately 418 feet of bolson deposits, which were mainly fine grained and were not saturated, and encountered igneous bedrock (apparently a felsite) at the depth of 418 feet. Water reportedly was encountered in fractures at a depth of about 450 feet, but several deeper water-bearing, fractured zones also reportedly were encountered. The well is equipped with a large pump jack and furnishes a relatively small supplemental water supply for road compaction. A water sample from the well was analyzed with the following results: 4,060 ppm

chloride, 859 ppm sulfate, 8,980 ppm total dissolved solids, and a specific conductance of 14,500 micromhos. The temperature of the pumped water was 142°F.

#### SUMMARY OF TEST DRILLING

The three test holes and the contractor's well did not locate supplies of potable ground water in sufficient quantity for use at the McGregor Range Camp Site. Test hole T-1, in which materials of low permeability were encountered, yielded a very small quantity (about 0.5 gpm) of water that exceeded in mineral content the desired limits and approached the recommended maximum limits of mineralization. The temperature of the water bailed from near the bottom of the hole was 122°F. In the contractor's well moderate quantities of water are produced from fractures in igneous rocks, but the water is very highly mineralized, which precludes its use for human consumption. The temperature of the pumped water is 142°F. In test hole T-2 the water-bearing materials encountered were relatively permeable, but the ground water was highly mineralized. The temperature of the water bailed from the hole was consistently about 69°F. Apparently no fresh water zones were encountered, either as strata of perched water or in the zone of saturation. In test hole T-5 the drill-stem test yielded water that exceeded in mineral content the limits for water suitable for human consumption. The maximum temperature of water obtained from the hole was 72°F. The electric log of test hole T-5 indicated a thin zone of water, somewhat less mineralized than that obtained from the drill-stem test, at about the water table.

## GENERAL SUMMARY OF GROUND-WATER CONDITIONS

The McGregor Range area is underlain mainly by bolson deposits. In the southwestern part, about 2 miles south of Hsana, the deposits reportedly extend to a depth of about 4,900 feet. Northeastward and eastward their thickness decreases quite rapidly to the line of isolated hills about 12 miles east of Hsana. In the low area between these outlying hills and the Hsana Mountains the fill extends to a depth of at least 705 feet. (See log of test hole T-2, 26.8.2.131.) The limestone strata, which underlie the bolson deposits and which compose the isolated hills and Hsana Mountains, probably are quite permeable owing to fractures and solution channels. Drillers' logs of wells in the area report that fractured and cavernous rocks were encountered below the bolson deposits.

Contours on the water table (see pl. 2) show that in the western and central parts of the area the ground water moves mainly southward and that in the eastern part of the area the ground water moves eastward into the mountains. In the central part of the area in T<sub>25</sub> and 26 S., R. 7 E., the contours form a southward-trending ridge indicating a ground-water divide. This divide is due partly to a decrease in transmissibility in the vicinity of Davis Dome and partly to an increase in local recharge. In this area the water level in well 26.7.22.122, which was measured in 1937, appears to be inconsistent with other water-level measurements in the vicinity. As the well has since been abandoned and plugged, no subsequent measurements could be made; therefore, the water level was not used in constructing the contour lines on the water table. The trough in the water table in the vicinity of the Hsana Range Camp probably reflects the pumping of the well at the camp.

The central part of the area in Tn. 24 and 25 S., Rs. 7 and 8 E. is characterized by numerous depressions, some of which exceed 25 feet in depth. This area therefore probably serves as a catchment area for recharge from precipitation. The origin of these depressions is imperfectly known. Though many appear to be blowouts, others may be surface reflections of faulting or solution. Along such a zone the relatively impervious caliche layer which underlies the area at a shallow depth would be fractured and possibly could have been carried away in solution by descending water. Thus, recharge to the water table by infiltration of precipitation would be facilitated. Local recharge also is indicated by the fact that the most shallow ground water under the area of the depressions is less highly mineralized than the ground water underlying the surrounding areas.

In the vicinity of Davis Dome, sec. 5, T. 26 S., R. 8 E., the water table slopes steeply eastward. This steep slope is due to a large decrease in transmissibility. In the vicinity of Davis Dome the bedrock nears the surface and the bolson deposits become finer grained. The net result is a mound of ground water that slopes steeply eastward. The fractured zones in the upper part of the felsite readily transmit the water eastward into the coarse-grained bolson deposits. The gradient of the water table as determined by interpolation between test hole T-1 and the contractor's well is about 60 feet per mile. East of Davis Dome the slope of the water table decreases abruptly.

The depth to water in the western and central parts of the area is relatively constant from north to south, increasing slightly near the



center of the area. Eastward, however, the depth to water increases quite rapidly in the vicinity of the line of outlying hills in the western part of Ts. 25 and 26 S., R. 8 E., and farther east increases rather gradually.

In much of the area the ground water is chemically unsatisfactory for human consumption. (See pl. 1.) However, the mineral concentration in water underlying a small area in the central part of the map area does not greatly exceed the generally recommended limits of 250 ppm chloride and 250 ppm sulfate, and in the extreme southwestern part of the area, the ground water is considered potable. In test hole 24.7.34.144 water containing 232 ppm chloride and 337 ppm sulfate was obtained from a drill-stem test of the interval from 400 to 447 feet--the water level was 312.7 feet. Water from well 25.7.16.121 at Alvarado contained 380 ppm chloride and 310 ppm sulfate--the water level was 355.3 feet. In the southeastern part of the area the concentration of dissolved minerals in the water from wells ranges from considerably below to slightly above the recommended limits. Westward and southwestward from the McGregor Range area with decreasing distance from the alluvial slopes of the Franklin Mountains, the quality of the water greatly improves to the extent that the water is used for both municipal and military supplies.

Moderate to large supplies of saline water (water containing more than 1,000 ppm dissolved solids) probably could be developed in the western part of the area. In the vicinity of the McGregor Range Camp

site wells probably would produce only small to possibly moderate supplies of saline water from the bolson deposits. Possibly larger supplies of more highly mineralized water would be encountered in the underlying bedrock. Wells of only relatively low yield apparently could be developed in the bolson deposits immediately west of the belt of outlying hills. The water encountered in bedrock in this area has a high temperature and a very high mineralization; however, the quantity of water available is not known. East of Davis Dome, in the alluvial fan area, moderate to large supplies of saline water probably could be developed from the coarse-grained materials that were encountered in test hole T-2.

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Table 1.--Records of wells and test holes in the McGregor Range area,  
Otero and Dona Ana Counties, New Mexico and El Paso County, Texas

Altitude above sea level: E, altitude estimated from topographic maps; others determined by spirit level.

Depth of well and water levels: Those expressed to the nearest 0.1 of a foot were measured by the Geological Survey, those in whole feet were reported by owner, tenant, or driller.

Type of pump: N, none; P, plunger, mostly windmill operated; T, turbine.

Use of water: C, construction; D, domestic; I, irrigation; N, none; O, observation; RR, railroad; S, stock; T, troops.

Remarks: CA, chemical analysis in table 3; DD, drawdown; L, log in table 2; T temperature of water.

