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REPORTS

DATE:

1981

Ground Water Report on the Southwestern Public Service Company Area located in Sections 33 and 34, Township 17 South, Range 35 East

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January 22, 1981

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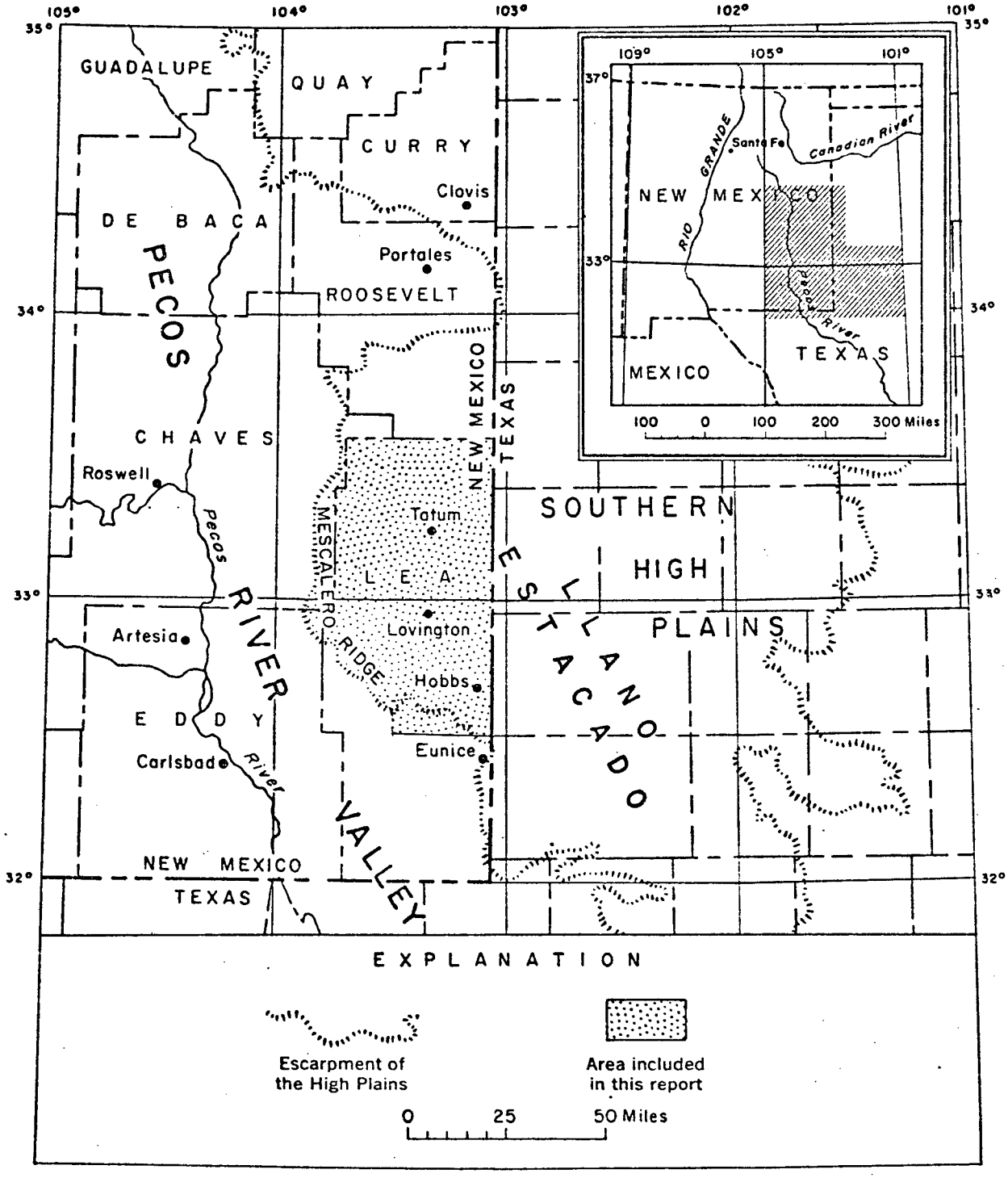
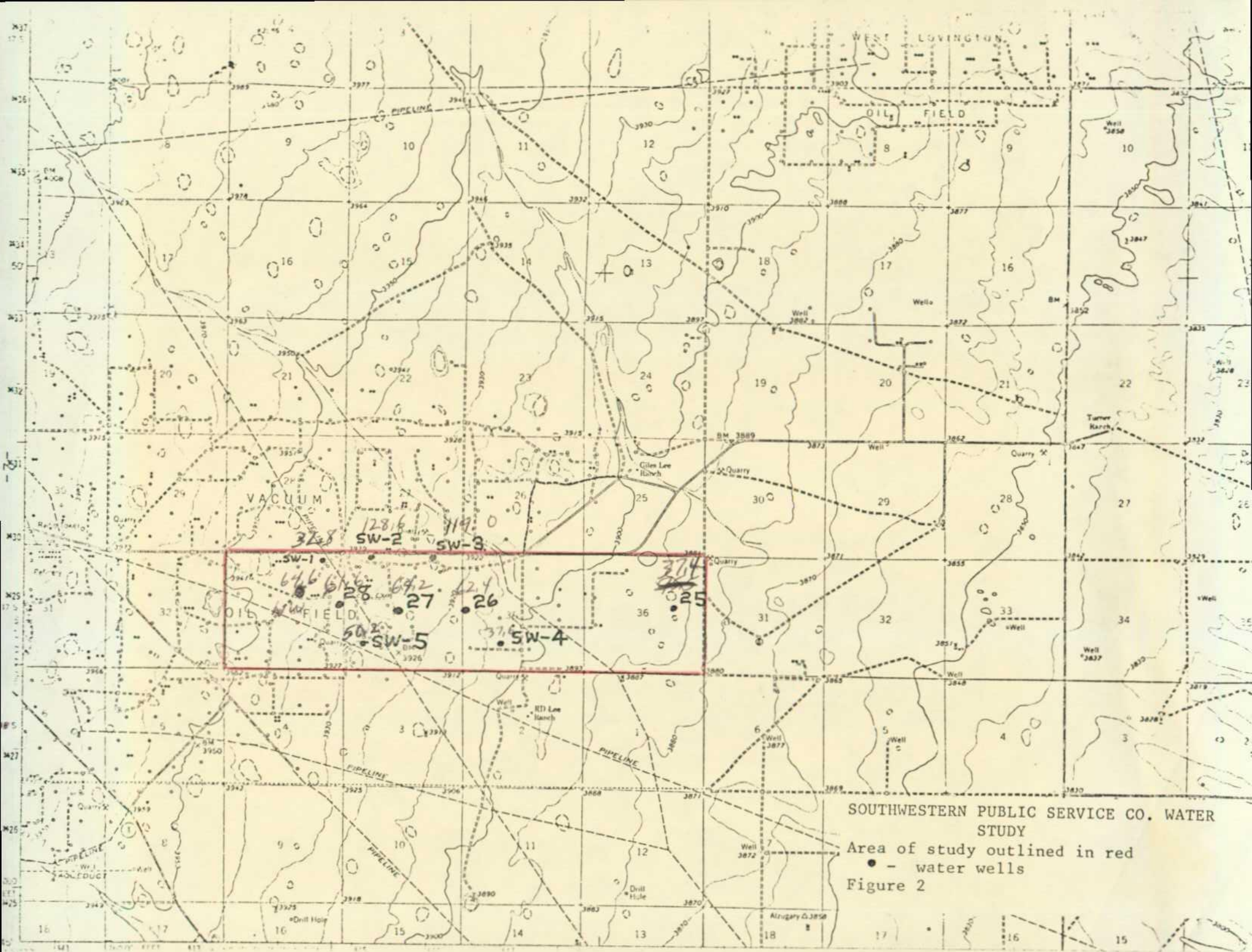


FIGURE 1.—INDEX MAP SHOWING THE LOCATION OF THE NORTHERN LEA COUNTY AREA AND ITS RELATION TO THE HIGH PLAINS AND THE PECOS RIVER VALLEY

Modified from Ash, 1963



SOUTHWESTERN PUBLIC SERVICE CO. WATER STUDY

Area of study outlined in red

● - water wells

Figure 2

INTRODUCTION

A reconnaissance type ground water program was done to determine the water quality in Sections 33 and 34, Township 17 South, Range 35 East, Lea County, New Mexico.

Five (5) test wells were drilled to obtain water samples and geological information about the area. In addition six (6) producing water wells had water samples collected from them for chemical analysis. This work was done between August 24, 1980 and September 8, 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 feature 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 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 includes minor

Table 1. Stratigraphic Units in and around Sections 33 and 34, Township 17 South, Range 35 East

	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 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

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.

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 range 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 two (2) principal geologic units, the Dockum group and 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 deposits is generally of a better chemical quality than that from Triassic age deposits. The younger rocks are more permeable, therefore producing wells with better yields.

The amount of water pumped (well yield) in gallons per minute (gpm) varies widely throughout northern Lea County. Data from Southwestern Public Service Co. water wells Nos. 25, 26, 27, and 28 indicate they all had a well yield of 750 gpm. See appendix E for more complete data on these wells.

In this area the ground water flows from a northwesterly direction to the southeast. The lateral water movement is estimated to be 150 feet per year (Ash, 1963).

HISTORY OF GROUND WATER PROBLEM

In 1975, Southwestern Public Service Company (S.W.P.Co.) first became aware of a water problem with their well No. 26, located 185 FEL, 1950 FSL, Section 35, Township 17 South, Range 35 East, which had a chloride content of 300 ppm (Runyan, 1979).

The Oil Conservation Division (O.C.D.) was first contacted about this problem in 1977. As a result all nine (9) salt water disposal wells in the Vacuum Field area were tested for leaks and found to be in good shape (Runyan, 1979).

In May of 1979, the O.C.D. conducted a series of water analyses for chloride values. Well No. 26 was pumped to see what the maximum chloride value would be (Runyan, 1979). This well was reported to have reached a maximum chloride content of 300 ppm. Since this time wells Nos. 25, 27, and 28 have developed some degree of contamination, based on the Ogallala formation having a natural salt content of 35 ppm chlorides (Runyan, 1979).

S.W.P.S.Co. reported that well No. 26 was contaminated in 1975, wells Nos. 27 and 28 became contaminated in 1976 and well No. 25 in 1978 (Runyan, 1979). Recent 48 hour pumping tests and 48 hour shut-in tests indicate that all four water wells have changed from their original chloride concentrations (Runyan, 1979). Wells Nos. 25 and 26 show a drop in chloride concentrations, while wells Nos. 27 and 28 have shown a slight increase in chloride concentration (Runyan, 1979).

GROUND WATER QUALITY

Eleven (11) water samples were collected for this project. Six (6) were from existing water wells and five (5) (see figure 2) were from recently drilled Oil Conservation Division water quality test holes.

All of the ground water analyses were run for the quantitative contents of calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), bicarbonate (HCO_3), carbonate (CO_3), chloride (Cl), sulfate (SO_4), and Total Dissolved Solids (T.D.S.). This work was done by Albuquerque Analytical, Inc. of Albuquerque, New Mexico.

The chloride values varied from 32.8 ppm to a high of 128.6 ppm. The average chloride content was 63.9 ppm and the mean was 61.6 ppm. See appendix B for information about other chemical substances present in ground water.

The total dissolved solids (T.D.S.) present in this area's water ran from 312 ppm to 508 ppm. The average T.D.S. was 386.9 ppm and the mean was 352.0 ppm.

All of the water in this area meets the standards set by the Water Quality Control Commission Regulations. Even so, the chloride content

PROPERTIES

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

0 100 500 1,000 5,000 10,000

Scale of diameters

0 100 500 1,000 5,000 10,000

Scale of radii

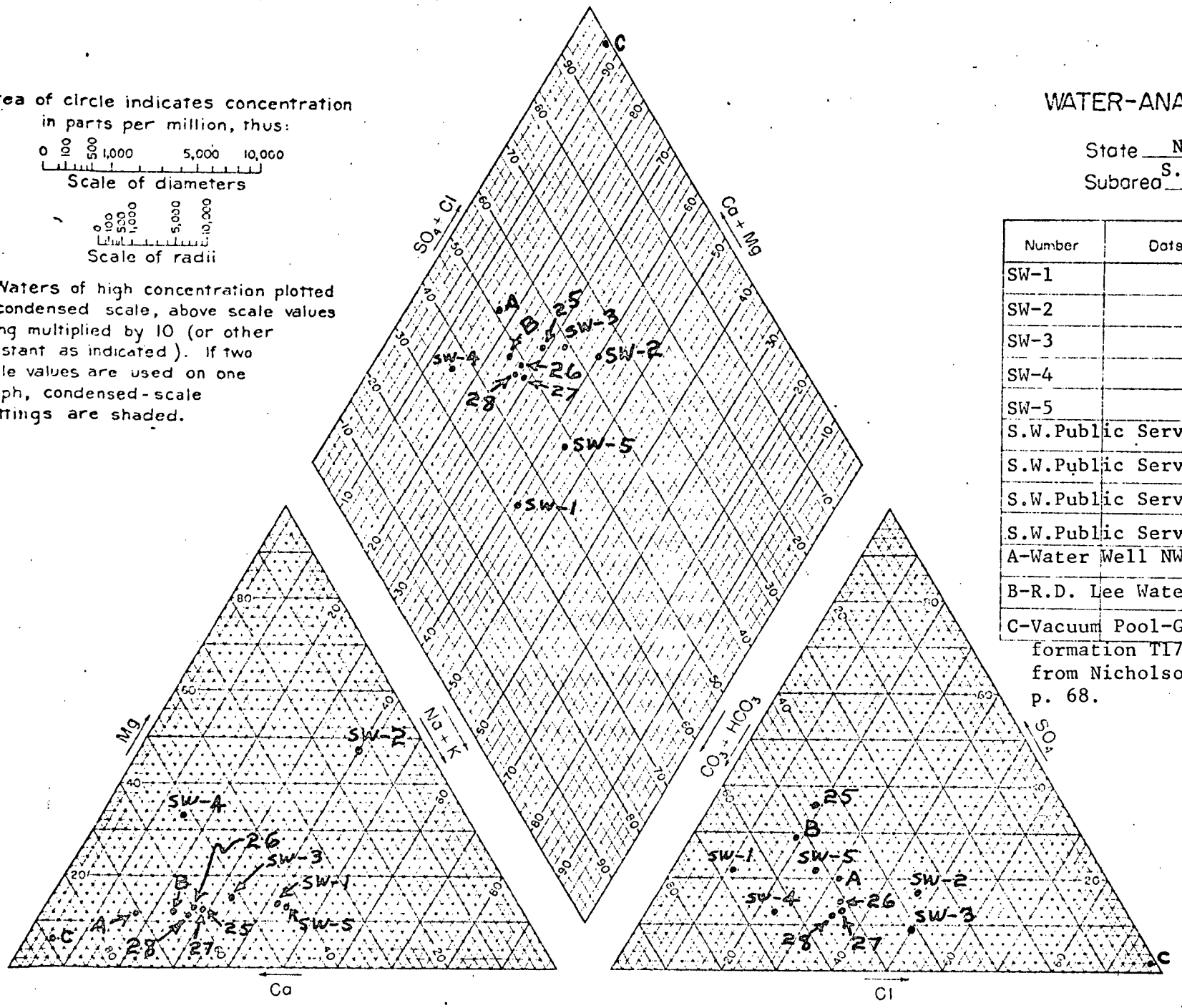
Waters of high concentration plotted at condensed scale, above scale values being multiplied by 10 (or other constant as indicated). If two scale values are used on one graph, condensed-scale plottings are shaded.

WATER-ANALYSIS DIAGRAM

State New Mexico

Subarea S.W. Public Service Co Area

Number	Date	Parts per million	Depth of perforations
SW-1			
SW-2			
SW-3			
SW-4			
SW-5			
S.W.Public Service Well #25			
S.W.Public Service Well #26			
S.W.Public Service Well #27			
S.W.Public Service Well #28			
A-Water Well NW/4 S33, T17S, R35E			
B-R.D. Lee Water Well NE/4 S2, T18S R35E			
C-Vacuum Pool-Grayburg-San Andres formation T17, 18S, R33, 34, 35E from Nicholson and Clebsch, 1961, p. 68.			



CATIONS Percentage reacting values ANIONS

Plotted by T.A. Parkhil

Checked by

Date

Figure 3

presents a problem for S.W.P.S.Co. when they have to use it as cooling tower water.

Trilinear diagrams were used to plot the results of the water analyses. The hydrochemical facies can be classified as generally a calcium type cation water and bicarbonate type anion water. It is important to note that almost all the water sample chemical analyses cluster in one area (see figure 3). The interpretation of this data is that the waters are closely related.

The only exception to this is a water sample from the Vacuum Oil Field (Nicholson and Clebsch, 1961, p.98). The geologic formation from which the brine water was produced was the Permian age Grayburg-San Andres formation located in Townships 17 and 18 South, Ranges 33, 34, and 35 East. This formation is probably the leading producer of oil in this oil field. The plot of the water on a trilinear diagram (see figure 3) indicates it is totally unrelated to any of the water samples collected for this project.

Water from holes SW-1 and SW-5 have slightly different hydrochemistry. Both holes are classified as no dominant type cation and bicarbonate anion type water. The difference in water chemistry may be attributed to an ion exchange phenomenon taking place in parts of the Ogallala formation. Another indication of this is the changes in lithologies from west to east. (See appendix C lithology logs)

WATER LEVEL MEASUREMENTS

The State Engineers Office measured the water levels when the water quality test hole locations were surveyed in. The water levels recorded in the test holes from ground level were: SW-1 57.98 feet, SW-2 54.50 feet, SW-3 49.53 feet, SW-4 48.00 feet and SW-5 57.21 feet.

Water level data from this study and S.W.P.S.Co. water supply wells numbers 26 through 28 were combined to produce Map 2.

The map shows that the ground water gradient is much steeper on the southeastern side of the study area (see Map 2). The ground gradient tends to be much flatter on the northern half of the study area. Map 2 indicates that ground water flow moves from a region of lower (western side) to higher (eastern side) permeability. Ground water contamination would remain a problem for a longer period of time on the northern two-thirds of the study area than it would be on the southern one-third. In other words ground water flows at a lower velocity in the northern two-thirds than in the southern one-third.

LITHOLOGY OF WATER QUALITY TEST HOLES

The holes were drilled through the Tertiary age Ogallala formation. The top twenty (20) to one hundred (100) feet of the hole consisted of a hard light pink upper caliche and a soft white lower caliche. In most

holes a light orange sand splits the two (2) caliche beds and it varies from ten (10) to fifty-five (55) feet in thickness. Directly below the caliche cap is a 95 to 200 feet section of very fine to fine quartz sand with moderate clay matrix which can be subdivided into two (2) to four (4) distinct beds. The color of the beds are light orange, reddish-brown or various shades of brown. The gravels of the lower Ogallala formation were present from 190 to 225 feet. Its thickness varied from four (4) to eleven (11) feet and was composed of a black, white, red and orange color material with a size range from ¼ to 1¾ inch.

