1R - 250

REPORTS

DATE:

1981

HEALTH & ENVIRONMENT department

STATE OF NEW MEXICO
ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87503
(505) 827-5271
Thomas E. Baca, M.P.H., Director

Bruce King
GOVERNOR

George S. Goldstein, Ph.D.
SECRETARY

Larry J. Gordon, M.S., M.P.H.
DEPUTY SECRETARY

MEMORANDUM

January 15, 1981

TO: R. L. Stamets, Technical Support Chief, Oil Conservation Division

FROM: David G. Boyer, Geohydrologist, Water Pollution Control Bureau, Environmental Improvement Division

SUBJECT: REVIEW OF GROUND WATER REPORT ON TAPP RANCH AREA, LEA COUNTY, NEW MEXICO

At your request, I have reviewed a report on the above area, prepared by a member of your staff, and have found that the report summary is not supported by the information presented in the text of the report. Specifically, the summary states that high concentration of minerals in the water is due to depletion of the Ogallala formation water by pumping with subsequent evaporation of the remaining water, and further states that this problem is not related to oil and gas production in the area. This conclusion is believed by me to be incorrect for the several reasons given below.

Aside from any information generated by the field data collection process, the conclusion is flawed because ground water can not have "evaporated" in the context used in this report. Significant evaporation can take place from shallow ground water surfaces at depths up to approximately six feet over relatively short periods of time (e.g., summer months) that can lead to a relatively small but constant increase in dissolved salts (salinity). Also, depletion of ground water bodies as a result of evaporation can occur in arid areas over long periods of dry climatic conditions (e.g., many centuries). Neither of these conditions occurs in the report area. In my opinion, the proposing of the scenario of ground water evaporation and concentration of salts resulting from the depletion of an aquifer by ground water pumping shows that the author lacks a basic understanding of fundamental hydrologic concepts.

Considerable field work was performed as part of this project, including drilling of test holes and water quality sampling. The lithologic logs presented in the report were prepared by this same staff member and appear to be complete and presented correctly. Water samples collected from the holes and nearby windmills were analyzed in all cases for chlorides and for major cations and anions in the samples from the testholes.

The results of the chemical analyses show high values of chlorides in the vicinity of the Vado Oil Field (1,704 and 8,450 mg/l) and a low value (42 mg/l) from a windmill about one-half mile away to the northwest (OCD report, Figure 2). The windmill values were not used in the report, according to the author, because of the long lapse between sampling of these windmill sites (February, 1980) and the sampling of the test holes (October, 1980). However, the chloride anion is both one of the most soluble and stable ground water constituents, and it is unlikely to have changed in value to such an extent as to be excluded from the presentation.

Information presented by Ash (1963) in a ground water study of northern Lea County that was referenced in the OCD report, shows chlorides ranging from 57 to 122 mg/l for wells completed in the same sediments as penetrated in the test area. These sediments are listed by Ash as lower Cretaceous clays with stringers of siltstone and brownish sandy limestone which he believes are probably equivalent to the Tucumcari Shale. The Chloride values in the Ash report are of the same magnitude as that from the windmill northwest of the oil field (42 mg/l).

There was no consideration given in the OCD report to oil and gas activities as a possible cause of the high values of Chloride and Total Dissolved Solids (TDS). Ground water pollution by past oil and gas activities has been previously documented in Lea County (See the 1980 Surface Impoundment Assessment report for a summary of known documentation). In the ground water study of southern Lea County done by Nicholson and Clebsch (1961) and listed as a reference in the OCD report, an extensive discussion on brine water contamination was presented along with a section on chemical criteria for recognition of brine contamination. This information was not utilized in any form in the preparation of the OCD report.

Using the water analyses given on pages 18-21 of the OCD report, I plotted water quality values for test holes TA-1, TA-6, TA-8, and TA-9 on Figures 28-30 from the Nicholson and Clebsch report (attached). With reference to these figures, statements (quoted below) as to the source of the waters were made by the authors of the southern Lea County report. Similar observations may be made for data presented in the OCD report:

1. "Any sample whose analysis plots to the right of the line 18-4 on Figure 28 should be suspected of contamination by Permian waters" (page 114). All OCD test hole samples plot to the right of this line.

2. On Figure 29, "the sulfate-chloride ratio of oil-field water from Paleozoic rocks is less than about 0.25" (page 111). The SO_4/Cl ratios for the OCD test holes listed above are 0.09, 0.35, 0.26, and 0.07, respectively.

3. Also on Figure 29, "All samples of water known to be contaminated by reason of the history of the wells from which they were obtained, have ratios of sulfate to chloride of less than 2 and a total concentration of sulphate plus chloride of greater than 5" (page 114). OCD total concentrations of sulphate plus chloride for the test wells range from 69.6 to 254 meq/l.

4. In Figure 30 "all the brines. . . have a ratio of alkaline earths [Ca + Mg] to alkalis [Na + K] of less than 1", while samples from the Ogallala formation and the alluvium "have alkaline earth to alkali ratios of more than 1" (page 114). Waters for the OCD test holes have ratios of 3.72, 0.89, 1.06 and 2.22 respectively. However, a high ratio may still indicate contaminated waters, since exchange of the sodium and potassium in the brine for calcium and magnesium in caliche and colcareous cementing material may have occurred as a result of brine percolation through these overlying sediments (page 114).

The above discussion shows a high probability for brine contamination to have occurred in the Tapp Range study area as a result of oil and gas activities, mainly disposal of brines. Unfortunately, the author of the OCD report, having exactly the same information available to him, comes to a completely opposite conclusion that excludes the possibility of oil and gas activities causing the contamination.

The author's conclusion, again in my opinion, is not realistic given the amount of field work conducted at the site and the other Lea County reference material available. It shows a lack of understanding of relatively basic geolydrologic and water chemistry principles, and an inability to examine technical data and make reasonable conclusions using that information.

In addition to the above remarks, I have several suggestions to improve the content of the report:

1. During field work, surface reconnaisance should have been performed to locate and map current oil field activities (e.g., active pits if any, and injection wells) and remaining evidence of past disposal practices (e.g., abandoned brine pits and caliche borrow pits used as disposal sites). The location of the OCD test wells should also be indicated on the surface map.

2. Records of oil field activities should be consulted to determine, if possible, past brine production volumes and disposal practices for the Vada Oil Field.

3. If available or possible, state engineer records, Tapp Ranch personnel and on-site measurements should have been utilized to provide information on water levels, well depth, and completion zones for the stock windmills.

4. In addition to the structural contour map (OCD report Figure 4) and the surface map (Suggested in Item 1) showing location of oil field activities, the following maps (with appropriate scale and other essential information) should have been prepared:

   a. A water level contour map to show elevation of water table and indicate direction of water movement, and

   b. an "Isochlor" map to show equal concentrations of chloride anions. This map can indicate the location of highest contamination which can then be related back to possible current or past surface activities.

REFERENCES:

Ash, S. R., (1963), Ground-Water Conditions in Northern Lea County, New Mexico: U. S. Geological Survey Hydrol. Inv. Atlas 62, 2 sheets, 5 figures.

Nicholson, A., and Clebsch, A., (1961), Geology and Ground Water Conditions in Southern Lea County, New Mexico: New Mexico Bureau of Mines Ground Water Report 6, 123 pages.

DGB/js

Attachments: Figures 28, 29, 30 from Nicholson and Clebsch (1961) as modified to include OCD data

cc: Joe Pierce, Environmental Manager, Water Pollution Control Bureau, Environmental Improvement Division

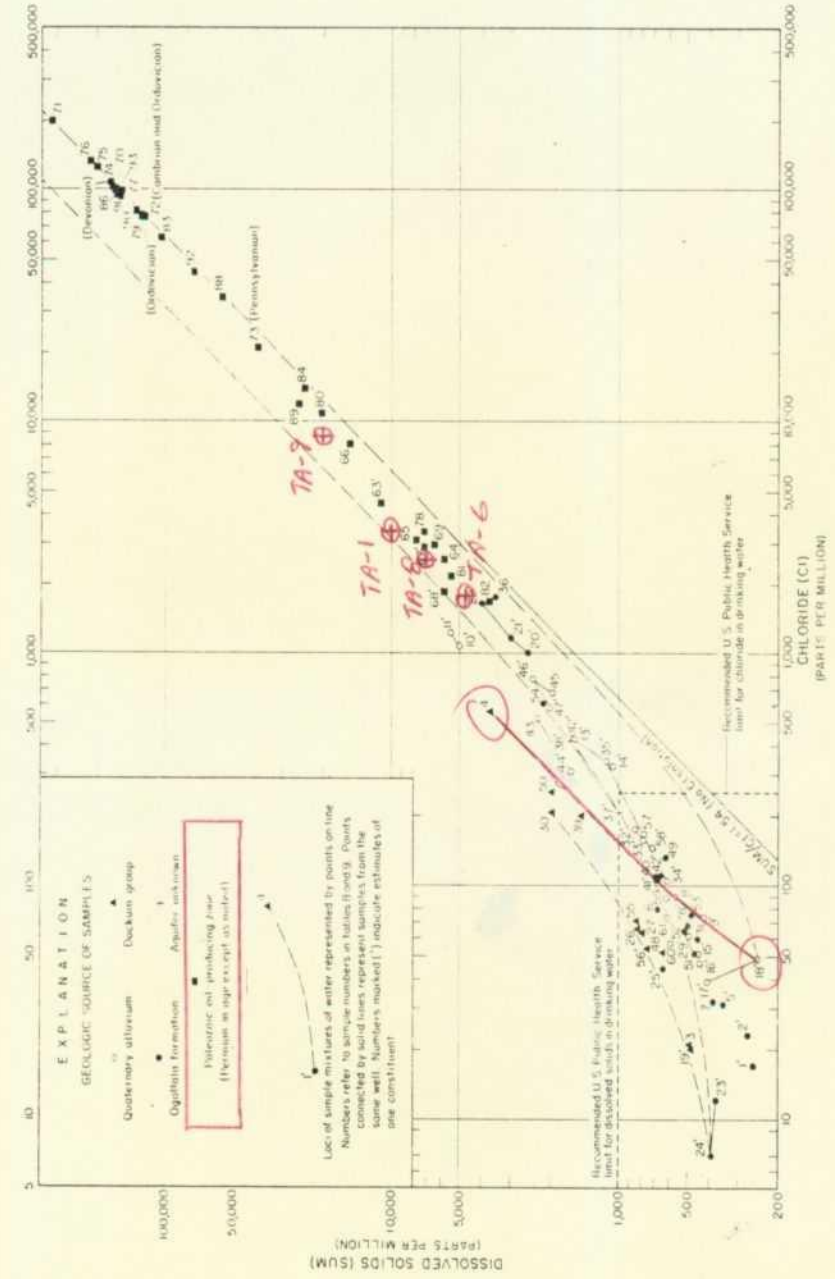


Figure 28

RELATION OF DISSOLVED SOLIDS TO CHLORIDE IN SAMPLES OF GROUND WATER FROM SOUTHERN LEA COUNTY, N. MEX.

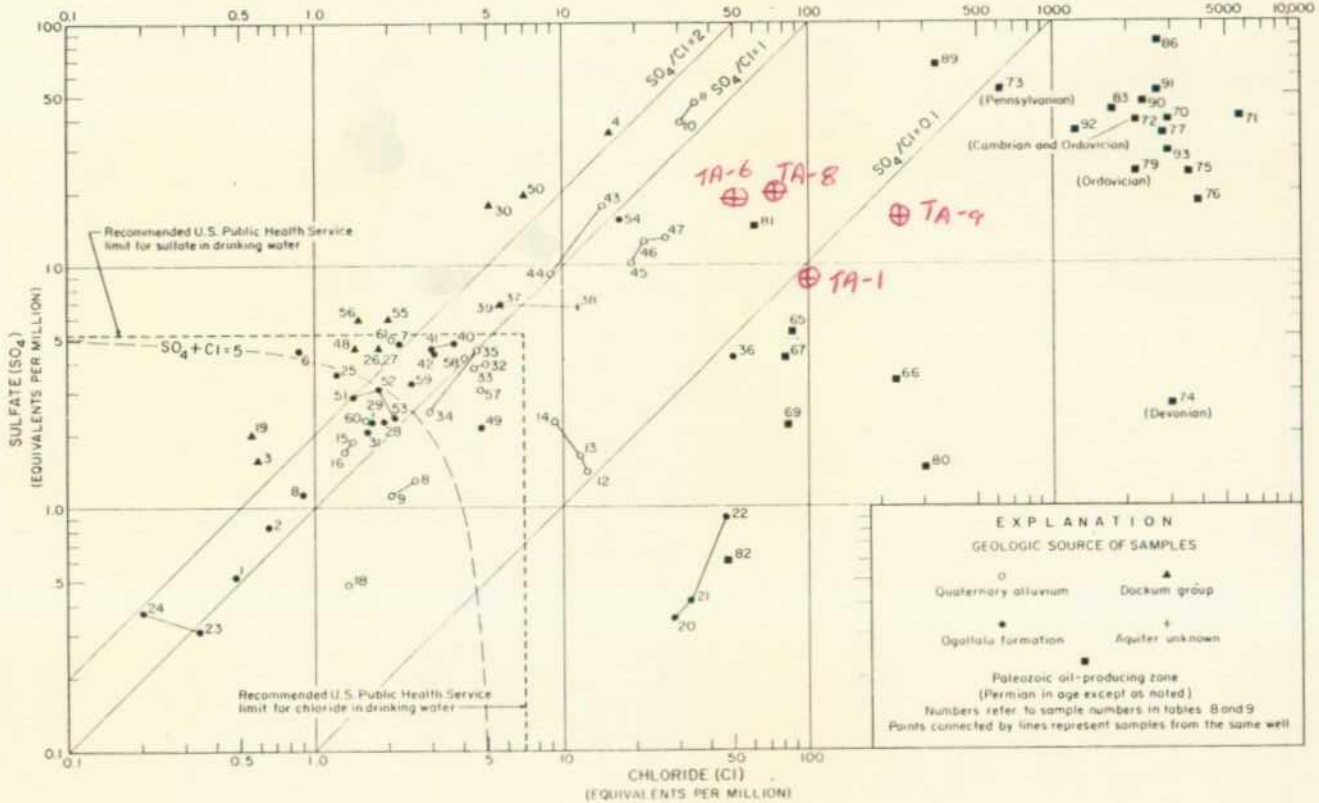


Figure 19.--Relation of sulfate to chloride in samples of ground water from southern Lea County, N. Mex.

Figure 29

RELATION OF SULFATE TO CHLORIDE IN SAMPLES OF GROUND WATER FROM SOUTHERN LEA COUNTY, N. MEX.

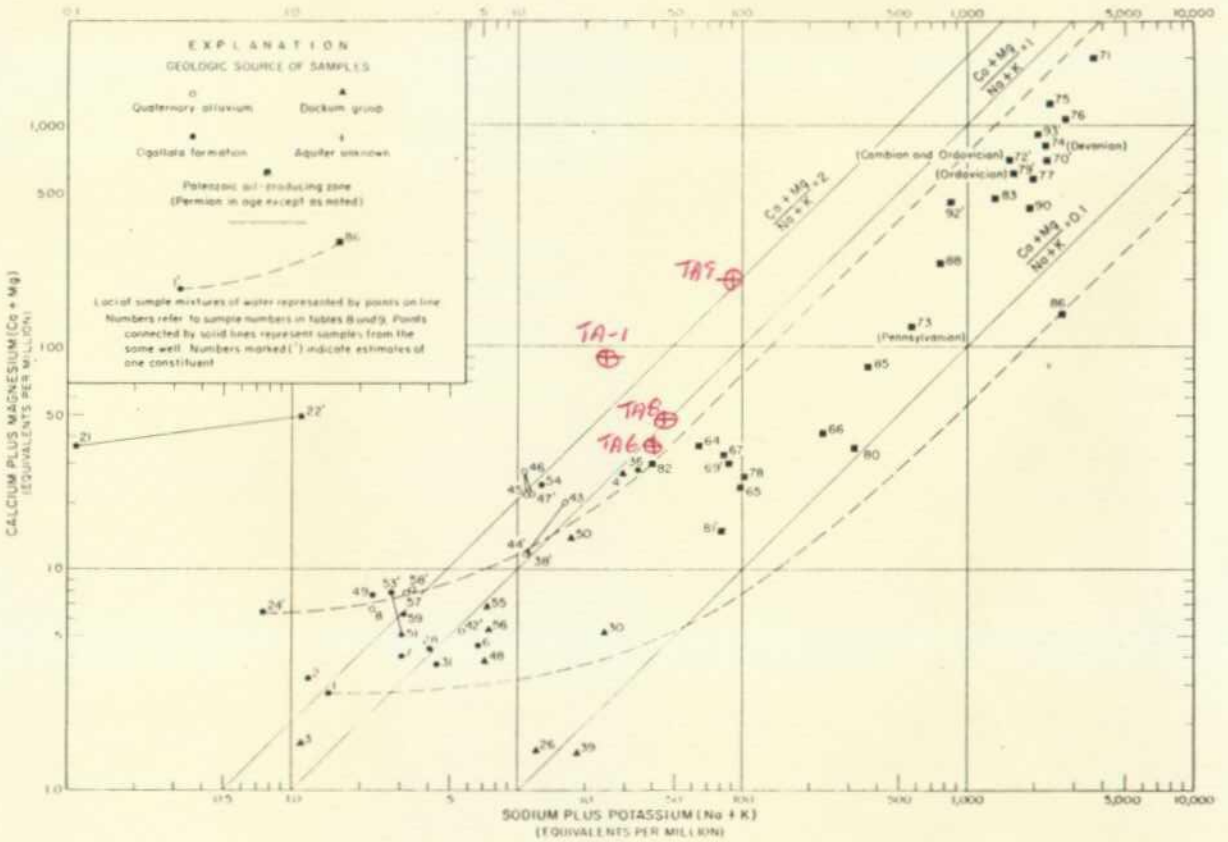


Figure 50.--Relation of calcium plus magnesium to sodium plus potassium in samples of ground water from southern Lea County, N. Mex.