Location number	Texas reference number	Texas test hole number	Owner or tenant	Driller	Year completed	Depth of well (feet)	Diameter of casing (inches)	Altitude above sea level (feet)	Water level		Type of pump	Use of water	Remarks
									Depth below land surface (feet)	Date			
NEW MEXICO													
23.6.35.100	G-1	T-22	U. S. Government	B. & W. Drilling Co.	1953	650.0	-	4,080.7	287.5	Mar. 29, 1953	N	N	El Paso test hole. CA, L, Electric log.
24.7.34.144	G-2	T-30	do.	do.	1953	1,209.0	-	4,070.5	312.7	July 14, 1953	N	N	El Paso test hole. CA, L, Electric log.
24.3.1.233	-	-	-	-	Old	410	-	4,220 E	365	-	P	N	Known as "Mott Well" and as "South Well"
25.5.36.111	L-6	T-35	U. S. Government	B. & W. Drilling Co.	1953	690.0	-	4,068.0	334.4	Apr. 11, 1953	N	N	El Paso test hole. CA, L, Electric log.
25.6.4.110	L-1	T-28	do.	do.	1953	1,208.0	-	4,051.6	300.3	Mar. 1, 1953	N	N	El Paso test hole. CA, L, Electric log.
25.6.19.440	L-7	-	do.	Layne-Texas Co.	1943	439	10, 8, 4	4,030 E	300	-	T	N	Hueco Camp No. 2. Casing: 10 in. to 333 ft., 8 in. slotted to 355, 4-in. slotted to 436 ft. Reported DD = 11 ft. at 100 gpm. Gravel-walled well. L. Well is covered.
25.6.20.333	-	-	do.	C. L. North	Old	378	8	4,025 E	300	-	N	N	Hueco Camp No. 1. Casing: 313 ft. of blank, 60 ft. of strainer. Well is capped.
25.6.20.343	L-8	-	do.	Layne-Texas Co.	1944	440	10, 12	4,020 E	293.0	Mar. 10, 1954	T	T	Hueco Camp No. 3. Casing: 10-in. blank to 320, 12-in. blank to 401, 12-in. screen to 440 ft. DD = 35 ft. at 250 gpm. Gravel-walled well. CA, L.
25.6.28.444	N-2	T-36	do.	B. & W. Drilling Co.	1953	737.0	-	3,998.7	270.0	Apr. 17, 1953	N	N	El Paso test hole. CA, L, Electric log.
25.7.16.121	-	-	do.	-	-	441.5	8	4,101.9	355.5	July 6, 1953	P	T	"Alvarado Well." CA. Reportedly drilled to 900 ft.
25.7.20.444	-	-	do.	-	1942	731	20, 15.5	4,095 E	365	-	N	N	Ernest No. 1 oil test. Casing: 20 in., 95 ft.; 15.5 in., 718 ft. shot perforations 457-461 ft. Total depth 3,941 plugged at 731 ft. Partial log.
25.7.24.410	-	-	do.	-	Old	404	6	4,115 E	-	-	N	N	"North Well."
25.8.1.220	-	-	do.	-	Old	775	6	4,150 E	506.7	Jan. 12, 1956	P	N	"Borego Well."
25.8.6.442	N-1	T-31	do.	B. & W. Drilling Co.	1953	945.0	-	4,070 E	-	-	N	N	El Paso test hole. No water encountered. L.
25.8.23.310	-	-	do.	Al Parker	-	1,000	8	4,205 E	-	-	N	N	Oil test. Driller reports Pennsylvanian rock encountered at 480 ft. Very porous limestone at 610 ft.

Table 1.--Records of wells and test holes in the McGregor Range area, Otero and Doña Ana Counties, New Mexico and El Paso County, Texas.--Continued

Location number	Texas reference number	Texas test hole number	Owner or tenant	Driller	Year completed	Depth of well (feet)	Diameter of casing (inches)	Altitude above sea level (feet)	Water level		Type of pump	Use of water	Remarks
									Depth below land surface (feet)	Date			
25.3.23.340	-	-	U. S. Government	Al Parker	-	700	-	4,220 E	-	-	N	N	Oil test. Driller reports igneous rock encountered at 650 ft.
25.8.32.220	-	-	do.	-	Old	785	6	4,100 E	-	-	N	N	"McElroy Well" Cased to 625. Reported as "fair" water
25.8.32.333	-	-	do.	Morrison Bros.	1956	745	6	4,110 E	450	-	P	C	"McMillan Well." Cased to 450. T = 142°F., CA, L
25.8.34.410	-	T-38	do.	B. & W. Drilling Co.	1953	100	-	4,195 E	-	-	N	N	El Paso test hole. Test hole abandoned at less than 100 ft.
25.9.30.340	-	-	do.	-	Old	210+	12, 8	4,405	-	-	N	N	Appears to be an old oil test.
26.5.24.320	L-13	-	do.	-	-	400	6	4,043.9	327.5	June 16, 1954	P	S?	-
26.6.23.113	-	-	do.	-	Old	-	-	3,970.5	-	-	-	-	Abandoned well.
26.6.23.332	-	-	do.	J. I. Collins and Son	1957	380.0	-	3,985 E	265.44	Jan. 3, 1957	-	-	Test hole T-5. McGregor Project. T = 72°F., CA, L, Electric log.
26.6.34.130	M-7	-	Southern Pacific Railroad	-	1902	332	6	4,000 E	-	-	-	-	Well No. 141 in Water Supply Paper 919. CA.
26.6.34.130a	M-6	-	do.	-	-	400	18	3,998.2	283.4	Jan. 7, 1954	P	RR	Well No. 140 in Water Supply Paper 919. L.
26.7.1.241	-	-	U. S. Government	J. I. Collins and Son	1956	504.0	-	4,100 E	367.4	Nov. 15, 1956	-	-	Test hole T-1 McGregor Project. T = 122°F. CA, L, Electric log.
26.7.22.122	-	-	do.	R. F. Casteel	1936	450	4	4,070 E	325.6	June 23, 1937	N	N	Abandoned well. Well No. 152 in Water Supply Paper 919.
26.7.32.122	M-5	T-6	do.	B. & W. Drilling Co.	1953	1,200.0	3	4,061.2	347.9	Jan. 6, 1954	N	O	Casing: 3-inch casing to 435 ft. - slotted from 425 to 435 ft. CA, L.
26.8.2.131	-	-	do.	J. I. Collins and Son	1956	705.0	-	4,200 E	542.2	Dec. 12, 1956	-	-	Test hole T-2 McGregor Project. T = 69°F. CA, L, Electric log.
26.8.5.332	-	-	do.	N. O. Walker	1945	451.6	8	4,105 E	437.1	Sept. 17, 1956	N	N	"Hot Well." T = 160°F. Reported CA. Abandoned well.
26.8.32.111	N-6	T-8	do.	B. & W. Drilling Co.	1953	825.0	-	4,094.6	447.3	June 21, 1953	N	N	El Paso test hole. CA, L, Electric log.
26.8.33.120	N-7	-	Navar Brothers	-	Old	300	-	4,095.3	162.0	Apr. 9, 1954	P	S	Well No. 154 in Water Supply Paper 919.
26.8.33.120a	N-8	-	do.	-	Old	-	-	4,095.3	452.9	July 19, 1938	N	N	"Nations Hot Well." Well No. 154a in Water Supply Paper 919. Water is reported to be hot and highly mineralized.
<u>EL PASO COUNTY, TEXAS</u>													
1.1.6.343	-	-	Navar Brothers	-	Old	500+	6	4,180 E	500+	1952	N	N	-
1.1.6.344	-	-	do.	Payne & Ballard	1956	585	8	4,175 E	570	-	N	N	L.
1.78.6.140	S-2	-	do.	-	Old	400	5	4,075.2	363.7	July 19, 1938	N	N	Old "Joint Well."
1.78.13.130	S-3	-	do.	-	-	430+	-	4,073.4	36.6	Apr. 14, 1954	P	S	New "Joint well." Reported DD of 60 ft. at 15 gpm.
1.79.16.340	S-4	-	U. S. Government	-	Old	-	-	4,043.3	337.5	Apr. 14, 1954	N	N	-

Table 1.--Records of wells and test holes in the McGregor Range area, Otero and Doña Ana Counties, New Mexico and El Paso County, Texas.--Continued

Location number	Texas reference number	Texas test hole number	Owner or tenant	Driller	Year completed	Depth of well (feet)	Diameter of casing (inches)	Altitude above sea level (feet)	Water level		Type of pump	Use of water	Remarks
									Depth below land surface (feet)	Date			
1.80.1.111	S-1	T-4	U. S. Government	B. & W. Drilling Co.	1953	300.0	-	3,994.7	270.0	Mar. 21, 1953	N	N	El Paso test hole. CA, L, Electric log.
1.80.4.222	R-4	T-3	do.	do.	1953	325.0	3	4,046.0	331.1	Jan. 7, 1954	N	O	El Paso test hole. Cased to 520 ft., slotted 500 to 520 ft. CA, L, Electric log.
1.80.6.222	R-3	T-2	do.	do.	1953	950.0	-	4,060.8	347.2	May 26, 1953	N	N	El Paso test hole. CA, L, Electric log.
1.30.7.444	-	-	Prices Dairy	Layne-Texas Co.	1955	370	24, 18, 12	4,030 E	338	May 1955	T	I	Drilled to 1,012 ft., plugged to 870 ft. Casing: 18" blank to 380 ft., 18 in. slotted to 497 ft., 12 in. screen to 860, 12 in. blank to 870. Reported DD = 62 ft at 2,146 gpm. Reported CA.
1.80.8.330	-	-	do.	do.	1955	753	-	4,035 E	338	June 1955	T	I	Drilled to 875 ft., plugged at 753 ft. Casing: 18" blank to 377 ft., 18" slotted to 501 ft., 12 in screen to 746 ft., 12 in. liner to 753 ft. Reported DD = 61 ft. at 2,146 gpm. Reported CA, L.
1.80.13.320	R-9	-	do.	-	Old	360	5	4,007.5	298.1	Jan. 7, 1954	P	S	-
1.80.19.344	R-13	T-10	U. S. Government	B. & W. Drilling Co.	1953	1,200.0	-	3,973.7	271.2	May 25, 1953	-	-	El Paso test hole. CA, L. Electric log.
1.80.23.444	S-6	-	do.	-	-	-	-	3,975.1	263.9	Jan. 6, 1954	P	N	"McElroy Cow Camp Well." Drilled as oil test. Well 138 in Water Supply Paper 919, CA.
1.30.24.333	S-5	T-11a	do.	B. & W. Drilling Co.	1953	1,005.0	-	3,973.1	266.8	Jan. 6, 1954	-	O	El Paso test hole. Cased to 450 ft., slotted 450 to 450 ft. CA, L, Electric log.
1.80.28.141	R-14	-	J. K. Shearman	Layne-Texas Co.	1942	515	3, 6	3,991.1	238.5	Apr. 7, 1953	T	D,I,S	Reported yield 150 gpm.