The Triassic red beds were penetrated in this area to a depth which varied from 200 to 225 feet. It is composed of a brick red clay. Hole SW-4 did contain a five (5) feet bed of brick red sandy clay which was found directly under the Ogallala formation's gravel. Only the top ten (10) to thirty-five (35) feet of this unit were penetrated during the project.

The total depth of the water quality test holes ranged from 220 to 240 feet. See lithology logs in appendix for more detailed information about the lithology of the observation holes.

SOUTHWESTERN PUBLIC SERVICE COMPANY DATA

On December 18, 1980, Southwestern Public Service Company (S.W.P.S.Co.) forwarded data about their ground water problem. This included information about pumping tests, ground water quality and water rights map. For further information see appendix E.

S.W.P.S.Co. expressed four (4) concerns about water quality of wells numbers 25, 26, 27, and 28. They are:

A. The effect it has on water treatment chemistry and increases in chemical usage because of increased hardness and total dissolved solids.

B. Water quality changes affect control point chemistry in the cooling towers and the quality of cooling tower blowdown water. This water is disposed of by means of irrigation which may have to be discontinued if the salinity increases.

C. Further degradation would limit the use of these wells even further than it does at this time.

D. The areal extent of the affected water is unknown.

The water analyses received from S.W.P.S.Co. included data for a nine (9) year period from February, 1971 to June, 1980. The data was for wells numbers 1 through 28. The author took the raw data presented by averaging the sulfates and chlorides. There were only two (2) ions tested for in the water analyses. The next step in this process was to determine what the ratio of chloride (Cl) ions was to sulfate (SO_4) ions.

Table 2 Chemical Analysis of Southwestern Public Service Company's Twenty-Eight Water Wells (ppm's)

Water Well Numbers	Chemical Ion	2-71	7-75	4-78	8-79	3-80	6-80	Average	Cl/SO_4 Ratio
Date of Analyses									
1	SO_4	46.5	No sample	39.5	42.1	47.0	53.5	45.7	0.68
	Cl	27	taken	33	32	28	35	31.0	
2	SO_4	47	28.4	32	38	44	41.7	38.52	0.78
	Cl	28	27	28	28	28	27	27.67	
3	SO_4	41.8	33.3	35.5	42.4	45.1	37.5	39.25	0.69
	Cl	27	26	27	29	29	26	27.33	
4	SO_4	47.8	33.3	No Anal.	46.4	41.2	40.8	41.9	0.69
	Cl	27	28	33	29	29	27	28.83	
5	SO_4	56.5	35.2	35	50.4	55.5	49.5	47.02	0.67
	Cl	27	29	38	32	35	29	31.67	
6	SO_4	60	38.8	35	61.2	No Anal.	52.0	49.4	0.64
	Cl	33	32	33	33	No Anal.	28.0	31.8	
7	SO_4	55.5	41.6	38.7	60.2	34.7	50.8	46.92	0.72
	Cl	33	37	35	34	36	29	34.0	
8	SO_4	46.5	38.8	29.5	49	23.9	47.1	39.13	0.76
	Cl	29	32	29	32	28	28	29.67	
9	SO_4	48	32.4	No Anal.	41.8	52.3	43.2	43.54	0.68
	Cl	28	30	35	29	27	29	29.67	

Table 2 Chemical Analysis of Southwestern Public Service Company's Twenty-Eight Water Wells (ppm's)

Water Well Numbers	Chemical Ion	2-71	7-75	4-78	8-79	3-80	6-80	Average	Cl/SO_4 Ratio
10	SO_4	40.6	36.4	No Anal.	35.4	31.9	45.0	37.86	0.83
	Cl	30	39	38	27	27	27	31.33	
11	SO_4	49	32.4	32.2	41	32.2	42.9	38.28	0.76
	Cl	30	27	29.0	34	28	26	29.0	
12	SO_4	45.2	34.0	32.2	41.2	49.2	32.2	39.00	0.78
	Cl	31	38.0	29.5	27	30	26	30.25	
13	SO_4	41	36.0	28	37.0	36.2	32.5	35.12	0.78
	Cl	27	32	26.5	27	27	25	27.42	
14	SO_4	44	38.2	30	38	26.1	43.0	38.22	0.75
	Cl	29	29.0	27	26	34	26	28.5	
15	SO_4	40.2	25.8	31	35.1	38.7	39.5	35.05	0.81
	Cl	28	32	30	26	29	26	28.5	
16	SO_4	45.3	38.6	33.8	52.0	42.8	45.0	42.92	0.70
	Cl	30	31	30	32	28	28	29.83	
17	SO_4	47.4	34.6	No Anal.	46.0	40.1	44.5	42.52	0.73
	Cl	31	32	34	30	29	29	30.83	
18	SO_4	43	30.4	No Anal.	41.7	37.3	41.8	38.84	0.88
	Cl	32	33	38	41	31	29	34.0	

Table 2 Chemical Analysis of Southwestern Public Service Company's Twenty-Eight Water Wells (ppm's)

Water Well Numbers	Chemical Ion	Date of Analyses 2-71	7-75	4-78	8-79	3-80	6-80	Average	Cl/SO_4 Ratio
19	SO_4	47.4	36.6	No Anal.	46.0	44.8	No	43.7	0.71
	Cl	30	27	40	29	29	Sample	31.0	
20	SO_4	44	36.6	39.8	41.0	43.4	49.8	42.43	0.74
	Cl	31	30	39	29	30	28	31.17	
21	SO_4	47.4	41.8	37.7	47.8	No	No	43.68	0.76
	Cl	31	35	35	31	Sample	Sample	33.0	
22	SO_4	50.5	29.0	39.2	48.6	No	47.1	41.83	0.77
	Cl	30	38	30	30	Sample	28	32.0	
23	SO_4	44	32.6	36.0	38.4	41.0	38.0	38.33	0.74
	Cl	28(?)	30	30	27	28	27	28.33	
24	SO_4	34.2	29.0	35.5	34.1	34.8	34.0	33.6	0.81
	Cl	23	37.6	27	24	26	25	27.1	
25	SO_4	No	40.8	40.5	44.5	54.4	45.2	45.08	0.85
	Cl	Sample	27	39	72	27	27	38.4	
26	SO_4	No	38	34.0	42.8	42.2	38.6	39.12	1.11
	Cl	Sample	32	52	71	36	26	43.4	
27	SO_4	No	35.6	34.6	44.1	38.0	37.8	38.02	1.43
	Cl	Sample	41	70	70	54	37	54.4	

Table 2 Chemical Analysis of Southwestern Public Service Company's Twenty-Eight Water Wells (ppm's)

Water Well Numbers	Chemical Ion	2-71	7-75	4-78	8-79	3-80	6-80	Average	Cl/SO_4 Ratio
28	SO_4	No	40.8	No Anal.	41.2	43.1	42.8	41.98	1.25
	Cl	Sample	36	58	48	64	57	52.6	

Note: On 7-75 a 48 hour pumping test was conducted on the following wells and samples were analyzed for chloride values: Well No. 25 - 32 ppm, Well No. 26 - 135 ppm, Well No. 27 - 85 ppm, and Well No. 28 - 58 ppm.

SO_4 - sulfate Cl - chloride ppm - parts per million

The ratio of chloride to sulfate ion was found useful in determining the solution of salt [sodium chloride (NaCl)] introduced by way of contamination. Ratios from wells with no ground water contamination problem varied from 0.64 to 0.88. Wells numbers 1 through 25 would have to be considered uncontaminated (see table 2). Ratios of wells with ground water contamination problems were found to have ratios greater than 1.00. Wells numbers 26 through 28 would have to be considered contaminated (see table 2).

S.W.P.S.Co. chloride to sulfate ratios were compared with O.C.D. work done in 1980. The O.C.D. water analyses for holes SW-1 through SW-4, S.W.P.S.Co. water wells numbers 26 through 28 and water well located in the NW/4 of Section 33, Township 17 South, Range 35 East, all have Cl/SO_4 ratios over 1.00 (see appendix B) which indicates they have a water contamination problem. Well SW-5, S.W.P.S.Co. Well No. 25 and R. D. Lee's water well located in the NE/4 of Section 2, Township 18 South, Range 35 East, had Cl/SO_4 ratios varying from 0.39 to 0.84 which indicates they are not having a water contamination problem. The O.C.D. and S.W.P.S.Co. data correlates well and seems to indicate that the water contamination problem may be getting worse with time. The O.C.D. analyses have a higher Cl/SO_4 ratio than previous S.W.P.S.Co. analyses for wells numbers 26 through 28.

S.W.P.S.Co. conducted two (2) pumping tests on well number 26 during 1976. The first one was run from September 14, 1976 until September 29, 1976. The chloride (Cl) values at the start of the test on September 14, 1976 was 40 ppm, rising to a high of 157 ppm on September 20, 1976 and then falling to 135 ppm on September 29, 1976. The second pumping test was run from October 8 to October 14, 1976. On October 8, 1976 the chloride value was 44 ppm. When the test ended on October 14, 1976, the chloride value had risen to 128 ppm. The pumping tests clearly indicate that the poorer quality water is coming from the lower part of the Ogallala formation. With time, under conditions of constant pumping, the cone of depression will be lowered, drawing in water from the lower part of the formation.

Twenty-five and one-quarter (25¼) sections of water rights in Lea County, New Mexico, are owned by S.W.P.S.Co. (see Figure 1, Appendix E). The water rights are located in the following sections: Sections 33, 34, 35 and 36, Township 17 South, Range 35 East; SW/4 Section 31, Township 17 South, Range 36 East; Sections 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 28, 29 and 30, Township 18 South, Range 36 East. All of this water is used at the Cunningham Plant located in the SE/4 SE/4 of Section 28, Township 18 South, Range 36 East.

OIL PRODUCTION DRILLING PRACTICES

Les Clements (oral communication - 1-19-81 and letter) (see appendix F) compiled a brief history of the drilling practices used to develop petroleum production in the Vacuum Oil Field.

The deep drilling commenced in 1963 and reached a peak in the years between 1965 to 1967. Some of these holes had total depths to as much as 13,000 feet.

The drilling of the Vacuum Oil Field requirements dictated that two (2) pits would be needed to be dug into the Ogallala formation. These pits are known as the mud pit and the reserve pit.

The mud pit is designed to hold a mixture of water and clay which is then used as a drilling fluid called "mud." This pit is generally about thirty (30) to forty (40) feet long, eight (8) to ten (10) feet wide and five (5) to six (6) feet deep. After the hole was drilled, the mud was hauled off and used in the drilling of other oil and gas wells. It should be noted that the mud pits in this area were unlined until 1964. After this time the pits were lined to save on water costs which were high because of the very rapid loss of water to the caliche layer of the Ogallala formation. After the pit had dried, it was overturned and covered with top soil.

The reserve pit was designed to hold extra mud and material recovered from the shale shaker. This pit had a size which ranged from 100 to 150 feet square and had a depth ranging from three (3) to five (5) feet. The deeper wells used a reserve pit which was about 200 feet square. After 1967 all of these pits were lined.

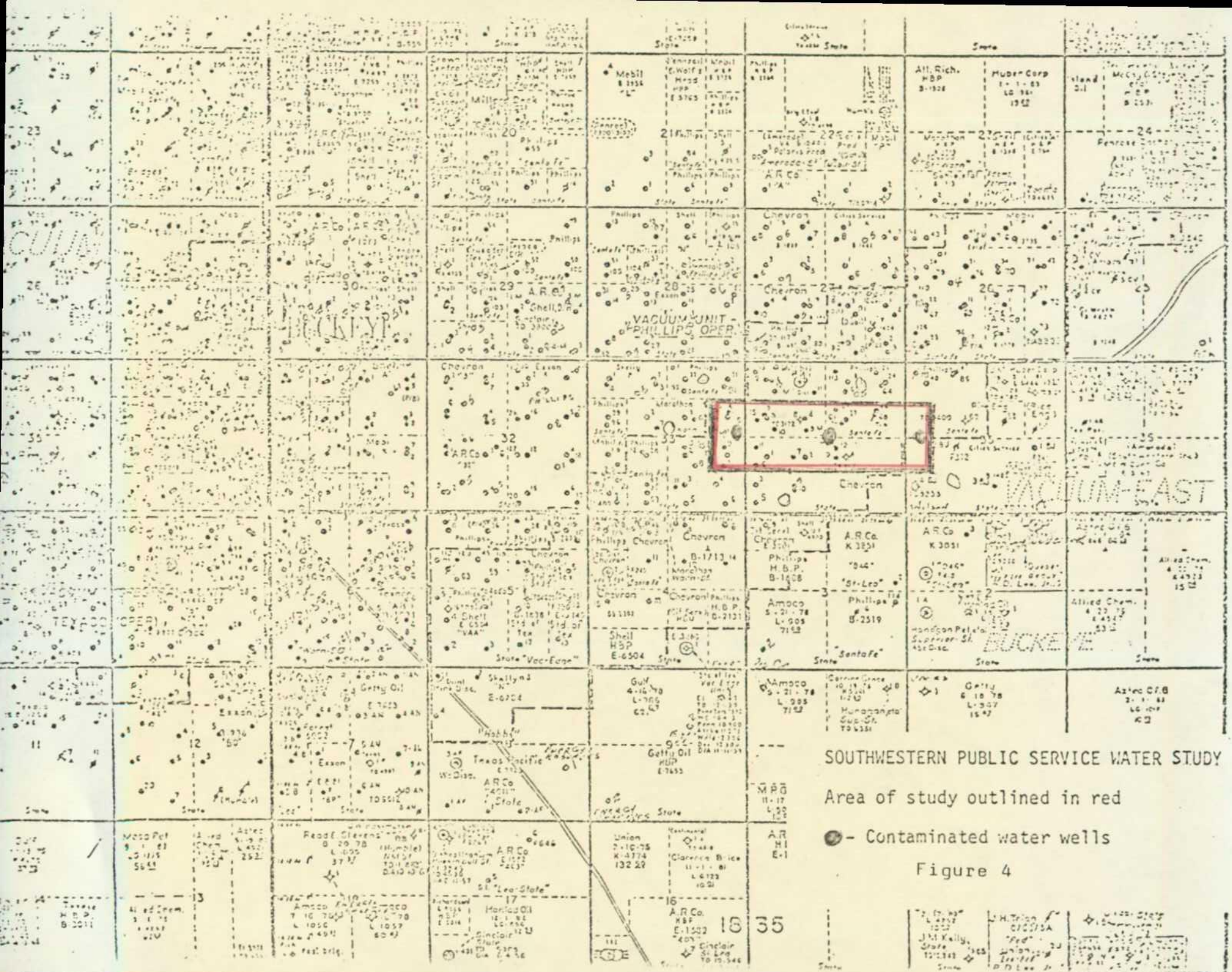
Pit lining for mud pits and reserve pits consists of a very thin plastic polyvinylchloride (PVC) lining. This type of lining was designed to be used for temporary purposes only.

The salt section present in the wells drilled in the Vacuum Oil Field ranges from 800 to 1800 feet thick. Many of the wells in this oil field had the salt section drilled using fresh water. The result of this would be to dissolve a large amount of salt, forming a cavity through the salt section. This practice is much more harmful to the ground water than if brine water mud was used to drill through the salt section because of the smaller amount of salt dissolved and smaller volume of water involved. It should be pointed out that some companies did use brine water muds when drilling through the salt section.

No estimates can be made of the volume of mud and water left in either the mud pit or reserve pit because the O.C.D. lacked the manpower to supervise this part of the drilling process.

PROBABLE SOURCE OF WATER CONTAMINATION PROBLEM

Water problems in this area seem to be related to the mud pits and reserve pits. Two hundred ninety-seven oil and gas wells (see figure 4 and appendix G) have been drilled in and around S.W.P.S.Co. water wells numbers 25, 26, 27 and 28. The average number of oil and gas wells per section is twenty-three (23). It seems probable that leaching of salt


17 S
VACUUM UNIT
PHILLIPS, OPER.
VACUUM-EAST
BUCKEYE
SOUTHWESTERN PUBLIC SERVICE WATER STUDY
Area of study outlined in red
- Contaminated water wells
Figure 4

from the abandoned pits has brought about a wide spread rise of the ground water chloride values of Sections 33 and 34, Township 17 South, Range 35 East. This was confirmed by the data obtained from S.W.P.S.Co. data which proved a high chloride (Cl) to sulfate (SO_4) ratio for water wells numbers 26 through 28 compared to water wells numbers 1 through 25 (see table 2).

Brine water associated with petroleum production was once disposed of by pumping it into unlined evaporation pits which have caused water contamination problems in other areas. This source of contamination has been ruled out in this case. If the contamination was related to a brine water pit, there should be a highly concentrated contamination plumb which covers a very small area. No evidence for this exists because almost all of the area's water clusters on a trilinear diagram (see figure 3) indicating they are related. The only exception to this is Vacuum Oil Field production water from the Grayburg-San Andres formation which is totally unrelated to the ground water of the Ogallala formation. If brine waters were diluted with the Ogallala formation water, then the points on the trilinear would fall on a different location, proving that no chemical relationship exists.

Complete dilution of a high chloride concentration contamination plumb has been considered to account for the rise in chloride values for Sections 33 and 34, Township 17 South, Range 35 East. Again, there is a problem with the large area which has been affected by a higher than normal chloride value. Another serious problem is the amount of precipitation needed to dilute a highly concentrated contamination plumb. To achieve this very high dilution, it would be necessary to have an annual precipitation amount of thirty (30) to forty (40) inches per year. Again the points on the trilinear diagrams would fall on a different location than the Ogallala formation water, proving that no chemical relationship exists.

RECOMMENDATIONS

Safety problems would prevent any close spaced drilling program to assess the water quality of this area. This area is located in the Vacuum Field which has an extremely high density of wells. In addition this field is crisscrossed with a very high number of high pressure gas, petroleum and brine water lines. A vast majority of pipelines is not marked and they are not visible because they are buried underground. The potential for an accident occurring during the drilling operation is extremely high and if it occurred, it could cause a very serious injury or even death to the personnel working on the drill rig.

Any water supply wells drilled by S.W.P.S.Co. should be drilled as exploration holes. The hole size should be five (5) inches in diameter. Lithologic samples should be logged by a geologist. A geophysical log should be run in the uncased hole for Spontaneous Potential, Natural Gamma, and Resistivity to better assess the quality of

the water and its location. These geophysical logs would show zones of high chloride content. If a zone of water rich in chloride exists in the hole, it should be cemented off five (5) feet above and below this zone in order to obtain only low chloride content water. If the water is satisfactory or can be made satisfactory, then the hole could be reamed out to 12 to 15 inches, with casing cemented in hole for final completion. The saturated water thickness (see Map 1) of this area ranges from 145 to 178 feet which should be adequate to complete a water well in the manner described above.

S.W.P.S.Co. should modify their chemical analyses program in order to be better able to detect and assess what the source of any water contamination is. The analyses should be run for the following ions: calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), bicarbonate (HCO_3), carbonate (CO_3), sulfate (SO_4), chloride (Cl) and total dissolved solids (T.D.S.).