Figure 30

RELATION OF CALCIUM-PLUS-MAGNESIUM TO SODIUM-PLUS-POTASSIUM IN SAMPLES OF GROUND WATER FROM SOUTHERN LEA COUNTY, N. MEX.

Ground Water Report on the Tapp Ranch Area located in Section 36, Township 9 South, Range 33 East and Section 31, Township 9 South, Range 34 East

Thomas A. Parkhill
Hydrogeologist
December 10, 1980

CONTENTS

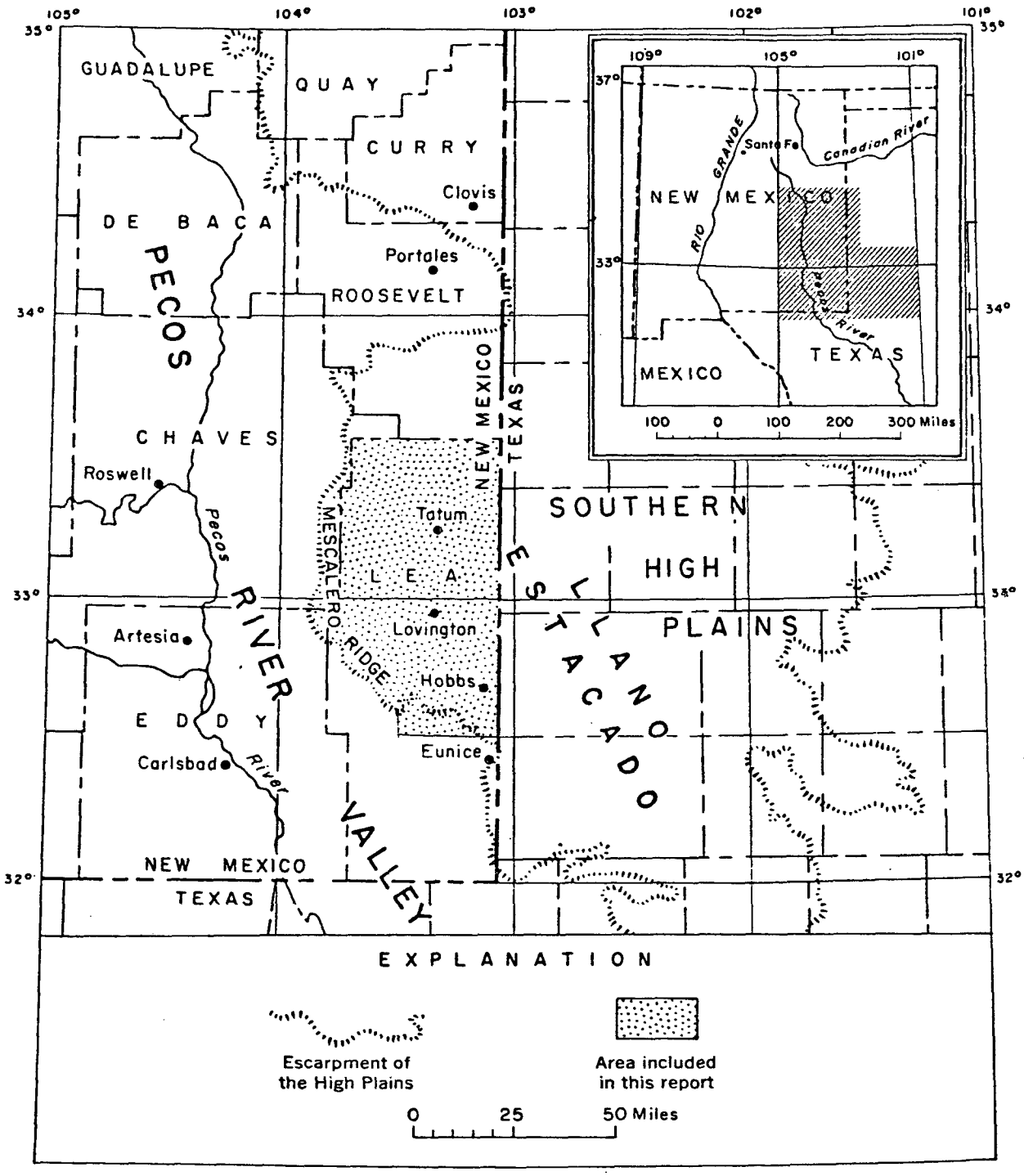
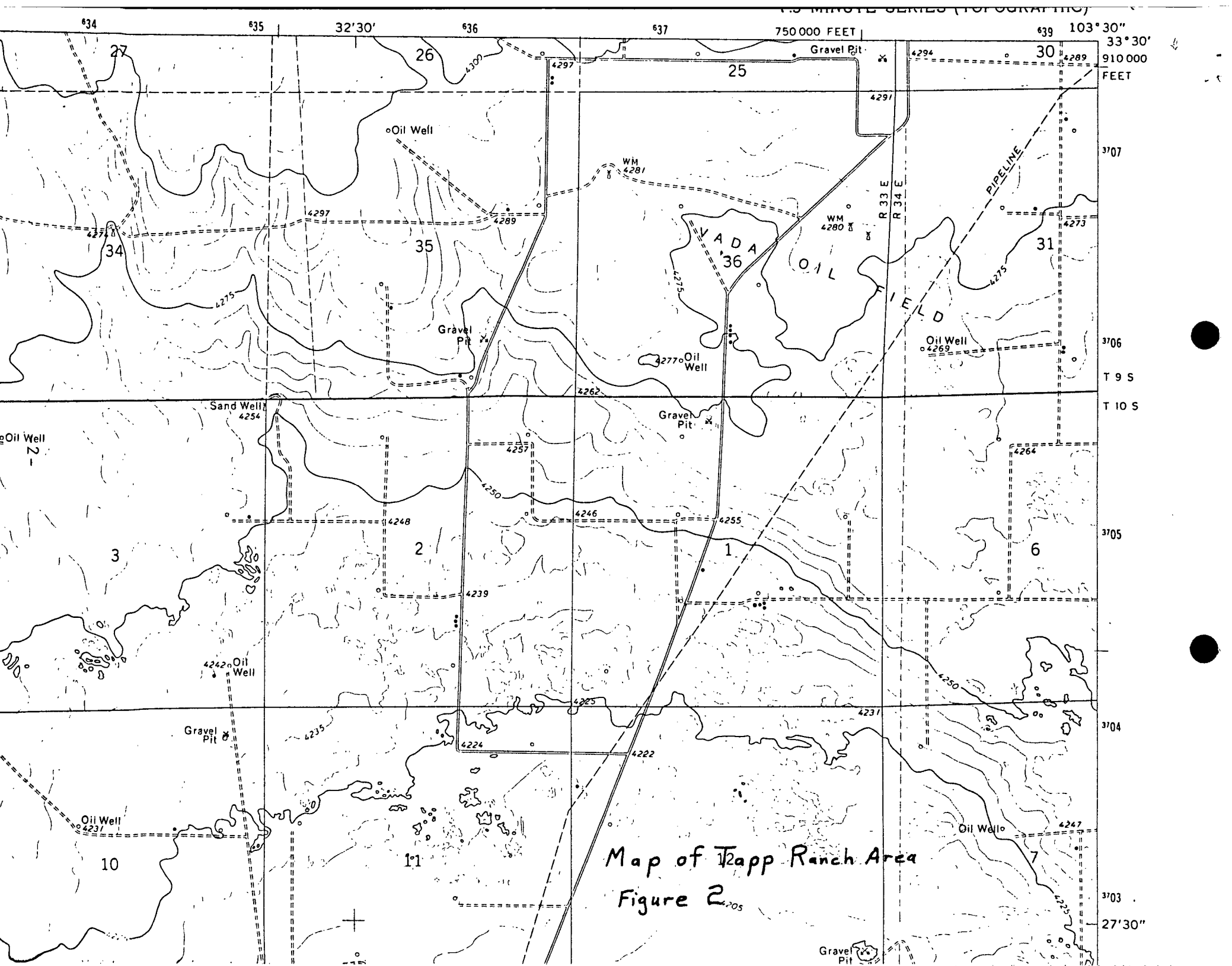


FIGURE 1.—INDEX MAP SHOWING THE LOCATION OF THE NORTHERN LEA COUNTY AREA AND ITS RELATION TO THE HIGH PLAINS AND THE PECOS RIVER VALLEY

Modified from Ash, 1963



Map of Tapp Ranch Area

Figure 2

INTRODUCTION

A detailed ground water study program was conducted to determine if a pollution problem existed in Section 36, Township 9 South, Range 33 East.

Eleven (11) test wells were drilled to obtain water samples and geological information. Two (2) of the holes remain as observation wells. No additional water samples could be obtained because all windmills in the area were shut down. This work was done between September 12, 1980 and September 14, 1980.

PHYSIOGRAPHY

The topography of this area is dominated by the Llano Estacado, which is the southern extension of the high plains in southeastern New Mexico (figure 1). It is a plateau which stands about 100 to 300 feet above the surrounding area. In general, the Llano Estacado surface is smooth and slopes toward the southeast at 10 to 20 feet per mile.

The most characteristic features of the Llano Estacado are undrained depressions or playas ranging from a few feet to 50 feet or more and from a few hundred feet to a mile or more in diameter. Most of the depressions form temporary ponds or lakes only during the summer rainy season. Some of the larger depressions contain perennial lakes of "alkali" or "saline water."

The Llano Estacado's stream drainage is poorly developed. Stream dissections are very shallow with almost no development of tributaries. The long shallow valleys follow the slope of the land surface at widely spaced intervals.

GEOLOGY

The surface geology of the study area is dominated by sediments of Quaternary, Tertiary, Cretaceous and Triassic age which relate directly to useable ground water. The subsurface geology of the area includes rocks which range from Precambrian to Permian in age. They are not significant to useable ground water, but they are the source of the highly mineralized water produced with oil. Rocks of these ages will not be described here.

Triassic age rocks of the Dockum group unconformably overlie rocks of Permian age and range in thickness from 1,400 to 2,100 feet in northern Lea County, New Mexico. The Dockum group can be divided into the Santa Rosa sandstone and the Chinle formation, but the distinction is not made in this area because of lithologic similarities and poor exposures. The group's lower section has a maximum thickness of 600 feet and consists mostly of a reddish sandstone but also in-

Table 1. Stratigraphic Units in and around T9S, R33E and R34E

Geologic Age	Geologic Unit	Thickness (ft.)	General Character	Water-Bearing Properties
Cenozoic Quaternary — Recent and Pleistocene	Alluvium	0 - 30 ±	Sand and gravel; may include redeposited material from Ogallala formation and Cretaceous and Triassic rocks.	Above the zone of saturation, hence does not yield water to wells. Aids recharge to underlying formations by permitting rapid infiltration of rain water.
	Ogallala formation	0 - 350 ±	Irregularly-bedded sand, grit, and local gravel conglomerate cemented by lime or caliche, and local beds of sand, clay and limestone; may include some redeposited material from Cretaceous and Triassic rocks.	Major water-bearing formation of the area. Well yields varied widely throughout area.
Mesozoic Cretaceous	Clay and limestone	0 - 150 ±	Yellow and blue clay with thin stringers of brown, and gray, limestone; probably equivalent to the Tucumcari shale.	Limited quantities of ground water occur in the Tucumcari shale. Beds of sandstone near the base of the formation constitute the principle aquifer.
Mesozoic Triassic	Dockum group, undivided	1400 - 2100 ±	Maroon, red, and gray irregularly-bedded sandstone, bright- and dark-red shale and sandy shale, and purplish limestone pebble beds.	The rocks of Triassic age contain some water but they are not considered productive aquifer.
Paleozoic Ordovician through Permian		11,000 - 14,000 ±	Thick deposits ranging from evaporites, limestone, dolomites, shale and sandstones.	No presently useable water supply available from these rocks. Source of highly mineralized oil-field waters.
Precambrian			Granite and volcanic rocks.	Not hydrologically significant.

Modified from Ash, 1963

cludes minor amounts of variegated shale and limestone. The upper part of the group can have a thickness up to 1,200 feet. This section is predominately a reddish shale but does contain minor amounts of variegated shale, sandstone, conglomerate and limestone. The Dockum group is exposed in the SW/4, Section 3, Township 11 South, Range 31 East.

Cretaceous age rocks of the Tucumcari shale unconformably overlie the Dockum group in northern Lea County.

Ash (1963) describes the Tucumcari shale as a generally fossiliferous dark gray siltstone and thin beds of brownish sandy limestone, grayish limestone and sandstone. In outcrop the siltstone beds weather to a yellowish color and the sandy limestone beds usually have the appearance of a yellowish sandstone because the weathering process has dissolved the calcium carbonate from around the sand grains (Ash, 1963).

The Tucumcari shale outcrops along the northern and western edges of North Lake (T11S, R34E), the eastern edge of Ranger Lake (T11S, R34E) and along the northwestern part of Middle Lake (T11S, R34E) (Ash, 1963). The greatest observed thickness of Tucumcari shale was seventeen (17) feet in a gully on the west side of North Lake (Ash, 1963).

Tertiary age rocks of the Ogallala formation consist of clay, silt, fine to coarse grained sand, gravel and caliche. The lithology changes rapidly within short distances, both horizontally and vertically, and individual beds or lenses are not continuous over wide areas.

Most of the Ogallala formation is unconsolidated, except for near the top and locally within the formation where the sediments have been cemented, chiefly with calcium carbonate, to form beds of caliche. The degree of cementation of caliche varies greatly from partially cemented to well cemented. No sharp break exists between the caliche caprock and the underlying sediments because the amount of cementation decreases gradually with depth. A bed of caliche on top of a formation will form a prominent topographic high because of its resistance to erosion.

Pleistocene and Recent age sediments composed of sand, soil and alluvium unconformably overlie the Ogallala formation on the Llano Estacado. The thickness of sediments ranges from 0 to about 30 feet. The sediments are off-white to light brown in color.

GROUND WATER RESOURCES

All useable ground water in this study area comes from three (3) principal geologic units, the Dockum group, the Tucumcari shale, and the Ogallala formation. No potable water is found below the Permian-Triassic unconformity.

The Ogallala formation of Tertiary age and the alluvium, soil, and sand of Pleistocene and Recent ages form a single hydrologic unit and in this report their hydrologic characteristics will be discussed together.

The water wells of the Tertiary and Cretaceous deposits are generally of a better chemical quality than that from Triassic age deposits. The younger (Tertiary age, only) rocks are more permeable, therefore producing wells with better yields.

The Tucumcari shale has limited quantities of ground water. The principal aquifer is the sandstone beds which lie near the base of the formation.

The ground water has to be pumped from the wells that penetrate rocks of Cretaceous age. It was reported that water in this formation flowed at the land surface under artesian pressure, but all artesian wells ceased to flow after 1940.

No data is available on amount of water pumped (well yield) but it appears to be low because of the high amount of clay in the Tertiary section.

In this area the ground water flows generally from a northwesterly direction to the southeast. This has not been positively confirmed because the data obtained was from an aquifer in a depleted state. The depleted state of the post-Mesozoic age aquifers was confirmed by Mourant's (1971) maps.

GROUND WATER QUALITY

Water samples were obtained from six (6) of the eleven (11) water quality test wells. Holes TA-1, TA-6, TA-8 and TA-9 had water analysis for calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), bicarbonate (HCO_3), carbonate (CO_3), sulfate (SO_4), chloride (Cl) and total dissolved solids (TDS). This work was performed by Albuquerque Analytical, Inc. of Albuquerque, New Mexico. Water samples obtained from TA-3 and TA-10 were run for chloride content by OCD personnel at Hobbs, New Mexico. For the holes in which water samples could be obtained, it was found that the chloride content varied from 1704.0 to 8450.0 ppm. In all cases the water exceeded the human health standards for ground water for chlorides which is 250 ppm.

The chemical data from holes TA-1, TA-6, TA-8 and TA-9 was plotted on a trilinear diagram. A random arrangement of data points (figure 3) indicates that the waters are not related. The chloride values of holes TA-3 and TA-10 also follow the random pattern.

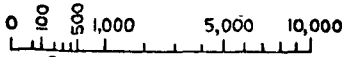
Holes TA-1 and TA-9 are calcium cation type and chloride anion type water. Hole TA-8 is a no dominant cation and chloride anion water. Hole TA-6 is a sodium cation and chloride anion type water.

WATER-ANALYSIS DIAGRAM

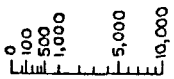
State New Mexico

Subarea Caprock

Area of circle indicates concentration in parts per million, thus:



Scale of diameters



Scale of radii

Waters of high concentration plotted at condensed scale, above scale values being multiplied by 10 (or other constant as indicated). If two scale values are used on one graph, condensed-scale plottings are shaded.