Table 2.--Logs of wells and test holes in the McGregor Range area,  
Otero and Dona Ana Counties, New Mexico and El Paso  
County, Texas

23.6.35.100 U. S. Government

Material	Thickness (feet)	Depth (feet)
Sand and caliche	10	10
Sand, red, medium	10	20
Sand, red, fine to coarse	10	30
Sand, red, fine to medium	10	40
Sand, red, fine and some caliche	20	60
Sand, red, very fine and some caliche	10	70
Sand and gravel	10	80
Clay and some sand	10	90
Clay and gravel	10	100
Sand and gravel	40	140
Sand, fine and clay	10	150
Sand, fine	10	160
Sand, fine and gravel	20	180
Sand, fine to coarse	13	193
Sand, fine and clay	16	209
Sand, fine to coarse	38	247
(Sample missing)	3	250
Sand, fine	10	260
Sand, fine and clay	10	270

23.6.35.100 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, fine, clay and gravel	19	289
Sand, medium	7	296
Sand, fine to medium and clay	4	300
Sand, fine to medium, clay and gravel	20	320
Sand, fine to medium	26	346
Sand and gravel	34	380
Sand, gravel and clay	10	390
Sand, fine and gravel	5	395
Sand, very fine to fine	19	414
Sand, gravel and clay	6	420
Sand, fine to medium	15	435
Sand, fine to coarse	15	450
Sand, fine to medium	18	468
Clay and fine sand	12	480
Sand, fine and some gravel	10	490
Sand, fine, with some gravel and clay	11	501
Sand, fine and clay	9	510
Sandy clay	10	520
Clay	10	530
Clay and some gravel	8	538
Sand, with some gravel and clay	2	540
Clay and some sand	20	560
Sand, fine to medium	12	572



Material	Thickness (feet)	Depth (feet)
Sand, medium and clay	8	580
Clay	5	585
Sand, medium and some clay	15	600
Sand, fine to coarse	10	610
Sand and clay	20	630
Sand, medium to coarse	10	640
Clay and sand	10	650

Material	Thickness (feet)	Depth (feet)
Sand, with some gravel and caliche	10	10
Sand, fine to medium	20	30
Sand, very fine to medium and some clay	10	40
Sand, very fine to medium and some gravel	10	50
Sand, fine to coarse and some caliche	30	80
Sand, fine to coarse, with some caliche and clay	40	120
Sand, clayey to sandy clay and some caliche	100	220
Clay, silty to sandy and some caliche	40	260
Clay, dark-brown, silty, plastic, some sand and caliche	50	310
Clay, reddish-brown and gray, mottled and some caliche	90	400
Clay, medium-brown, silty, with some sand and caliche	90	490
Clay, light to medium-brown and some caliche	130	620
Clay, reddish-brown, mottled with gray clay and some caliche	280	900
Clay, medium-brown, silty and some caliche	309	1,209

24.8.32.34 State of New Mexico

Material	Thickness (feet)	Depth (feet)
Sand, buff, clay and caliche	10	10
Clay, light-red, sandy and caliche	10	20
Clay, red	10	30
Clay, light-brown	10	40
Clay, light-brown, sandy and caliche	14	54
Sand, reddish, fine	10	64
Clay, light-brown, sandy and caliche	10	74
Sand, buff, clayey and caliche	18	92
Sand, gray, fine, clayey	10	102
Sand, gray, fine and caliche pebbles	22	124
Clay, light-red to buff	20	144
Clay, red, hard	10	154
Clay, red, waxy, heavy and caliche	40	194
Clay, light-red, sandy	10	204
Clay, light-red, waxy, hard and caliche	60	264
Clay, light-red, very hard, 264-267 (Sample missing)	10	274
Clay, light-red and caliche	10	284
Clay, light-red, slightly sandy and caliche	10	304
Clay, light-red, hard and caliche	10	314
Clay, light-red and caliche	10	324

24.8.32.344 State of New Mexico--Continued

Material	Thickness (feet)	Depth (feet)
Clay, buff	30	354
Clay, light-red and caliche	20	374
Clay, dark-red and caliche	10	384
Clay, red, shaly and caliche	20	404
Clay, red and caliche	10	414
Clay, red, hard	50	464
Clay, red, slightly sandy, hard	8	472
Clay, red, hard	32	504
Clay, red, slightly sandy	6	510
Clay, light-red, sandy and caliche	10	520
Clay, light-red, very fine-grained sandstone, and caliche	10	530
Clay, light-red, sandy and caliche	10	540
Clay, light-red, slightly sandy, calcareous	40	580
Clay, light-red and gray, sandy, calcareous	24	604
Clay, light-red, slightly sandy	34	638
Clay, buff to reddish-brown	132	770
Clay, reddish-brown	120	890
(Sample missing - electric log indicates limestone was penetrated from about 892 to 910 feet)	40	930
Clay and limestone cuttings	15	945

25.5.36.111 U. S. Government

Material	Thickness (feet)	Depth (feet)
Clay, pink and fine sand	10	10
Sand, medium to coarse	10	20
Sand, very coarse	10	30
Clay, buff, very coarse sand and gravel	10	40
Clay, buff, sandy and caliche	10	50
Sand, coarse	20	70
Sand, coarse, gravel and caliche	10	80
Sand, medium	10	90
Sand, coarse to very coarse	10	100
Clay, buff	20	120
Sand, medium	10	130
Sand, fine to medium	10	140
Sand, medium to coarse	10	150
Sand, coarse to very coarse	10	160
Sand, medium	20	180
Sand, coarse to very coarse and gravel	62	242
Sand, medium to coarse, pebbles	10	252
Sand, medium to coarse and gravel	10	262
Sand, coarse to very coarse and gravel	30	292
Sand, coarse to very coarse, gravel and clay	10	302
Sand, fine to medium	10	312

25.5.36.111 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, medium to coarse	10	322
Sand, coarse to very coarse	10	332
Sand, very coarse and gravel	10	342
Sand, medium to very coarse	10	352
Sand, medium to coarse and gravel	10	362
Sand, fine to very coarse and gravel	30	392
Clay, buff, sandy and gravel	10	402
Sand, fine to coarse and gravel	30	432
Sand, fine to coarse and angular, coarse gravel	10	442
Sand, fine to coarse, clay and gravel	9	451
Clay, sand and coarse gravel	5	456
Clay, sand, coarse gravel and pebbles	4	460
Clay, buff, sandy and pebbles	17	477
Sand, fine to coarse, gravel and clay	20	497
Sand, coarse to very coarse and clay	5	502
Sand, medium to coarse	10	512
Sand, medium	8	520
Gravel, coarse, angular and medium sand	5	525
Gravel, coarse, angular, medium sand and clay	5	530
Sand, fine to coarse and gravel	15	545
Sand, medium to very coarse	10	555

25.5.36.111 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, fine to coarse and gravel	7	562
Sand, very fine to very coarse and gravel	13	575
Sand, very fine to medium and clay	10	585
Sand, very fine to coarse and gravel	5	590
Sand, coarse to very coarse and gravel	10	600
Sand, very fine to fine	10	610
Sand, medium to very coarse	10	620
Sand, fine to coarse	10	630
Sand, very fine to medium	10	640
Sand, very fine to coarse	10	650
Gravel and medium to coarse sand	10	660
Gravel, medium sand and some clay	7	667
Clay, sandy, gravel and pebbles	3	670
Sand, fine to very coarse, gravel and clay	3	673
Shale, buff and gravel	5	678
Clay, sandy and gravel	12	690

Material	Thickness (feet)	Depth (feet)
Sand, fine	20	20
Sand, very fine and clay	20	40
Sand, fine, gravel and caliche	10	50
Clay, buff, sandy	10	60
Clay, buff	40	100
Clay, buff and sandstone	40	140
Clay, buff, sandy	10	150
Clay, buff and coarse gravel	12	162
Sand, fine	8	170
Clay, buff	39	209
Sand, fine	19	228
Clay, buff	12	240
Sand, medium	10	250
Clay, buff	1	251
Sand, medium	10	261
Sand, medium to very coarse	10	271
Sand, fine	20	291
Sand, very fine	10	301
Sand, very fine and gravel	20	321
Clay, very sandy	10	331
Sand, very coarse and clay	10	341
Clay, sandy and angular gravel	12	353
Clay, sandy	3	356