The interval of time between sampling and analyses of the nine (9) major ions is very important in maintaining an adequate water surveillance program. Water supply wells numbers 1 through 24 need only have the nine ion analyses done on an annual basis. If a water problem is suspected at any of these wells, the nine ion analyses should be shortened to every month until the problem ceases to exist. The problem water supply wells numbers 25 through 28 should have a nine ion chemical analysis every month until the water problem is resolved. Any new water supply well should have this type of analysis done on a monthly basis for a three (3) month period. If no problem exists, then it should be continued on an annual basis. The water samples should be obtained only after the water supply well has been pumped for 45 minutes.

The Oil Conservation Division should sample the two (2) existing observation wells (SW-1 and SW-4) on a monthly basis for one (1) year. At that time the program should be reviewed to see if it needs to be modified.

The water samples should be run for the same nine (9) chemical ions as described three (3) paragraphs ago.

The water sampling program should be done with a portable submergible water well pump to obtain a representative water sample from the aquifer. The water sample should be taken only after a volume of water equal to ten (10) well volumes is pumped from the well. One well volume is computed as the volume of a cylinder by knowing the total depth of the water well minus the depth to the static water level multiplied by the area of the end of the casing.

The O.C.D. should formulate a set of regulations which will protect the ground water rights within a buffer zone of four (4) sections of an electric generating plant and/or established ground water basins. The regulations have to take into account that the O.C.D. lacks the personnel and the time to enforce any rules that are complicated and are time consuming to enforce. The regulations should require that all

pits associated with oil and gas drilling and well repairs be lined with impermeable plastic liner and the pits should have materials removed from them. The material removed should be disposed of in a manner which protects the quality of the ground water. The regulations also need to state that all wells drilled through a salt section must be done with a brine water mud. This would reduce the amount of dissolved salts that could damage the quality of the ground water in a given area.

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Appendix A

OBSERVATION WELL FIELD NOTES

OBSERVATION WELL FIELD NOTES

SW-1

August 24, 1980 0 to 244 feet T.D.

Hole completed with 3 inch plastic PVC pipe.

0.5 x 142.0 = 71.0 ppm Cl.	15 min. jetting of well
0.4 x 142.0 = 56.8 ppm Cl.	30 min. jetting of well

SW-2

August 24, 1980 0 to 100 ft.
August 25, 1980 100 to 244 ft. T.D.

Hole completed with 3 inch plastic PVC pipe.

1.6 x 142.0 = 227.2 ppm Cl.	15 min. jetting of well
1.2 x 142.0 = 170.4 ppm Cl.	30 min. jetting of well
1.1 x 142.0 = 156.2 ppm Cl.	45 min. jetting of well

SW-3

August 25, 1980 0 to 244 ft. T.D.

Hole completed with 3 inch plastic PVC pipe.

1.1 x 142.0 = 156.2 ppm Cl.	15 min. jetting of well
1.1 x 142.0 = 156.2 ppm Cl.	30 min. jetting of well

SW-4

September 4, 1980 0 to 40 ft. Drill rig broke down-cooling system problem.
September 5, 1980 40 to 60 ft. No helper on drill rig.
September 8, 1980 60 to 220 ft. T.D.

Hole completed with 3 inch plastic PVC pipe.

0.3 x 142.0 = 42.6 ppm Cl.	15 min. jetting of well
0.7 x 142.0 = 99.4 ppm Cl.	30 min. jetting of well
0.5 x 142.0 = 71.0 ppm Cl.	45 min. jetting of well

SW-5

September 8, 1980 0 to 244 ft. T.D.

Hole completed with 3 inch plastic PVC pipe.

0.8 x 142.0 =	113.6 ppm Cl.	15 min.	jetting of well
0.6 x 142.0 =	85.2 ppm Cl.	30 min.	jetting of well
0.6 x 142.0 =	85.2 ppm Cl.	45 min.	jetting of well

Note: 0 to 60 ft. drilled with air. As a result a truckload of water required to complete drilling of hole.

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 SW-1 Chemist J.M. Grover, M.S.

	mg/l	meq/l
Aluminum		
Ammonium		
Arsenic		
Barium		
Cadmium		
Calcium	45.5	
Chromium ($CrO_3^=$)		
Cobalt		
Copper		
Gold		
Iron		
Lead		
Lithium		
Magnesium	9.2	
Manganese		
Mercury T		
Nickel		
Potassium	3.59	
Silver		
Sodium	47.9	
Uranium (U_3O_8)		
Zinc		

	mg/l	meq/l
Beryllium ($BeO_3^=$)		
Bicarbonate	172.0	
Boron (BO_2^-)		
Bromide		
Carbonate	1.0	
Chloride	32.8	
Cyanide		
Fluoride		
Hydroxide		
Iodide		
Molybdenum ($MoO_4^=$)		
Nitrate		
Nitrite		
Phosphate (Tot.)		
Phosphate (Meta)		
Phosphate (Ortho)		
Selenium ($SeO_4^=$)		
Sulfate	22.5	
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.)	384.0 ppm
Solids (Tot. Susp.)	ppm
Solids ( )	ppm
Surfactant	ppm
Turbidity	JTU
Volatile Acids	ppm

$\frac{Cl}{SO_4}$ ratio = 1.98

Albuquerque Analytical, Inc.

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

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

No. 12686

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WATER ANALYSIS

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

Appearance and Data SW-2 Chemist J.M. Grover, M.S.

	mg/l	meq/l
Aluminum		
Ammonium		
Arsenic		
Barium		
Cadmium		
Calcium	74.3	
Chromium ($CrO_3^=$)		
Cobalt		
Copper		
Gold		
Iron		
Lead		
Lithium		
Magnesium	12.4	
Manganese		
Mercury T		
Nickel		
Potassium	3.7	
Silver		
Sodium	73.2	
Uranium (U_3O_8)		
Zinc		

	mg/l	meq/l
Beryllium ($BeO_3^=$)		
Bicarbonate	172.0	
Boron (BO_2^-)		
Bromide		
Carbonate	<0.1	
Chloride	128.6	
Cyanide		
Fluoride		
Hydroxide		
Iodide		
Molybdenum ($MoO_4^=$)		
Nitrate		
Nitrite		
Phosphate (Tot.)		
Phosphate (Meta)		
Phosphate (Ortho)		
Selenium ($SeO_4^=$)		
Sulfate	65.0	
Sulfite		
Tellurium ($TeO_3^=$)		
Vanadium		

$\frac{Cl}{SO_4}$ ratio = 1.98

Acidity	pp
Alkalinity	pp
BOD	pp
Chlorine	pp
COD	pp
Color	PC
Conductance	μho/
Dissolved O_2	ppi
Hardness	ppi
H_2S	ppi
Hydrazine	ppi
Odor	T.C
pH	
Phenols	ppi
Silica	ppi
Solids (Tot.)	ppi
Solids (Tot. Diss.)	500.0 ppi
Solids (Tot. Susp.)	ppi
Solids (;)	ppi
Surfactant	ppi
Turbidity	JTU
Volatile Acids	ppi

Albuquerque Analytical, Inc.

[505] 266-9106
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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 SW-3 Chemist J.M. Grover, M.S.

	mg/l	meq/l
Aluminum		
Ammonium		
Arsenic		
Barium		
Cadmium		
Calcium	82.6	
Chromium ($CrO_3^=$)		
Cobalt		
Copper		
Gold		
Iron		
Lead		
Lithium		
Magnesium	14.3	
Manganese		
Mercury T		
Nickel		
Potassium	3.9	
Silver		
Sodium	56.7	
Uranium (U_3O_8)		
Zinc		

	mg/l	meq/l
Beryllium ($BeO_3^=$)		
Bicarbonate	168.0	
Boron (BO_2^-)		
Bromide		
Carbonate	<0.1	
Chloride	119.0	
Cyanide		
Fluoride		
Hydroxide		
Iodide		
Molybdenum ($MoO_4^=$)		
Nitrate		
Nitrite		
Phosphate (Tot.)		
Phosphate (Meta)		
Phosphate (Ortho)		
Selenium ($SeO_4^=$)		
Sulfate	30.0	
Sulfite		
Tellurium ($TeO_3^=$)		
Vanadium		

$\frac{Cl}{SO_4}$ ratio = 3.96

Acidity		ppm
Alkalinity		ppm
BOD		ppm
Chlorine		ppm
COD		ppm
Color		PCU
Conductance		μmho/c
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.)	508.0	ppm
Solids (Tot. Susp.)		ppm
Solids ( )		ppm
Surfactant		ppm
Turbidity		JTU
Volatile Acids		ppm

Albuquerque Analytical, Inc.

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

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

No. 12686

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WATER ANALYSIS

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

Appearance and Data SW-4 Chemist J.M. Grover, M.S.

	mg/l	meq/l		mg/l	meq/l		
Aluminum			Beryllium (BeO_3^-)			Acidity	ppm
Ammonium			Bicarbonate	176.0		Alkalinity	ppm
Arsenic			Boron (BO_2^-)			BOD	ppm
Barium			Bromide			Chlorine	ppm
Cadmium			Carbonate	<0.1		COD	ppm
Calcium	57.8		Chloride	37.6		Color	PCU
Chromium (CrO_3^-)			Cyanide			Conductance	μmho/c
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.C
Lithium			Nitrite			pH	
Magnesium	9.7		Phosphate (Tot.)			Phenols	ppm
Manganese			Phosphate (Meta)			Silica	ppm
Mercury T			Phosphate (Ortho)			Solids (Tot.)	ppm
Nickel			Selenium (SeO_4^-)			Solids (Tot. Diss.)	312.0 ppm
Potassium	3.2		Sulfate	27.5		Solids (Tot. Susp.)	ppm
Silver			Sulfite			Solids ( )	ppm
Sodium	39.6		Tellurium (TeO_3^-)			Surfactant	ppm
Uranium (U_3O_8)			Vanadium			Turbidity	JTU
Zinc						Volatile Acids	ppm

$\frac{Cl}{SO_4}$ ratio = 1.37

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

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WATER ANALYSIS

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

Appearance and Data SW-5 Chemist J.M. Grover, M.S.

	mg/l	meq/l
Aluminum		
Ammonium		
Arsenic		
Barium		
Cadmium		
Calcium	50.5	
Chromium (CrO_3^-)		
Cobalt		
Copper		
Gold		
Iron		
Lead		
Lithium		
Magnesium	9.5	
Manganese		
Mercury		
Nickel		
Potassium	3.1	
Silver		
Sodium	57.2	
Uranium (U_3O_8)		
Zinc		

	mg/l	meq/l
Beryllium (BeO_3^-)		
Bicarbonate	176.0	
Boron (BO_2^-)		
Bromide		
Carbonate	<0.1	
Chloride	50.2	
Cyanide		
Fluoride		
Hydroxide		
Iodide		
Molybdenum (MoO_4^-)		
Nitrate		
Nitrite		
Phosphate (Tot.)		
Phosphate (Meta)		
Phosphate (Ortho)		
Selenium (SeO_4^-)		
Sulfate	60.0	
Sulfite		
Tellurium (TeO_3^-)		
Vanadium		

$\frac{Cl}{SO_4}$ ratio = 0.84

Acidity	ppm
Alkalinity	ppm
BOD	ppm
Chlorine	ppm
COD	ppm
Color	PC
Conductance	μmho/
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.)	312.0 ppm
Solids (Tot. Susp.)	ppm
Solids ( )	ppm
Surfactant	ppm
Turbidity	JTU
Volatile Acids	ppm

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Albuquerque Analytical, Inc.

4115 Silver S.E.
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WATER ANALYSIS

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

Appearance and Data SW Public Service Well #25 Chemist J.M. Grover, M.S.

	mg/l	meq/l		mg/l	meq/l		
Aluminum			Beryllium ($BeO_3^=$)			Acidity	pp
Ammonium			Bicarbonate	154.0		Alkalinity	pp
Arsenic			Boron (BO_2^-)			BOD	pp
Barium			Bromide			Chlorine	pp
Cadmium			Carbonate	<0.1		COD	pp
Calcium	63.7		Chloride	37.4		Color	PC
Chromium ($CrO_3^=$)			Cyanide			Conductance	μho
Cobalt			Fluoride			Dissolved O_2	pp
Copper			Hydroxide			Hardness	pp
Gold			Iodide			H_2S	pp
Iron			Molybdenum ($MoO_4^=$)			Hydrazine	pp
Lead			Nitrate			Odor	T.
Lithium			Nitrite			pH	
Magnesium	8.6		Phosphate (Tot.)			Phenols	pp
Manganese			Phosphate (Meta)			Silica	pp
Mercury T			Phosphate (Ortho)			Solids (Tot.)	pp
Nickel			Selenium ($SeO_4^=$)			Solids (Tot. Diss.)	320.0 pp
Potassium	2.7		Sulfate	95.5		Solids (Tot. Susp.)	pp
Silver			Sulfite			Solids ( )	pp
Sodium	32.8		Tellurium ($TeO_3^=$)			Surfactant	pp
Uranium (U_3O_8)			Vanadium			Turbidity	JT
Zinc						Volatile Acids	pp

$\frac{Cl}{SO_4}$ ratio = 0.39

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 SW Pbulic Service Well #26 Chemist J.M. Grover, M.S.

	mg/l	meq/l
Aluminum		
Ammonium		
Arsenic		
Barium		
Cadmium		
Calcium	71.7	
Chromium ($CrO_3^=$)		
Cobalt		
Copper		
Gold		
Iron		
Lead		
Lithium		
Magnesium	9.1	
Manganese		
Mercury T		
Nickel		
Potassium	2.6	
Silver		
Sodium	35.2	
Uranium (U_3O_8)		
Zinc		

	mg/l	meq/l
Beryllium ($BeO_3^=$)		
Bicarbonate	158.0	
Boron (BO_2^-)		
Bromide		
Carbonate	<0.1	
Chloride	62.4	
Cyanide		
Fluoride		
Hydroxide		
Iodide		
Molybdenum ($MoO_4^=$)		
Nitrate		
Nitrite		
Phosphate (Tot.)		
Phosphate (Meta)		
Phosphate (Ortho)		
Selenium ($SeO_4^=$)		
Sulfate	37.5	
Sulfite		
Tellurium ($TeO_3^=$)		
Vanadium		

$\frac{Cl}{SO_4}$ ratio = 1.66

Acidity	pp
Alkalinity	pp
BOD	pp
Chlorine	pp
COD	pp
Color	PC
Conductance	μho
Dissolved O_2	pp
Hardness	pp
H_2S	pp
Hydrazine	pp
Odor	T.O
pH	
Phenols	ppm
Silica	ppm
Solids (Tot.)	ppm
Solids (Tot. Diss.)	332.0 ppm
Solids (Tot. Susp.)	ppm
Solids ( )	ppm
Surfactant	ppm
Turbidity	JTU
Volatile Acids	ppm

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

Albuquerque Analytical, Inc.

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 SW Public Service Well #27 Chemist J.M. Grover, M.S.

	mg/l	meq/l
Aluminum		
Ammonium		
Arsenic		
Barium		
Cadmium		
Calcium	68.2	
Chromium (CrO_3^-)		
Cobalt		
Copper		
Gold		
Iron		
Lead		
Lithium		
Magnesium	8.9	
Manganese		
Mercury T		
Nickel		
Potassium	2.8	
Silver		
Sodium	35.6	
Uranium (U_3O_8)		
Zinc		

	mg/l	meq/l
Beryllium (BeO_3^-)		
Bicarbonate	169.0	
Boron (BO_2^-)		
Bromide		
Carbonate	<0.1	
Chloride	64.2	
Cyanide		
Fluoride		
Hydroxide		
Iodide		
Molybdenum (MoO_4^-)		
Nitrate		
Nitrite		
Phosphate (Tot.)		
Phosphate (Meta)		
Phosphate (Ortho)		
Selenium (SeO_4^-)		
Sulfate	40.0	
Sulfite		
Tellurium (TeO_3^-)		
Vanadium		

$\frac{Cl}{SO_4}$ ratio = 1.61

Acidity	ppm
Alkalinity	ppm
BOD	ppm
Chlorine	ppm
COD	ppm
Color	PCU
Conductance	μmho/c
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.)	352.0 ppm
Solids (Tot. Susp.)	ppm
Solids ( )	ppm
Surfactant	ppm
Turbidity	JTU
Volatile Acids	ppm

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

Albuquerque Analytical, Inc.

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 SW Public Service We.. #28 Chemist J.M. Grover, M.S.

	mg/l	meq/l		mg/l	meq/l		
Aluminum			Beryllium (BeO_3^-)			Acidity	ppm
Ammonium			Bicarbonate	163.0		Alkalinity	ppm
Arsenic			Boron (BO_2^-)			BOD	ppm
Barium			Bromide			Chlorine	ppm
Cadmium			Carbonate	<0.1		COD	ppm
Calcium	73.1		Chloride	61.6		Color	PCU
Chromium (CrO_3^-)			Cyanide			Conductance	μmho/c
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	9.1		Phosphate (Tot.)			Phenols	ppm
Manganese			Phosphate (Meta)			Silica	ppm
Mercury T			Phosphate (Ortho)			Solids (Tot.)	ppm
Nickel			Selenium (SeO_4^-)			Solids (Tot. Diss.)	344.0 ppm
Potassium	3.5		Sulfate	32.5		Solids (Tot. Susp.)	ppm
Silver			Sulfite			Solids ( )	ppm
Sodium	35.4		Tellurium (TeO_3^-)			Surfactant	ppm
Uranium (U_3O_8)			Vanadium			Turbidity	JTU
Zinc						Volatile Acids	ppm

$\frac{Cl}{SO_4}$ ratio = 1.90

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 Conservations Address P.O. Box 2088 Santa Fe, NM 87501

Appearance and Data Water Well NW 1/4 Sec 33 T17SR35E Chemist J.M. Grover, M.S.

	mg/l	meq/l
Aluminum		
Ammonium		
Arsenic		
Barium		
Cadmium		
Calcium	88.7	
Chromium ($CrO_3^=$)		
Cobalt		
Copper		
Gold		
Iron		
Lead		
Lithium		
Magnesium	9.1	
Manganese		
Mercury T		
Nickel		
Potassium	2.7	
Silver		
Sodium	22.6	
Uranium (U_3O_8)		
Zinc		

	mg/l	meq/l
Beryllium ($BeO_3^=$)		
Bicarbonate	172.0	
Boron (BO_2^-)		
Bromide		
Carbonate	<0.1	
Chloride	64.6	
Cyanide		
Fluoride		
Hydroxide		
Iodide		
Molybdenum ($MoO_4^=$)		
Nitrate		
Nitrite		
Phosphate (Tot.)		
Phosphate (Meta)		
Phosphate (Ortho)		
Selenium ($SeO_4^=$)		
Sulfate	55.0	
Sulfite		
Tellurium ($TeO_3^=$)		
Vanadium		

$\frac{Cl}{SO_4}$ ratio = 1.17

Acidity	ppm
Alkalinity	ppm
BOD	ppm
Chlorine	ppm
COD	ppm
Color	PCU
Conductance	µmho/c
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.)	440.0 ppm
Solids (Tot. Susp.)	ppm
Solids ( )	ppm
Surfactant	ppm
Turbidity	JTU
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

Sec. 2 -->

Appearance and Data R. D. Lee Water Well NE 1/4 T18SR35E Chemist J.M. Grover, M.S.

	mg/l	meq/l		mg/l	meq/l		
Aluminum			Beryllium (BeO_3^-)			Acidity	ppm
Ammonium			Bicarbonate	215.0		Alkalinity	ppm
Arsenic			Boron (BO_2^-)			BOD	ppm
Barium			Bromide			Chlorine	ppm
Cadmium			Carbonate	<0.1		COD	ppm
Calcium	96.4		Chloride	45.0		Color	PCU
Chromium (CrO_3^-)			Cyanide			Conductance	μmho/c
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	10.7		Phosphate (Tot.)			Phenols	ppm
Manganese			Phosphate (Meta)			Silica	ppm
Mercury T			Phosphate (Ortho)			Solids (Tot.)	ppm
Nickel			Selenium (SeO_4^-)			Solids (Tot. Diss.)	452.0 ppm
Potassium	3.3		Sulfate	95.0		Solids (Tot. Susp.)	ppm
Silver			Sulfite			Solids ( )	ppm
Sodium	38.9		Tellurium (TeO_3^-)			Surfactant	ppm
Uranium (U_3O_8)			Vanadium			Turbidity	JTU
Zinc						Volatile Acids	ppm

$\frac{Cl}{SO_4}$ ratio = 0.47

-35-

From: Nicholson, A., and Clebsch, A., (1961), Geology and Ground-Water condition in Southern Lea County, New Mexico: N. Mex. Bur. of Mines Ground-Water Report 6, p. 98.