Number	Date	Parts per million	Depth or perforations
TA-1			
TA-6			
TA-8			
TA-9			

Figure 3

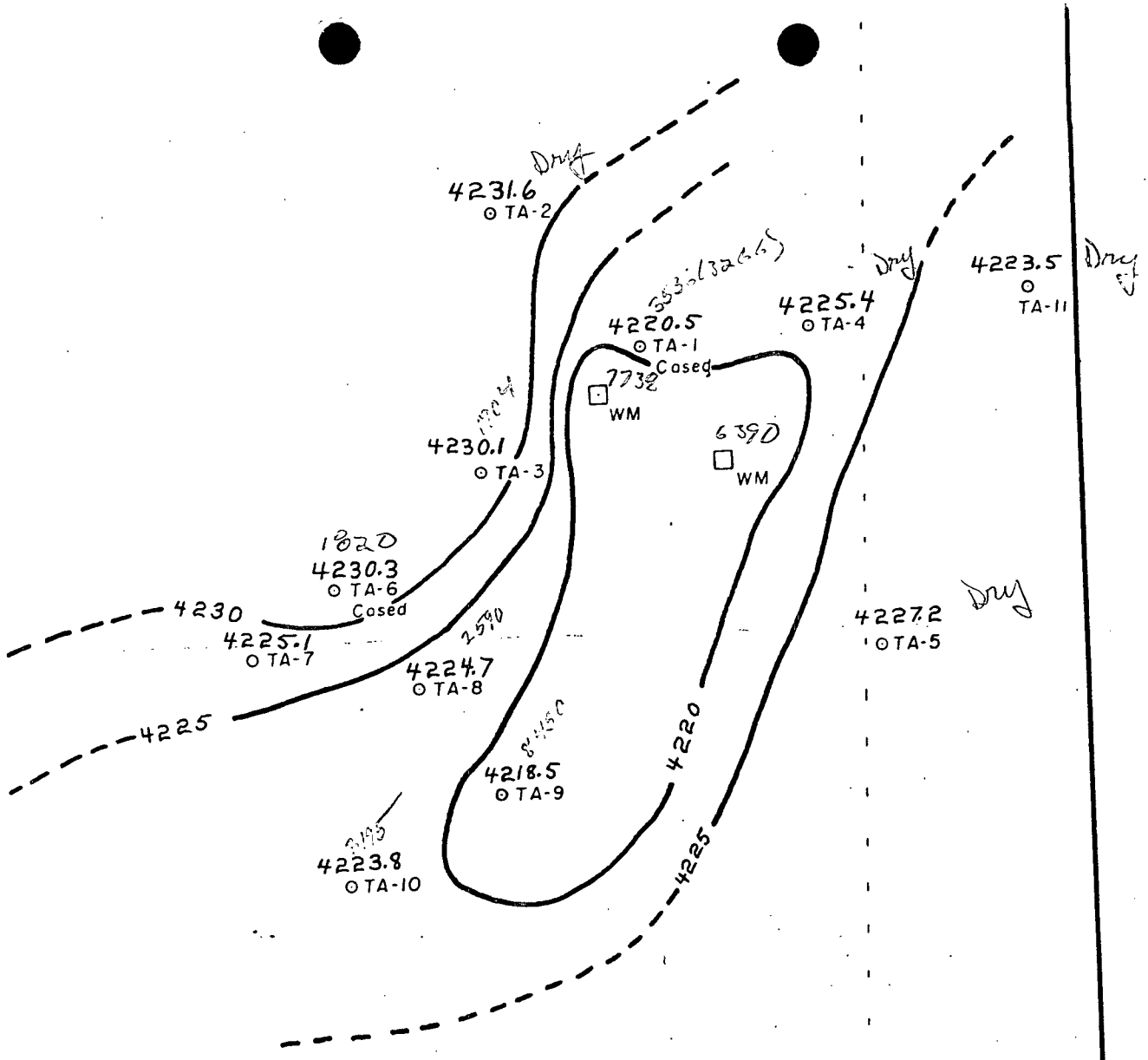
T.A.

Plotted by Parkhill

Checked by

Date

-7-



Structural Contour Map
Drawn on Top of Tucumcari shale
Elevation Shown in Feet

Figure 4

Scale?

36	31	T 9 S
1	6	T 10 S
R 33 E		R 34 E

Chloride values for the six (6) holes averaged 3,549.2 ppm and the means was 2,590.0 ppm. The difference between the average and the mean of the chloride value was 959.2 ppm. This is yet another indicator that the water from these holes is unrelated.

The three (3) windmills shown in Section 36, Township 9 South, Range 33 East (see figure 2) sampled and analyzed for chloride values by the OCD office at Hobbs on February 14, 1980.

The well in the NW/4 of Section 36 had a low chloride value of 42.6 ppm. Two (2) wells were located in the NE/4 of Section 36. The southeast well had chloride values of 6,390.0 ppm. The northwest well had a chloride value of 7,738.0 ppm.

These values were not used for the ground water quality assessment because of the long period of time which lapsed between the time the well samples were collected and the time well water samples were obtained from test hole drilling. The chloride values may have changed considerably due to a change in season.

Cl very soluble and is unlikely to change seasonally in GW.

The probable cause of this wide hydrogeochemistry variation is the advanced stage of depletion of the Ogallala formation aquifer. As a result, the recharge water percolating through the Ogallala formation has become mineralized. This water would tend to accumulate in the small depressions (figure 4) found on the erosion surface of the impermeable Cretaceous age Tucumcari shale. For all practical purposes the water is now in a stagnate state. These depressions would tend to lose most of their water by means of evaporation which tends to concentrate the mineral content of the remaining ground water.

HISTORY OF THE GROUND WATER PROBLEM

The OCD Hobbs office notified the author that a potential ground water problem existed at the Tapp Ranch. A bradenhead survey was conducted on all oil and gas wells in the area by the OCD Hobbs office. These tests indicated none of the wells were leaking. The wells tested are part of the Vada Oil Field.

Research work was done to assess the area's ground water resources and study the geology of the aquifers.

A drilling program was planned and carried out to completion between September 12, 1980 to September 14, 1980.

WATER QUALITY OF TEST WELLS

Water samples obtained from holes TA-1, TA-3, TA-6, TA-8, TA-9 and TA-10 indicate that the ground water is unsuitable for

both human consumption and irrigation purposes. The total dissolved solids (TDS) ran from 4844.0 to 20,688.0 ppm.

At least one (1) well, TA-9, was also unsuitable for cattle because the TDS is above 10,000 ppm. This may also apply to other water test wells from which no water samples could be obtained.

See appendix for further information on the water quality analyses.

LITHOLOGY OF THE WATER QUALITY TEST HOLES

The holes were drilled through the Tertiary age Ogallala formation. The top ten (10) to twenty-five (25) feet of the hole consisted of a hard pinkish-white or white caliche. Only hole TA-5 was found to have a thick (5 feet) soil cover overlying the caliche and it can be described as a brown, very fine to fine qtz. sand with a trace of clay matrix. The lower Ogallala formation in this area consists of clays and sands. The clays are orangish-brown and are from ten (10) to thirty (30) feet thick. Clay sections are absent in some of the holes. The sands are orange with very fine to fine quartz grains and have a thickness from five (5) to thirty-five (35) feet. Sand sections are not present in all of the holes. The bottom of the Ogallala formation is usually defined by a distinct gravel bed. The gravels found in this area are of a spotty nature. In some cases they are completely missing or only a minor constituent of the sand beds. When present, the gravels range from five (5) to ten (10) feet thick with a grain size varying from 1/4 to 2 inches. The color of the individual pebbles varies from black, white, gray, orange and red.

All of the water well test holes drilled in this area were completed in the Tucumcari shale. Most of the holes penetrated from five (5) to twenty (20) feet of a yellow or greenish-yellow clay. Holes TA-1 and TA-2 penetrated the unweathered dark gray clay and/or shale.

One (1) combination stratigraphic and water well exploration hole was drilled. Hole TA-2 was drilled to 145 feet. This hole did penetrate a small, non water-bearing gray sand at the interval between 135 to 140 feet.

No Triassic age Dockum group sediments were penetrated during the drilling program conducted at the Tapp Ranch area.

Most of the holes drilled in this area had a total depth of about 65 feet. One hole was drilled to a depth of 145 feet.

Further information about the lithology of these holes can be obtained from the appendix.

WATER LEVEL MEASUREMENTS

The State Engineers Office measured the water level of the wells when the hole locations were surveyed in. The water level in the water quality test wells from ground level were:

TA-1	55.89 feet	TA-2	Dry hole	TA-3	54.15 feet
TA-4	56.66 feet	TA-5	59.89 feet	TA-6	51.58 feet
TA-7	50.22 feet	TA-8	52.39 feet	TA-9	52.19 feet
TA-10	51.88 feet	TA-11	Dry hole		

Water level measurement elevations were compared with the elevation of the bottom of the gravels which is the most permeable unit of the Ogallala formation.

In many cases the water levels were found to be below the bottom of the gravels. This is another indicator that the aquifer is depleted. The source of this water was probably a very thin saturated or the unsaturated vadose of the gravel.

Water levels in or above the gravel beds indicate the saturated water zones are discontinuous lenses of ground water.

SUMMARY

The information collected in the field indicates that the ground water problem is not related to any oil and gas production in the area. The high concentration of minerals in the water is due to the depletion of the Ogallala formation ground water by pumping and the subsequent evaporation of the remaining water.

RECOMMENDATIONS

The OCD should monitor the two (2) observation wells to determine if any changes have occurred in ground water quality. The water levels must also be measured to determine if the aquifer has any potential for recharge. This work must be done on a monthly basis for one (1) year. After one (1) year the program should be reviewed to see if it needs to be continued.

This area has limited potential for the development of ground water resources.

The owner of this land should consider drilling a ground water exploration hole. Any other potential aquifers in the area would certainly have to be drilled to a depth greater than 145 feet. A pumping test should be conducted to determine the capacity of the well and the hydraulic characteristics of the aquifer. Water samples must be obtained and a chemical analysis run to determine water quality.

REFERENCES

Ash, S. R., (1963), Ground-Water Conditions in northern Lea County, New Mexico: U.S. Geol. Survey Hydrol. Inv. Atlas 62, 2 sheets, 5 figs.

Cronin, J. G., (1969), Ground Water in the Ogallala Formation in the southern High Plains of Texas and New Mexico: U.S. Geol. Survey Hydrol. Inv. Atlas 330, 4 p., 4 sheets.

Fetter, C. W., (1980), Applied Hydrogeology: Columbus, Ohio, Charles E. Merrill Publishing Co., 488 p.

Fried, Jean J., (1975), Groundwater Pollution: New York, New York, Elsevier Scientific Publishing Company, 330 p.

Mourant, W. A., (1971), Saturated thickness of post-Mesozoic deposits in the central and northern parts of Lea County, New Mexico, January, 1962: N. Mex. State Eng. Maps LC4 and LN4, 2 sheets

Nicholson, A., and Clebsch, A., (1961), Geology and Ground-water conditions in southern Lea County, New Mexico: N. Mex. Bur. of Mines Ground-Water Report 6, 123 p.

Todd, D. K., (1959), Ground-Water Hydrology: New York, J. Wiley and Sons, 336 p.

Appendix A

FIELD NOTES ABOUT WATER WELL DRILLING

FIELD NOTES ABOUT WATER WELL DRILLING

TA-1

September 12, 1980 0 to 80 feet T.D.
Hole completed with 3 inch plastic PVC pipe

21.2 x 142.0 = 3010.4 ppm Cl 15 min. jetting of well
Note: Very little water present in formation. Water sample was thick with clay and hole was almost dry. Water sample was obtained after sediments had settled out. Hole was drilled with water.

TA-2

September 13, 1980 0 to 145 feet T.D.
No casing in hole

Note: Dry hole
0 to 60 feet drilled with air. 60 to 145 feet drilled with water.

TA-3

September 13, 1980 0 to 60 feet T.D.
No casing in hole

Note: Dry hole, but bottom of hole was damp.
Hole was drilled with air.

TA-4

September 13, 1980 0 to 65 feet T.D.
No casing in hole

Note: Dry hole, but bottom of hole was damp.
Hole was drilled with air.

TA-5

September 13, 1980 0 to 65 feet T.D.
No casing in hole

Note: Dry hole, but bottom of hole was damp.
Hole was drilled with air.

TA-6

September 13, 1980 0 to 65 feet T.D.
Hole completed with 3 inch plastic PVC pipe

12.0 x 142.0 = 1704.0 ppm Cl 15 min. jetting of well
Note: Hole was dry after sample obtained. Water sample taken after sediments had settled out. Hole was drilled with air.

TA-7

September 14, 1980 0 to 65 feet T.D.
No casing in hole

Note: Hole was dry with a small seepage of water in insufficient quantities to be blown out of hole. Hole was drilled with air.

TA-8

September 14, 1980 0 to 65 feet T.D.
No casing in hole

17.6 x 142.0 = 2499.2 ppm Cl 15 min. jetting of well
Note: The hole yielded only a small amount of water. Water sample taken after sediments had settled out. Hole was drilled with air.

TA-9

September 14, 1980 0 to 65 feet T.D.
No casing in hole

58.3 x 142.0 = 8278.6 ppm Cl. 15 min. jetting of well
Note: The hole yielded only a small amount of water. Water sample taken after sediments had settled out. Hole was drilled with air.

TA-10

September 14, 1980 0 to 65 feet T.D.
No casing in hole

Note: Dry hole. Hole was drilled with air.

TA-11

September 14, 1980 0 to 60 feet T.D.
No casing in hole

Note: Hole was dry with a small seepage of water in insufficient quantities to be blown out of hole. Hole was drilled with air.

September 15, 1980

Drilling water for Holes TA-1 and TA-2 was tested for chloride content.

0.5 x 142.0 = 71.0 ppm Cl.
Note: This was rain water obtained from bar-ditch on road to Paul Hamilton area. This water was also used for Hamilton well HO-1.

Appendix B

WATER ANALYSES

Albuquerque Analytical, Inc.

[505] 266-9106
[505] 294-6310 Nights

4115 Silver S.E.
Albuquerque, N.M. 87108

No. 12686

Rec'd. September 19, 1980

WATER ANALYSIS

Owner Oil Conservation Address P.O. Box 2088 Santa Fe, NM 87501

Appearance and Data T-A-1 Chemist J.M. Grover, M.S.

	mg/l	meq/l		mg/l	meq/l			
Aluminum			Beryllium (BeO_3^-)			Acidity		ppm
Ammonium			Bicarbonate	72.0		Alkalinity		ppm
Arsenic			Boron (BO_2^-)			BOD		ppm
Barium			Bromide			Chlorine		ppm
Cadmium			Carbonate	<0.1		COD		ppm
Calcium	1467.5		Chloride	3536.0		Color		PCU
Chromium (CrO_3^-)			Cyanide			Conductance		µho/cm
Cobalt			Fluoride			Dissolved O_2		ppm
Copper			Hydroxide			Hardness		ppm
Gold			Iodide			H_2S		ppm
Iron			Molybdenum (MoO_4^-)			Hydrazine		ppm
Lead			Nitrate			Odor		T.O.
Lithium			Nitrite			pH		
Magnesium	209.25		Phosphate (Tot.)			Phenols		ppm
Manganese			Phosphate (Meta)			Silica		ppm
Mercury T			Phosphate (Ortho)			Solids (Tot.)		ppm
Nickel			Selenium (SeO_4^-)			Solids (Tot. Diss.)	9976.0	ppm
Potassium	15.5		Sulfate	415.0		Solids (Tot. Susp.)		ppm
Silver			Sulfite			Solids ( )		ppm
Sodium	550.0		Tellurium (TeO_3^-)			Surfactant		ppm
Uranium (U_3O_8)			Vanadium			Turbidity		JTU
Zinc						Volatile Acids		ppm

Albuquerque Analytical, Inc.

[505] 266-9106
[505] 294-6310 Nights

4115 Silver S.E.
Albuquerque, N.M. 87108

No. 12686

Rec'd. September 19, 1980

WATER ANALYSIS

Owner Oil Conservation Address P.O. Box 2088 Santa Fe, NM 87501

Appearance and Data T-A-6 Chemist J.M. Grover, M.S.

	mg/l	meq/l
Aluminum		
Ammonium		
Arsenic		
Barium		
Cadmium		
Calcium	597.5	
Chromium (CrO_3^-)		
Cobalt		
Copper		
Gold		
Iron		
Lead		
Lithium		
Magnesium	72.5	
Manganese		
Mercury T		
Nickel		
Potassium	237.5	
Silver		
Sodium	785.0	
Uranium (U_3O_8)		
Zinc		

	mg/l	meq/l
Beryllium (BeO_3^-)		
Bicarbonate	96.0	
Boron (BO_2^-)		
Bromide		
Carbonate	<0.1	
Chloride	1,820.0	
Cyanide		
Fluoride		
Hydroxide		
Iodide		
Molybdenum (MoO_4^-)		
Nitrate		
Nitrite		
Phosphate (Tot.)		
Phosphate (Meta)		
Phosphate (Ortho)		
Selenium (SeO_4^-)		
Sulfate	875.0	
Sulfite		
Tellurium (TeO_3^-)		
Vanadium		

Acidity	ppm
Alkalinity	ppm
BOD	ppm
Chlorine	ppm
COD	ppm
Color	PCU
Conductance	μmho/cm
Dissolved O_2	ppm
Hardness	ppm
H_2S	ppm
Hydrazine	ppm
Odor	T.O.
pH	
Phenols	ppm
Silica	ppm
Solids (Tot.)	ppm
Solids (Tot. Diss.)	4844.0 ppm
Solids (Tot. Susp.)	ppm
Solids ( )	ppm
Surfactant	ppm
Turbidity	JTU
Volatile Acids	ppm

-19-

Albuquerque Analytical, Inc.

[505] 266-9106
[505] 294-6310 Nights

4115 Silver S.E.
Albuquerque, N.M. 87108

No. 12686

Rec'd. September 19, 1980

WATER ANALYSIS

Owner Oil Conservation Address P.O. Box 2088 Santa Fe, NM 87501

Appearance and Data T-A-8 Chemist J.M. Grover, M.S.

	mg/l	meq/l		mg/l	meq/l			
Aluminum			Beryllium (BeO_3^-)			Acidity		ppm
Ammonium			Bicarbonate	90.0		Alkalinity		ppm
Arsenic			Boron (BO_2^-)			BOD		ppm
Barium			Bromide			Chlorine		ppm
Cadmium			Carbonate	<0.1		COD		ppm
Calcium	805.0		Chloride	2590.0		Color		PCU
Chromium (CrO_3^-)			Cyanide			Conductance		µmho/cm
Cobalt			Fluoride			Dissolved O_2		ppm
Copper			Hydroxide			Hardness		ppm
Gold			Iodide			H_2S		ppm
Iron			Molybdenum (MoO_4^-)			Hydrazine		ppm
Lead			Nitrate			Odor		T.O.
Lithium			Nitrite			pH		
Magnesium	100.25		Phosphate (Tot.)			Phenols		ppm
Manganese			Phosphate (Meta)			Silica		ppm
Mercury T			Phosphate (Ortho)			Solids (Tot.)		ppm
Nickel			Selenium (SeO_4^-)			Solids (Tot. Diss.)	6948.0	ppm
Potassium	12.5		Sulfate	925.0		Solids (Tot. Susp.)		ppm
Silver			Sulfite			Solids ( )		ppm
Sodium	1042.5		Tellurium (TeO_3^-)			Surfactant		ppm
Uranium (U_3O_8)			Vanadium			Turbidity		JTU
Zinc						Volatile Acids		ppm

Albuquerque Analytical, Inc.