25.6.4.110 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Clay, buff	15	371
Clay and sand	10	381
Sand and some clay	10	391
Sand, fine	10	401
Sand, medium	10	411
Sand, medium and clay	10	421
Sand, medium	10	431
Sand, fine to medium	10	441
Sand, fine to medium and clay	20	461
Sand, medium	10	471
Clay, sandy	14	485
Clay, brown and angular	10	495
Gravel, coarse, angular, sand and clay	10	505
Sand, coarse, clay and gravel	10	515
Clay, sandy	16	531
Clay, sandy and very coarse gravel	10	541
Sand, fine to medium and some clay	10	551
Clay, buff, sandy	10	561
Clay, sandy and gray clay	10	571
Clay, buff, sandy	10	581
Clay, buff, sandy and caliche pebbles	10	591
Clay, buff and some very fine sand	10	601

25.6.4.110 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, very fine to medium and clay	10	611
Sand, very fine to medium and gravel	5	616
Clay, buff and sand	20	636
Clay, buff, sand and gravel	10	646
Clay, buff and sand	20	666
Sand, medium, gravel and much clay	10	676
Clay, buff and sand	13	689
Clay buff and bentonite (?)	10	699
Clay, buff, sandy	10	709
Clay, buff and medium sand	10	719
Sand, very fine and clay	10	729
Sand, fine to coarse and clay	10	739
Sand, very fine and clay	20	759
Sand, very fine to coarse and much clay	4	763
Clay, buff, sandy	10	773
Sand, very fine and clay	10	783
Clay, buff and some sand	25	808
Clay, buff	20	828
Clay, buff and some fine sand	20	848
Sand, medium and clay	10	858
Clay, buff	10	868
Clay, buff and medium sand	20	888

Material	Thickness (feet)	Depth (feet)
Sand, fine to medium and clay	10	893
Sand, fine and clay	10	908
Sand, very fine to medium, clay and gravel	10	918
Clay, buff, sandy	10	928
Sand, very fine and clay	10	938
Sand, very fine	10	948
Sand, very fine and clay	10	958
Clay and very fine sand	10	968
Sand, very fine and clay	20	988
Clay and very fine sand	40	1,028
Clay, very fine to coarse sand and gravel	10	1,038
Clay, brown	10	1,048
Clay, brown and fine gravel	38	1,086
Clay, buff and fine sand	10	1,096
Clay, brown, fine sand and gravel	9	1,105
Sand, very fine, gravel and clay	11	1,116
Clay, buff, sandy	20	1,136
Clay, buff and fine sand	20	1,156
Clay, buff	10	1,166
Sand, very fine and clay	10	1,176
Sand, medium and clay	10	1,186
Sandstone, very fine-grained	10	1,196
Clay, buff	9	1,205

25.6.19.440 U. S. Government

Log by driller: Layne-Texas Drilling Co.

Material	Thickness (feet)	Depth (feet)
Sand	3	3
Caliche	2	5
Sand	21	26
Clay	8	34
Sand	20	54
Sand and clay	38	92
Clay and sand	30	122
Clay	31	153
Sand	4	157
Clay and sand	83	245
Sand and boulders	6	251
Clay	15	266
Sand and boulders	23	289
Boulders	7	296
Clay, sand and boulders	9	305
Sandy clay	28	333
Water sand	32	365
Sand and clay layers	13	378
Clay	22	400
Sand and gravel - water	15	415
Sand and boulders - water	16	431
Clay	2	433

Log by driller: Layne-Texas Drilling Co.

Material	Thickness (feet)	Depth (feet)
Sand, clay and caliche	17	17
Sand	13	30
Sand and clay breaks	21	51
Clay	31	82
Sand and clay layers	90	172
Clay	42	214
Sand	52	266
Clay	12	278
Hard sand and gravel	18	296
Clay	12	308
Clay layers and sand	10	318
Boulders	7	325
Sand	29	354
Clay layers and sand	36	390
Broken sand and clay	14	404
Boulders	8	412
Clay	10	422
Sand	14	436
Shale	4	440

Material	Thickness (feet)	Depth (feet)
Sand, fine to medium and caliche	20	20
Sand, fine to very coarse, gravel and caliche	10	30
Gravel, pebbles and caliche	20	50
Sand, quartz, very coarse and gravel	20	70
Sand, fine to very coarse and gravel	10	80
Clay, brown and gravel	10	90
Sand, fine to coarse and gravel	10	100
Clay, brown and gravel	10	110
Sand, very fine to very coarse and gravel	20	130
Sand, very fine to medium	30	160
Sand, very fine to medium, gravel and clay	10	170
Clay, brown	10	180
Clay, brown and caliche pebbles	6	186
Clay, buff, sandy	4	190
Clay, buff and pebbles	10	200
Clay, brown and gravel	6	206
Sand, coarse and some clay	4	210
Sand, medium to coarse and gravel	5	215
Clay, brown, sand and gravel	2	217
Sand, very fine to coarse	3	220
Sand, fine to very coarse and gravel	10	230

Material	Thickness (feet)	Depth (feet)
Sand, fine to coarse, gravel and clay	10	240
Clay, buff and coarse gravel	14	254
Sand, coarse to very coarse and clay	6	260
Clay, buff and pebbles	10	270
Sand, coarse to very coarse and some clay	10	280
Gravel, sharp or angular and caliche	10	290
Clay, buff, sandy	10	300
Gravel, angular and some clay	10	310
Sand, buff, very fine to medium and clay	6	316
Clay, buff	4	320
Clay, brown to buff and caliche	10	330
Sand, fine to coarse	6	336
Clay, buff	4	340
Clay, buff and gravel	6	346
Sand, fine	7	353
Clay, buff	3	356
Sand, medium	4	360
Clay, buff and coarse gravel	10	370
Clay, buff	20	390
Sand, medium	10	400
Sand, very fine to fine	10	410
Sand, fine, gravel and caliche	11	421
Sand, fine to medium and caliche	19	440
Sand, very fine to fine	11	451

Material	Thickness (feet)	Depth (feet)
Clay, buff, sandy and caliche	9	460
Clay, buff, sandy and caliche	10	470
Sand, very fine to fine and clay	10	480
Clay, buff, sandy and caliche gravel	10	490
Clay, buff, coarse sand and gravel	10	500
Sand, very coarse, gravel and caliche	20	520
Sand, very fine to fine	10	530
Sand, medium to coarse, gravel and caliche	12	542
Sand, fine to coarse and caliche gravel	18	560
Sand, medium to coarse, gravel, caliche and clay	10	570
Clay, buff, sandy and caliche gravel	10	580
Clay, coarse sand and gravel	5	585
Sand, fine to coarse and gravel	10	595
Clay, very sandy and gravel	10	605
Clay, sandy and much caliche	3	608
Clay, sandy, gravel and caliche	7	615
Clay, buff	10	625
Sand, very fine	20	645
Sand, medium to coarse and caliche gravel	20	665
Sand, very coarse and gravel	12	677
Clay, sandy and caliche gravel	13	690
Sand, medium to coarse and clay	10	700



Material	Thickness (feet)	Depth (feet)
Sand, medium and clay	10	710
Sand, medium and gravel	10	720
Sand, medium to coarse and gravel	10	730
Sand, medium to coarse, gravel and caliche	5	735

## Partial driller's log

Material	Thickness (feet)	Depth (feet)
Surface sand	7	7
Caliche	10	17
White sand	5	22
Fine gravel	8	30
Brown sand	45	75
Caliche and red mud	5	80
Brown sand - 20" casing set at 95	28	108
Red mud	82	190
Sand	20	210
Red mud	100	310
Brown sand	40	350
Red mud	38	388
Sand	15	403
Red mud	12	415
Sand - fresh water - 2 bailers in 12 hours	3	418
Red mud	37	455
Sand - water - 16 bailers in 12 hours	10	465
Red mud	25	490
Sand	15	505
Red mud	25	530
Fine sand	31	561

## Partial driller's log

Material	Thickness (feet)	Depth (feet)
Brown shale	9	570
Quick sand	5	575
Brown shale	19	594
Quicksand	16	610
Red shale	10	620
Brown shale	60	680
Quicksand	10	690
Brown shale - 15½" casing set at 726 feet	62	752
Brown sand	4	756
Brown shale	35	791
Sandy shale	37	828
Sand	15	843
Brown shale	55	898
Brown sandy shale	32	930
Brown shale	50	980
Sand	13	993
Brown shale	7	1,000
Sand	10	1,010
Brown gumbo	130	1,140
Sand	4	1,144
Brown shale	19	1,163
Sand	11	1,174
Brown shale	56	1,230