TABLE 9. CHEMICAL ANALYSES OF OIL-FIELD WATERS IN SOUTHERN LEA COUNTY, N. MEX. (continued)

PART B. ANALYSES REPORTED IN ROSWELL GEOL. SOC. (1956)*

(Chemical constituents are in parts per million and equivalents per million [underscored].)

Sample No.	Pool name	Location†	Pay zone‡	Calcium (Ca)	Magnesium (Mg)	Sodium plus potassium (Na+K)	Iron (Fe)	Bicarbonate (HCO_3)	Carbon-dioxide (CO_2)	Sulfate (SO_4)	Chloride (Cl)	Hydroxyl (OH)	Hydrogen sulfide (H_2S)	Dissolved solids	Resistivity	
															Ohm-meters	Degrees (°F)
82	Langlie-Mattix	T. 22 thru 26 S., R. 36, 37 E.	Yates, Seven Rivers Queen	214 10.68	233 19.16	922 40.09	–	1,364 22.36	–	29 .603	1,665 46.9	–	–	4,425	–	–
83	Littman	T. 21 S., R. 38 E.	San Andres	5,240 261.47	2,527 207.8	30,900 1,343.53	0	–	0	2,080 43.3	62,000 1,748.4	–	T	93,400	1.07	79
84	Maljamar	T. 17 S., R. 31, 32, 33 E., T. 18 S., R. 32 E.	Grayburg-San Andres	2,480 123.7	1,370 112.7	–	T	710 11.64	–	H	127,300 3,589.9	–	–	–	–	–
85	Maljamar (Devonian)	T. 17 S., R. 32 E.	Devonian	920 45.9	305 25.08	8,450 367.41	–	807 13.23	–	1.63 .034	14,000 394.8	–	–	25,000	–	–
86	Mason, North	T. 26 S., R. 31, 32 E.	Delaware	2,480 123.7	170 13.98	61,000 2,652.28	–	2,890 47.37	–	4,000 83.3	94,800 2,673.4	–	–	165,340	.06	65
87	Pearsall	T. 17, 18 S., R. 32 E.	Queen	6,500 324.4	4,530 372.5	–	–	95 1.56	–	M	123,000 3,468.6	–	–	–	–	–
88	San Simon	T. 21, 22 S., R. 35 E.	Yates	1,990 99.3	1,700 139.81	17,100 756.55	0	443 7.26	0	0	34,000 981.2	0	–	[56,208]	–	–
89	Skaggs	T. 20 S., R. 37, 38 E.	Queen-Grayburg	300 14.97	N	10,000 434.80	100	710 11.64	180	3,200 66.6	12,000 338.4	N	3	37,000	–	–
90	Skaggs (Drinkard)	T. 20 S., R. 37 E.	Drinkard	5,330 265.97	1,830 150.49	43,700 1,900.68	115	428 7.01	–	2,250 46.84	82,500 2,320.9	–	–	141,300	.052	76
91	Vacuum	T. 17, 18 S., R. 33, 34, 35 E.	Grayburg-San Andres	3,195 159.43	796 65.46	57,900 2,517.49	112	700 11.47	–	2,470 51.43	94,221 2,657.0	–	–	160,000	–	–
92	Wantz	T. 21 S., R. 37, 38 E.	Abo	3,375 168.4	0	19,500 847.86	10	744 12.19	103	1,689 35.16	44,325 1,249.9	N	175	81,208	0.08-0.106	–
93	Warren	sec. 27 and 28, T. 20 S., R. 38 E.	Drinkard	7,000 349.3	0	47,500 2,065.30	75	496 8.13	0	1,402 29.19	103,898 2,929.9	N	N	[166,800]	.080	60

* Analyses are quoted verbatim except for calculated values, which are enclosed in brackets or underscored; N, none or nil; T, trace; M, medium; H, heavy.

† Location: The water analyses listed in the source reference are headed "Nature of producing zone water." The wells from which the samples were taken are not given.

‡ Pay zone: Terminology is that used in the source reference and not necessarily approved for use in the U.S. Geological Survey.

GROUND WATER

ards against which to
conservative when a
where much of the g
mum concentrations
chemical constituents

Numerous analyse
or more constituents.
conditions, many ap
cussed in the section

Chemical require
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industrial uses for w
boiler feed. Excessive
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specify a concentratio
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in southern Lea Cou
for use as boiler feed

CHEMICAL CHA
IN S

The dissolved che
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with which it is in in

* Mandatory limit.

† Unless water of better
1,000 ppm may be permitted.

Appendix C

LITHOLOGY LOGS

SAMPLE LOG

Hole SW-1 Logged by Thomas A. Parkhill Date Aug. 24, 1980 page 1 of 2

Driller John Scarborough TD 240 ft. Date 8-24-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4¾ in. Log Types Collar Elev. 3938.4 ft

Location 850 FNL 475 FEL Sec. 33 T 17S R 35E

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

Remarks

Depth	Log	Description
		Caliche - light pink, tr. of vf. qtz. grains, a few veinlets of hydroqtz., hard
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd, tr. of clay matrix
50		Caliche - white, abt. vf. qtz. grains, soft
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
100		
		Sand - reddish-brown, vf. to f. qtz. grains, ang. to subrd., abt. clay matrix
150		
200		

Hole No SW-1
page 1 of 2

SAMPLE LOG

Hole SW-1 Logged by Thomas A. Parkhill Date Aug. 24, 1980 page 2 of 2

Driller ~~John Scarborough~~ TD 240 ft. Date 8-24-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4¾ in. Log Types Collar Elev. 3938.4 ft

Location 850 FNL 475 FEL Sec. 33 T 17S R 35E

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

Remarks

Depth	Log	Description
		Sand - dark brown, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
		Gravel - Red, white, black, ⅛ to ½ in. subang. to rd., tr. of clay matrix 225 to 229 ft.
		Clay - brick red, tr. of vf. qtz. grains, a few grains of mica
250		T.D. - 240 ft.

Hole No SW-1
page 2 of 2

SAMPLE LOG

O

Hole SW-2 Logged by Thomas A. Parkhill Date Aug. 24, 1980 page 1 of 2

Driller John Scarborough TD 240 ft. Date 8-25-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 ¾ in. Log Types Collar Elev. 3930.4 ft

Location 370 FNL 1800 FWL Sec. 34 T 17S R 35E

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

Remarks

Depth	Log	Description
		Caliche - light pink, tr. of vf. qtz. grains, a few veinlets of hydroqtz., hard
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
50		
		Caliche - white, abt. vf. qtz. grains, soft
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
100		
		Sand - light brown, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix, a few stringers of light brown clay
150		
200		

Hole No SW-2
page 1 of 2

SAMPLE LOG

Hole ~~SW-2~~ Logged by Thomas A. Parkhill Date Aug. 24, 1980 page 2 of 2

Driller John Scarborough TD 240 ft. Date 8-25-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 ¾ in. Log Types Collar Elev. 3930.4 ft

Location 370 FNL 1800 FWL Sec. 34 T 17S R 35E

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

Remarks

Depth	Log	Description
		Gravel - white, red, black, ¼ to 1 in., subang. to subrd. tr. of clay 219 to 224 ft.
		Clay - brick red, tr. of vf. qtz. grains and mica
250		T.D. - 240 ft.

Hole No SW-2
page 2 of 2

SAMPLE LOG

Hole SW-3 Logged by Thomas A. Parkhill Date Aug. 25, 1980 page 1 of 2

Driller John Scarborough TD 240 ft. Date 8-25-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 ¾ in. Log Types Collar Elev. 3924.2 ft

Location 500 FNL 1150 FEL Sec. 34 T 17S R 35E

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

Remarks

Depth	Log	Description
		Caliche - light pink, mod. vf. qtz. grains, a few veinlets of hydroqtz., hard
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
50		
		Caliche - white, abt. vf. qtz. grains, soft
100		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
150		
		Sand - light brown, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
200		Gravel - white, red, black, ¼ to 1¾ in., subang. to subrd., tr. of clay matrix 195 to 206 ft.

SAMPLE LOG

Hole SW-3 Logged by Thomas A. Parkhill Date Aug. 25, 1980 page 2 of 2

Driller John Scarborough TD 240 ft. Date 8-25-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 ¾ in. Log Types Collar Elev. 3924.2ft.

Location 500 FNL 1150 FEL Sec. 34 T 17S R 35E

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

Remarks

Depth	Log	Description
		Clay - brick red, tr. of vf. qtz. grains
250		T.D. - 240 ft.

Hole No SW-3
page 2 of 2

SAMPLE LOG

O

Hole SW-4 Logged by Thomas A. Parkhill Date Sept. 4, 1980 page 1 of 2

Driller John Scarborough TD 220 ft. Date 9-8-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 ¾ in. Log Types Collar Elev. 3908.1 ft

Location 860 FSL 1550 FWL Sec. 35 T 17S R 35E

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

Remarks

Depth	Log	Description
		Caliche - light pink, tr. of vf. qtz. grains, a few veinlets of hydroqtz., hard
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
		Caliche - light pink, mod. vf. qtz. grains, hard
50		
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
		Sand - light brown, vf. to f. qtz. grains, ang. to subrd., mod. clay matrix
100		
150		
		Gravel - black, white, red, ¼ to ½ in., subang. to subrd., tr. of clay matrix 192 to 198 ft.
200		

SAMPLE LOG

Hole SW-4 Logged by Thomas A. Parkhill Date Sept. 4, 1980 page 2 of 2

Driller John Scarborough TD 220 ft. Date 9-8-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 ¾ in. Log Types Collar Elev. 3908.1 ft

Location 860 FSL 1550 FWL Sec. 35 T 17S R 35E

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

Remarks

Depth	Log	Description
		Sandy clay - brick red, vf. qtz. grains, tr. of silt
		Clay - brick red, tr. of vf. qtz. grains and mica
		T.D. - 220 ft.
250		

Hole No SW-4
page 2 of 2

SAMPLE LOG

Hole SW-5 Logged by Thomas A. Parkhill Date Sept. 8, 1980 page 1 of 2

Driller John Scarborough TD 240 ft. Date 9-8-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 ¾ in. Log Types Collar Elev. 3930.0 ft

Location 1300 FSL 840 FWL Sec. 34 T 17S R 35E

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

Remarks

Depth	Log	Description
		Caliche - light pink, tr. of vf. qtz. grains, a few veinlets of hydroqtz., hard
		Sand - light orange, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
50		
		Sand - light brown, vf. to f. qtz. grains, ang. to subrd., tr. of clay matrix
100		
150		
		Sand - brown, vf. to med. ang. to subrd., stringer of light green shale, tr. of clay
200		

SAMPLE LOG

Hole SW-5 Logged by Thomas A. Parkhill Date Sept. 8, 1980 page 2 of 2

Driller John Scarborough TD 240 ft. Date 9-8-80

Probe None TD Date

Est Mud Wt. Water Hole Size 4 ¾ in. Log Types Collar Elev. 3930.0 ft.

Location 1300 FSL 840 FWL Sec. 34 T 17S R 35E

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

Remarks

Depth	Log	Description
		Sand - brown, vf. to large, ang. to rd., mod. clay
		Gravel - red, black, white, orange, ¼ to ¾ in., subang. to rd., sand matrix, 220 to 230 ft
		Clay - brick red, tr. of vf. qtz. grains
250		T.D. - 240 ft.

Hole No SW-5
page 2 of 2

Appendix D

DRILLER'S LOGS

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

SW 2

WELL LOG

From	To	FORMATION
0	1	top soil
1	15	caliche
15	22	Rock
22	55	clay w/ Rock ledges
55	217	Sand w/ clay ledges
217	219	Gravel
219	225	Brown clay
225	244	Red Bed
		Run 3" PVC Pipe
Set		2" Jet Pipe
Jetted Well + Pull		
2" Jet Pipe		
		$976.00

8-22-80 Driller Scarborough

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

SW 1

WELL LOG

From	To	FORMATION
0	2	top soil
2	40	caliche
40	46	Rock
46	55	clay w/ Rock ledges
55	224	Sand + W/ clay ledges
224	229	Gravel
229	244	Red Bed drill Well
Set 3" PVC Pipe		
Set 2" Jetting Pipe		
Jetted Well + Pull		
2" Jetting Pipe		
		$976.00

8-24-80 Driller Scarborough

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

SW 3

WELL LOG

From	To	FORMATION
0	2	top soil
2	40	caliche
40	55	clay + Rock ledges
55	197	Sand w/ clay ledges
197	226	Gravel
226	230	Red + Brn clay
230	244	Red Bed
Set 3" PVC Pipe		
Set 2" Jet Pipe		
Jetted Well Pull		
Jet Pipe		
		$976.00

8-24-80 Driller Scarborough

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

SW. #4 WELL LOG

From	To	FORMATION
0	2	top Soil
2	20	caliche
20	24	Rock
24	80	Clay & Sand W/ Rock ledges
80	192	Sand
192	198	Gravel
198	207	Clay
207	220	Red Bed
		Drilled 5" Well
Set	3"	PVC Riser
Set	3"	Set Pipe Slotted
Well		Pull 2" Set Pipe
		@ 40 $220.00

Date 10-8-80 Driller Scarborough

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

SW. #5 WELL LOG

From	To	FORMATION
0	1	top Soil
1	20	caliche
20	40	Clay W/ Rock ledges
40	44	Rock
44	220	Sand
220	230	Gravel
230	244	Red Bed
		Drilled 5" Well
Run	3	PVC Pipe Set
2"	Set	Pipe Pitted
Well		Pull Set Pipe
	@	40 $ 976.00

Date 10-8-80 Driller Scarborough

Appendix E

SOUTHWESTERN PUBLIC SERVICE COMPANY
WATER WELL DATA

Southwestern Public Service Company

BOX 1261 • AMARILLO, TEXAS 79170 • 806 378-2121

December 18, 1980

Mr. Tom Parkhill
N.M. Oil Conservation Division
Room 206
310 Old Santa Fe Trail
Santa Fe, NM 87501

Dear Tom:

Attached are copies of two maps showing Southwestern Public Service Company's water rights area and water well locations for Cunningham Station, Lea County, N.M. Also attached are the following: 1) water levels in water wells, August, 1975, 2) historical water well analyses and 3) some historical raw water and cooling tower overflow analyses showing the Cl and SO_4 content over about 2 years. All analyses for Cl and SO_4 are reported as the ion, even though the forms show NaCl and Na_2SO_4. Calcium and magnesium hardness are reported as $CaCO_3$ equivalents, as is total hardness.

Our concern over wells #25, 26, 27 and 28 can be summarized by four main points:

1) When these wells are used, it affects water treatment chemistry and increases chemical usage at the plant due to increased hardness and total dissolved solids in the water from these wells. When these wells are started, the chloride and hardness levels are only slightly different (not significant) from the average for wells #1 through 24. However, as they are pumped the quality gets worse. Two pumping tests for well #26 showed chlorides increasing from about 40 ppm to 124 ppm after pumping. At the same time, total hardness increased from 200 to about 285 ppm and went as high as 308 ppm. The attached summary sheet shows these results. The data used is included in the attachments.

2) Because of the water quality changes, this also affects the control point chemistry in the cooling towers and the quality of the cooling tower blowdown. Since we dispose of the blowdown water via irrigation, an increase in salinity may affect our ability to continue this practice at some future date.

3) We are concerned over the possibility that these wells might degrade further in the future, thus limiting their use even further. At the present, about 7 to 8 wells are

usually pumping (depending on plant load) and we limit ourselves to only one well at a time from numbers 25 through 28 for reasons given above.

4) We do not know the areal extent of affected waters. This might affect the operation and design parameters for a future plant, if it was sited near Cunningham.

Our water analyses, supported by the attached data indicate that the water from wells 25 through 28 is significantly different from that in wells 1 through 24, even without considering the length of time they have been pumping. The only test of quality versus time that I had available was for well #26. This well definitely shows an increase in hardness and chlorides shortly after beginning the pump. I do not know if sulfate will show the same changes - possibly not.

I know that you have done a lot of test hole drilling and pump tests in investigating this problem. We would like to have two copies of your report when it is finished (one for Cunningham Station and one for our system files in Amarillo).

If you have any questions or need additional information, please feel free to call me at 806-378-2197.