[505] 266-9106
[505] 294-6310 Nights

4115 Silver S.E.
Albuquerque, N.M. 87108

No. 12686

Rec'd. September 19, 1980

WATER ANALYSIS

Owner Oil Conservation Address P.O. Box 2088 Santa Fe, NM 87501

Appearance and Data T-A-9 Chemist J.M. Grover, M.S.

	mg/l	meq/l		mg/l	meq/l			
Aluminum			Beryllium (BeO_3^-)			Acidity		ppm
Ammonium			Bicarbonate	66.0		Alkalinity		ppm
Arsenic			Boron (BO_2^-)			BOD		ppm
Barium			Bromide			Chlorine		ppm
Cadmium			Carbonate	<0.1		COD		ppm
Calcium	3371.0		Chloride	8450.0		Color		PCU
Chromium (CrO_3^-)			Cyanide			Conductance		μho/cm
Cobalt			Fluoride			Dissolved O_2		ppm
Copper			Hydroxide			Hardness		ppm
Gold			Iodide			H_2S		ppm
Iron			Molybdenum (MoO_4^-)			Hydrazine		ppm
Lead			Nitrate			Odor		T.O.
Lithium			Nitrite			pH		
Magnesium	364.0		Phosphate (Tot.)			Phenols		ppm
Manganese			Phosphate (Meta)			Silica		ppm
Mercury T			Phosphate (Ortho)			Solids (Tot.)		ppm
Nickel			Selenium (SeO_4^-)			Solids (Tot. Diss.)	20,688.0	ppm
Potassium	25.2		Sulfate	750.0		Solids (Tot. Susp.)		ppm
Silver			Sulfite			Solids ( )		ppm
Sodium	2039.0		Tellurium (TeO_3^-)			Surfactant		ppm
Uranium (U_3O_8)			Vanadium			Turbidity		JTU
Zinc						Volatile Acids		ppm

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: Tapp TPapp Well No. #1

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter ____, Section 36, T 9 S, R 33E

SE Windmill - Sample taken while pumping.

Type Well: _____ Depth _____ feet.

Well Use: Stock

Sample Number: #1 Date Taken: 2-14-80

Taken By: Sexton

Specific Conductance: _____ m/ohm

Total dissolved Solids: _____ PPM.

Chlorides: 6,390 PPM.

Sulfates: _____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

_____ : _____

Date Analyzed: 2-14-80 By: John W. Runyan
Oil Conservation Division

REMARKS: _____

25 ml Sample = 142.0 factor x 45.0 titration = 6390

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: ~~Fapp~~ TRAPP Well No. #2

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter ____, Section 25, T 9 S, R 33 E

NW windmill — Sample taken while Pumping

Type Well: _____ Depth _____ feet.

Well Use: Stock

Sample Number: #1 Date Taken: 2-14-80

Taken By: Sexton

Specific Conductance: _____ m/ℓ

Total dissolved Solids: _____ PPM.

Chlorides: 42.6 PPM.

Sulfates: _____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

_____ : _____

Date Analyzed: 2-14-80 By: John W. Runyan
Oil Conservation Division

REMARKS: _____

25 ml Sample = 142.0 factor X .3 titration = 42.6

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: Tapp Well No. #3

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter P?, Section 36, T 9 S, R 33 E

located in SE Corner sec. 36.

Type Well: Abd. water well Depth ____ feet.

Well Use: Orig. - stock - windmill

Sample Number: #1 Date Taken: 2-21-80

Taken By: Eddy Seay

Specific Conductance: ____ m/s

Total dissolved Solids: ____ PPM.

Chlorides: 7,738 PPM.

Sulfates: ____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

____ : ____

Date Analyzed: 2-22-80 By: John W. Runyan
Oil Conservation Division

REMARKS: Water level 57 feet.

5 ml sample = 710.0 factor x 10.9 titration = 7,738 PPM

CORRECTED ANALYSIS

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: OCD - Tapp Ranch Well No. TA #1

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter ____, Section 36, T 9 S, R 33 E

Type Well: test well, water Depth 80 feet.

Well Use: water contamination study

Sample Number: #1 Date Taken: 10-21-80

Taken By: Eddie Seay

Specific Conductance: ____ m/~

Total dissolved Solids: ____ PPM.

Chlorides: 3266 PPM.

Sulfates: ____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

____ : ____

Date Analyzed: 10-28-80 By: Leslie A. Clement
Oil Conservation Division

REMARKS:

5 ml sample = 710 x 4.6 = 3266 ppm

CORRECTED ANALYSIS

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: OCD TAPP RANCH Well No. TA #3

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter ____, Section 36, T 9 S, R 33 E

Type Well: water test well Depth 59 feet.

Well Use: water contamination study

Sample Number: 1 Date Taken: 10-21-80

Taken By: Eddie Seay

Specific Conductance: ____ m/~

Total dissolved Solids: ____ PPM.

Chlorides: 1704 PPM.

Sulfates: ____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

____ : ____

Date Analyzed: 10-28-80 By: Leslie A. Clement
Oil Conservation Division

REMARKS:

5 ml sample = 710 x 2.4 = 1704 ppm

CORRECTED ANALYSIS

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: OCD TAPP RANCH Well No. TA #10

Land Status: State _____ Federal _____ Fee _____

Well Location: Unit Letter _____, Section 36, T 9 S, R 33 E

Type Well: water test well Depth 55 feet.

Well Use: water contamination study

Sample Number: 1 Date Taken: 10-21-80

Taken By: _____

Specific Conductance: _____ m/~

Total dissolved Solids: _____ PPM.

Chlorides: 3195 PPM.

Sulfates: _____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

_____ : _____

Date Analyzed: 10-28-80 By: Leslie A. Clements
Oil Conservation Division

REMARKS:

5 ml sample = 710 x 4.5 = 3195 ppm (gasey smell)

Appendix C

LITHOLOGY LOGS

SAMPLE LOG

Hole TA-1 Logged by Thomas A. Parkhill Date Sept. 12, 1980 page 1 of 1

Driller John Scarborough TD 80 ft. Date 9-12-80

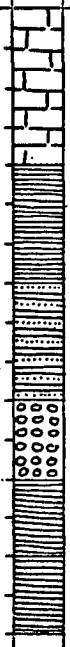
Probe None TD Date

Est Mud Wt. Water Hole Size 4¾ in. Log Types Collar Elev. 4280.5 ft

Location 2185 FNL 535 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks



Depth	Description
	Caliche - light pink, tr. of vf. qtz. grains
	Clay - orange, tr. of vf. qtz. grains
	Clay - brownish-orange, mod. vf. qtz. grains
50	Gravel - black, white, orange, ⅛ to ¾ in., ang. to subrd., clay matrix
	Clay - greenish-yellow, tr. of vf. qtz. grains
	Clay - dark gray, tr. of vf. qtz. grains
	T.D. - 80 ft.
100	
150	
200	

Hole No TA-1
page 1 of 1

SAMPLE LOG

Hole TA-2 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 145 ft. Date 9-13-80

Probe None TD Date

Est Mud Wt. Air & water Hole Size 4½ in. Log Types Collar Elev. 4281.6 ft

Location 1855 FNL 885 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks Air-0-60 ft. water-60 to 145 ft. Dry hole - no water

Depth	Log	Description
		Caliche - pinkish-white, tr. of vf. qtz. grains, hard
		Sand - orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
		Gravel - black, white, orange, ¼ to ½ in. subang. to subrd., sand matrix
50		Clay - orange, mod. vf. qtz. grains, tr. of mica
		Shale - dark gray, tr. of silt and vf. qtz. grains
100		
		135 to 140 - stringer of gray sand - vf. to f. qtz. grains, ang. to subang. mod. clay matrix
150		T.D. - 145 ft.
200		

Hole No TA-2 page 1 of 1

SAMPLE LOG

Hole 3 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-13-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4¾ in. Log Types Collar Elev. 4280.1 ft

Location 2465 FNL 920 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks Dry hole - bottom of hole was damp.

Depth	Log	Description
		Caliche - pinkish-white, tr. of vf. qtz. grains, hard
		Sand - light orange, vf. to f. qtz. grains, ang. to subang., tr. of clay matrix
		Clay - orange, tr. of f. qtz. grains
50		Sand - orange, vf. to L. qtz. grains, 10% gravel - ¼ to ½ in., black, white, subang. to subrd.
		Clay - yellow, tr. of vf. qtz. grains
		T.D. - 65 ft.
100		
150		
200		

Hole No T.A.-3
page 1 of 1

SAMPLE LOG

Hole TA-4 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-13-80

Probe None TD _____ Date _____

Est Mud Wt. Air Hole Size 4¾ in. Log Types _____ Collar Elev. 4280.4 ft

Location 2150 FNL 135 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N _____ E _____

Remarks _____

Depth	Log	Description
		Caliche - pinkish-white, tr. of vf. qtz. grains
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd. tr. of clay matrix
		Clay - brown, tr. of vf. qtz. grains
50		Gravel - black, red, gray, ¼ to 2 in., ang. to subrd., sand matrix (f
		Clay - yellow, tr. of vf. qtz. grains
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-4
page 1 of 1

SAMPLE LOG

Hole [redacted]-5 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-13-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4¾ in. Log Types Collar Elev. 4277.2 ft

Location 2720 FSL 40 FWL Sec. 31 T 9S R 34E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks 3 feet of gravel reported by driller but not seen in 45 to 50 ft. sample

Depth	Log	Description
		Soil - brown, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
		Caliche - white, tr. of vf. qtz. grains
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
		Sand - orange, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
50		Clay - yellow, mod. vf. qtz. grains
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-5
page 1 of 1

SAMPLE LOG

Hole [redacted]6 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-13-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4¾ in. Log Types Collar Elev. 4280.3 ft

Location 2720 FNL 1260 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Description
	Caliche - pinkish-white, tr. of vf. qtz. grains, hard
	Sand - light orange, vf. qtz. grains, ang. to subrd., tr. of clay matrix
	Clay - orangish-brown, tr. of silt
	Sand - orange, vf. to f. qtz. grains, ang. to subrd.
50	Gravel - black, white, orange, ¼ to 1 in., subang. to subrd., sand matrix
	Clay - yellow, tr. of vf. qtz. grains
	T.D. - 65 ft.
100	
150	
200	

Hole No TA-6
page 1 of 1

SAMPLE LOG

Hole TA-7 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4¾ in. Log Types Collar Elev. 4280.1 ft

Location 2345 FSL 1460 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of vf. qtz. grains
		Clay - orangish-brown, tr. of qtz. grains
		Sand - orange, vf. to f. qtz. grains, ang. to subrd., no matrix
50		50 to 55 ft. - 15% of sample gravel - black white, ¼ to ½ in., subang. to subrd.
		Clay - greenish-yellow, tr. of silt
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-7
page 1 of 1

SAMPLE LOG

Hole TA-8 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4¾ in. Log Types Collar Elev. 4279.7 ft

Location 2265 FSL 1060 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of vf. qtz. grains
		Sand - light orange, vf. qtz. grains, ang. to subang., tr. of clay matrix
		Clay - orangish-brown, tr. of vf. qtz. grains
		Sand - orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
50		Gravel - black, orange, white, ¼ to 3/8 in., subang. to subrd.
		Clay - yellow, tr. of silt
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-8
page 1 of 1

SAMPLE LOG

Hole TA-9 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4½ in. Log Types Collar Elev. 4278.5 ft

Location 2005 FSL 870 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of vf. qtz. grains
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
		Clay - orangish-brown, tr. of vf. qtz. grains
50		Sand - orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
		Gravel - black, white, orange, ¼ to 1½ in., subang. to subrd., sand matrix 50 to 60 ft.
		Clay - yellow, tr. of silt
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-9
page 1 of 1

SAMPLE LOG

Hole TA-10 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4¾ in. Log Types Collar Elev. 4278.8 ft

Location 1810 FSL 1225 FEL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of vf. qtz. grains
		Sand - brownish-orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
50		Sand - orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix, 3 to 5% of sample contained gravel - black, gray, ¼ to ½ in., subang. to subrd.
		Clay - yellow, tr. of vf. qtz. grains
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-10
page 1 of 1

SAMPLE LOG

Hole TA-11 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 60 ft. Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4¾ in. Log Types Collar Elev. 4278.5 ft

Location 2085 FNL 390 FWL Sec. 31 T 9S R 34E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of vf. qtz. grains
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
		Clay - brownish-orange, tr. of vf. qtz. grains
		Sand - orange, vf. to f. qtz. grains, ang. to subrd.
50		Clay - yellow, tr. of vf. qtz. grains
		T.D. - 60 ft.
100		
150		
200		

Hole No TA-11 page 1 of 1

Appendix D

DRILLER'S LOGS

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-2 WELL LOG

From	To	FORMATION
0	1	top soil
1	20	caliche
20	45	clay
45	50	sand
50	58	gravel
58	70	yellow clay
70	144	Blue clay
		4" test hole
		@ $3.00 $432.00
		Set Well Pull Test Pipe

Date 10-13-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-1 WELL LOG

From	To	FORMATION
0	1	top soil
1	20	caliche
20	50	Sandy clay
50	60	Gravel
60	65	yellow clay
65	80	Blue clay
		Pull 3" PVC Pipe
		Plug Well
		Pull Test Pipe
		@ 400 $320.00

Date 10-12-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-3 WELL LOG

From	To	FORMATION
0	1	top soil
1	15	Caliche
15	20	clay
20	40	Gravel
40	56	Yellow clay
56	64	Blue clay
		5" Hole @ 80' @ $2.00 $160.00
		Pull 4" PVC Pipe

Date 10-15-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-5 **WELL LOG**

From	To	FORMATION
0	2	top soil
2	40	caliche clay
40	50	Red clay
50	53	Gravel
53	64	yellow clay
		5" Well
		Jetted Well
		Pull Pipe
		@ 3.00 - $192.00

Date 10-13-80 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-4 **WELL LOG**

From	To	FORMATION
0	1	top
1	20	caliche
20	40	Sandy clay
40	56	Sand & Gravel
56	64	yellow clay
		5" Hole & jet
		Hole Pull jet Pipe
		@ 3.00 $192.00

Date 10-13-80 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-1 WELL LOG

From	To	FORMATION
0	1	top soil
1	20	caliche
20	30	sand
30	50	red clay
50	58	gravel
58	64	yellow clay
		5" Well Jetted Well
		Pull Pipe
		@ 300 #1920.00

Date 10-14-80 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-6 WELL LOG

From	To	FORMATION
0	1/2	top soil
1/2	20	caliche
20	30	red clay
30	50	sand
50	58	gravel
58	64	yellow clay
		5" Well Jetted Well
		Pull Jet Pipe
		Set 5" PVC
		@ 400 #1256.00

Date 10-13-80 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-8 WELL LOG

From	To	FORMATION
0	1	top soil
1	20	caliche
20	30	red clay
30	50	gravel
50	64	yellow clay
		5" Well Jetted Well
		Pull Pipe
		@ 300 #1920.00

Date 10-14-80 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-10 WELL LOG

From	To	FORMATION
0	2	top soil
2	25	caliche
25	34	Red clay
34	50	sand
50	61	Gravel
61	64	yellow clay
		5" Well Jetted
		Well Pull Pipe
		@ 300 #192.00

Date 10-14-82 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-9 WELL LOG

From	To	FORMATION
0	2	top soil
2	25	caliche
25	32	Red clay
32	57	Sand + Gravel
57	64	yellow clay
		5" Well Jetted
		Well Pull Pipe
		@ 300 #192.00

Date 10-14-82 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-11 WELL LOG

From	To	FORMATION
0	10	top soil
10	30	caliche
30	57	Red clay + sand
57	64	Gravel
64		yellow clay
		5" Well Jetted
		Well Pull Pipe
		@ 300 #192.00

Date 10-14- Driller Scarborough

Appendix E

STATE ENGINEER'S WELL SCHEDULE

State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by GROSECLOSE / CHAVES

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4281.6

DEPTH 144 ft ☒ Rept ☐ Meas Use TEST HOLE

~~CASING~~ 5" HOLE in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: DRY ft rept (meas) 9-25 1980 above (below)

LAND SURFACE

_____ which is ____ ft above below LS

PERMANENT RP is _____

DRY HOLE

which is ____ ft above below described MP and ____ ft above below LS

REMARKS _____

SOURCE:

Well No. ____ on Photo _____ DPN _____

File No TA.2 Loc. No. 9.33.36.241432 3

TEMP NE COR T E-LINE

FE-1

State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by CHAVES / SCARBOROUGH

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-12 1980

TOPO SITUATION FLAT SEO Elev 4280.5

DEPTH 80 ft ☒ Rept ☐ Meas Use TEST HOLE

CASING 3 PLASTIC in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 57.54 ft rept (meas) 9-25 1980 above (below)

TOP OF CASING

_____ which is 1.65 ft (above) below LS

PERMANENT RP is _____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS _____

AQUIFER(S):

Well No. ____ on Photo _____ DPN _____

File No TA-1 Loc. No. 9.33.36.244132 0

TEMP NE COR T EAST LINE

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER Below MP 1st	2nd	3rd	Below LS
Date SEPT. 25, 1980	65.00	59.00		57.54
Hour 3:30 AM PM Obs AMC JCC	7.46	1.46		1.65
Not POA (✓) POA ( )	57.54	57.54		55.89

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER Below MP 1st	2nd	3rd	Below LS
Date SEPT. 25, 1980	65.00			
Hour 3:45 AM PM Obs AMC JCC	DRY HOLE			
Not POA (✓) POA ( )				

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 1980 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH DRLG. Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4280.3

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

CASING 3" PLASTIC in to _____ ft Log DRILLERS

PUMP: Type NONE Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 52.93 ft rept (meas) 9-25 1980 above (below)

TOP OF CASING

_____ which is 1.35 ft (above) below LS

PERMANENT RP is _____

_____

_____

_____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS CASED WITH 3" PLASTIC PIPE

AQUIFER(S):

Well No. ____ on Photo _____ DPN _____

File No TA-6 Loc. No. 9.33.36.4211312

TEMP SE COR of SECTION

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH DRILLING Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4280.1