## Partial driller's log

Material	Thickness (feet)	Depth (feet)
Gray sand	10	1,240
Brown shale - 12½" casing set at 1,250 feet	10	1,250
Brown shale	19	1,269
Brown gumbo	23	1,292
Brown sandy shale	59	1,351
Gray and brown sandy shale	27	1,378
Brown shale	12	1,391
Gray shale and lime	19	1,410
Gray and brown shale and lime	26	1,436
Brown shale	34	1,470
Brown shale-lime	81	1,551
Brown shale	88	1,639
Brown shale - very sandy	11	1,650
Brown sandy shale	8	1,658
Lime shell	2	1,660
Brown shale	120	1,780
Brown shale - very sandy - show of oil and gas	8	1,788
Brown sandy shale	40	1,828
Brown shale	31	1,859
Brown shale	39	1,898
Shale and sand	2	1,900
Brown sandy shale	50	1,950

## Partial driller's log

Material	Thickness (feet)	Depth (feet)
Sandy lime and brown shale - show of oil	4	1,954
Sandy lime	30	1,984
Sandy lime, chert and detrital - 10 $\frac{1}{2}$ " casing set at 1,990 feet	4	1,988
Conglomerate, lime chert, etc.	21	2,009
Sandy lime	12	2,021
Brown shale and sandy lime	14	2,035
Brown shale (sandy)	2	2,037
Brown shale	9	2,046
Brown sandy shale - salt water at 2,035-37 feet	23	2,069
Brown shale	16	2,085
Gray sandy lime	4	2,089
Hard gray sandy lime - show of oil	4	2,093
Conglomerate	21	2,114
Brown shale	6	2,120
Conglomerate	27	2,147
Lime and shale and conglomerate	3	2,150
Conglomerate	9	2,159
Conglomerate and yellow shale	5	2,164
Conglomerate-lime-shale-detrital	9	2,173
Hard lime	2	2,175
Conglomerate	7	2,182

25.8.6.422 State of New Mexico

Material	Thickness (feet)	Depth (feet)
Sand, buff, clay and caliche	10	10
Clay, light-red, sandy and caliche	10	20
Clay, red	10	30
Clay, light-brown	10	40
Clay, light-brown, sandy and caliche	14	54
Sand, reddish, fine	10	64
Clay, light-brown, sandy and caliche	10	74
Sand, buff, clayey and caliche	18	92
Sand, gray, fine	10	102
Sand, gray, fine and caliche pebbles	22	124
Clay, light-red to buff	20	144
Clay, red, hard	10	154
Clay, red, waxy, heavy and caliche	40	194
Clay, light-red, sandy	10	204
Clay, light-red, waxy, hard and caliche	60	264
Clay, light-red, very hard (Sample missing from 264-267 feet)	10	274
Clay, light-red and caliche	10	284
Clay, light-red, slightly sandy and caliche	10	304
Clay, light-red, hard and caliche	10	314
Clay, light-red and caliche	10	324

Log by driller: Morrison Bros.

Material	Thickness (feet)	Depth (feet)
Caliche	5	5
Clay and caliche	7	12
Sand, medium to coarse	6	18
Caliche	7	25
Clay, red	40	65
Caliche	30	95
Clay, red	10	105
Clay, yellow	25	130
Clay, red	12	142
Clay, yellow	18	160
Clay, red	30	190
Shale	5	195
Clay, red	45	240
Clay, yellow	25	265
Shale	10	275
Clay, red	75	350
Clay, brown, sandy	5	355
Clay, red	15	370
Clay, yellow, sandy	15	385
Shale	5	390
Gravel, white, sharp	5	395
Clay	5	400
White rock	3	403

Log by driller: Morrison Bros.

Material	Thickness (feet)	Depth (feet)
Clay	7	410
White rock	2	412
Clay	6	418
Hard rock, white	14	432
Hard rock, green	23	455
Hard rock, gray	37	492
Soft break	3	495
Hard rock	2	497
Soft break	3	500
Hard rock, white	60	560
Hard rock, brown	43	603
Fractured zone	5	608
Hard rock, brown	33	641
Hard ledge (had to shoot)	2	643
Hard rock, white, brown and green	102	745



Testhole T-5

Material	Thickness (feet)	Depth (feet)
Sand, red, up to coarse and caliche	10	10
Sand, red, medium and some gravel	5	15
Clay, reddish brown, fairly hard, containing caliche fragments	20	35
Clay, brownish, sandy and gravel	25	60
Gravel, up to medium and sandy clay	20	80
Clay, brownish, sandy, containing gravel	10	90
Clay, pinkish, containing sand and gravel	35	125
Clay, brownish	5	130
Clay, sand and gravel	15	145
Clay, brownish, soft	50	195
Clay, brownish, sandy and fine to medium gravel	15	210
Clay, brownish	10	220
Clay, brownish, sandy and fine to medium gravel	30	250
Clay, brownish	5	255
Clay, brownish, soft and sand and gravel	25	280
Clay	5	285
Clay, brownish, soft and sand and gravel	15	300
Clay, brownish, moderately hard	25	325
Sand, gravel and clay	20	345
Clay, brownish, sandy, soft to moderately hard	10	355
Gravel and sand, clay and silt	25	380

26.6.34.150a Southern Pacific Railroad (Well 3)  
Driller's log

Material	Thickness (feet)	Depth (feet)
Sand	10	10
Caliche	5	15
Sand	135	150
Clay	5	155
Sand	20	175
Clay	4	179
Sand	8	187
Clay	3	190
Sand	43	233
Clay	4	237
Sand	7	244
Rock	1	245
Sand	55	300
Clay	4	304
Sand	4	308
Clay	4	312
Sand, water	38	350
Clay	10	360
Sandstone	20	380
Sand, water	17	397
Clay	2	399
White rock	1	400

## Test hole T-1

Material	Thickness (feet)	Depth (feet)
Sand, red, very fine to coarse, contains caliche	5	5
Caliche to 8 feet; sand, red, very fine to fine, hard	5	10
Sand, very fine to fine, some caliche fragments and coarse sand	5	15
Sand, mainly medium to coarse	4.5	19.5
Clay, reddish	5.5	25
Silt, gray	5	30
Sand, red, fine, clayey in part (probably clay lenses)	5	35
Clay, grayish and fine to medium sand	5	40
Sand, red, fine and gray clay	10	50
Clay, brownish and fine to medium sand	15	65
Clay, light brown and very fine, red sand	15	80
Sand, red, fine	5	85
Sand, red, fine; contains clay	10	95
Clay, gray	5	100
Clay, gray and brown and fine sand	5	105
Clay, gray and fine sand	5	110
Sand, red, fine	15	125
Clay, gray, with sand lenses	5	130
Sand, red	5	135
Clay, gray, with sand lenses	25	160
Clay, gray, with sand lenses	20	180
Caliche and fine sand	10	190

Material	Thickness (feet)	Depth (feet)
Sand, fine, and gray clay	15	205
Sand, fine, with some caliche	5	210
Clay, gray, with some sand	5	215
Clay, gray, with some red sand	5	220
Clay, gray, sand and scattered pebbles	15	235
Clay, brownish; contains some white, sandy clay	5	240
Clay, brownish; contains some caliche and very fine sand	5	245
Clay, brownish, fine sand and silt	5	250
Clay, brownish and fine sand	5	255
Clay, brownish and gray and fine sand	5	260
Clay, brownish and gray	5	265
Clay, gray and fine sand	5	270
Clay, brownish and gray and fine sand	20	290
Clay, brownish and sand	5	295
Clay, brownish and gray; contains some fine sand and caliche	5	300
Clay, brownish and gray, with some fine sand	10	310
Clay, brownish and gray; contains some fine sand and caliche	10	320
Clay, brownish; contains some very fine sand and caliche	10	330
Sand, very fine to fine; contains some brown clay and caliche	5	335
Sand, fine to coarse and brownish clay	5	340

26.7.1.241 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Clay, brownish	5	345
Sand, very fine to fine and brownish clay	5	350
Clay, brownish and fine sand	5	355
Clay, brownish, brittle; contains some fine sand and silt	5	360
Clay, brownish to red-brown and some green	15	375
Clay as above and silt fragments	5	380
Silt, grayish to brown and brownish clay	5	385
Silt, grayish, very coarse sand and clay	5	390
Clay, brown and silt	5	395
Silt, grayish and brown clay	20	415
Silt, grayish and brown clay	5	420
Clay, brown to red-brown, with some green	5	425
As above with some silt	20	445
Silt and some brown clay	5	450
Clay, brown and some silt	2.5	452.5
As above and some very fine sand	5	447.5
Clay, brown and silt	7.5	465
Clay, brownish to red-brown and gray-green silt with very fine sand	2.5	467.5
Clay, brownish, in hard fragments and greenish- gray, clayey silt and very fine sand	2.5	470
As above with some brownish silt, sandier than above	2.5	472.5