Sincerely,

Gale Henslee

Gale Henslee
Environmentalist

ps
enc

cc: J. C. Claughton
K. L. Ladd
Art Carmichael
Ken Lindemann

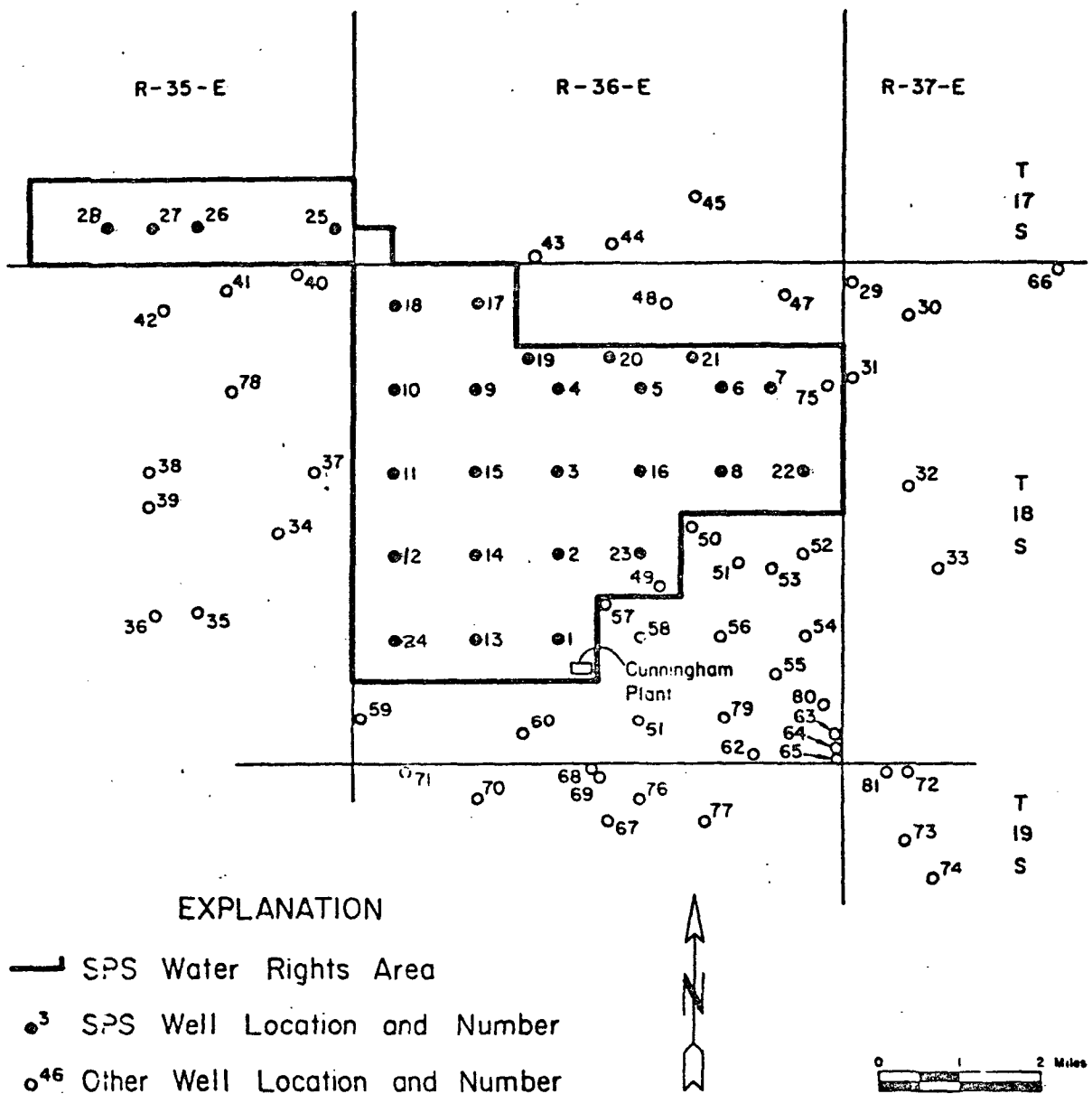
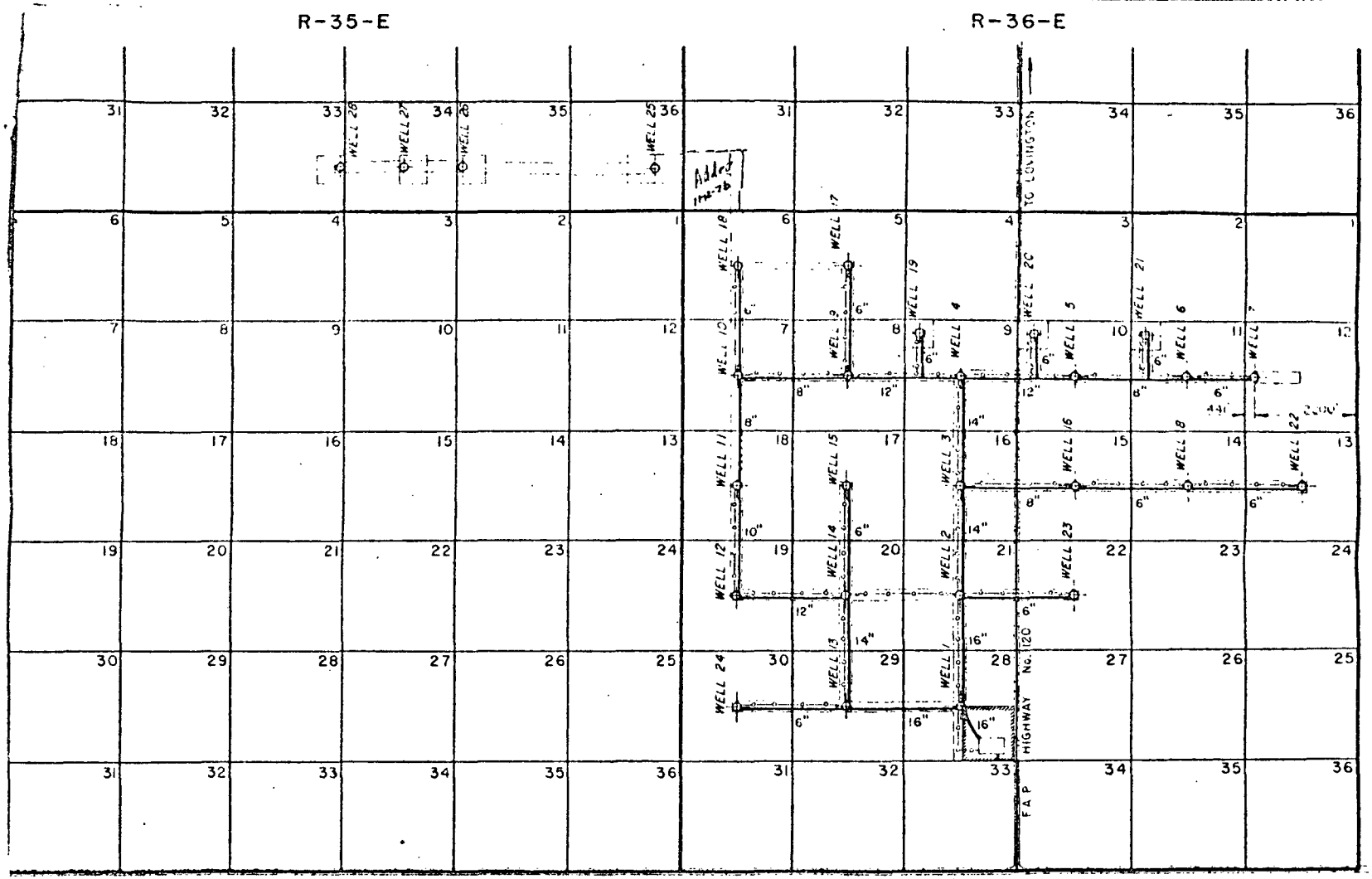


Figure 1 WATER RIGHTS AREA AND WELL LOCATIONS

SOUTHWESTERN PUBLIC SERVICE COMPANY

WATER LEVELS IN WATER WELL, CUNNINGHAM STATION August '75

Well Number	Static Level	Drawdown Level
1	41' 10"	12' 2"
2	51' 3"	3' 5"
3	53' 4"	6' 8"
4	49' 8"	3' 2"
5	51' 6"	7' 6"
6	56'	5' 9"
7	45'	3' 6'
8	44' 1"	5' 2"
9	56'	14'
10	53' 9"	7' 7"
11	55' 5"	9' 8"
12	51' 9"	6' 9"
13	50' 10"	10'11"
14	54' 6"	20' 4"
15	47' 10"	15' 2"
16	52' 7"	2' 2"
17	60' 2"	9' 3"
18	61' 10"	13' 4"
19	50'	3' 4"
20	55'	8' 2"
21	61' 2"	7'10"
22	31' 5"	25' 2"
23	53' 10"	8' 2"
24	52' 4"	9' 6"
25	55' 10"	3' 2"
26	52'	17' 4"
27	55'	12' 6"
28	65'	9' 6"



-50-

TABULATION OF WELLS
PERMIT DATA

WELL NO	PERMIT NO	DATE	WELL NO	PERMIT NO	DATE
1	L-1550	7/7/53	16	L-3118	6/6/56
2	L-1547	7/7/53	17	L-3116	6/6/56
3	L-1542	7/7/53	18	L-3117	6/6/56
4	L-1535	7/7/53	19	L-5200	6/5/64
5	L-1536	7/7/53	20	L-5200-X	6/5/64
6	L-1537	7/7/53	21	L-5200-X-2	6/5/64
7	L-1538	7/7/53	22	L-5200-X-3	6/5/64
8	L-1540	7/7/53	23	L-5200-X-4	6/5/64
9	L-1534	7/7/53	24	L-5200-X-5	6/5/64
10	L-1533	7/7/53	25	L-5834-X-3	1/30/69
11	L-1544	7/7/53	26	L-5834-X-2	1/30/69
12	L-1545	7/7/53	27	L-5834-X	1/30/69
13	L-3121	6/6/56	28	L-5834	1/30/69
14	L-3120	6/6/56			
15	L-3119	6/6/56			

LEGEND

Underground Water Pipe Line (Size as indicated)

Overhead Electrical Distribution Circuit

WELL No. Water Well & Number (All wells are situated at center of the section , unless otherwise indicated.) All wells are located within 100' wide R.O.W. strip.

100' Ft Wide R.O.W Strip

Revised 3/20/68 - Completely Redrawn - Added - R-35-E etc

Southwestern *PUBLIC SERVICE* Company

WATER SYSTEM AS COMPLETED

Cunningham Station

Lea County, N. Mex.

APPROVED

DWG. No. PLI-I-X8A

Summary Sheet

Cl in Wells 1-24

date	avg	# wells
Feb, 1971	29.17	24
7-22-75	31.74	23
4-11-78	32.25	24
8-8-79	29.92	24
3-4-80	29.35	20
6-16-80	27.64	22
Avg	30.05 ppm	137

Cl in Wells 25-28

date	avg	# wells sampled	
7-22-75	34.	4	} begin pumping
7-24-75	77.5	4	} after 48 hours
3-23-76	57.5	4	
4-11-78	54.75	4	
8-8-79	65.25	4	
3-4-80	45.25	4	
6-16-80	36.75	4	
Avg	53.0 ppm	28	

Results of two tests of pumping time vs. Cl in well #26

	#26 Cl	Total Hardness as $CaCO_3$	
9-14-76	40	200	* not incl. in avg.
9-16-76	100	246	
9-17-76	110	272	
9-20-76	157	300	
9-23-76	112	282	
9-29-76	135	268	
10-8-76	44	222	* not incl. in avg.
10-11-76	125	300	
10-13-76	126	308	
10-14-76	128	308	
	Av. 124.1 ppm	Av. 285.5 ppm	

SEP 20 1979

File

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 9-18-78

RECEIVED DEC 22 … OIL CONS… SANTA FE

~~Well No.~~ Raw Water

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2 SO_4	49.2	PPM
c.	NaCl	35	PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ____

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2 SO_4		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

~~Well No.~~ Cooling Tower Overflow

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2 SO_4	710	PPM
c.	NaCl	152	PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ____

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2 SO_4		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ____

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2 SO_4		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ____

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2 SO_4		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Amos

Form 6001

So..nwestern PUBLIC SERVICE Company JUL 13 1979

WATER WELL TEST DATA

PLANT CUNNINGHAM DATE 7-10-79

Well No. RAW WATER

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	$Na_2 SO_4$	45.9	PPM
c.	NaCl	29	PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ________

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	$Na_2 SO_4$		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. COOLING TOWER OVERFLOW

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	$Na_2 SO_4$	764	PPM
c.	NaCl	114	PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ________

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	$Na_2 SO_4$		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ________

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	$Na_2 SO_4$		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ________

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	$Na_2 SO_4$		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

rm 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT [illegible] DATE 8-1-79

[illegible] AUG 3 1979

~~Well~~ No. Raw Water

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. Na_2SO_4 42.2 PPM
   c. NaCl 29 PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM
   g. Total Hardness ______ PPM

Well No. ______

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. Na_2SO_4 ______ PPM
   c. NaCl ______ PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM
   g. Total Hardness ______ PPM

~~Well~~ No. C.T. Overflow

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. Na_2SO_4 612 PPM
   c. NaCl 111 PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM
   g. Total Hardness ______ PPM

Well No. ______

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. Na_2SO_4 ______ PPM
   c. NaCl ______ PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM
   g. Total Hardness ______ PPM

Well No. ______

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. Na_2SO_4 ______ PPM
   c. NaCl ______ PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM
   g. Total Hardness ______ PPM

Well No. ______

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. Na_2SO_4 ______ PPM
   c. NaCl ______ PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM
   g. Total Hardness ______ PPM

[illegible]

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT [redacted] DATE Aug 13-79

[redacted] No. Raw Water

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2SO_4	44	PPM
c. NaCl	34	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

AUG 15 1979

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2SO_4		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

[redacted] No. C.T. Overflow

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2SO_4	660	PPM
c. NaCl	128	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2SO_4		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2SO_4		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Barney

~~File~~ File + plot

AUG 30 1979

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 8-28-79

~~Well~~ No. Raw Water

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2SO_4	45.2	PPM
c.	NaCl	411	PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

increase? not really

Well No. ____

1. Static Level ____ Ft.
2. Pumping Level ____ Ft.
3. Flow ____ GPM
4. Chemical Analysis:
   a. M. Alk. ____ PPM
   b. Na_2SO_4 ____ PPM
   c. NaCl ____ PPM
   d. Ca Hardness ____ PPM
   e. Mg Hardness ____ PPM
   f. SiO_2 ____ PPM
   g. Total Hardness ____ PPM

~~Well~~ No. Cooling Tower Overflow

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2SO_4	630	PPM
c.	NaCl	152	PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ____

1. Static Level ____ Ft.
2. Pumping Level ____ Ft.
3. Flow ____ GPM
4. Chemical Analysis:
   a. M. Alk. ____ PPM
   b. Na_2SO_4 ____ PPM
   c. NaCl ____ PPM
   d. Ca Hardness ____ PPM
   e. Mg Hardness ____ PPM
   f. SiO_2 ____ PPM
   g. Total Hardness ____ PPM

Well No. ____

1. Static Level ____ Ft.
2. Pumping Level ____ Ft.
3. Flow ____ GPM
4. Chemical Analysis:
   a. M. Alk. ____ PPM
   b. Na_2SO_4 ____ PPM
   c. NaCl ____ PPM
   d. Ca Hardness ____ PPM
   e. Mg Hardness ____ PPM
   f. SiO_2 ____ PPM
   g. Total Hardness ____ PPM

Well No. ____

1. Static Level ____ Ft.
2. Pumping Level ____ Ft.
3. Flow ____ GPM
4. Chemical Analysis:
   a. M. Alk. ____ PPM
   b. Na_2SO_4 ____ PPM
   c. NaCl ____ PPM
   d. Ca Hardness ____ PPM
   e. Mg Hardness ____ PPM
   f. SiO_2 ____ PPM
   g. Total Hardness ____ PPM

Amos

Form 6001

South[illegible]stern PUBLIC SERVICE Comp[illegible]y

WATER WELL TEST DATA

SEP 14 1979

PLANT Cunn. Stat. DATE Sept. 11-79

No. Raw Water

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2 SO_4	45.8	PPM
c. NaCl	37	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM

Well No.

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2 SO_4		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM

No. C.T. Overflow

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2 SO_4	750	PPM
c. NaCl	140	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM

Well No.

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2 SO_4		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM

Well No.

Static Level		Ft.
Pumping Level		Ft.
Flow		GPM
Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2 SO_4		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM

Well No.

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. Na_2 SO_4		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM

Barney

Southwestern PUBLIC SERVICE Company

SEP 27 1979

File

WATER WELL TEST DATA

PLANT Cunn. Stat. DATE 9-25-79

~~Well~~ No. RAW WATER

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2\ SO_4$ 49.2 PPM
   c. NaCl 31 PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Well No. ________

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2\ SO_4$ ________ PPM
   c. NaCl ________ PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

~~Well~~ No. C.T. OVERFLOW ~~[illegible]~~

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2\ SO_4$ 512 PPM
   c. NaCl 98 PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Well No. ________

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2\ SO_4$ ________ PPM
   c. NaCl ________ PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Well No. ________

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2\ SO_4$ ________ PPM
   c. NaCl ________ PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Well No. ________

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2\ SO_4$ ________ PPM
   c. NaCl ________ PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Barney

Form 6001

Southwestern PUBLIC SERVICE Company

OCT 22 1979

Abbott File

WATER WELL TEST DATA

PLANT *Cunningham Stat.*   DATE *10-18-79*

~~Well~~ No. *RAW WATER*

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2SO_4	*46.4*	PPM
c.	NaCl	*48*	PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ______

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2SO_4		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

~~Well~~ No. *C.T. OVERFLOW*

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2SO_4	*754*	PPM
c.	NaCl	*143*	PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ______

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2SO_4		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ______

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2SO_4		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Well No. ______

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
a.	M. Alk.		PPM
b.	Na_2SO_4		PPM
c.	NaCl		PPM
d.	Ca Hardness		PPM
e.	Mg Hardness		PPM
f.	SiO_2		PPM
g.	Total Hardness		PPM

Barney

NOV 5 1979

Southwestern PUBLIC SERVICE Compa...

WATER WELL TEST DATA

PLANT Cunn. Stat. DATE Oct. 30-79

~~Well No.~~ Raw Water

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2 SO_4$ 42.6 PPM
   c. NaCl 29 PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Well No. ________

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2 SO_4$ ________ PPM
   c. NaCl ________ PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

~~Well No.~~ C.T. Overflow.