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

~~CASING~~ 5" HOLE in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 54.15 ft rept (meas) 9-25 1980 above (below)

LAND SURFACE

_____ which is ____ ft ~~above~~ ~~below~~ LS

PERMANENT RP is _____

_____

_____

_____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS OPEN HOLE, NO CASING

AQUIFER(S):

Well No. ____ on Photo _____ DPN _____

File No TA-3 Loc. No. 9.33.36.2434312

TEMP NE COR of SE LINE

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date 9 25 ,1980	59.00	56.00		
Hour 2:10 AM (PM) Obs SCC ELC	4.85	1.85		
Not POA (X) POA ( )	54.15	54.15		54.15

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT 25 ,1980	53.00	5900		52.93
Hour 2:17 AM (PM) Obs SCC ELC	5.07	1.07		1.35
Not POA (/) POA ( )	52.93	52.93		51.58

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE
Source of data: Obser ☑ Owner ☐ Other ____
Date 9-25 19 80 Record by CHILES & CROSSLAND
LOCATION: County LEA Map 95.2.2
OWNER ____
DRILLER SCARBOROUGH Completed 9-13 19 80
TOPO SITUATION FLAT SEO Elev 4280.4
DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE
CASING ____ in to ____ ft Log DRILLERS
PUMP: Type ____ Make ____
Ser.no./model ____ Size of discng ____ in.
PRIME MOVER: Make ____ HP ____
Ser.no. ____ Power/Fuel ____
PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack
Make ____ Ser.no ____ ☐ VHS
WATER LEVEL: 56.66 ft rept meas 9-25 19 80 above below
WIND SURFACE
____ which is ____ ft above below LS
PERMANENT RP is ____
____
____
____
which is ____ ft above below described MP and ____ ft above below LS
REMARKS ____

NUMBER(S):
Well No. ____ on Photo ____ DPN ____
File No TA-4 Loc. No. 9.33.36.2442411
TEMP NE COR & E-LINE

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE
Source of data: Obser ☑ Owner ☐ Other ____
Date SEPT. 25 19 80 Record by CROSSLAND & CHILES
LOCATION: County LEA Map 95.2.2
OWNER ____
DRILLER SCARBOROUGH Completed 9-14 19 80
TOPO SITUATION FLAT SEO Elev 4278.5
DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE
5" HOLE
CASING ____ in to ____ ft Log DRILLERS
PUMP: Type ____ Make ____
Ser.no./model ____ Size of discng ____ in.
PRIME MOVER: Make ____ HP ____
Ser.no. ____ Power/Fuel ____
PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack
Make ____ Ser.no ____ ☐ VHS
WATER LEVEL: DRY ft rept meas 9-25 19 80 above below
WIND SURFACE
____ which is ____ ft above below LS
PERMANENT RP is ____
DRY HOLE
____
____
which is ____ ft above below described MP and ____ ft above below LS
REMARKS ____

NUMBER(S):
Well No. ____ on Photo ____ DPN ____
File No TA-11 Loc. No. 9.34.31.1332132
TEMP NW COR & W-LINE

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER Below MP 1st	2nd	3rd	Below LS
Date SEPT. 25 ,19 80	[illegible]			
Hour 3:10 AM (PM) Obs [illegible]		DRY		
Not POA ( ) POA ( )				

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER Below MP 1st	2nd	3rd	Below LS
Date SEPT 25 ,1980	~~61.00~~	59.00	58.00	
Hour 3:10 AM (PM) Obs [illegible]	~~3.03~~	2.34	1.34	
Not POA ( ) POA ( )	~~57.97~~	56.66	56.66	56.66

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by [illegible] of CHINLE

LOCATION: County LEA Map 95.22.

OWNER _____

DRILLER SOUTHWESTERN Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4277.2

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

5" HOLE

~~CASING~~ _____ in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 59.89 ft rept meas 9-25 1980 above below

LAND SURFACE

_____ which is ____ ft above below LS

PERMANENT RP is _____

_____

_____

_____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-5 Loc. No. 9.34.31.3111333

TEMP. NW COR & W. LINE

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT 23, 1980	61.00	62.00		
Hour 3:20 AM (PM) Obs [illegible]	1.11	1.11		
Not POA (✓) POA ( )	59.89	59.89		59.89

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other ____

Date 9-15 1980 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER ____

DRILLER SCARBOROUGH DRLG. Completed 9-14 1980

TOPO SITUATION FLAT SEO Elev 4280.1

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

CASING 5" HOLE in to ____ ft Log DRILLERS

PUMP: Type ____ Make ____

Ser.no./model ____ Size of dischg ____ in.

PRIME MOVER: Make ____ HP ____

Ser.no. ____ Power/Fuel ____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make ____ Ser.no ____ ☐ VHS

WATER LEVEL: 50.22 ft rept (meas) 9.25 1980 above (below)
LAND SURFACE

____ which is ____ ~~ft~~ ~~above~~ ~~below~~ LS

PERMANENT RP is ____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS ____

Well No. ____ on Photo ____ DPN ____

File No TA-7 Loc. No. 9.33.36.412411
TEMP SE Cor & E-Line

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other ____

Date 9-15 1980 Record by GROSECLOSE & HINKLE

LOCATION: County LEA Map 95.2.2

OWNER ____

DRILLER SCARBOROUGH Completed 9-14 1980

TOPO SITUATION FLAT SEO Elev 4279.1

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

CASING 5" HOLE in to ____ ft Log DRILLERS

PUMP: Type ____ Make ____

Ser.no./model ____ Size of dischg ____ in.

PRIME MOVER: Make ____ HP ____

Ser.no. ____ Power/Fuel ____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make ____ Ser.no ____ ☐ VHS

WATER LEVEL: 52.39 ft rept (meas) 9-25 1980 above (below)
LAND SURFACE

____ which is ____ ft above below LS

PERMANENT RP is ____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS ____

AQUIFER(S):

Well No. ____ on Photo ____ DPN ____

File No TA-8 Loc. No. 9.33.36.421320
TEMP SE Cor & E-Line

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT. 25, 1980	54.00	53.00		
Hour 2:30 AM PM Obs ENSCO	1.61	2.61		
Not POA ( ) POA ( )	52.39	52.39		

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT. 25, 1980	55.00	52.00		
Hour 2:25 AM (PM) Obs ENSCO	4.78	2.78		
Not POA (X) POA ( )	50.22	50.22		50.22

W L meas after pump shut off _____ min. Pumping W L (

Remarks _____

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 19 80 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-14 19 80

TOPO SITUATION FLAT SEO Elev 4278.5

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE
5" HOLE

~~CASING~~ _____ in to _____ ft Log _____

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 51.19 ft rept (meas) SEPT 25 19 80 above (below)
LIND SURFACE

_____ which is ____ ft ~~above~~ below LS

PERMANENT RP is _____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS _____

Well No. ___ on Photo _____ DPN _____

File No TH-9 Loc. No. 9.33.36.4232121
TEMP SE COR & E-LINE

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 19 80 Record by GROSECLOSE & CHAVES

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-14 19 80

TOPO SITUATION FLAT SEO Elev 4278.8

DEPTH 64 ft ☒ Rept ☐ Meas Use _____
5" HOLE

~~CASING~~ _____ in to _____ ft Log _____

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 51.88 ft rept (meas) 9-25 19 80 above (below)
LIND SURFACE

_____ which is ____ ft above (below) LS

PERMANENT RP is _____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-10 Loc. No. 9.33.36.42313213
TEMP SE COR & E-LINE

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER Below MP 1st	2nd	3rd	Below LS
Date SEPT 25, 1980	55.00	56.00		
Hour 2:40 AM (PM) Obs EAC JCG	3.12	4.12		
Not POA ( ) POA ( )	51.88	51.88		51.88

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

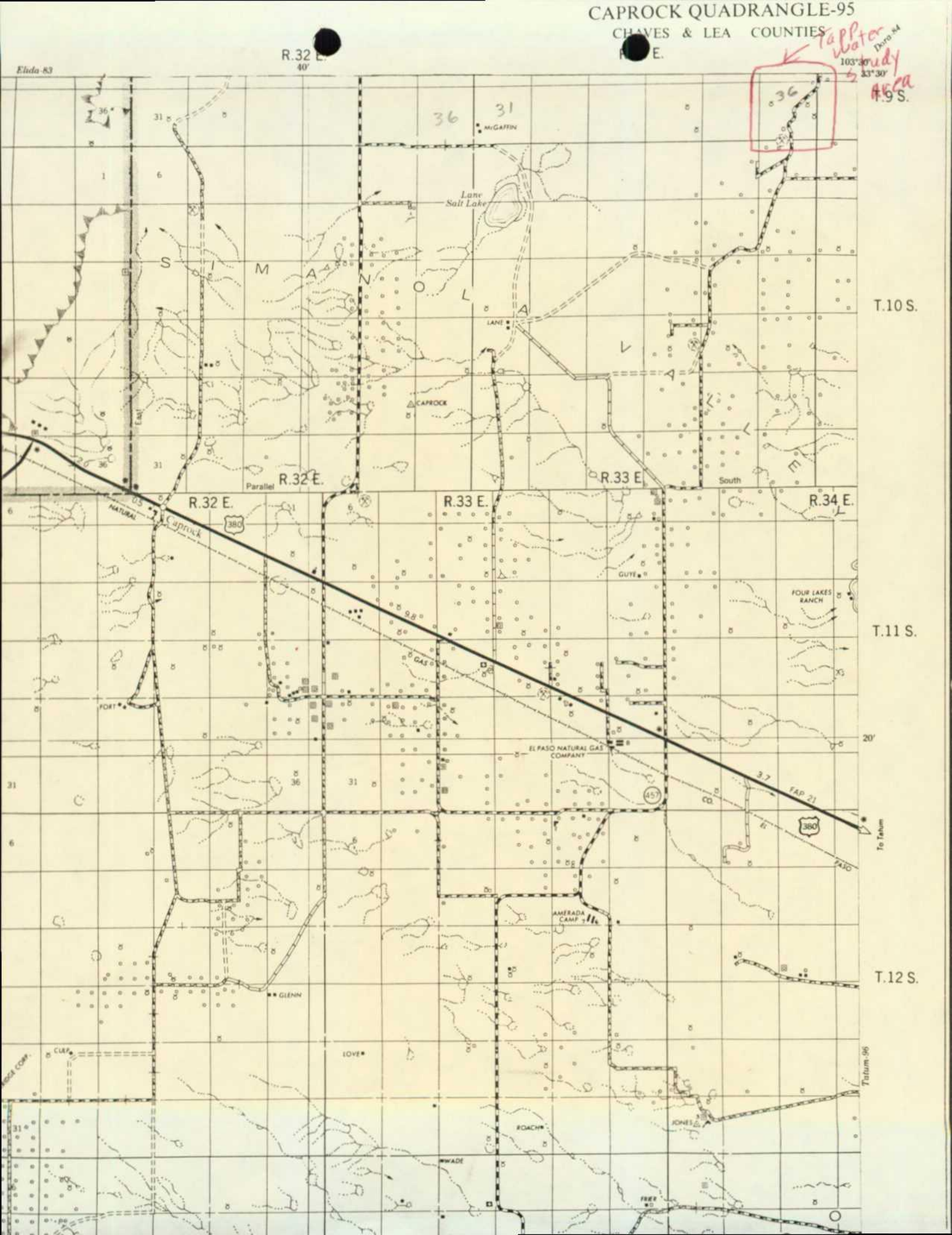
SKETCH:

N

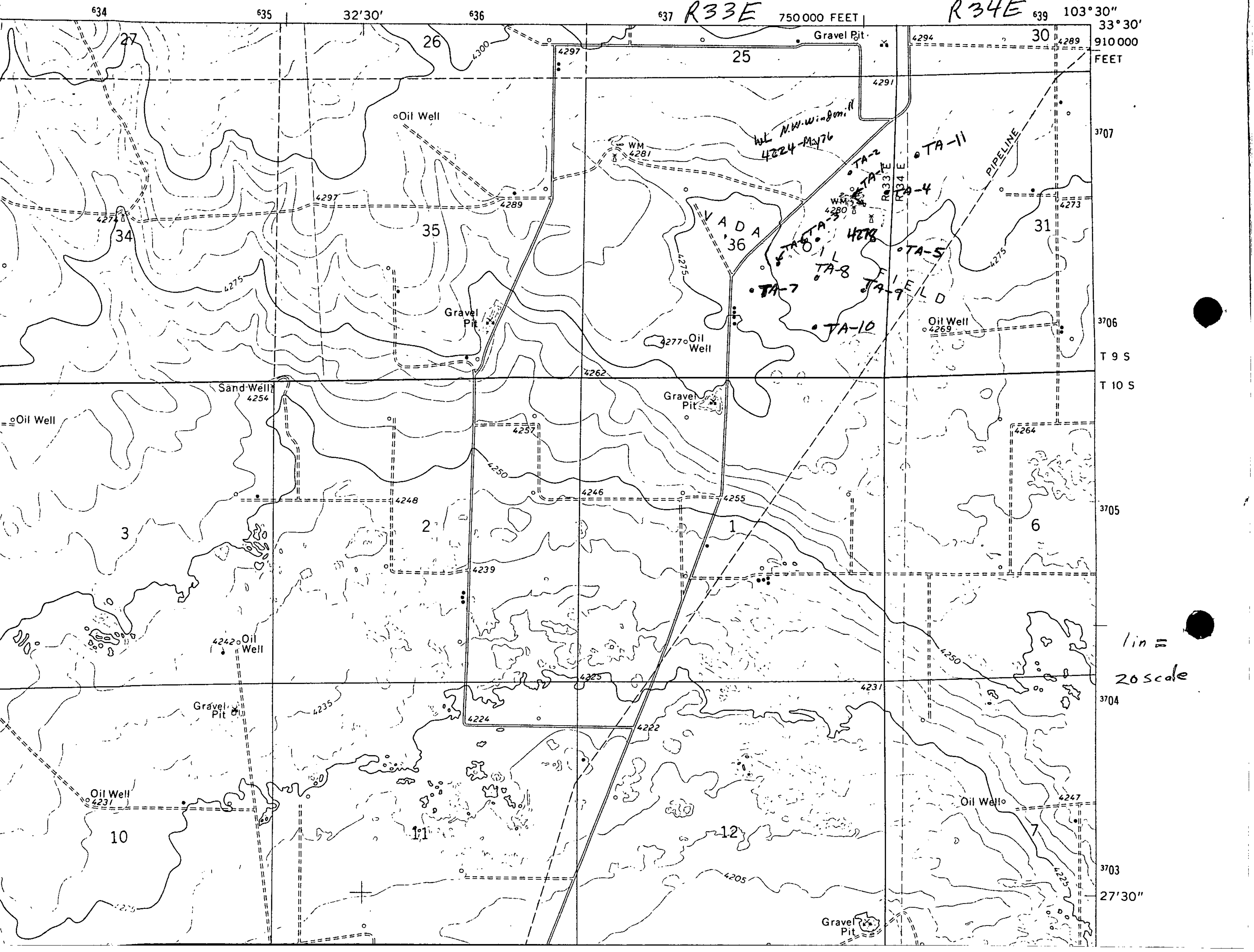
INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER Below MP 1st	2nd	3rd	Below LS
Date SEPT 25, 1980	55.00	54.00		
Hour 2:35 AM (PM) Obs EAC JCG	2.81	1.81		
Not POA ( ) POA ( )	52.19	52.19		52.19

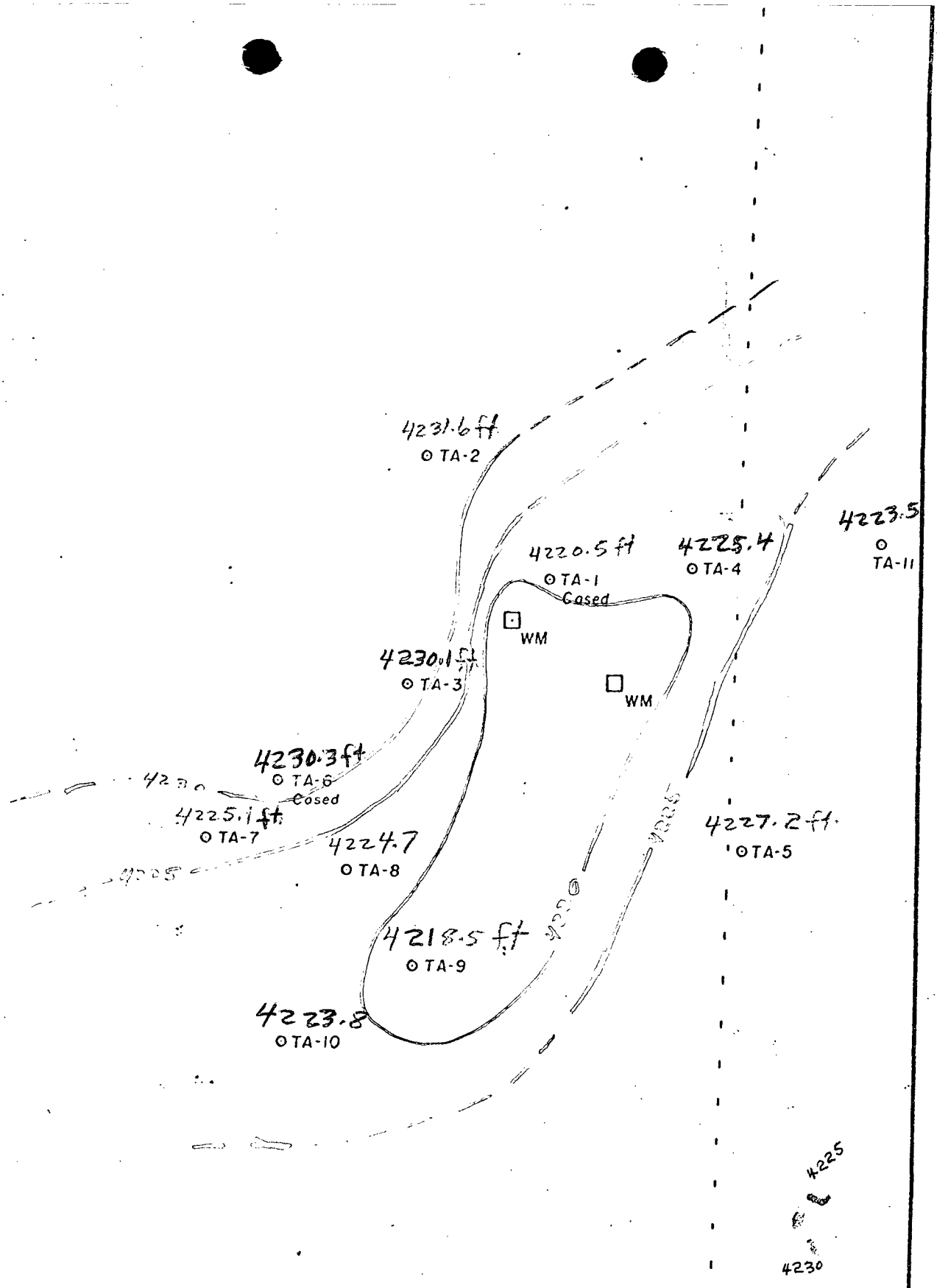
W L meas after pump shut off _____ min. Pumping W L (