26.7.1.241 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
As above, increase in loose silt and very fine sand	20	445
Clay, brownish; contains some silt and fine sand	2.5	477.5
Clay, grayish brown	2.5	480
Clay, brownish, soft	5	485
Clay, brownish, soft, somewhat silty	5	490
Clay, light brown, silty in part; contains pieces of red-brown and green clay	2.5	492.5
Clay, dark brown; contains light brown and green moderately hard clay fragments	2.5	495
Clay as above; contains some silty clay and very fine sand	2.5	497.5
Clay as above with some silty clay	2.5	500

26.7.32.122 State of New Mexico

Material	Thickness (feet)	Depth (feet)
Caliche	20	20
Gravel, coarse, red clay and caliche	30	50
Gravel, coarse, angular and caliche	10	60
Shale, brown and caliche	10	70
Clay, brown, sandy and caliche	10	80
Shale, brown, sand and caliche	20	100
Gravel, very coarse, angular	20	120
Sand, reddish, fine	2	122
Sand, coarse, clay and caliche	8	130
Caliche	10	140
Sand, very coarse to coarse	10	150
Shale, brown and caliche	10	160
Sand, very fine to very coarse and coarse, angular gravel	30	190
Sand, very fine to coarse, coarse, angular gravel and caliche	10	200
Clay, buff, sandy	20	220
Shale, brown, sandy and caliche	10	230
Clay, buff and fine, angular gravel	10	240
Sand, very coarse, angular gravel and brown shale	10	250
Gravel, fine to coarse, angular	10	260
Sand, fine to coarse	10	270
Sand, coarse and angular gravel	10	280

26.7.32.122 State of New Mexico.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, fine to coarse	10	290
Clay, buff, sandy	10	300
Sand, fine to coarse	10	310
Sand, coarse, some gravel and pink shale	10	320
Clay, brown, sandy	10	330
Clay, brown, coarse sand and gravel	10	340
Sand, very fine	8	348
Clay, buff and coarse sand	2	350
Clay, brown and very fine-grained sandstone	20	370
Gravel, angular and very fine sand	10	380
Sand, very fine to fine	10	390
Clay, buff, sandy	7	397
Shale, brown and bentonite	3	400
Clay, pink and coarse sand	10	410
Clay, pink, sandy	4	414
Sand and clay	6	420
Sand, fine to medium	10	430
Sand, fine to medium and clay	10	440
Clay, pink, sandy	20	460
Sand, medium and clay	10	470
Sand, fine to medium	10	480
Sand, fine to medium and clay	10	490
Clay, pink and some sand	20	510
Clay, pink, sandy	10	520



26.7.32.122 State of New Mexico.--Continued

Material	Thickness (feet)	Depth (feet)
Clay, pink	24	544
Clay and sand	6	550
Sand, medium and clay	10	560
Clay, pink	20	580
Sand, fine to medium	4	584
Clay, pink, sandy	6	590
Sand, fine to medium	10	600
Clay, pink, sandy	10	610
Sand, very fine to medium and clay	10	620
Gravel, angular, quartz, sand and clay	4	624
Sand, fine to medium	6	630
Sand, medium	5	635
Shale, red and coarse sand	5	640
Sandstone, fine and sand	10	650
Sand, coarse, gravel and clay	10	660
Shale, brown and sandy clay	10	670
Sand, medium to coarse	3	673
Shale, brown	17	690
Shale, brown, sandy, and caliche	10	700
Shale, brown and sandstone	10	710
Sand, fine to medium	8	718
Sand, medium sandstone and clay	2	720
Sand, medium to coarse	10	730
Sand, medium to coarse and gravel	10	740

26.7.32.122 State of New Mexico.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, very fine to fine	10	750
Sand, fine to medium	5	755
Clay, brown and bentonite	5	760
Clay, sandy and bentonite	9	769
Sand, fine to medium	5	774
Clay, brown	3	777
Sand, medium	3	780
Sand, very fine to medium	10	790
Sand, very fine to medium and clay	3	793
Clay, brown and gray shale	7	800
Clay, brown, sandy	10	810
Sand, medium and clay	12	822
Clay, brown and very fine-grained sandstone	18	840
Clay, brown, sandy	4	844
Sand, very fine to fine	5	849
Clay, brown	11	860
Sandstone, very fine and brown clay	10	870
Sandstone, very fine-grained and medium sand	10	880

## Test hole T-2

Material	Thickness (feet)	Thick (feet)
Sand, red, medium and caliche	5	5
Sand and gravel	20	25
Sand and gravel with $\text{CaCO}_3$ cement	5	30
Sand and gravel with clay lenses	30	60
Sand, fairly well consolidated, with scattered gravel	15	75
Gravel and sandy clay	5	80
Clay, brown, sandy	5	85
Clay, brown, with sand and gravel	15	100
Clay, brown	10	110
Clay, brown and sand	15	125
Clay, brown, with some sand and scattered gravel	25	150
More clay than above	20	170
Clay, sandy, with gravel	25	195
Clay, sandy, with gravel and cobbles	20	215
Clay, brownish with some silt	345	560
Silt with clay	30	590
Clay and silt, brownish	45	635
Sand and gravel; contains clay and silt and scattered cobbles	70	705

26.8.32.111

Material	Thickness (feet)	Depth (feet)
Sand, medium to coarse and caliche	30	30
Sand, medium to coarse	20	50
Sand, very fine to fine	40	90
Sand, very fine to medium	10	100
Sand, fine to coarse	10	110
Sand, very fine to medium	60	170
Sand, very fine to very coarse	30	200
Sand, very fine to coarse and some clay	30	230
Sand, very fine, silt and some clay	20	250
Sand, very fine to medium and some clay	10	260
Sand, very fine to medium and clay	10	270
Clay, brown and very fine sand	10	280
Clay, brown	10	290
Clay, brown and some very fine sand	10	300
Clay, red, some silt and fine sand	10	310
Clay, red, some fine sand	30	340
Clay, red, very fine sand and gray silt	30	370
Clay, red and medium to coarse sand	10	380
Clay, red and medium to very coarse sand	10	390
Sand, medium to very coarse, clay and some granules	10	400
Sand, medium to very coarse and red clay	10	410
Clay, red and very coarse sand	10	420

26.8.32.111.--Continued

Material	Thickness (feet)	Depth (feet)
Clay, red, very coarse sand and some granules	10	430
Clay, red and very fine to coarse sand	10	440
Clay, red, gray silt and some granules	10	450
Clay, red and silt	10	460
Clay, red, very coarse, sandy silt and some granules	20	480
Clay, red, silt, very coarse sand, some granules and lime	10	490
Clay, red and silt	10	500
Clay, red, silt and some calcite	10	510
Clay, red, silt, caliche and some coarse sand	10	520
Clay, red, silt and some caliche	10	530
Clay, red, silt, some caliche and some coarse sand	10	540
Clay, red, medium to coarse sand, silt and some granules	10	550
Clay, brown, medium to coarse sand and silt	20	570
Clay, brown and very fine to medium sand	10	580
Clay, brown, very fine to medium sand and some granules	10	590
Clay, brown, very fine to coarse sand and granules	10	600
Clay, red and brown, silt and very fine to medium sand	10	610
Clay, red and brown, silt, very fine to medium sand and granules	10	620
Clay, brown, very fine to medium sand and granules	10	630
Clay, brown, very fine to coarse sand, granules and pebbles	10	640

26.8.32.111.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, very fine to very coarse, clay, granules and pebbles	10	650
Clay, brown, very fine to very coarse sand and granules	20	670
Clay, brown, very fine sand, granules and pebbles	10	680
Granules, pebbles, lime, very fine to medium sand and clay	5	685
Granules and pebbles	5	690
Granules, pebbles, red clay and fine to medium sand	10	700
Conglomerate of granules, lime shell and fine sand	10	710
Conglomerate of granules, very fine to coarse sand and lime shell	20	730
Conglomerate of granules, pebbles and fine sand	10	740
Conglomerate of granules and pebbles	40	780
Conglomerate of granules, pebbles, some red clay and very fine sand	30	810
Conglomerate of granules, pebbles and very fine to coarse sand	10	820

1.1.6.344 Navar Bros.

Log by driller: Payne and Ballard Drilling Co.