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2 SO_4$ 724 PPM
   c. NaCl 127 PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Well No. ________

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2 SO_4$ ________ PPM
   c. NaCl ________ PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Well No. ________

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2 SO_4$ ________ PPM
   c. NaCl ________ PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Well No. ________

1. Static Level ________ Ft.
2. Pumping Level ________ Ft.
3. Flow ________ GPM
4. Chemical Analysis:
   a. M. Alk. ________ PPM
   b. $Na_2 SO_4$ ________ PPM
   c. NaCl ________ PPM
   d. Ca Hardness ________ PPM
   e. Mg Hardness ________ PPM
   f. SiO_2 ________ PPM
   g. Total Hardness ________ PPM

Barnett

Form 6001

Southw[estern] PUBLIC SERVICE Compa[ny]

WATER WELL TEST DATA

NOV 30 1979

File

PLANT Cunn Station DATE 11-27-79

[Well] No. Raw Water tank

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. $Na_2 SO_4$ 46.6 PPM
   c. NaCl 37 PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM

Well No. ______

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. $Na_2 SO_4$ ______ PPM
   c. NaCl ______ PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM

[Well] No. C.T. Overflow

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. $Na_2 SO_4$ 660 PPM
   c. NaCl 120 PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM

Well No. ______

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. $Na_2 SO_4$ ______ PPM
   c. NaCl ______ PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM

Well No. ______

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. $Na_2 SO_4$ ______ PPM
   c. NaCl ______ PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM

Well No. ______

1. Static Level ______ Ft.
2. Pumping Level ______ Ft.
3. Flow ______ GPM
4. Chemical Analysis:
   a. M. Alk. ______ PPM
   b. $Na_2 SO_4$ ______ PPM
   c. NaCl ______ PPM
   d. Ca Hardness ______ PPM
   e. Mg Hardness ______ PPM
   f. SiO_2 ______ PPM

Barney

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Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham Station DATE 3-6-80

No. Raw Water Storage Well No. _____

tatic Level	_____ Ft.	1. Static Level	_____ Ft.
umping Level	_____ Ft.	2. Pumping Level	_____ Ft.
low	_____ GPM	3. Flow	_____ GPM
hemical Analysis:		4. Chemical Analysis:	
. M. Alk.	_____ PPM	a. M. Alk.	_____ PPM
. Na_2 SO_4	44.9 PPM	b. Na_2 SO_4	_____ PPM
. NaCl	27. PPM	c. NaCl	_____ PPM
. Ca Hardness	_____ PPM	d. Ca Hardness	_____ PPM
. Mg Hardness	_____ PPM	e. Mg Hardness	_____ PPM
. SiO_2	_____ PPM	f. SiO_2	_____ PPM

No. Cooling Tower Overflow Well No. _____

tatic Level	_____ Ft.	1. Static Level	_____ Ft.
umping Level	_____ Ft.	2. Pumping Level	_____ Ft.
low	_____ GPM	3. Flow	_____ GPM
hemical Analysis:		4. Chemical Analysis:	
. M. Alk.	_____ PPM	a. M. Alk.	_____ PPM
. Na_2 SO_4	632.9 PPM	b. Na_2 SO_4	_____ PPM
. NaCl	125. PPM	c. NaCl	_____ PPM
. Ca Hardness	_____ PPM	d. Ca Hardness	_____ PPM
. Mg Hardness	_____ PPM	e. Mg Hardness	_____ PPM
. SiO_2	_____ PPM	f. SiO_2	_____ PPM

No. _____ Well No. _____

tatic Level	_____ Ft.	1. Static Level	_____ Ft.
umping Level	_____ Ft.	2. Pumping Level	_____ Ft.
low	_____ GPM	3. Flow	_____ GPM
hemical Analysis:		4. Chemical Analysis:	
. M. Alk.	_____ PPM	a. M. Alk.	_____ PPM
. Na_2 SO_4	_____ PPM	b. Na_2 SO_4	_____ PPM
. NaCl	_____ PPM	c. NaCl	_____ PPM
. Ca Hardness	_____ PPM	d. Ca Hardness	_____ PPM
. Mg Hardness	_____ PPM	e. Mg Hardness	_____ PPM
. SiO_2	_____ PPM	f. SiO_2	_____ PPM

Barney

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT CUNNINGHAM STATION DATE FEBRUARY 1971

Well No. 1

1.	Static Level	41'6"	Ft.
2.	Pumping Level	53'9"	Ft.
3.	Flow	440	GPM
4.	Chemical Analysis:		
	a. M. Alk.	150	PPM
	b. $Na_2 SO_4$	46.5	PPM
	c. NaCl	27	PPM
	d. Ca Hardness	152	PPM
	e. Mg Hardness	28	PPM
	f. SiO_2	27.4	PPM
	g. Total Hardness	180	PPM

Well No. 2

1.	Static Level	47'3"	Ft.
2.	Pumping Level	58'3"	Ft.
3.	Flow	450	GPM
4.	Chemical Analysis:		
	a. M. Alk.	148	PPM
	b. $Na_2 SO_4$	47	PPM
	c. NaCl	28	PPM
	d. Ca Hardness	158	PPM
	e. Mg Hardness	22	PPM
	f. SiO_2	26	PPM
	g. Total Hardness	180	PPM

Well No. 3

1.	Static Level	47'7"	Ft.
2.	Pumping Level	55'0"	Ft.
3.	Flow	415	GPM
4.	Chemical Analysis:		
	a. M. Alk.	154	PPM
	b. $Na_2 SO_4$	41.8	PPM
	c. NaCl	27	PPM
	d. Ca Hardness	144	PPM
	e. Mg Hardness	28	PPM
	f. SiO_2	26	PPM
	g. Total Hardness	172	PPM

Well No. 4

1.	Static Level	43'6"	Ft.
2.	Pumping Level	56'2"	Ft.
3.	Flow	445	GPM
4.	Chemical Analysis:		
	a. M. Alk.	151	PPM
	b. $Na_2 SO_4$	47.8	PPM
	c. NaCl	27	PPM
	d. Ca Hardness	158	PPM
	e. Mg Hardness	33	PPM
	f. SiO_2	29.4	PPM
	g. Total Hardness	191	PPM

Well No. 5

1.	Static Level	44'0"	Ft.
2.	Pumping Level	55'2"	Ft.
3.	Flow	395	GPM
4.	Chemical Analysis:		
	a. M. Alk.	148	PPM
	b. $Na_2 SO_4$	56.5	PPM
	c. NaCl	27	PPM
	d. Ca Hardness	160	PPM
	e. Mg Hardness	26	PPM
	f. SiO_2	29.4	PPM
	g. Total Hardness	186	PPM

Well No. 6

1.	Static Level	50'6"	Ft.
2.	Pumping Level	59'0"	Ft.
3.	Flow	300	GPM
4.	Chemical Analysis:		
	a. M. Alk.	150	PPM
	b. $Na_2 SO_4$	60	PPM
	c. NaCl	33	PPM
	d. Ca Hardness	184	PPM
	e. Mg Hardness	36	PPM
	f. SiO_2	28.4	PPM
	g. Total Hardness	220	PPM

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WATER WELL TEST DATA

PLANT CUNNINGHAM STATION

DATE FEBRUARY 1971

Well No. 7

1.	Static Level	39'5"	Ft.
2.	Pumping Level	45'3"	Ft.
3.	Flow	233	GPM
4.	Chemical Analysis:		
	a. M. Alk.	158	PPM
	b. $Na_2 SO_4$	55.5	PPM
	c. NaCl	33	PPM
	d. Ca Hardness	171	PPM
	e. Mg Hardness	35	PPM
	f. SiO_2	25	PPM
	g. Total Hardness	206	PPM

Well No. 8

1.	Static Level	42'0"	Ft.
2.	Pumping Level	47'0"	Ft.
3.	Flow	220	GPM
4.	Chemical Analysis:		
	a. M. Alk.	142	PPM
	b. $Na_2 SO_4$	46.5	PPM
	c. NaCl	29	PPM
	d. Ca Hardness	146	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	23	PPM
	g. Total Hardness	180	PPM

Well No. 9

1.	Static Level	50'6"	Ft.
2.	Pumping Level	67'0"	Ft.
3.	Flow	435	GPM
4.	Chemical Analysis:		
	a. M. Alk.	156	PPM
	b. $Na_2 SO_4$	48	PPM
	c. NaCl	28	PPM
	d. Ca Hardness	148	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	22.6	PPM
	g. Total Hardness	182	PPM

Well No. 10

1.	Static Level	54'2"	Ft.
2.	Pumping Level	63'3"	Ft.
3.	Flow	320	GPM
4.	Chemical Analysis:		
	a. M. Alk.	150	PPM
	b. $Na_2 SO_4$	40.6	PPM
	c. NaCl	30	PPM
	d. Ca Hardness	146	PPM
	e. Mg Hardness	24	PPM
	f. SiO_2	26.2	PPM
	g. Total Hardness	170	PPM

Well No. 11

1.	Static Level	50'0"	Ft.
2.	Pumping Level	56'10"	Ft.
3.	Flow	342	GPM
4.	Chemical Analysis:		
	a. M. Alk.	156	PPM
	b. $Na_2 SO_4$	49	PPM
	c. NaCl	30	PPM
	d. Ca Hardness	160	PPM
	e. Mg Hardness	37	PPM
	f. SiO_2	27.2	PPM
	g. Total Hardness	197	PPM

Well No. 12

1.	Static Level	51'6"	Ft.
2.	Pumping Level	56'2"	Ft.
3.	Flow	330	GPM
4.	Chemical Analysis:		
	a. M. Alk.	162	PPM
	b. $Na_2 SO_4$	45.2	PPM
	c. NaCl	31	PPM
	d. Ca Hardness	158	PPM
	e. Mg Hardness	38	PPM
	f. SiO_2	27.2	PPM
	g. Total Hardness	196	PPM

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WATER WELL TEST DATA

PLANT CUNNINGHAM STATION DATE FEBRUARY 1971

Well No. 13

1.	Static Level	50'0"	Ft.
2.	Pumping Level	60'8"	Ft.
3.	Flow	458	GPM
4.	Chemical Analysis:		
	a. M. Alk.	164	PPM
	b. $Na_2 SO_4$	41	PPM
	c. NaCl	27	PPM
	d. Ca Hardness	152	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	34	PPM
	g. Total Hardness	186	PPM

Well No. 14

1.	Static Level	47'3"	Ft.
2.	Pumping Level	69'0"	Ft.
3.	Flow	500	GPM
4.	Chemical Analysis:		
	a. M. Alk.	158	PPM
	b. $Na_2 SO_4$	44	PPM
	c. NaCl	29	PPM
	d. Ca Hardness	153	PPM
	e. Mg Hardness	27	PPM
	f. SiO_2	29.6	PPM
	g. Total Hardness	180	PPM

Well No. 15

1.	Static Level	43'6"	Ft.
2.	Pumping Level	58'11"	Ft.
3.	Flow	475	GPM
4.	Chemical Analysis:		
	a. M. Alk.	174	PPM
	b. $Na_2 SO_4$	40.2	PPM
	c. NaCl	28	PPM
	d. Ca Hardness	162	PPM
	e. Mg Hardness	32	PPM
	f. SiO_2	31.8	PPM
	g. Total Hardness	194	PPM

Well No. 16

1.	Static Level	51'8"	Ft.
2.	Pumping Level	72'5"	Ft.
3.	Flow	444	GPM
4.	Chemical Analysis:		
	a. M. Alk.	160	PPM
	b. $Na_2 SO_4$	45.3	PPM
	c. NaCl	30	PPM
	d. Ca Hardness	144	PPM
	e. Mg Hardness	44	PPM
	f. SiO_2	31.8	PPM
	g. Total Hardness	188	PPM

Well No. 17

1.	Static Level	55'0"	Ft.
2.	Pumping Level	65'6"	Ft.
3.	Flow	513	GPM
4.	Chemical Analysis:		
	a. M. Alk.	160	PPM
	b. $Na_2 SO_4$	47.4	PPM
	c. NaCl	31	PPM
	d. Ca Hardness	166	PPM
	e. Mg Hardness	24	PPM
	f. SiO_2	30.6	PPM
	g. Total Hardness	190	PPM

Well No. 18

1.	Static Level	51'0"	Ft.
2.	Pumping Level	63'4"	Ft.
3.	Flow	493	GPM
4.	Chemical Analysis:		
	a. M. Alk.	162	PPM
	b. $Na_2 SO_4$	43	PPM
	c. NaCl	32	PPM
	d. Ca Hardness	156	PPM
	e. Mg Hardness	30	PPM
	f. SiO_2	31.8	PPM
	g. Total Hardness	176	PPM

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WATER WELL TEST DATA

PLANT CUNNINGHAM STATION DATE FEBRUARY 1971

Well No. 19

1.	Static Level	59'0"	Ft.
2.	Pumping Level	61'4"	Ft.
3.	Flow	493	GPM
4.	Chemical Analysis:		
	a. M. Alk.	160	PPM
	b. $Na_2 SO_4$	47.4	PPM
	c. NaCl	30	PPM
	d. Ca Hardness	160	PPM
	e. Mg Hardness	32	PPM
	f. SiO_2	31.8	PPM
	g. Total Hardness	192	PPM

Well No. 20

1.	Static Level	47'4"	Ft.
2.	Pumping Level	55'4"	Ft.
3.	Flow	458	GPM
4.	Chemical Analysis:		
	a. M. Alk.	162	PPM
	b. $Na_2 SO_4$	44	PPM
	c. NaCl	31	PPM
	d. Ca Hardness	154	PPM
	e. Mg Hardness	30	PPM
	f. SiO_2	30.6	PPM
	g. Total Hardness	184	PPM

Well No. 21

1.	Static Level	54'1"	Ft.
2.	Pumping Level	65'2"	Ft.
3.	Flow	428	GPM
4.	Chemical Analysis:		
	a. M. Alk.	156	PPM
	b. Na2 SO4	47.4	PPM
	c. NaCl	31	PPM
	d. Ca Hardness	156	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	31	PPM
	g. Total Hardness	190	PPM

Well No. 22

1.	Static Level	26'0"	Ft.
2.	Pumping Level	35'9"	Ft.
3.	Flow	305	GPM
4.	Chemical Analysis:		
	a. M. Alk.	157	PPM
	b. $Na_2 SO_4$	50.5	PPM
	c. NaCl	30	PPM
	d. Ca Hardness	164	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	34	PPM
	g. Total Hardness	198	PPM

Well No. 23

1.	Static Level	48'4"	Ft.
2.	Pumping Level	56'0"	Ft.
3.	Flow	445	GPM
4.	Chemical Analysis:		
	a. M. Alk.	160	PPM
	b. $Na_2 SO_4$	44	PPM
	c. NaCl	128	PPM ← ?
	d. Ca Hardness	152	PPM
	e. Mg Hardness	38	PPM
	f. SiO_2	33	PPM
	g. Total Hardness	190	PPM

Well No. 24

1.	Static Level	55'0"	Ft.
2.	Pumping Level	62'0"	Ft.
3.	Flow	482	GPM
4.	Chemical Analysis:		
	a. M. Alk.	162	PPM
	b. $Na_2 SO_4$	34.2	PPM
	c. NaCl	23	PPM
	d. Ca Hardness	160	PPM
	e. Mg Hardness	26	PPM
	f. SiO_2	33	PPM
	g. Total Hardness	186	PPM

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Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 7-22-75

Well No. 1

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 2

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	163	PPM
b. $Na_2 SO_4$	28.4	PPM
c. NaCl	27	PPM
d. Ca Hardness	136	PPM
e. Mg Hardness	54	PPM
f. SiO_2	35.7	PPM
g. Total Hardness	190	PPM

Well No. 3

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	164	PPM
b. $Na_2 SO_4$	33.3	PPM
c. NaCl	26	PPM
d. Ca Hardness	144	PPM
e. Mg Hardness	36	PPM
f. SiO_2	35.0	PPM
g. Total Hardness	180	PPM

Well No. 4

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	160	PPM
b. $Na_2 SO_4$	33.3	PPM
c. NaCl	28	PPM
d. Ca Hardness	142	PPM
e. Mg Hardness	38	PPM
f. SiO_2	33.8	PPM
g. Total Hardness	180	PPM

Well No. 5

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	154	PPM
b. $Na_2 SO_4$	35.2	PPM
c. NaCl	29	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	36	PPM
f. SiO_2	36.	PPM
g. Total Hardness	196	PPM

Well No. 6

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	156	PPM
b. $Na_2 SO_4$	38.8	PPM
c. NaCl	32	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	42	PPM
f. SiO_2	34.0	PPM
g. Total Hardness	198	PPM

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WATER WELL TEST DATA

PLANT Cunningham DATE 7-75

Well No. 7

. Static Level		Ft.
. Pumping Level		Ft.
. Flow		GPM
. Chemical Analysis:		
a. M. Alk.	150	PPM
b. $Na_2 SO_4$	41.6	PPM
c. NaCl	37	PPM
d. Ca Hardness	174	PPM
e. Mg Hardness	36	PPM
f. SiO_2	440	PPM
g. Total Hardness	210	PPM

Well No. 8

. Static Level		Ft.
. Pumping Level		Ft.
. Flow		GPM
. Chemical Analysis:		
a. M. Alk.	154	PPM
b. $Na_2 SO_4$	38.8	PPM
c. NaCl	32	PPM
d. Ca Hardness	140	PPM
e. Mg Hardness	54	PPM
f. SiO_2	40.	PPM
g. Total Hardness	194	PPM

Well No. 9

. Static Level		Ft.
. Pumping Level		Ft.
. Flow		GPM
. Chemical Analysis:		
a. M. Alk.	154	PPM
b. $Na_2 SO_4$	32.4	PPM
c. NaCl	30	PPM
d. Ca Hardness	148	PPM
e. Mg Hardness	56	PPM
f. SiO_2	28.0	PPM
g. Total Hardness	204	PPM

Well No. 10

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	150	PPM
b. $Na_2 SO_4$	36.4	PPM
c. NaCl	34	PPM
d. Ca Hardness	170	PPM
e. Mg Hardness	30	PPM
f. SiO_2	40.	PPM
g. Total Hardness	200	PPM

Well No. 11

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	178	PPM
b. $Na_2 SO_4$	32.4	PPM
c. NaCl	17	PPM
d. Ca Hardness	166	PPM
e. Mg Hardness	32	PPM
f. SiO_2	34.0	PPM
g. Total Hardness	198	PPM

Well No. 12

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	164	PPM
b. $Na_2 SO_4$	34.0	PPM
c. NaCl	38	PPM
d. Ca Hardness	170	PPM
e. Mg Hardness	26	PPM
f. SiO_2	34.0	PPM
g. Total Hardness	196	PPM

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WATER WELL TEST DATA

PLANT Cunningham DATE 7-75

Well No. 13

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	158	PPM
b. $Na_2 SO_4$	36.0	PPM
c. NaCl	32	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	26	PPM
f. SiO_2	40.0	PPM
g. Total Hardness	186	PPM

Well No. 16

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	160	PPM
b. $Na_2 SO_4$	38.6	PPM
c. NaCl	31	PPM
d. Ca Hardness	162	PPM
e. Mg Hardness	38	PPM
f. SiO_2	32.	PPM
g. Total Hardness	200	PPM

Well No. 14

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	166	PPM
b. $Na_2 SO_4$	38.2	PPM
c. NaCl	29	PPM
d. Ca Hardness	146	PPM
e. Mg Hardness	34	PPM
f. SiO_2	34.0	PPM
g. Total Hardness	180	PPM

Well No. 17

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	154	PPM
b. $Na_2 SO_4$	34.6	PPM
c. NaCl	32	PPM
d. Ca Hardness	174	PPM
e. Mg Hardness	30	PPM
f. SiO_2	40.0	PPM
g. Total Hardness	204	PPM

Well No. 15

Static Level		Ft.
Pumping Level		Ft.
Flow		GPM
Chemical Analysis:		
a. M. Alk.	160	PPM
b. $Na_2 SO_4$	25.8	PPM
c. NaCl	32	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	30	PPM
f. SiO_2	34.0	PPM
g. Total Hardness	186	PPM

Well No. 18

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	154	PPM
b. $Na_2 SO_4$	30.4	PPM
c. NaCl	33	PPM
d. Ca Hardness	162	PPM
e. Mg Hardness	24	PPM
f. SiO_2	28.0	PPM
g. Total Hardness	186	PPM

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WATER WELL TEST DATA

PLANT Cunningham DATE 7-75

Well No. 19

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	160	PPM
b. $Na_2 SO_4$	36.6	PPM
c. NaCl	27	PPM
d. Ca Hardness	162	PPM
e. Mg Hardness	38	PPM
f. SiO_2	32.9	PPM
g. Total Hardness	200	PPM