Remarks _____


CAPROCK QUADRANGLE-95
CHAVES & LEA COUNTIES
R.32 E.
R.E.
Elida-83
40'
103°30'
33°30'
T.9 S.
T.10 S.
T.11 S.
T.12 S.
R.32 E.
R.33 E.
R.34 E.
Parallel
South
McGAFFIN
Lane Salt Lake
SIMANOLA
LANE
CAPROCK
GUYE
FOUR LAKES RANCH
EL PASO NATURAL GAS COMPANY
AMERADA CAMP
GLENN
LOVE
ROACH
JONES
WADE
FAP 21
To Tatum
Tatum-96
20'

7.5 MINUTE SERIES (TOPOGRAPHIC)

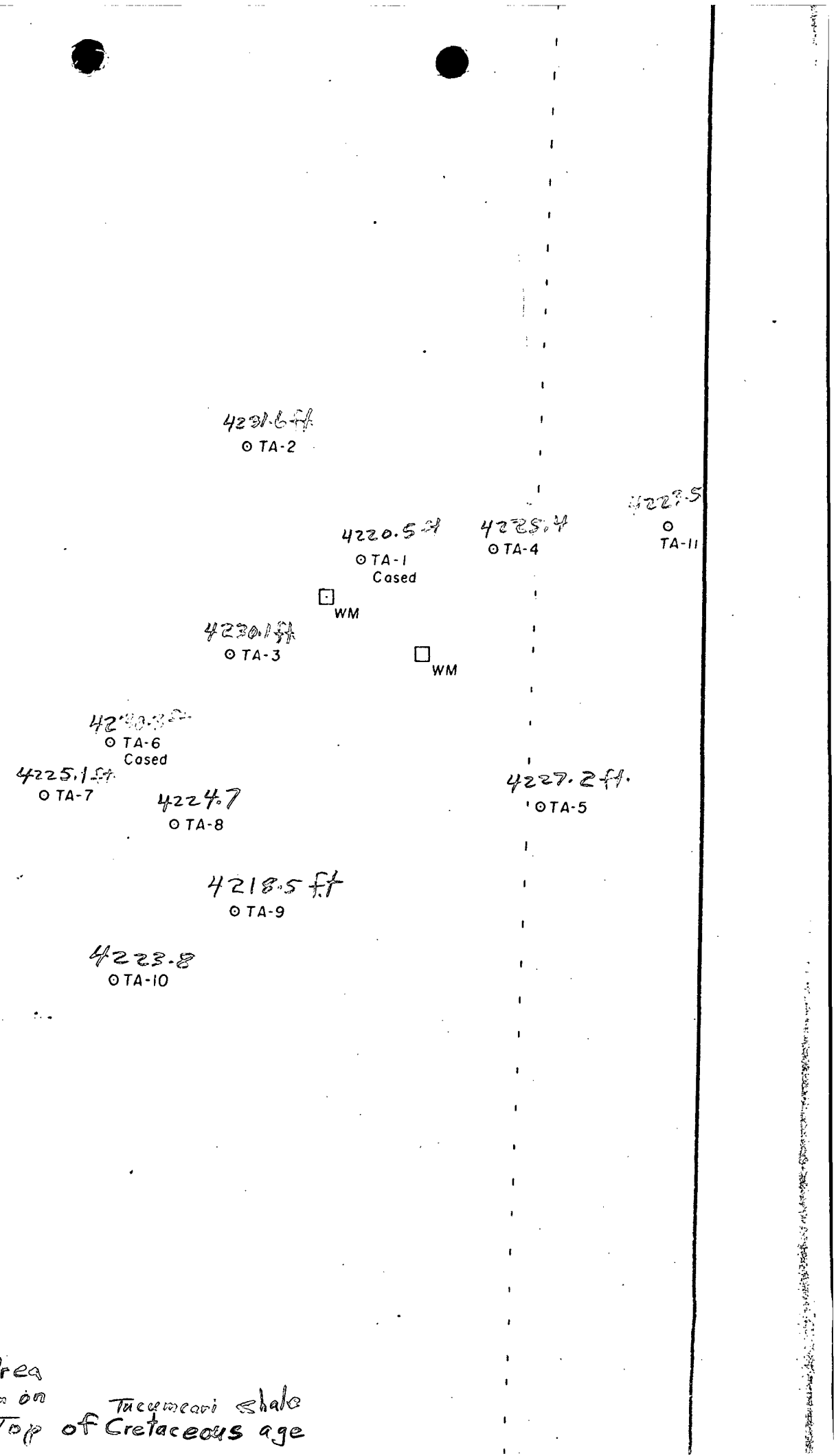




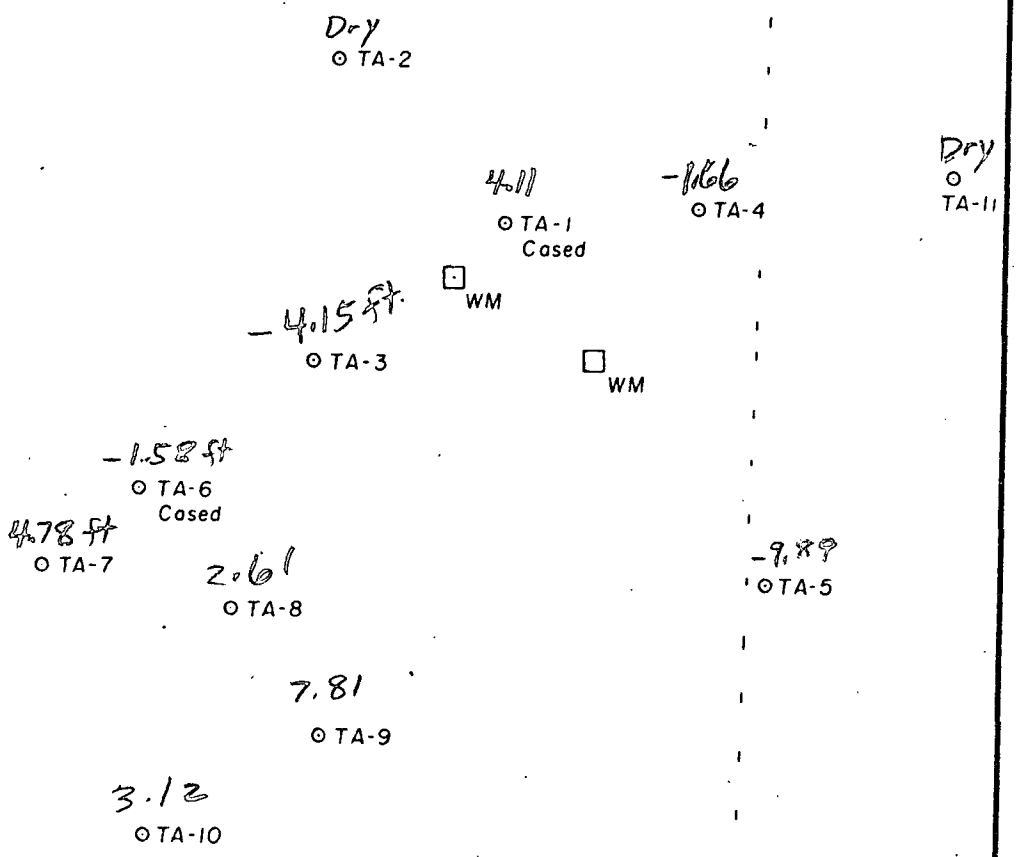
Structural Contour Map
Drawn on Top of Tucumcari shale
Elevation shown in Feet
Figure

Structural Contour Map
Drawn on Top of Tucumcari shale
Elevation shown in Feet
Figure

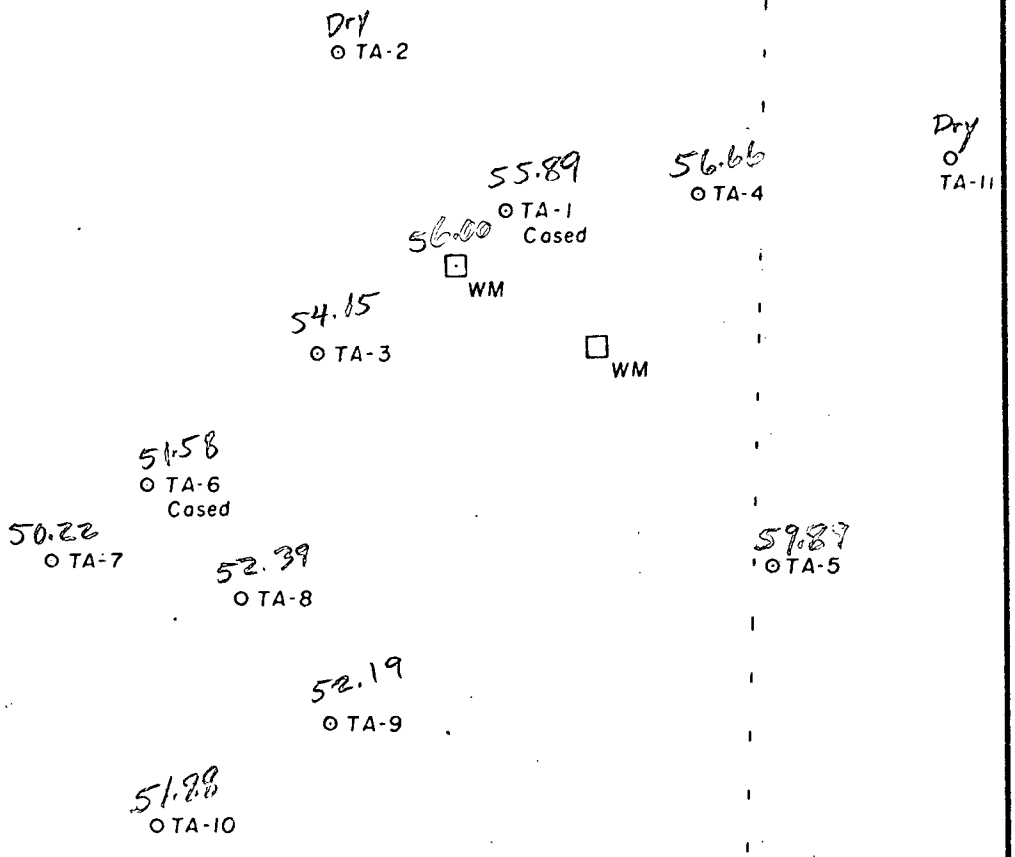
Structural Map – Top of Cretaceous



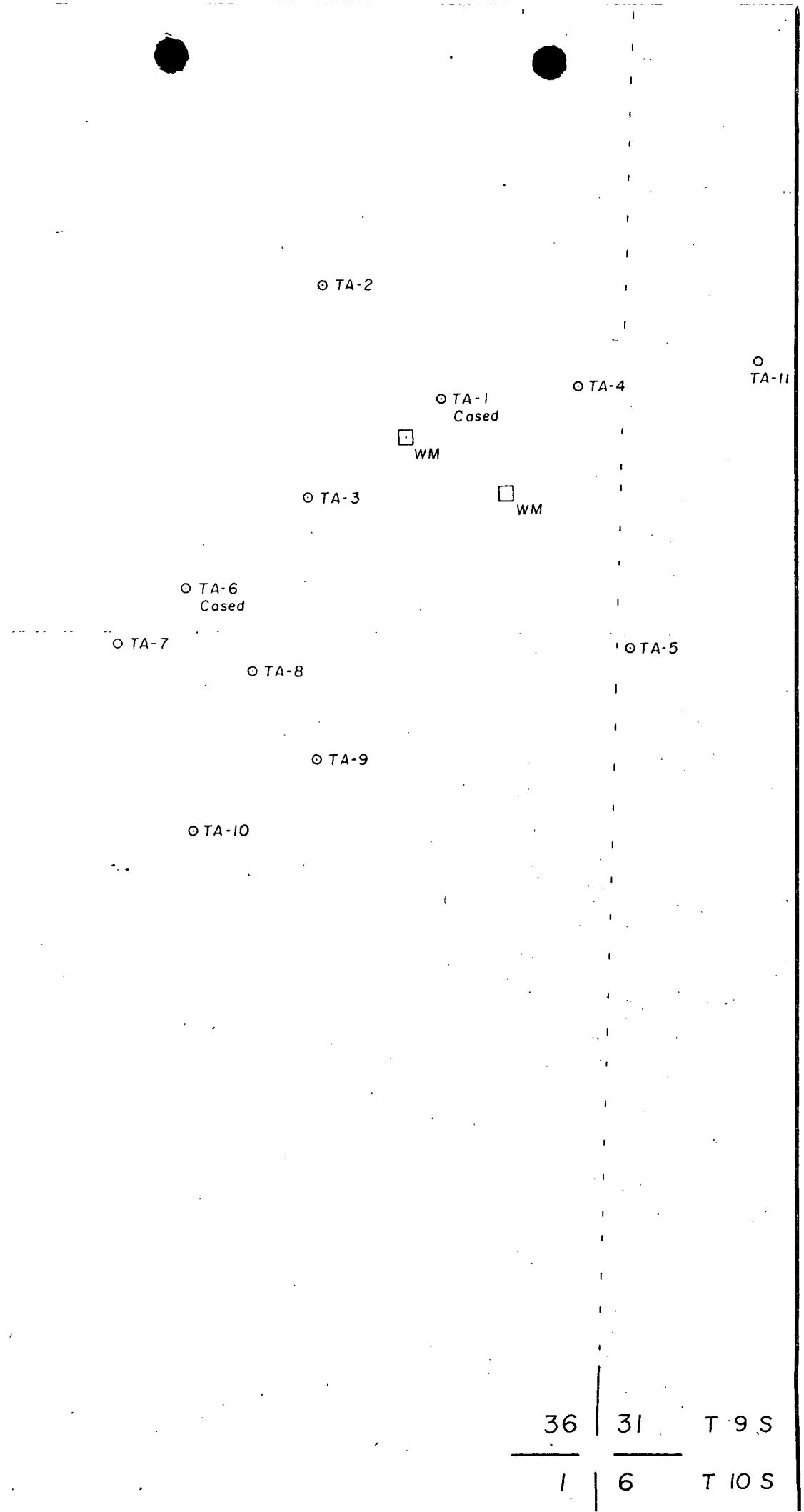
Tapp Ranch Area
Structural Contour drawn on Tuscumcari shale Map - Top of Cretaceous age



Saturated water thickness — 10 feet above bottom of gravel



water levels - L.S.


TA-2
TA-11
TA-4
TA-1
Cased
WM
WM
TA-3
TA-6
Cased
TA-7
TA-5
TA-8
TA-9
TA-10
36
31
T 9 S
1
6
T 10 S

SAMPLE LOG

Hole TA-1 Logged by Thomas A. Parkhill Date Sept. 12, 1980 page 1 of 1

Driller John Scarborough TD 80 ft Date 9-12-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 3/4 in Log Types Collar Elev. 4280.5 ft.

Location 535 FEL 2185 FNL Sec. 36 T 9 S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - light pink, tr. of vf. qtz. grains
		Clay - orange, tr. of vf. qtz. grains
		Clay - brownish-orange, mod. vf. qtz. grains
50		Gravel - black, white, orange, 1/4 to 3/4 in, ang to subrd, clay matrix
		Clay - greenish-yellow, tr. of vf. qtz. grains
		Clay - dark gray, tr. of vf. qtz. grains
		T.D. - 80 ft.
100		
150		
200		

Hole No TA-1
page 1 of 1

SAMPLE LOG

Hole TA-2 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 145 ft Date 9-13-80

Probe None TD Date

Est Mud Wt. Air & water Hole Size 4 3/4 in Log Types Collar Elev. 4281.6 ft

Location 885 FEL 1855 FNL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks Air-0-60ft water-60 to 145 ft Dry hole - no water

Depth	Log	Description
		Caliche - pinkish-white, tr. of uf. qtz. grains hard
		Sand - orange, uf. to f. qtz. grains, ang. to subrd, tr. of clay matrix
		Gravel - black/white, orange, 1/4 to 1/2 in. subang. to subrd, sand matrix
50		Clay - orange, mod. uf. qtz. grains, tr. of mica
		Shale - dark gray, tr. of silt and uf. qtz. grains
100		
		135 to 140 - stringer of gray sand - vf. to f. qtz. grains, ang. to sub. ang. mod. clay matrix
150		T.D. - 145 ft
200		

Hole No TA-2
page 1 of 1

SAMPLE LOG

Hole TA-3 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 65 ft Date 9-13-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in Log Types Collar Elev. 4280.1 ft.