Material	Thickness (feet)	Depth (feet)
Clay and sand streaks; very little sand	400	400
Conglomerate and yellow shale	35	435
Conglomerate	24	459
Hard quartzite: drilling rate, 1 foot per hour	9	468
Black shale and lime	12	480
Lime	5	485
Lime and shale streaks	17	502
Soft, black shale	12	514
Black lime	26	540
Hard, black lime	30	570
Yellow lime - lots of water	15	585

1.8D.1.111 U. S. Government

Material	Thickness (feet)	Depth (feet)
Sand, medium, caliche and pink clay	20	20
Sand, medium and very coarse gravel	10	30
Sand, medium to coarse, caliche and pebbles	10	40
Sand, medium	10	50
Sand, coarse, red shale and caliche	20	70
Sand, medium to coarse	10	80
Clay, pink	10	90
Clay, pink, sandy	10	100
Sand, coarse	10	110
Sand, medium to coarse	30	140
Sand, medium to coarse and some large gravel	40	180
Clay, buff, sandy	10	190
Clay, buff	23	213
Sand, medium to coarse	7	220
Sand, medium to fine	30	250
Sand, fine to medium, some clay and caliche	10	260
Sand, fine to medium	10	270
Sand, fine to medium some clay and gravel	20	290
Sand, fine	1	291
Sand, fine to medium and clay	9	300
Sand, medium and clay	5	305
Sand, coarse to very coarse	15	320



1.80.1.111 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, coarse to very coarse	10	330
Sand, fine to medium	10	340
Sand, medium to coarse and clay	10	350
Clay, buff, sandy	19	369
Sand, fine to very fine	6	375
Sand, medium to coarse	5	380
Sand, fine to medium	20	400
Clay, sandy	2	402
Sand, medium to coarse	7	409
Sand, medium and clay	11	420
Clay, pink	10	430
Clay, pink, sandy	20	450
Sand, coarse	10	460
Sand, medium to coarse	12	472
Sand, very coarse, caliche and pebbles	8	480
Shale, red	7	487
Sand, fine to medium	3	490
Shale, red	5	495
Sand, fine to medium and clay	5	500
Sand, fine to coarse and quartz	5	505
Sand, fine to coarse and some gravel	5	510
Sand, fine to medium	10	520
Sand, fine and some red shale	5	525

1.80.1.111 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Clay, pink, sandy	5	530
Gravel, coarse and clay	22	552
Clay, pink, sandy	4	556
Clay, pink	4	560
Clay, pink, sandy	9	569
Sand, coarse	35	604
Clay, pink, sandy	24	628
Clay, pink	12	640
Sand, very coarse	10	650
Sand, very coarse and some clay	20	670
Clay, pink, sandy	10	680
Clay, sandy, some caliche and gravel	10	690
Sand, coarse to very coarse	10	700
Clay, pink, sandy	7	707
Sand, fine to medium	3	710
Sand, medium to coarse	10	720
Sand, fine to coarse	15	735
Clay, pink, sandy	5	740
Clay, some coarse gravel and boulders	2	742
Sand, medium and red shale	8	750
Sand, very coarse	10	760
Sand, very coarse and gray shale	10	770

1.80.1.111 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, very coarse, some gravel and shale	3	773
Clay, pink and some very coarse gravel	7	780
Clay, pink, sandy	20	800

1.80.6.222 U. S. Government

Material	Thickness (feet)	Depth (feet)
Sand, fine caliche and granules	10	10
Sand, fine, granules and pebbles	10	20
Gravel	10	30
Gravel and medium to coarse sand	10	40
Sand, medium to coarse and gravel	10	50
Sand, fine to coarse and gravel	10	60
Gravel, sand and clay	10	70
Gravel, fine, sand and clay	10	80
Sand, fine to coarse and gravel	20	100
Sand, medium to coarse and gravel	70	170
Sand, gray, fine to coarse and gravel	10	180
Sand, gray, fine to medium and gravel	4	184
Sand, fine to coarse and gravel	6	190
Sand, fine to medium	10	200
Sand, fine to medium and gravel	10	210
Sand, medium to coarse and gravel	10	220
Sand, fine to coarse and gravel	20	240
Sand, fine to coarse, gravel and clay	10	250
Sand, fine to medium and gravel	10	260
Sand, fine to coarse, gravel and clay	10	270
Sand, fine to medium and some gravel	20	290
Sand, fine to medium, some clay and gravel	10	300
Sand, medium to very coarse	10	310

1.80.6.222 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, fine to coarse, some clay and gravel	10	320
Sand, fine to coarse and gravel	10	330
Sand, fine to coarse and some gravel	10	340
Sand, fine to coarse, some gravel and caliche	10	350
Sand, fine to very coarse	20	370
Sand, fine to very coarse and some caliche	10	380
Sand, fine and some gravel	10	390
Sand, fine to coarse and some gravel	50	440
Sand, fine to medium and clay	10	450
Missing	10	460
Sand, fine to medium	10	470
Sand, fine to medium and caliche	10	480
Sand, fine to coarse and caliche	20	500
Sand, fine to medium	20	520
Sand, clayey	10	530
Sand, fine to medium	20	550
Sand, fine to medium and some gravel	45	595
Clay and gravel, very coarse	5	600
Sand, medium to coarse, granules and pebbles	10	610
Sand, fine to medium and granules	10	620
Sand, very fine, silt, clay and some granules	10	630
Sand, very fine, silt, clay and caliche	10	640
Sand, very fine to medium and caliche	10	650

1.80.6.222 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, very fine to fine and caliche	6	656
Sand, fine to medium and caliche	3	659
Sandstone, fine to medium and granules	10	669
Sand, very fine to medium, caliche and granules	10	679
Sand, fine to coarse, caliche and clay	10	689
Sand, fine to medium, indurated, granules and pebbles	11	700
Silt, clay and fine to medium, indurated sand	10	710
Clay, sandy and caliche	20	730
Sand, fine to medium, some clay and caliche	10	740
Silt, clay and very fine sand	20	760
Silt, clay, very fine to fine sand and caliche	10	770
Silt, clay, very fine sand and caliche	10	780
Missing	3	783
Clay, sandy, granules, caliche and pebbles	7	790
Clay, silt and very fine sand	30	820
Clay and silt	20	840
Clay, silt and very fine sand	30	870
Clay, silt and very fine, indurated sand	10	880
Sand, fine to medium and some clay	10	890
Sand, fine to medium, caliche and some clay	30	920
Sandstone, fine to medium, granules and caliche	10	930
Sand, fine to coarse and granules	10	940
Sand, fine to coarse, clay, granules and caliche	10	950

1.80.8.530 Price's Dairy

Log by driller: Layne-Texas Drilling Co.

Material	Thickness (feet)	Depth (feet)
Soil	2	2
Caliche	6	8
Sand and gravel	27	35
Clay	10	45
Sandy clay	20	65
Sand and gravel	74	139
Sand and clay	45	184
Sand and gravel	28	212
Sandy clay	61	273
Sand and gravel	24	297
Clay and sand	43	340
Sand and clay breaks	230	570
Hard shale	6	576
Coarse sand	17	593
Shale and layers of sand	12	605
Sand, broke n	109	714
Sandy clay	40	754
Sand, broken	30	784
Clay	18	802
Hard shale	5	807
Sand	63	870
Sandy shale	5	875

Material	Thickness (feet)	Depth (feet)
Sand, fine to very coarse and caliche	10	10
Sand, medium to very coarse	10	20
Sand, medium to very coarse and caliche	10	30
Sand, fine to coarse and caliche	10	40
Sand, fine to very coarse and caliche	10	50
Sand, fine to very coarse, granules and pebbles	50	100
Sand, fine to very coarse, clay, granules and pebbles	10	110
Sand, fine to medium, clay and granules	10	120
Sand, very fine to medium, caliche and pebbles	30	150
Sand, fine to coarse, granules, pebbles and caliche	30	180
Sand, very fine to medium, granules, pebbles, caliche and clay	10	190
Sand, very fine to medium, granules, pebbles and caliche	10	200
Sand, very fine to coarse, granules and caliche	10	210
Sand, fine and caliche	10	220
Sand, very fine to medium, some caliche and granules	10	230
Sand, very fine to medium	10	240
Sand, very fine to fine and silt	10	250
Sand, very fine to coarse and red clay	10	260
Sand, very fine to medium, caliche and some clay	10	270
Sand, fine to coarse, granules and pebbles	10	280



1.80.19.344 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, fine to medium, granules and pebbles	10	290
Sand, very fine to very coarse	20	310
Sand, very fine to very coarse	10	320
Sand, very fine to medium	10	330
Sand, very fine to medium and some clay	10	340
Sand, very fine to fine	10	350
Sand, very fine to coarse and some clay	10	360
Clay, silt and very fine sand	20	380
Sand, very fine to coarse	10	390
Sand, fine to coarse	10	400
Sand, fine to very coarse	30	430
Sand, fine to coarse and some granules	10	440
Sand, fine to coarse and caliche	10	450
Sand, fine to coarse and some granules	10	460
Sand, fine to coarse	10	470
Sand, very fine to coarse and some clay	10	480
Sand, very fine to very coarse	10	490
Sand, very fine to very coarse and some granules	10	500
Sand, very fine to coarse	20	520
Sand, very fine to very coarse	10	530
Sand, very fine to coarse	10	540
Sand, very fine to medium	10	550