Well No. 22

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	152	PPM
b. $Na_2 SO_4$	29.0	PPM
c. NaCl	36	PPM
d. Ca Hardness	168	PPM
e. Mg Hardness	38	PPM
f. SiO_2	42.0	PPM
g. Total Hardness	206	PPM

Well No. 20

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	162	PPM
b. $Na_2 SO_4$	36.6	PPM
c. NaCl	30	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	36	PPM
f. SiO_2	36	PPM
g. Total Hardness	196	PPM

Well No. 23

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	152	PPM
b. $Na_2 SO_4$	32.6	PPM
c. NaCl	30	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	30	PPM
f. SiO_2	28.0	PPM
g. Total Hardness	190	PPM

Well No. 21

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	158	PPM
b. $Na_2 SO_4$	41.8	PPM
c. NaCl	35	PPM
d. Ca Hardness	172	PPM
e. Mg Hardness	34	PPM
f. SiO_2	33.5	PPM
g. Total Hardness	206	PPM

Well No. 24

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	160	PPM
b. $Na_2 SO_4$	29.0	PPM
c. NaCl	37.6	PPM
d. Ca Hardness	174	PPM
e. Mg Hardness	32	PPM
f. SiO_2	34	PPM
g. Total Hardness	206	PPM

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 7-22-75

Well No. 25

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	136	PPM
b. $Na_2 SO_4$	40.8	PPM
c. NaCl	27	PPM = 32 *
d. Ca Hardness	137	PPM
e. Mg Hardness	38	PPM
f. SiO_2	31.6	PPM
g. Total Hardness	176	PPM

Well No. 26

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	148	PPM
b. $Na_2 SO_4$	38.	PPM
c. NaCl	32	PPM = 135 *
d. Ca Hardness	164	PPM
e. Mg Hardness	34	PPM
f. SiO_2	40.	PPM
g. Total Hardness	198	PPM

Well No. 27

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	154	PPM
b. $Na_2 SO_4$	35.6	PPM
c. NaCl	41	PPM = 85 *
d. Ca Hardness	170	PPM
e. Mg Hardness	30	PPM
f. SiO_2	34.8	PPM
g. Total Hardness	200	PPM

Well No. 28

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	110	PPM
b. $Na_2 SO_4$	40.8	PPM
c. NaCl	36	PPM = 58
d. Ca Hardness	116	PPM
e. Mg Hardness	24	PPM
f. SiO_2	43.0	PPM
g. Total Hardness	144	PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

* denotes pumping ≈ 48 hours

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Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunn. DATE March 28-76

Well No. 25

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	144	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	54	PPM
	d. Ca Hardness	180	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2		PPM
	g. Total Hardness	214	PPM

Well No. 26

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	146	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	56	PPM
	d. Ca Hardness	180	PPM
	e. Mg Hardness	40	PPM
	f. SiO_2		PPM
	g. Total Hardness	220	PPM

Well No. 27

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	144	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	62	PPM
	d. Ca Hardness	180	PPM
	e. Mg Hardness	28	PPM
	f. SiO_2		PPM
	g. Total Hardness	208	PPM

Well No. 28

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	144	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	58	PPM
	d. Ca Hardness	188	PPM
	e. Mg Hardness	28	PPM
	f. SiO_2		PPM
	g. Total Hardness	216	PPM

Well No. R.D. Lee #1

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	158	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	30	PPM
	d. Ca Hardness	190	PPM
	e. Mg Hardness	20	PPM
	f. SiO_2		PPM
	g. Total Hardness	210	PPM

Well No. _____

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.		PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl		PPM
	d. Ca Hardness		PPM
	e. Mg Hardness		PPM
	f. SiO_2		PPM
	g. Total Hardness		PPM

Form 6021

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT _____ DATE _____

9-16-76
Well No. 26

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	130	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	100	PPM
	d. Ca Hardness	214	PPM
	e. Mg Hardness	32	PPM
	f. SiO_2		PPM
	g. Total Hardness	246	PPM

9-14-76
Well No. 26

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	134	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	40	PPM
	d. Ca Hardness	172	PPM
	e. Mg Hardness	28	PPM
	f. SiO_2		PPM
	g. Total Hardness	200	PPM

Well No. 26 9-17-76

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	140	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	110	PPM
	d. Ca Hardness	232	PPM
	e. Mg Hardness	40	PPM
	f. SiO_2		PPM
	g. Total Hardness	272	PPM

Well No. 26 9-20-76

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	142	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	157	PPM
	d. Ca Hardness	242	PPM
	e. Mg Hardness	58	PPM
	f. SiO_2		PPM
	g. Total Hardness	300	PPM

Well No. 26 - 9-23-76

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	142	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	112	PPM
	d. Ca Hardness	232	PPM
	e. Mg Hardness	50	PPM
	f. SiO_2		PPM
	g. Total Hardness	282	PPM

Well No. 26 - 9-29-76

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	124	PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl	135	PPM
	d. Ca Hardness	230	PPM
	e. Mg Hardness	38	PPM
	f. SiO_2		PPM
	g. Total Hardness	268	PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT _____ DATE _____

Well No. 26 — 10-8-76

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	152	PPM
b. $Na_2 SO_4$		PPM
c. NaCl	44	PPM
d. Ca Hardness	172	PPM
e. Mg Hardness	50	PPM
f. SiO_2		PPM
g. Total Hardness	222	PPM

Well No. Plant Raw Water — 10-13-76

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	152	PPM
b. $Na_2 SO_4$		PPM
c. NaCl	90	PPM
d. Ca Hardness	172	PPM
e. Mg Hardness	42	PPM
f. SiO_2		PPM
g. Total Hardness	214	PPM

Well No. 26 — 10-11-76

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$		PPM
c. NaCl	125	PPM
d. Ca Hardness	246	PPM
e. Mg Hardness	54	PPM
f. SiO_2		PPM
g. Total Hardness	300	PPM

Well No. 26 — 10-14-76

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$		PPM
c. NaCl	128	PPM
d. Ca Hardness	248	PPM
e. Mg Hardness	60	PPM
f. SiO_2		PPM
g. Total Hardness	308	PPM

Well No. 26 — 10-13-76

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$		PPM
c. NaCl	126	PPM
d. Ca Hardness	248	PPM
e. Mg Hardness	60	PPM
f. SiO_2		PPM
g. Total Hardness	308	PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 4-11-78

Well No. #1 Cooling Tower

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	72	PPM
b. $Na_2 SO_4$	420	PPM
c. NaCl	122	PPM
d. Ca Hardness	612	PPM
e. Mg Hardness	141	PPM
f. SiO_2	150	PPM
g. Total Hardness	753	PPM

Well No. 2

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	158	PPM
b. $Na_2 SO_4$	32	PPM
c. NaCl	28	PPM
d. Ca Hardness	148	PPM
e. Mg Hardness	35	PPM
f. SiO_2	36	PPM
g. Total Hardness	183	PPM

Well No. #2 Cooling Tower

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	105	PPM
b. $Na_2 SO_4$	480	PPM
c. NaCl	115	PPM
d. Ca Hardness	596	PPM
e. Mg Hardness	126	PPM
f. SiO_2	152	PPM
g. Total Hardness	722	PPM

Well No. 3

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	155	PPM
b. $Na_2 SO_4$	35.5	PPM
c. NaCl	27	PPM
d. Ca Hardness	148	PPM
e. Mg Hardness	29	PPM
f. SiO_2	34	PPM
g. Total Hardness	177	PPM

Well No. 1

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	149	PPM
b. $Na_2 SO_4$	39.5	PPM
c. NaCl	33	PPM
d. Ca Hardness	151	PPM
e. Mg Hardness	27	PPM
f. SiO_2	34	PPM
g. Total Hardness	178	PPM

Well No. 4

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	134	PPM
b. $Na_2 SO_4$	—	PPM
c. NaCl	33	PPM
d. Ca Hardness	118	PPM
e. Mg Hardness	40	PPM
f. SiO_2	40	PPM
g. Total Hardness	158	PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 4-11-78

Well No. 5

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	148	PPM
b. $Na_2 SO_4$	35	PPM
c. NaCl	38	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	8	PPM
f. SiO_2	35	PPM
g. Total Hardness	164	PPM

Well No. 6

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	150	PPM
b. $Na_2 SO_4$	35	PPM
c. NaCl	33	PPM
d. Ca Hardness	154	PPM
e. Mg Hardness	22	PPM
f. SiO_2	40	PPM
g. Total Hardness	176	PPM

Well No. 7

1. Static Level	1	Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	150	PPM
b. $Na_2 SO_4$	38.7	PPM
c. NaCl	35	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	20	PPM
f. SiO_2	40	PPM
g. Total Hardness	176	PPM

Well No. 8

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	150	PPM
b. $Na_2 SO_4$	29.5	PPM
c. NaCl	29	PPM
d. Ca Hardness	143	PPM
e. Mg Hardness	41	PPM
f. SiO_2	31	PPM
g. Total Hardness	184	PPM

Well No. 9

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	134	PPM
b. $Na_2 SO_4$	—	PPM
c. NaCl	35	PPM
d. Ca Hardness	136	PPM
e. Mg Hardness	20	PPM
f. SiO_2	34	PPM
g. Total Hardness	156	PPM

Well No. 10

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	149	PPM
b. $Na_2 SO_4$	—	PPM
c. NaCl	38	PPM
d. Ca Hardness	146	PPM
e. Mg Hardness	42	PPM
f. SiO_2	34	PPM
g. Total Hardness	188	PPM

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Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 4-11-78

Well No. 11

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	162	PPM
b. $Na_2 SO_4$	32.2	PPM
c. NaCl	29	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	24	PPM
f. SiO_2	36	PPM
g. Total Hardness	184	PPM

Well No. 12

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	156	PPM
b. $Na_2 SO_4$	32.2	PPM
c. NaCl	29.5	PPM
d. Ca Hardness	159	PPM
e. Mg Hardness	21	PPM
f. SiO_2	39	PPM
g. Total Hardness	180	PPM

Well No. 13

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	153	PPM
b. $Na_2 SO_4$	28	PPM
c. NaCl	26.5	PPM
d. Ca Hardness	140	PPM
e. Mg Hardness	26	PPM
f. SiO_2	39	PPM
g. Total Hardness	166	PPM

Well No. 14

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	160	PPM
b. $Na_2 SO_4$	30	PPM
c. NaCl	27	PPM
d. Ca Hardness	152	PPM
e. Mg Hardness	24	PPM
f. SiO_2	39	PPM
g. Total Hardness	176	PPM

Well No. 15

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	156	PPM
b. $Na_2 SO_4$	31	PPM
c. NaCl	30	PPM
d. Ca Hardness	154	PPM
e. Mg Hardness	24	PPM
f. SiO_2	40	PPM
g. Total Hardness	178	PPM

Well No. 16

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	153	PPM
b. $Na_2 SO_4$	33.8	PPM
c. NaCl	30	PPM
d. Ca Hardness	154	PPM
e. Mg Hardness	30	PPM
f. SiO_2	33	PPM
g. Total Hardness	184	PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 4-11-78

17

Level _____ Ft.
Level _____ Ft.
_____ GPM
Analysis:
_____ 146 PPM
_____ — PPM
_____ 34 PPM
Hardness _____ 164 PPM
Hardness _____ 18 PPM
_____ 36 PPM
Hardness _____ 182 PPM

18

Level _____ Ft.
Level _____ Ft.
_____ GPM
Analysis:
_____ 150 PPM
_____ — PPM
_____ 38 PPM
Hardness _____ 150 PPM
Hardness _____ 24 PPM
_____ 33 PPM
Hardness _____ 174 PPM

19

Level _____ Ft.
Level _____ Ft.
_____ GPM
Analysis:
_____ 150 PPM
_____ — PPM
_____ 40 PPM
Hardness _____ 172 PPM
Hardness _____ 28 PPM
_____ 26 PPM
Hardness _____ 200 PPM

Well No. 20

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. 152 PPM
   b. $Na_2 SO_4$ 39.8 PPM
   c. NaCl 39 PPM
   d. Ca Hardness 174 PPM
   e. Mg Hardness 30 PPM
   f. SiO_2 34 PPM
   g. Total Hardness 204 PPM

Well No. 21

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. 152 PPM
   b. $Na_2 SO_4$ 37.7 PPM
   c. NaCl 35 PPM
   d. Ca Hardness 156 PPM
   e. Mg Hardness 34 PPM
   f. SiO_2 39 PPM
   g. Total Hardness 180 PPM

Well No. 22

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. 152 PPM
   b. $Na_2 SO_4$ 39.2 PPM
   c. NaCl 30 PPM
   d. Ca Hardness 168 PPM
   e. Mg Hardness 18 PPM
   f. SiO_2 40 PPM
   g. Total Hardness 186 PPM

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 4-11-78

Well No. 23

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	153	PPM
	b. $Na_2 SO_4$	36.0	PPM
	c. NaCl	30	PPM
	d. Ca Hardness	164	PPM
	e. Mg Hardness	16	PPM
	f. SiO_2	39	PPM
	g. Total Hardness	180	PPM

Well No. 24

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	158	PPM
	b. $Na_2 SO_4$	35.5	PPM
	c. NaCl	27	PPM
	d. Ca Hardness	138	PPM
	e. Mg Hardness	28	PPM
	f. SiO_2	24.0	PPM
	g. Total Hardness	166	PPM

Well No. 25

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	152	PPM
	b. $Na_2 SO_4$	40.5	PPM
	c. NaCl	39	PPM
	d. Ca Hardness	160	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	33	PPM
	g. Total Hardness	194	PPM

Well No. 26

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	150	PPM
	b. $Na_2 SO_4$	34.0	PPM
	c. NaCl	52	PPM
	d. Ca Hardness	174	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	31	PPM
	g. Total Hardness	208	PPM

Well No. 27

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	152	PPM
	b. $Na_2 SO_4$	34.6	PPM
	c. NaCl	70	PPM
	d. Ca Hardness	192	PPM
	e. Mg Hardness	18	PPM
	f. SiO_2	33	PPM
	g. Total Hardness	210	PPM

Well No. 28

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	138	PPM
	b. $Na_2 SO_4$	—	PPM
	c. NaCl	58	PPM
	d. Ca Hardness	156	PPM
	e. Mg Hardness	46	PPM
	f. SiO_2	30	PPM
	g. Total Hardness	202	PPM

Form 6001

Southwestern PUBLIC SERVICE Company

AUG 13 1979

WATER WELL TEST DATA

PLANT Harrington Station DATE Aug. 8-79

Well No. 1

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.		PPM
	b. $Na_2 SO_4$	42.1	PPM
	c. NaCl	32	PPM
	d. Ca Hardness		PPM
	e. Mg Hardness		PPM
	f. SiO_2		PPM
	g. Total Hardness		PPM

Well No. 2

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.		PPM
	b. $Na_2 SO_4$	38.0	PPM
	c. NaCl	28	PPM
	d. Ca Hardness		PPM
	e. Mg Hardness		PPM
	f. SiO_2		PPM
	g. Total Hardness		PPM

Well No. 3

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.		PPM
	b. $Na_2 SO_4$	42.4	PPM
	c. NaCl	29	PPM
	d. Ca Hardness		PPM
	e. Mg Hardness		PPM
	f. SiO_2		PPM
	g. Total Hardness		PPM

Well No. 4

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.		PPM
	b. $Na_2 SO_4$	46.4	PPM
	c. NaCl	29	PPM
	d. Ca Hardness		PPM
	e. Mg Hardness		PPM
	f. SiO_2		PPM
	g. Total Hardness		PPM

Well No. 5

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.		PPM
	b. $Na_2 SO_4$	50.4	PPM
	c. NaCl	32	PPM
	d. Ca Hardness		PPM
	e. Mg Hardness		PPM
	f. SiO_2		PPM
	g. Total Hardness		PPM

Well No. 6

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.		PPM
	b. $Na_2 SO_4$	61.2	PPM
	c. NaCl	33	PPM
	d. Ca Hardness		PPM
	e. Mg Hardness		PPM
	f. SiO_2		PPM
	g. Total Hardness		PPM

Form 6001

Southwestern PUBLIC SERVICE Compa

WATER WELL TEST DATA

PLANT _____ DATE 8-8-79

Well No. 7

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. _____ PPM
   b. $Na_2 SO_4$ 60.2 PPM
   c. NaCl 34 PPM
   d. Ca Hardness _____ PPM
   e. Mg Hardness _____ PPM
   f. SiO_2 _____ PPM
   g. Total Hardness _____ PPM

Well No. 8

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. _____ PPM
   b. $Na_2 SO_4$ 49 PPM
   c. NaCl 32 PPM
   d. Ca Hardness _____ PPM
   e. Mg Hardness _____ PPM
   f. SiO_2 _____ PPM
   g. Total Hardness _____ PPM

Well No. 9

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. _____ PPM
   b. $Na_2 SO_4$ 41.8 PPM
   c. NaCl 29 PPM
   d. Ca Hardness _____ PPM
   e. Mg Hardness _____ PPM
   f. SiO_2 _____ PPM
   g. Total Hardness _____ PPM

Well No. 10

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. _____ PPM
   b. $Na_2 SO_4$ 35.4 PPM
   c. NaCl 27 PPM
   d. Ca Hardness _____ PPM
   e. Mg Hardness _____ PPM
   f. SiO_2 _____ PPM
   g. Total Hardness _____ PPM

Well No. 11

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. _____ PPM
   b. $Na_2 SO_4$ 41 PPM
   c. NaCl 34 PPM
   d. Ca Hardness _____ PPM
   e. Mg Hardness _____ PPM
   f. SiO_2 _____ PPM
   g. Total Hardness _____ PPM

Well No. 12

1. Static Level _____ Ft.
2. Pumping Level _____ Ft.
3. Flow _____ GPM
4. Chemical Analysis:
   a. M. Alk. _____ PPM
   b. $Na_2 SO_4$ 41.2 PPM
   c. NaCl 27 PPM
   d. Ca Hardness _____ PPM
   e. Mg Hardness _____ PPM
   f. SiO_2 _____ PPM
   g. Total Hardness _____ PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Jones Unit DATE 8-8-79

Well No. 13

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	37.0	PPM
c. NaCl	27	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 14

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	38.0	PPM
c. NaCl	26	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 15

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	35.1	PPM
c. NaCl	26	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 16

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	52.0	PPM
c. NaCl	32	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 17

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	46.0	PPM
c. NaCl	30	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 18

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	41.7	PPM
c. NaCl	41	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT [illegible] DATE 8-8 79

Well No. 19

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	46.0	PPM
c. NaCl	29	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 22

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	48.6	PPM
c. NaCl	30	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 20

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	41.0	PPM
c. NaCl	29	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 23

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	38.4	PPM
c. NaCl	27	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 21

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	47.8	PPM
c. NaCl	31	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 24

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	34.1	PPM
c. NaCl	24	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 8-8-79

Well No. 25

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	44.5	PPM
c. NaCl	72	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 28

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	41.2	PPM
c. NaCl	48	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 26

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	42.8	PPM
c. NaCl	71	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 27

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$	44.1	PPM
c. NaCl	70	PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Problem appears to be getting bigger. Pull 8/13 We are going to have to develop a plan of