Location 920 FEL 2465 FNL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex Collar Coor. N E

Remarks Dry hole - bottom of hole was damp

Depth	Log	Description
		Caliche - pinkish-white, tr. of vf. qtz. grains, hard
		Sand - light orange, vf. to f. qtz. grains, ang. to sub ang., tr. of clay matrix
		Clay - orange, tr of f. qtz. grains
50		Sand - orange, vf. to l. qtz. grains, 10% gravel - 1/4 to 1/2 in, black, white, sub ang. to subrd.
		Clay - yellow, tr. of vf. qtz. grains
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-3
page 1 of 1

SAMPLE LOG

Hole TA-4 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 65 ft Date 9-13-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in Log Types Collar Elev. 4280.4 ft

Location 135 FEL 2150 FNL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - pinkish-white, tr. of vf. qtz. grains
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd, tr. of clay matrix
		Clay - brown, tr. of vf. qtz. grains
50		Gravel - black, red, gray, 1/4 to 2 in, ang to subrd, sand matrix (f.)
		Clay - yellow, tr. of vf. qtz. grains
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-4
page 1 of 1

SAMPLE LOG

Hole TA-5 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 65 ft Date 9-13-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in Log Types Collar Elev. 4277.2 ft.

Location 40 FWL 2720 FSL Sec. 31 T 9S R 34E

Area Caprock County Lea State N. Mex Collar Coor. N E

Remarks 3 feet of Gravel reported by driller, but not seen in 45 to 50 ft sample.

Depth	Log	Description
		Soil - brown, vf to f. qtz. grains, ang. to sub rd., tr. of f clay matrix
		Caliche - white, tr. of vf qtz. grains
		Sand - light orange, vf. to f. qtz. grains, ang to subrd, tr. of clay matrix
		Sand - orange, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
50		Clay - yellow, mod. vf. qtz. grains
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-5
page 1 of 1

SAMPLE LOG

Hole TA-6 Logged by Thomas A. Parkhill Date Sept. 13, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-13-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in. Log Types Collar Elev. 4280.3 ft

Location 1260 FEL 2720 FNL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche – pinkish-white, tr. of uf. qtz. grains, hard
		Sand – light orange, vf. qtz. grains, ang. to subrd, tr. of clay matrix
		Clay – orangish-brown, tr. of silt
		Sand – orange, vf. to f. qtz grains, ang. to subrd,
50		Gravel – black, white, orange, ¼ to 1in, subang. to subrd, sand matrix
		Clay – yellow, tr. of uf. qtz. grains
		T.D. – 65 ft.
100		
150		
200		

Hole No TA-6
page 1 of 1

SAMPLE LOG

Hole TA-7 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in Log Types Collar Elev. 4280.1 ft

Location 1460 FEL 2345 FSL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of v f. qtz grains
		Clay - orangish-brown tr. of qtz grains
		Sand - orange, v f. to f. qtz. grains, ang to subrd, no matrix.
50		50 to 55 ft. - 15% of sample gravel - black white, 1/4 to 1/2 in, subang to subrd.
		Clay - greenish-yellow, tr. of silt.
		T.D. - 65 ft.
100		
150		
200		

Hole No TA-7
page 1 of 1

SAMPLE LOG

Hole TA-8 Logged by Thomas A. Pavkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 65 ft Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in Log Types Collar Elev. 4279.7 ft.

Location 1060 FEL 2265 FSL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche – yellowish-white, tr. of uf. qtz grains
		Sand – light orange, vf. qtz grains, ang. to subang. tr. of clay matrix
		Clay – orangish-brown, tr. of vf. qtz. grains
		Sand – orange, vf. to f. qtz grains, ang. to subrd, tr. of clay matrix
50		Gravel – black, orange, white, ~~1/4~~ to 3/8 in, subang. to subrd
		Clay – yellow, tr. of silt
		T.D. – 65 ft.
100		
150		
200		

Hole No TA-8
page 1 of 1

SAMPLE LOG

Hole TA-9 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 65 ft. Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in Log Types Collar Elev. 4278.5 ft.

Location 870 FEL 2005 FSL Sec. 36 T 9S R 33E

Area Caprock County Lea State N Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of uf. qtz grains
		Sand - light orange, uf. to f. qtz. grains, ang. to subrd, tr of clay matrix
		Clay - orangish-brown, tr of uf. qtz. grains
50		Sand - orange, uf. to f. qtz grains, ang. to subrd, tr. of clay matrix
		Gravel - black, white, orange, 1/4 to 1/2 in., sub ang to subrd., sand matrix 50 to 60 ft
		Clay - yellow, tr of silt
		T.D. - 65 ft
100		
150		
200		

Hole No TA-9
page 1 of 1

SAMPLE LOG

Hole TA-10 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 65 ft Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in Log Types Collar Elev 4278.8

Location 1225 FEL 1810 FSL Sec. 36 T 9S R 33E

Area Caprock County Lea State N. Mex Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of uf. qtz. grains
		Sand - brownish-orange, vf. to f. qtz. grains, ang. to subrd, tr. of clay matrix
50		Sand - orange, uf to f. qtz. grains, ang to subrd, tr. of clay matrix
		3 to 5% of sample contained gravel - black, gray, 1/4 to 1/2 in, subang to subrd
		Clay - yellow, tr of uf. qtz grains
		T.D. - 65 ft.
100		
150		

Hole No TA-10
page 1 of 1

SAMPLE LOG

O

Hole TA-11 Logged by Thomas A. Parkhill Date Sept. 14, 1980 page 1 of 1

Driller John Scarborough TD 60 ft. Date 9-14-80

Probe None TD Date

Est Mud Wt. Air Hole Size 4 3/4 in Log Types Collar Elev. 4278.5 ft.

Location 390 FWL 2085 FNL Sec. 31 T 9S R 34E

Area Caprock County Lea State N. Mex. Collar Coor. N E

Remarks

Depth	Log	Description
		Caliche - yellowish-white, tr. of vf. qtz. grains
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd, tr. of clay matrix
		Clay - brownish-orange, tr. of vf. qtz. grains
		Sand - orange, vf. to f. qtz grains, ang. to subrd.
50		Clay - yellow, tr. of vf. qtz. grains
		T.D. - 60 ft
100		
150		

Hole No TA-11
page 1 of 1

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-2 WELL LOG

From	To	FORMATION
0	1	top soil
1	20	caliche
20	45	clay
45	50	sand
50	58	gravel
58	70	yellow clay
70	144	blue clay
		5" Hole
		@ 3.00 #432.00
		Jet Well Pull
		Jet Pipe

Date 10-13-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-1 WELL LOG

From	To	FORMATION
0	1	top soil
1	20	caliche
20	50	sandy clay
50	60	gravel
60	65	yellow clay
65	80	Blue clay
		Run 3" PVC Pipe
		Jetted Well
		Pull Jet Pipe
		@ 400 #320.00

Date 10-12-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-3 WELL LOG

From	To	FORMATION
0	1	top soil
1	15	caliche
15	30	clay
30	40	sand
40	56	gravel
56	64	yellow clay
		5" Hole
		@ 3.00 #192.00
		Pull Jet Pipe

Date 10-13-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-5 WELL LOG

From	To	FORMATION
0	2	top soil
2	40	caliche clay
40	50	red clay
50	53	Gravel
53	64	yellow clay
		5" well
		Jetted well
		Pull Rig
		@ 3.00. $192.00

Date 10-13-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-4 WELL LOG

From	To	FORMATION
0	1	top
1	20	caliche
20	46	Sandy clay
46	56	Sand & gravel
56	64	yellow clay
		5" Hole & set
		Hole Ream & set
		Pipe
		@ 3.00 $192.00

Date 10-13-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-1 WELL LOG

From	To	FORMATION
0	1/2	top soil
1/2	20	caliche
20	30	red clay
30	58	Gravel
58	64	yellow clay
		5" Well
		Jetted Well
		Pull Rig
		@ 3.00 $192.00

Date 10-13-80 Driller Scarbrough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-8 WELL LOG

From	To	FORMATION
0	1	top soil
1	20	caliche
20	21	Sand
21	51	Red clay
51	57	Gravel
57	64	yellow clay
		5" Well Gotta Well
		Pull Pipes
		@ 300 #19200

Date 10-14-80 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-7 WELL LOG

From	To	FORMATION
0	1	top soil
1	20	caliche
20	30	Sand
30	50	Red clay
50	58	Gravel
58	64	yellow clay
		5" Well Gotta Well
		Pull Pipes
		@ 300 #19200

Date 10-14-80 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-9 WELL LOG

From	To	FORMATION
0	2	top soil
2	25	caliche
25	35	Red clay + Sand
35	57	Gravel clay
57	64	yellow clay
		5" Well Gotta Well
		Water Pull Pipes
		@ 300 #19200

Date 10-14-80 Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-11 WELL LOG

From	To	FORMATION
0	10	tops soil
10	30	caliche
30	51	Red clay & sand
51	54	Gravel
54	64	yellow clay
		5" Well Jetted
		Well Rule Rigs
		@ 300 # 192.00

Date 10-14- Driller Scarborough

SCARBOROUGH DRILLING
TEST HOLES — WATER WELLS
122 N. 24th St. - Ph. 806-872-3285 or 3125
LAMESA, TEXAS 79331

TA-10 WELL LOG

From	To	FORMATION
0	2	tops soil
2	25	Caliche
25	34	Red clay
34	50	Sand
50	61	Gravel
61	64	yellow clay
		5" Well Jetted
		Well Rule Rigs
		@ 300 # 192.00

Date 10-14-8 Driller Scarborough

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by GROSECLOSE & CHAVES

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4281.6

DEPTH 144 ft ☒ Rept ☐ Meas Use TEST HOLE

~~CASING~~ 5" HOLE in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: DRY ft (rept / meas) 9-25 1980 (above / below)

LAND SURFACE

_____ which is ____ ft (above / below) LS

PERMANENT RP is _____

DRY HOLE

which is ____ ft (above / below) described MP and ____ ft (above / below) LS

REMARKS _____

BOULDER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-2 Loc. No. 9.33.36.241432 3

TEMP NE COR & E-LINE

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-12 1980

TOPO SITUATION FLAT SEO Elev 4280.5

DEPTH 80 ft ☒ Rept ☐ Meas Use TEST HOLE

CASING 3 PLASTIC in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 57.54 ft (rept / meas) 9-25 1980 (above / below)

TOP OF CASING

_____ which is 1.65 ft (above / below) LS

PERMANENT RP is _____

which is ____ ft (above / below) described MP and ____ ft (above / below) LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-1 Loc. No. 9.33.36.241320

TEMP NE COR & EAST LINE

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT. 25, 1980	65.00	59.00		57.54
Hour 3:00 AM (PM) Obs ERIC JCC	7.46	1.46		1.65
Not POA (✓) POA ( )	57.54	57.54		55.89

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT. 25, 1980	65.00			
Hour 3:45 AM (PM) Obs ERIC JCC	DRY HOLE			
Not POA (✓) POA ( )				

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 1980 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH DRLG. Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4280.3

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

CASING 3" PLASTIC in to _____ ft Log DRILLERS

PUMP: Type NONE Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 52.93 ft rept (meas) 9-25 1980 above (below)

TOP OF CASING

_____ which is 1.35 ft (above) below LS

PERMANENT RP is _____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS CASED WITH 3" PLASTIC PIPE

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-6 Loc. No. 9.33.36.4211312

TEMP SE COR of 4th EAST LINE

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCHARBOROUGH DRILLING Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4280.1

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

~~CASING~~ 5" HOLE in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 54.15 ft rept (meas) 9-25. 1980 above (below)

LAND SURFACE

_____ which is ____ ft ~~above~~ ~~below~~ LS

PERMANENT RP is _____

which is ____ ft above below described MP and ____ ft above below LS

REMARKS OPEN HOLE, NO CASING

Well No. ___ on Photo _____ DPN _____

File No TA-3 Loc. No. 9.33.36.2434312

TEMP NE COR of E. LINE

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date 9 25 ,1980	59.00	56.00		
Hour 2:10 AM (PM) Obs SCC EAG	4.85	1.85		
Not POA (X) POA ( )	54.15	54.15		54.15

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Bel LS
	1st	2nd	3rd	
Date SEPT 25 ,1980	58.00	5700		52.93
Hour 2:17 AM (PM) Obs SCC, ZEMC	5.07	1.07		1.35
Not POA (/) POA ( )	52.93	52.93		51.58

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by [illegible] & CHAVES

LOCATION: County LEA Map 95.22.

OWNER _____

DRILLER SCARBOROUGH Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4271.2

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

5" HOLE

~~CASING~~ _____ in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 59.89 ft rept (meas) 9-15 1980 above (below)

LAND SURFACE

_____ which is _____ ft ~~above~~ below LS

PERMANENT RP is _____

_____

_____

_____

which is _____ ft above (below) described MP and _____ ft above (below) LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-5 Loc. No. 9.34.31.3111333

TEMP. NW COR & W. LINE

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT 25, 1980	61.00	62.00		
Hour 3:20 AM (PM) Obs [illegible]	1.11	2.11		
Not POA (✓) POA ( )	59.89	59.89		59.89

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 1980 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH DRLG. Completed 9-14 1980

TOPO SITUATION FLAT SEO Elev 4280.1

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

~~CASING~~ 5" HOLE in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 50.22 ft (rept meas) 9-25 1980 (above below)

LAND SURFACE

_____ which is _____ ~~ft above below~~ LS

PERMANENT RP is _____

_____

_____

_____

which is _____ ft above below described MP and _____ ft above below LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-7 Loc. No. 9.33.36.412411
TEMP SE Cor & E-LINE

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 1980 Record by GROSECLOSE & CHAVES

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-14 1980

TOPO SITUATION FLAT SEO Elev 4279.7

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

~~CASING~~ 5" HOLE in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 52.39 ft (rept meas) 9-25 1980 (above below)

LAND SURFACE

_____ which is _____ ~~ft above below~~ LS

PERMANENT RP is _____

_____

_____

_____

which is _____ ft above below described MP and _____ ft above below LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-8 Loc. No. 9.33.36.421320
TEMP SE Cor & E-LINE

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT. 25, 1980	54.00	53.00		
Hour 2:30 AM PM Obs EAS/GG	1.61	2.61		
Not POA (X) POA ( )	52.39	52.39		

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Be[illegible] LS
	1st	2nd	3rd	
Date SEPT. 25, 1980	55.00	52.00		
Hour 2:25 AM PM Obs EAS/GG	4.78	2.78		
Not POA (X) POA ( )	50.22	50.22		50.22

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1

State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 19 80 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-14 19 80

TOPO SITUATION FLAT SEO Elev 4278.5

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE
5" HOLE

~~CASING~~ _____ in to _____ ft Log _____

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 51.19 ft rept (meas) SEPT 25 19 80 above (below)
LAND SURFACE

_____ which is _____ ft ~~above~~ below LS

PERMANENT RP is _____

_____

_____

_____

which is _____ ft above below described MP and _____ ft above below LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-9 Loc. No. 9.33.36.4232121
TEMP SE COR & E-LINE

FE-1

State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 19 80 Record by GROSECLOSE & CHAVES

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-14 19 80

TOPO SITUATION FLAT SEO Elev 4278.8

DEPTH 64 ft ☒ Rept ☐ Meas Use _____
5" HOLE

~~CASING~~ _____ in to _____ ft Log _____

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 51.88 ft rept (meas) 9-25 19 80 above (below)
LAND SURFACE

_____ which is _____ ft ~~above~~ below LS

PERMANENT RP is _____

_____

_____

_____

which is _____ ft above below described MP and _____ ft above below LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-10 Loc. No. 9.33.21.4231321
TEMP SE COR & E-LINE

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date SEPT 25, 1980	55.00	56.00		
Hour 2:40 AM (PM) Obs EAC JCG	3.12	4.12		
Not POA (✓) POA ( )	51.88	51.88		51.88

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Bel LS
	1st	2nd	3rd	
Date SEPT 25, 1980	55.00	54.00		
Hour 2:35 AM (PM) Obs EAC JCG	2.81	1.81		
Not POA (✓) POA ( )	52.19	52.19		52.19

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

FE-1

State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 9-25 1980 Record by CHAVES & GROSECLOSE

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-13 1980

TOPO SITUATION FLAT SEO Elev 4280.4

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

CASING _____ in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: 56.66 ft rept meas 9-25 1980 above below

LAND SURFACE

_____ which is _____ ft ~~above~~ ~~below~~ LS

PERMANENT RP is _____

_____

_____

_____

which is _____ ft above below described MP and _____ ft above below LS

REMARKS _____

AQUIFER(S):

Well No. ___ on Photo _____ DPN _____

File No TA-4 Loc. No. 9.33.36.2442411

TEMP NE COR & E-LINE

FE-1

State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date SEPT. 25 1980 Record by GROSECLOSE & CHAVES

LOCATION: County LEA Map 95.2.2

OWNER _____

DRILLER SCARBOROUGH Completed 9-14 1980

TOPO SITUATION FLAT SEO Elev 4278.5

DEPTH 64 ft ☒ Rept ☐ Meas Use TEST HOLE

5" HOLE

CASING _____ in to _____ ft Log DRILLERS

PUMP: Type _____ Make _____

Ser.no./model _____ Size of dischg _____ in.

PRIME MOVER: Make _____ HP _____

Ser.no. _____ Power/Fuel _____

PUMP DRIVE: ☐ Gear Head ☐ Belt Head ☐ Pump Jack

Make _____ Ser.no _____ ☐ VHS

WATER LEVEL: DRY ft rept meas 9-25 1980 above below

LAND SURFACE

_____ which is _____ ft above below LS

PERMANENT RP is _____

DRY HOLE

_____

_____

which is _____ ft ~~above~~ below described MP and _____ ft above below LS

REMARKS _____

Well No. ___ on Photo _____ DPN _____

File No TA-11 Loc. No. 9.34.31.1332132

TEMP NW COR & W-LINE

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER Below MP 1st	2nd	3rd	Below LS
Date SEPT. 25, 1980	[illegible]			
Hour 3:10 AM (PM) Obs 2[illegible]6		DRY		
Not POA ( ) POA ( )				

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Remarks cont. _____

SKETCH:

N

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER Below MP 1st	2nd	3rd	Bel LS
Date SEPT 25, 1980	61.00	59.00	58.00	
Hour 3:10 AM (PM) Obs [illegible]6	3.03	2.34	1.34	
Not POA ( ) POA ( )	57.97	56.66	56.66	5666

W L meas after pump shut off _____ min. Pumping W L ( )

Remarks _____

Memo

February 15, 1980

From

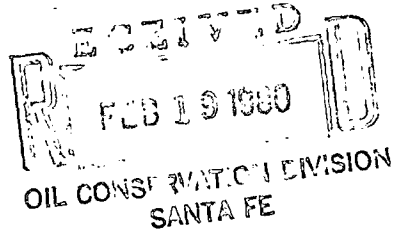
JERRY SEXTON
District Supervisor

To Dick,

As I have previously advised you, we have had a windmill go bad in the northern part of Lea County. We are now setting up a bradenhead survey of the area.