1.80.19.374 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, very fine to very coarse	20	570
Sand, very fine to very coarse and some granules	3	573
Sand, fine to very coarse and granules	7	580
Sand, fine to very coarse, granules and clay	10	590
Sand, very fine to coarse and granules	10	600
Sand, very fine to very coarse, granules and clay	10	610
Sand, fine to very coarse, granules and pebbles	10	620
Sand, very fine to coarse and clay	10	630
Sand, very fine to very coarse	10	640
Sand, fine to coarse, granules and clay	10	650
Sand, fine to very coarse, granules and pebbles	10	660
Sand, very fine to very coarse and some granules	30	690
Sand, fine to very coarse and clay	10	700
Sand, fine to very coarse, granules, some pebbles and clay	10	710
Sand, fine to very coarse, granules and pebbles	10	720
Sand, fine to very coarse, granules and clay	8	728
Sand, fine to very coarse, granules, pebbles and clay	2	730
Sand, very fine to medium and granules	10	740
Sand, fine to medium, granules, pebbles and clay	10	750
Sand, fine to medium and some granules	10	760
Sand, gray, fine to medium	10	770

1.80.19.344 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, very fine to coarse and some granules	6	776
Sand, fine to medium	14	790
Sand, medium to coarse and granules	10	800
Sand, very fine to medium and some granules	10	810
Sand, fine to medium and some clay	10	820
Sand, fine to medium	10	830
Sand, fine to medium, clay and granules	10	840
Sand, fine to medium and clay	10	850
Sand, fine to medium, granules and pebbles	10	860
Sand, fine to medium, granules, pebbles and clay	10	870
Sand, very fine to medium and clay	4	874
Sand, very fine to medium, granules and clay	6	880
Sand, very fine to coarse, granules, pebbles and clay	10	890
Sand, very fine to coarse and clay	10	900
Silt, very fine to medium sand and clay	16	916
Sand, fine to coarse, granules and pebbles	4	920
Sandstone, granules, pebbles, clay and medium to coarse sand	20	940
Sand, fine to coarse, granules, pebbles and clay	10	950
Sandstone, hard, fine to coarse sand, granules, pebbles and clay	30	980

1.80.19.344 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Silt, very fine to medium sand, sandstone and clay	10	990
Silt, very fine to medium sand, granules, pebbles and clay	20	1,010
Silt, sandstone and clay	22	1,032
Silt, very fine to medium, granules and clay	8	1,040
Sand, very fine to very coarse, granules and some clay	10	1,050
Sand, very fine to medium, granules and clay	10	1,060
Clay, very sandy	10	1,070
Clay, sand, granules and caliche	10	1,080
Sand, very fine to fine, granules and some clay	10	1,090
Sand, very fine to fine	10	1,100
Sand, very fine to coarse	10	1,110
Sand, very fine to medium	20	1,130
Sand, very fine to medium, granules and pebbles	2	1,132
Sand, very fine to medium, pebbles and clay	8	1,140
Sand, fine to medium, granules and some clay	10	1,150
Sand, very fine to fine, granules, pebbles and some clay	10	1,160
Sand, fine to coarse and granules	10	1,170
Sand, very fine to fine and granules	10	1,180
Sand, very fine to very coarse, granules and clay	10	1,190
Sand, very fine to very coarse and granules	10	1,200

Material	Thickness (feet)	Depth (feet)
Sand and caliche	10	10
Sand, medium to coarse	40	50
Sand, medium to coarse, some clay and gravel	10	60
Clay, buff and some coarse gravel	10	70
Sand, coarse and some coarse gravel	10	80
Sand, coarse, some clay and gravel	10	90
Sand, fine to coarse and some clay	30	120
Clay, buff and some coarse gravel	10	130
Clay, buff, sandy and some coarse gravel	20	150
Sand, very fine to fine	10	160
Sand, medium to coarse	30	190
Sand, very fine to coarse and some fine gravel	10	200
Sand, fine to medium	90	290
Sand, medium to coarse	60	350
Sand, very fine to medium	10	360
Sand, very fine to medium and some gravel	10	370
Gravel, medium and some medium sand	10	380
Gravel, medium and some clay	10	390
Sand, very fine, clay and gravel	10	400
Clay, buff and some sand	10	410
Sand, very fine to medium and some gravel	10	420
Clay, buff and some sand	10	430
Sand, fine to medium and some caliche	10	440

1.30.24.333 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, very fine to fine and some gravel	20	460
Sand, very fine to fine	10	470
Clay, buff, sandy and some coarse gravel	10	480
Gravel, coarse, some pebbles and clay	10	490
Sand, medium	10	500
Clay, buff	5	505
Pebbles, subangular, gravel and sandy clay	15	520
Sand, very fine to coarse, some gravel and pebbles	10	530
Clay, sandy, some sandstone, brown and angular pebbles	10	540
Sand, medium to coarse, round gravel and pebbles	20	560
Sand, very fine to medium and some round gravel	10	570
Sand, medium to coarse, round gravel and pebbles	10	580
Sand, medium to coarse, round gravel and pebbles	10	590
Sand, fine to coarse, clay and gravel	30	620
Clay, sandy and some gravel	10	630
Clay, sandy	10	640
Sand, fine to medium, gravel and pebbles	10	650
Clay, sandy and gravel	10	660
Sand, very fine to coarse, clay and gravel	20	680
Sand, fine to coarse, clay and gravel	20	700
Sand, very fine to fine and clay	20	720
Sand, medium	10	730

1.80.24.333 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Clay, sandy and subangular pebbles	10	740
Sand, fine to medium, clay and gravel	30	770
Clay, sandy and some subangular gravel	10	780
Clay, sandy	140	920
Sand, fine to medium and some clay	20	940
Sand, fine to coarse	40	980
Sand, very fine to coarse and some clay	10	990
Sand, very fine to fine	15	1,005

Material	Thickness (feet)	Depth (feet)
Sand and clay	10	10
Sand, silt and caliche	10	20
Sand, medium to coarse	10	30
Sand, medium to very coarse, granules and pebbles	10	40
Sand, medium to very coarse, with some granules and clay	10	50
Sand, contains some granules, pebbles and clay	40	90
Sand, fine to very coarse and sandy clay	10	100
Sand, fine to coarse, with some clay and silt	10	110
Clay, sand and some gravel	20	130
Clay, silt, medium to very coarse sand, granules and pebbles	40	170
Sand, fine to very coarse, with some granules, clay and silt	30	200
Sand, fine to very coarse and granules	50	250
Sand, fine to very coarse, granules and pebbles	10	260
Sand, fine to very coarse, granules, pebbles, clay and silt	10	270
Sand, fine to very coarse	20	290
Sand, fine to very coarse, granules, some silt and clay	10	300
Sand, fine to medium and sandy clay	10	310
Clay, sandy and fine to medium sand	10	320
Sand, medium to coarse	10	330
Sand, fine to coarse and a few granules	10	340
Sand, sandy clay and clay	10	350



Material	Thickness (feet)	Depth (feet)
Sand, fine to very coarse, with some clay and silt	20	370
Sand, fine to medium, with some silt and clay	10	380
Sand, fine to coarse and some granules	20	400
Sand, fine to very coarse and some clay	20	420
Sand, sandy clay and clay	10	430
Sand, fine to very coarse, granules and clay	10	440
Sand, clay and sandy clay	10	450
Clay, sandy	10	460
Clay and sandy clay	10	470
Clay, sandy and clay	10	480
Sand and sandy clay	10	490
Sand, fine to coarse, granules and clay	10	500
Sand, medium to coarse and some granules	10	510
Sand, fine to very coarse, granules and silt	20	530
Sand, fine to coarse and clay	10	540
Sand, fine to medium and clay	20	560
Sand, very fine to coarse	10	570
Sand, fine to coarse and granules	10	580
Sand, fine to coarse, granules and pebbles	5	585
Sand, medium to very coarse, granules and pebbles	5	590
Sand, fine to very coarse and some clay	10	600
Sand, fine to coarse and some clay	30	630

1.80.4.222 U. S. Government.--Continued

Material	Thickness (feet)	Depth (feet)
Sand, medium to very coarse, granules and pebbles	10	640
Sand and clay	10	650
Sand, fine to very coarse, granules and pebbles	10	660
Sand, fine to coarse, granules and clay	10	670
Sand, fine to medium and pebbles	10	680
Sand, clay, sandy and some pebbles	10	690
Sand, fine to very coarse, granules and pebbles	10	700
Sand, medium to very coarse	20	720
Sand, medium to very coarse and granules	20	740
Sand, fine to medium, clay and sandy clay	10	750
Sand, fine to medium and some clay	10	760
Sand, medium to very coarse	20	780
Sand, very fine to medium and some clay	10	790
Sand, very fine to coarse	17	807
Sand, very fine to medium	3	810
Sand, very fine to coarse	15	825