The area has very little fresh water and the State Engineers have a fresh water well some 5 miles away which went bad in 1966.

I would like to have the new hydrologist in on it from the very beginning. He can take it over or he can work under me, but I think we should get together and decide what we will end up with and how much we will do. I can either come to Santa Fe or you folks can come down. I feel Joe will want to be in on this.



ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: Tapp TRapp Well No. #1

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter ____, Section 36, T 9 S, R 33E

SE Windmill - Sample taken while pumping.

Type Well: _____ Depth _____ feet.

Well Use: Stock

Sample Number: #1 Date Taken: 2-14-80

Taken By: Sexton

Specific Conductance: _____ m/ohm

Total dissolved Solids: _____ PPM.

Chlorides: 6,390 PPM.

Sulfates: _____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

_____ : _____

Date Analyzed: 2-14-80 By: John W. Runyan
Oil Conservation Division

REMARKS: _____

25 ml Sample = 142.0 factor X 45.0 titration = 6390

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: ~~Fopp~~ TRADD Well No. #2

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter ____, Section 25, T 9 S, R 33 E

NW windmill — Sample taken while Pumping

Type Well: _____ Depth _____ feet.

Well Use: Stock

Sample Number: #1 Date Taken: 2-14-80

Taken By: Sexton

Specific Conductance: _____ m/ω

Total dissolved Solids: _____ PPM.

Chlorides: 42.6 PPM.

Sulfates: _____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

_____ : _____

Date Analyzed: 2-14-80 By: John W. Runyan
Oil Conservation Division

REMARKS: _____

25 ml Sample = 142.0 factor X .3 titration = 42.6

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: Tapp Well No. #3

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter P?, Section 36, T 9 S, R 33 E

located in SE Corner sec. 36.

Type Well: Abd. water well Depth ____ feet.

Well Use: Orig. - stock - windmill

Sample Number: #1 Date Taken: 2-21-80

Taken By: Eddy Seay

Specific Conductance: ____ m/ohm

Total dissolved Solids: ____ PPM.

Chlorides: 7,738 PPM.

Sulfates: ____ PPM.

Ortho-phosphates: ☐ V.Low ☐ Low ☐ Medium ☐ High

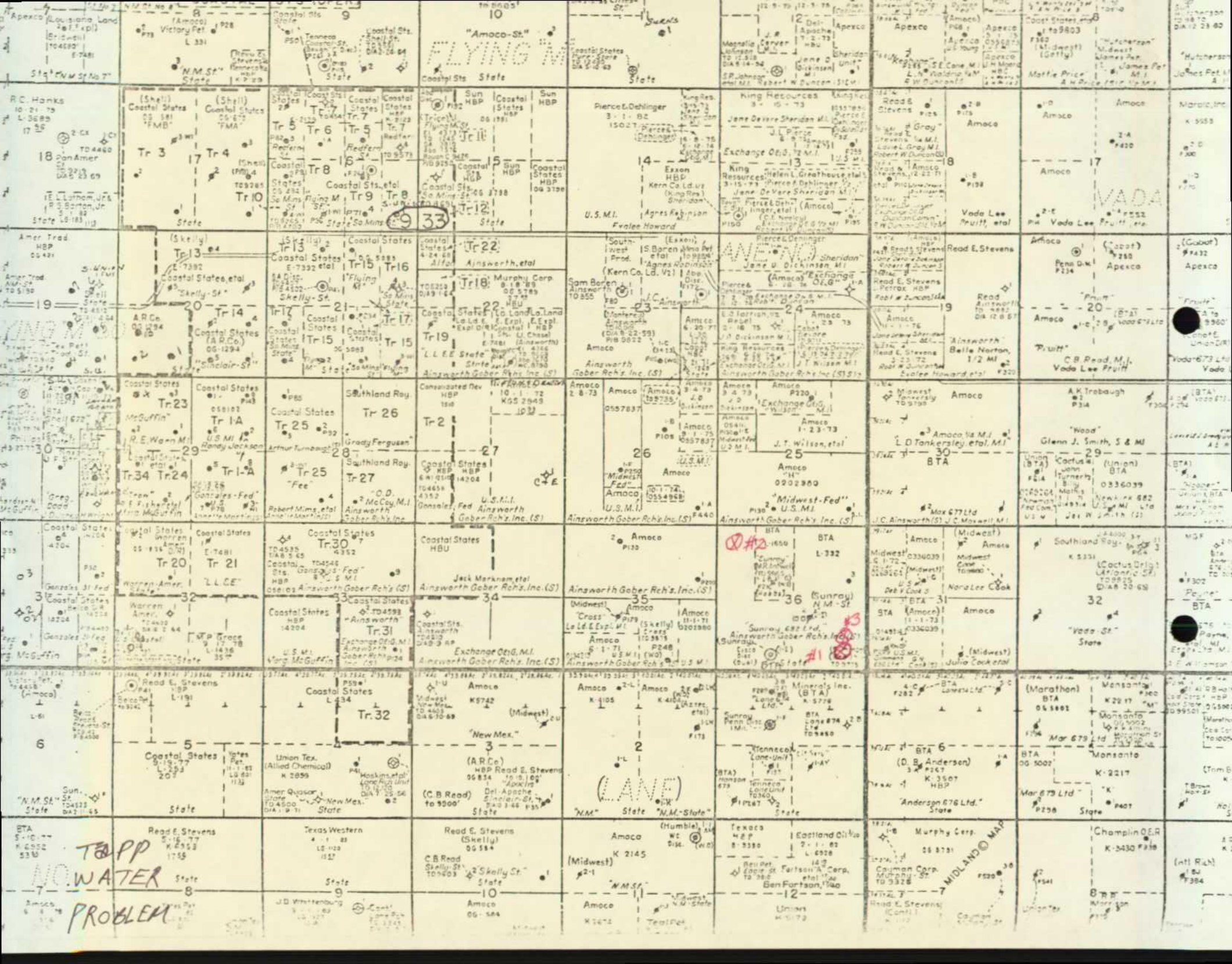
Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

____ : ____

Date Analyzed: 2-22-80 By: John W. Runyan
Oil Conservation Division

REMARKS: Water level 57 feet.

5 ml Sample - 710.0 factor x 10.9 titration = 7,738 Plus


FLYING M
"Amoco-St."
Coastal Sts. State
Tr 1
Tr 2
Tr 3
Tr 4
Tr 5
Tr 6
Tr 7
Tr 8
Tr 9
Tr 10
Tr 11
Tr 12
Tr 13
Tr 14
Tr 15
Tr 16
Tr 17
Tr 18
Tr 19
Tr 20
Tr 21
Tr 22
Tr 23
Tr 24
Tr 25
Tr 26
Tr 27
Tr 30
Tr 31
Tr 32
Tr 34
Tr 1-A
Coastal States
Amoco
Exxon HBP
Kern Co. Ld. Co.
Ainsworth Gober Rch's. Inc. (S)
Midwest-Fed
Sunray
Lane
Vada
Apexco
Read E. Stevens
Southland Roy.
Midland Map
No. Water Problem
Topp

LOCATION	DATE COLLECTED	CHLORIDE PPM	CONDUCTANCE M-MHOS	TEMP DEG	WBF	BASIN FILE	REFERENCE FILE	USE	PT CLTN	CLTR	SEC DATA	CARD DATE	SEC RCD
AVERAGES BY WELL LOCATION		.0	.0	.00									
03N 26E 02 42443	5/16/72	680	3290	68F	TRS	06				SEC	X	1278	U
03N 26E 02 42443	5/16/72	656	3571	68F	TRS	06				SEC	X	1278	F
AVERAGES BY WELL LOCATION		668.0	3430.5	68.00									
04N 25E 02 41441	5/16/72	33	1060	66F	TRS	FS		IRR		SEC	X	1278	U
04N 25E 02 41441	5/16/72	60	1219	66F	TRS	FS		IRR		SEC	X	1278	F
AVERAGES BY WELL LOCATION		46.5	1139.5	66.00									
04N 26E 16 2222	5/15/72	69	1270	65F	TRS	FS		IRR		SEC	X	1278	U
04N 26E 16 2222	5/15/72	90	1333	65F	TRS	FS		IRR		SEC	X	1278	F
AVERAGES BY WELL LOCATION		79.5	1301.5	65.00									
05N 24E 13 34111	5/16/72	83	1449	66F	TRS	FS		STK		SEC	X	1278	F
05N 24E 13 34111	5/16/72	66	1370	66F	TRS	FS		STK		SEC	X	1278	U
AVERAGES BY WELL LOCATION		74.5	1409.5	66.00									
05N 26E 30 3000	5/15/72	67	862	68F	TRS	FS		IRR		SEC	X	1278	F
05N 26E 30 3000	5/15/72	41	787	68F	TRS	FS		IRR		SEC	X	1278	U
AVERAGES BY WELL LOCATION		54.0	824.5	68.00									
08S 35E 21 343322	1/02/72	4672	7400		K			STK	PIT	CCC			C
AVERAGES BY WELL LOCATION		4672.0	7400.0	.00									
08S 35E 27 111313	1/02/72	263	1280		K			STK	DP	CCC			C
AVERAGES BY WELL LOCATION		263.0	1280.0	.00									
09S 32E 36 424224	6/25/70	123	1402		K	13		STK	YT	SEC			
09S 32E 36 424224	11/03/76	130	1393	62F	K	13		STK	DP	SEC			
AVERAGES BY WELL LOCATION		126.5	1397.5	62.00									
09S 32E 36 424242	10/05/73	142	590		K	13		DOM	DP	OCC			C
AVERAGES BY WELL LOCATION		142.0	590.0	.00									
→ 09S 33E 20 41CC	9/02/66	37500			TRS	13		SRD	SWAB	ONR	X	PLUG	U
AVERAGES BY WELL LOCATION		37500.0	.0	.00									
→ 09S 33E 21 243221	6/30/66	114		75F	QAL	13		SRD	DP	ONR	X		F
AVERAGES BY WELL LOCATION		114.0	.0	75.00									

POOL: Vada Penn (Bough "C")

Le2

All values in Parts per Million - PPM.

COMPANY	LOCATION	FORMATION	CODE	Chloride Cl.	Sodium Na.	Magesium Mg.	Calcium Ca.	Sulfate So4	Sulfide H2S
Midwest OCD	O-20-9-34	Bough "C"		53,960	35,074				
Stallworth-OCD	N-2-9-33	" "	PW	54,300	—	—	—	—	—

Pool Chloride Average (All Pool Formations).	Form. Penn (Clastic)	54,130
Pool Formation Average - PPM Cl.	Form.	
Pool Formation Average - PPM Cl.	Form.	
Pool Formation Average - PPM Cl.	Form.	

CODE:

WF = Water Flood Water

PW = Produced Water (Primary)

R = Reef water.

LEA

POOL: Lane - middle Penn

All values in Parts per Million - PPM.

COMPANY	LOCATION	FORMATION	CODE	Chloride Cl.	Sodium Na.	Magesium Mg.	Calcium Ca.	Sulfate So4	Sulfide H2S
Midwest OCD	NE/4 - 14-10-35	Penn	PW	53,605	34,843				
Tenneco OCD	I - 35-10-33	Penn	PW	48,500	24400	1030	4870	500	

Pool Chloride Average (All Pool Formations).	Form. M. Penn.	51,052
Pool Formation Average - PPM Cl.	Form.	
Pool Formation Average - PPM Cl.	Form.	
Pool Formation Average - PPM Cl.	Form.	

CODE:

WF = Water Flood Water

PW = Produced Water (Primary)

R = Reef water.

LEA

POOL: South Flying "M" Penn

All values in Parts per Million - PPM.

COMPANY	LOCATION	FORMATION	CODE	Chloride Cl.	Sodium Na.	Magesium Mg.	Calcium Ca.	Sulfate So4	Sulfide H2S
Union Tex OCD	30-9-33	Penn	PW	52,256	33,966				
Stanolind OCD	2-9-33	Penn	PW	54,300					

Pool Chloride Average (All Pool Formations).	Form. Penn	53,278
Pool Formation Average - PPM Cl.	Form.	
Pool Formation Average - PPM Cl.	Form.	
Pool Formation Average - PPM Cl.	Form.	

CODE:

WF = Water Flood Water

PW = Produced Water (Primary)

R = Reef water.

Lea

POOL: Flying "M" San Andres

All values in Parts per Million - PPM.

COMPANY	LOCATION	FORMATION	CODE	Chloride Cl.	Sodium Na.	Magesium Mg.	Calcium Ca.	Sulfate So4	Sulfide H2S
(USGS)	20-9-33	SA	Pw	134,900	78,700	2010	6090	2100	
(USGS)	16-9-33	SA	Pw	116,000	73,700	525	3800	955	

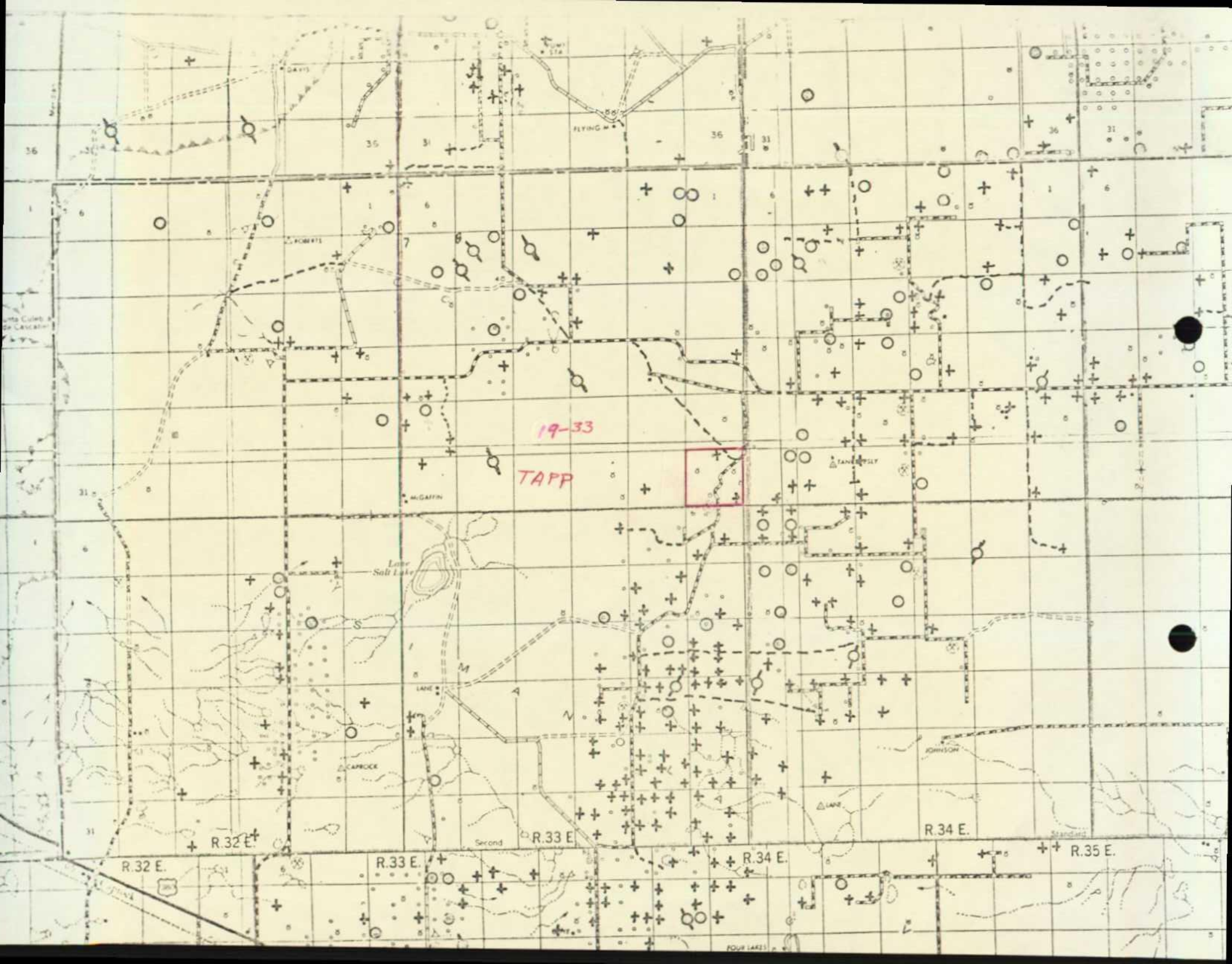
Pool Chloride Average (All Pool Formations).	Form. SA	125,350
Pool Formation Average - PPM Cl.	Form.	
Pool Formation Average - PPM Cl.	Form.	
Pool Formation Average - PPM Cl.	Form.	

CODE:

WF = Water Flood Water

PW = Produced Water (Primary)

R = Reef water.


19-33
TAPP
R.32 E.
R.33 E.
R.34 E.
R.35 E.
R.32 E.
R.33 E.
R.34 E.
Lake Salt Lake
McGAFFIN
CAPROCK
LANE
JOHNSON
Second

26 | 25
35 | 36

25 | 30
36 | 31

TA-2

TA-1
Cased

WM

TA-4

TA-11

TA-3

WM

TA-6
Cased

TA-7

TA-8

TA-5

TA-9

TA-10

⊙ OIL WELL

35 | 36
2 | 1

36 | 31 T 9 S
1 | 6 T 10 S

R 33 E R 34 E

BRUNING 44-510

STATE OF NEW MEXICO
OFFICE OF STATE ENGINEER

Location of wells and test holes in the vicinity of Section 36, T 9 S, R 33 E and Section 31, T 9 S, R 34 E.

Date Sept 26, 1980 Scale 1" = 400'

Engineer
Drawn by R. J. McBroyer
Approved J. C. Groseclose

Serial

Sheet No.
WR-108-D