Form 6001

Quarterly Well Tests

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Plant Station DATE March 4-80

Well No. 1

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	112	PPM
	b. $Na_2 SO_4$	47	PPM
	c. NaCl	28	PPM
	d. Ca Hardness	124	PPM
	e. Mg Hardness	46	PPM
	f. SiO_2	40.0	PPM
	g. Total Hardness	170	PPM

Well No. 2

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	138	PPM
	b. $Na_2 SO_4$	44	PPM
	c. NaCl	28	PPM
	d. Ca Hardness	118	PPM
	e. Mg Hardness	54	PPM
	f. SiO_2	36.	PPM
	g. Total Hardness	172	PPM

Well No. 3

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	130	PPM
	b. $Na_2 SO_4$	45.1	PPM
	c. NaCl	29	PPM
	d. Ca Hardness	144	PPM
	e. Mg Hardness	14	PPM
	f. SiO_2	36.5	PPM
	g. Total Hardness	158	PPM

Well No. 4

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	132	PPM
	b. $Na_2 SO_4$	41.2	PPM
	c. NaCl	29	PPM
	d. Ca Hardness	150	PPM
	e. Mg Hardness	26	PPM
	f. SiO_2	36.0	PPM
	g. Total Hardness	176	PPM

Well No. 5

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	130	PPM
	b. $Na_2 SO_4$	55.5	PPM
	c. NaCl	35	PPM
	d. Ca Hardness	176	PPM
	e. Mg Hardness	20	PPM
	f. SiO_2	36.5	PPM
	g. Total Hardness	196	PPM

Well No. 6

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.		PPM
	b. $Na_2 SO_4$		PPM
	c. NaCl		PPM
	d. Ca Hardness		PPM
	e. Mg Hardness		PPM
	f. SiO_2		PPM
	g. Total Hardness		PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT _____ DATE 3-4-80

Well No. 7

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	114	PPM
b. $Na_2 SO_4$	34.7	PPM
c. NaCl	36	PPM
d. Ca Hardness	174	PPM
e. Mg Hardness	34	PPM
f. SiO_2	48.0	PPM
g. Total Hardness	208	PPM

Well No. 8

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$	23.9	PPM
c. NaCl	28	PPM
d. Ca Hardness	176	PPM
e. Mg Hardness	14	PPM
f. SiO_2	37.0	PPM
g. Total Hardness	190	PPM

Well No. 9

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	142	PPM
b. $Na_2 SO_4$	52.3	PPM
c. NaCl	27	PPM
d. Ca Hardness	152	PPM
e. Mg Hardness	34	PPM
f. SiO_2	37.0	PPM
g. Total Hardness	186	PPM

Well No. 10

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	148	PPM
b. $Na_2 SO_4$	31.9	PPM
c. NaCl	27	PPM
d. Ca Hardness	124	PPM
e. Mg Hardness	24	PPM
f. SiO_2	30.5	PPM
g. Total Hardness	148	PPM

Well No. 11

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	148	PPM
b. $Na_2 SO_4$	32.2	PPM
c. NaCl	28	PPM
d. Ca Hardness	130	PPM
e. Mg Hardness	34	PPM
f. SiO_2	33.5	PPM
g. Total Hardness	164	PPM

Well No. 12

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	140	PPM
b. $Na_2 SO_4$	49.2	PPM
c. NaCl	30	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	36	PPM
f. SiO_2	35.0	PPM
g. Total Hardness	192	PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT _____ DATE 3-4-80

Well No. 13

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	36.2	PPM
c. NaCl	27	PPM
d. Ca Hardness	154	PPM
e. Mg Hardness	24	PPM
f. SiO_2	35.5	PPM
g. Total Hardness	178	PPM

Well No. 14

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	116	PPM
b. $Na_2 SO_4$	36.1	PPM
c. NaCl	34	PPM
d. Ca Hardness	132	PPM
e. Mg Hardness	28	PPM
f. SiO_2	35.2	PPM
g. Total Hardness	160	PPM

Well No. 15

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	116	PPM
b. $Na_2 SO_4$	38.7	PPM
c. NaCl	29	PPM
d. Ca Hardness	164	PPM
e. Mg Hardness	30	PPM
f. SiO_2	33.5	PPM
g. Total Hardness	194	PPM

Well No. 16

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	42.8	PPM
c. NaCl	28	PPM
d. Ca Hardness	154	PPM
e. Mg Hardness	32	PPM
f. SiO_2	32.5	PPM
g. Total Hardness	186	PPM

Well No. 17

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	140	PPM
b. $Na_2 SO_4$	40.1	PPM
c. NaCl	29	PPM
d. Ca Hardness	152	PPM
e. Mg Hardness	34	PPM
f. SiO_2	32.5	PPM
g. Total Hardness	186	PPM

Well No. 18

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	152	PPM
b. $Na_2 SO_4$	37.3	PPM
c. NaCl	31	PPM
d. Ca Hardness	150	PPM
e. Mg Hardness	30	PPM
f. SiO_2	33.5	PPM
g. Total Hardness	180	PPM

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Plant Site

DATE 3-4-80

Well No. 19

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	142	PPM
b. $Na_2 SO_4$	44.8	PPM
c. NaCl	29	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	34	PPM
f. SiO_2	36.0	PPM
g. Total Hardness	194	PPM

Well No. 20

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	154	PPM
b. $Na_2 SO_4$	43.4	PPM
c. NaCl	30	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	30	PPM
f. SiO_2	35.0	PPM
g. Total Hardness	190	PPM

Well No. 21

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 22

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 23

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	41.0	PPM
c. NaCl	28	PPM
d. Ca Hardness	146	PPM
e. Mg Hardness	34	PPM
f. SiO_2	35	PPM
g. Total Hardness	190	PPM

Well No. 24

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	142	PPM
b. $Na_2 SO_4$	34.8	PPM
c. NaCl	26	PPM
d. Ca Hardness	158	PPM
e. Mg Hardness	20	PPM
f. SiO_2	36.5	PPM
g. Total Hardness	178	PPM

Form 6001

Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Plant Artesia DATE 3-4-80

Well No. 25

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	54.4	PPM
c. NaCl	27	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	30	PPM
f. SiO_2	34.0	PPM
g. Total Hardness	190	PPM

Well No. 26

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	42.2	PPM
c. NaCl	36	PPM
d. Ca Hardness	166	PPM
e. Mg Hardness	28	PPM
f. SiO_2	38.5	PPM
g. Total Hardness	194	PPM

Well No. 27

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$	38.0	PPM
c. NaCl	54	PPM
d. Ca Hardness	166	PPM
e. Mg Hardness	30	PPM
f. SiO_2	33.5	PPM
g. Total Hardness	196	PPM

Well No. 28

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	43.1	PPM
c. NaCl	64	PPM
d. Ca Hardness	190	PPM
e. Mg Hardness	28	PPM
f. SiO_2	34.5	PPM
g. Total Hardness	218	PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. _____

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

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WATER WELL TEST DATA

PLANT Cunningham

DATE 6-16-80 JUN 24 1980

Well No. 25

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$	45.2	PPM
c. NaCl	27	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	32	PPM
f. SiO_2	35.0	PPM
g. Total Hardness	188	PPM

Well No. 26

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$	38.6	PPM
c. NaCl	26	PPM
d. Ca Hardness	166	PPM
e. Mg Hardness	30	PPM
f. SiO_2	34.25	PPM
g. Total Hardness	196	PPM

Well No. 27

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	142	PPM
b. $Na_2 SO_4$	37.8	PPM
c. NaCl	37	PPM
d. Ca Hardness	160	PPM
e. Mg Hardness	34	PPM
f. SiO_2	34.5	PPM
g. Total Hardness	194	PPM

Well No. 28

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	141	PPM
b. $Na_2 SO_4$	42.8	PPM
c. NaCl	57	PPM
d. Ca Hardness	178	PPM
e. Mg Hardness	40	PPM
f. SiO_2	32.75	PPM
g. Total Hardness	218	PPM

Well No. #1 Cooling tower

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	88	PPM
b. $Na_2 SO_4$	688	PPM
c. NaCl	120	PPM
d. Ca Hardness	760	PPM
e. Mg Hardness	30	PPM
f. SiO_2	138	PPM
g. Total Hardness	792	PPM

Well No. #2 Cooling Tower

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	86	PPM
b. $Na_2 SO_4$	664	PPM
c. NaCl	115	PPM
d. Ca Hardness	638	PPM
e. Mg Hardness	58	PPM
f. SiO_2	147	PPM
g. Total Hardness	696	PPM

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Southwestern PUBLIC SERVICE Company

WATER WELL TEST DATA

PLANT Cunningham DATE 6-16-80

Well No. 19 No Sample

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 20

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	49.8	PPM
c. NaCl	28	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	34	PPM
f. SiO_2	345	PPM
g. Total Hardness	190	PPM

Well No. 21 No Sample

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.		PPM
b. $Na_2 SO_4$		PPM
c. NaCl		PPM
d. Ca Hardness		PPM
e. Mg Hardness		PPM
f. SiO_2		PPM
g. Total Hardness		PPM

Well No. 22

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$	47.1	PPM
c. NaCl	28	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	36	PPM
f. SiO_2	34.75	PPM
g. Total Hardness	192	PPM

Well No. 23

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	152	PPM
b. $Na_2 SO_4$	380	PPM
c. NaCl	27	PPM
d. Ca Hardness	144	PPM
e. Mg Hardness	36	PPM
f. SiO_2	35.75	PPM
g. Total Hardness	180	PPM

Well No. 24

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	154	PPM
b. $Na_2 SO_4$	340	PPM
c. NaCl	25	PPM
d. Ca Hardness	132	PPM
e. Mg Hardness	30	PPM
f. SiO_2	33.75	PPM
g. Total Hardness	162	PPM

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WATER WELL TEST DATA

PLANT Cunningham DATE 6-16-80

Well No. 13

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	150	PPM
	b. $Na_2 SO_4$	32.5	PPM
	c. NaCl	25	PPM
	d. Ca Hardness	140	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	35.0	PPM
	g. Total Hardness	174	PPM

Well No. 14

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	146	PPM
	b. $Na_2 SO_4$	43.0	PPM
	c. NaCl	26	PPM
	d. Ca Hardness	152	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	37.0	PPM
	g. Total Hardness	186	PPM

Well No. 15

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	148	PPM
	b. $Na_2 SO_4$	39.5	PPM
	c. NaCl	26	PPM
	d. Ca Hardness	150	PPM
	e. Mg Hardness	30	PPM
	f. SiO_2	36.25	PPM
	g. Total Hardness	180	PPM

Well No. 16

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	146	PPM
	b. $Na_2 SO_4$	45.0	PPM
	c. NaCl	28	PPM
	d. Ca Hardness	146	PPM
	e. Mg Hardness	34	PPM
	f. SiO_2	34.75	PPM
	g. Total Hardness	180	PPM

Well No. 17

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	144	PPM
	b. $Na_2 SO_4$	44.5	PPM
	c. NaCl	29	PPM
	d. Ca Hardness	152	PPM
	e. Mg Hardness	38	PPM
	f. SiO_2	34.75	PPM
	g. Total Hardness	190	PPM

Well No. 18

1.	Static Level		Ft.
2.	Pumping Level		Ft.
3.	Flow		GPM
4.	Chemical Analysis:		
	a. M. Alk.	148	PPM
	b. $Na_2 SO_4$	41.8	PPM
	c. NaCl	29	PPM
	d. Ca Hardness	148	PPM
	e. Mg Hardness	28	PPM
	f. SiO_2	34.5	PPM
	g. Total Hardness	176	PPM

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Southwestern PUBLIC SERVICE Compa.

WATER WELL TEST DATA

PLANT Cunningham DATE 6-16-80

Well No. 7

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	50.8	PPM
c. NaCl	29	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	30	PPM
f. SiO_2	35.0	PPM
g. Total Hardness	186	PPM

Well No. 8

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	47.1	PPM
c. NaCl	28	PPM
d. Ca Hardness	154	PPM
e. Mg Hardness	34	PPM
f. SiO_2	37.0	PPM
g. Total Hardness	188	PPM

Well No. 9

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$	43.2	PPM
c. NaCl	27	PPM
d. Ca Hardness	152	PPM
e. Mg Hardness	32	PPM
f. SiO_2	37.0	PPM
g. Total Hardness	182	PPM

Well No. 10

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	45.0	PPM
c. NaCl	27	PPM
d. Ca Hardness	148	PPM
e. Mg Hardness	34	PPM
f. SiO_2	35.0	PPM
g. Total Hardness	182	PPM

Well No. 11

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	148	PPM
b. $Na_2 SO_4$	42.9	PPM
c. NaCl	26	PPM
d. Ca Hardness	146	PPM
e. Mg Hardness	34	PPM
f. SiO_2	34.75	PPM
g. Total Hardness	180	PPM

Well No. 12

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	150	PPM
b. $Na_2 SO_4$	32.2	PPM
c. NaCl	26	PPM
d. Ca Hardness	136	PPM
e. Mg Hardness	32	PPM
f. SiO_2	33.75	PPM
g. Total Hardness	168	PPM

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Southwestern PUBLIC SERVICE Compa

WATER WELL TEST DATA

PLANT Cunningham DATE 6-16-80

Well No. 1

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$	53.5	PPM
c. NaCl	35	PPM
d. Ca Hardness	168	PPM
e. Mg Hardness	34	PPM
f. SiO_2	36.25	PPM
g. Total Hardness	202	PPM

Well No. 2

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	150	PPM
b. $Na_2 SO_4$	44.7	PPM
c. NaCl	27	PPM
d. Ca Hardness	154	PPM
e. Mg Hardness	34	PPM
f. SiO_2	37.25	PPM
g. Total Hardness	188	PPM

Well No. 3

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	148	PPM
b. $Na_2 SO_4$	37.5	PPM
c. NaCl	26	PPM
d. Ca Hardness	148	PPM
e. Mg Hardness	32	PPM
f. SiO_2	37.25	PPM
g. Total Hardness	180	PPM

Well No. 4

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	144	PPM
b. $Na_2 SO_4$	40.8	PPM
c. NaCl	27	PPM
d. Ca Hardness	146	PPM
e. Mg Hardness	32	PPM
f. SiO_2	34.75	PPM
g. Total Hardness	178	PPM

Well No. 5

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	146	PPM
b. $Na_2 SO_4$	49.5	PPM
c. NaCl	29	PPM
d. Ca Hardness	156	PPM
e. Mg Hardness	34	PPM
f. SiO_2	37.0	PPM
g. Total Hardness	190	PPM

Well No. 6

1. Static Level		Ft.
2. Pumping Level		Ft.
3. Flow		GPM
4. Chemical Analysis:		
a. M. Alk.	142	PPM
b. $Na_2 SO_4$	52.0	PPM
c. NaCl	28	PPM
d. Ca Hardness	158	PPM
e. Mg Hardness	32	PPM
f. SiO_2	37.0	PPM
g. Total Hardness	190	PPM

Form 6001

SOUTHWESTERN PUBLIC SERVICE COMPANY
WATER WELL DATA

Well No. 25

1320 FEL, 1940 FNL, Section 36, Township 17 South, Range 35 East
12¾ in. casing set at 214 ft (T.D.), perforated from 74 ft. to 194 ft., 6 in. suction pipe set at 169 ft., Turbine motor pump, 72 hour test - drawdown from 51 ft. (static water level) to 90 ft., specific capacity of well - 19 gal./min./ft., Average discharge - 750 gpm.

Well No. 26

185 FEL, 1950 FSL, Section 34, Township 17 South, Range 35 East
12¾ in. casing set at 214 ft. (T.D.), perforated from 80 ft. to 200 ft., 6 in. suction pipe set at 169 ft., Turbine motor pump, 48 hour test - drawdown from 48 ft. (static water level) to 88 ft., specific capacity of well - 19 gal./min./ft., Average discharge - 750 gpm.

Well No. 27

2625 FEL, 2000 FSL, Section 34, Township 17 South, Range 35 East
12¾ in. casing set at 234 ft. (T.D.), perforated from 114 ft. to 234 ft., 6 in. suction pipe set at 169 ft., Turbine motor pump, 48 hour test - drawdown from 51 ft. (static water level) to 80 ft., specific capacity of well - 26 gal./min./ft., Average discharge - 750 gpm.

Well No. 28

100 FEL, 2055 FSL, Section 33, Township 17 South, Range 35 East
12¾ in. casing set at 234 ft. (T.D.), perforated from 114 ft. to 234 ft., 6 in. suction pipe set at 169 ft., Turbine motor pump, 48 hour test - drawdown from 60 ft. (static water level) to 103 ft., specific capacity of well - 18 gal./ft./min., Average discharge - 750 gpm.

Appendix F

L. A. CLEMENTS LETTER (OCD-HOBBS)

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS DISTRICT OFFICE

BRUCE KING
GOVERNOR

LARRY KEHOE
SECRETARY

January 20, 1981

POST OFFICE BOX 1980
HOBBS, NEW MEXICO 88240
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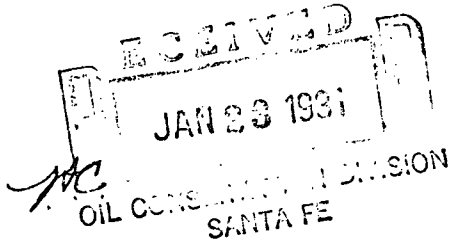


MEMO TO: Mr. Tom Parkhill

FROM: Leslie A. Clements

SUBJECT: Deeper Well Drilling in the Vacuum Area

Deeper well drilling commenced in 1963, and drilling activity fluctuated up and down as economics dictated in the pre-energy crunch days, with the most active years being 1965 through 1967, with some drilling continuing throughout the 1970's.

Reserve pits have been lined as good drilling practices throughout this period of time due to the lack of substantial soil in the area. The average pit lining being approximately 6 mills thick.

The amount of fluids diverted to reserve pits could only be at best a poor assumption, with volumes varing as to problems encountered while drilling.

The average size of reserve pits would be approximately 150' x 150' x 3'--5' in depth. Mud pits would be 6 to 8 feet wide by 30 to 50 feet in length and approximately 6 feet deep.

Appendix G

LIST OF OIL AND GAS WELL LOCATIONS

Explanation of Column Heading

Operator and Well Name: Btry - battery Tr. - Tract

Location from Section Line (In Feet) and Unit Letter: 660/N - 1980/E means location coordinate is 660 feet from north line of section and the other is 1980 feet from east line.
(B) - Refer to the location of a 40-acre lease tract within a section (640 acres)

D	C	B	A
E	F	G	H
L	K	J	I
M	N	O	P

Pool, Formation and Production Status: P&A - plugged and abandoned, Prod. - producing well, TA - temporarily abandoned, V. Glor. - Vacuum pool, Glorieta formation, V. Abo Reef - Vacuum pool, Abo formation, V. Abo - Vacuum pool, Abo formation, V. GbSA - Vacuum pool, Grayburg-San Andres formation, V. GB - Vacuum pool, Grayburg formation, Com. Penn/Wolf - commingled production from Pennsylvanian and Wolfcamp formations, V. Yates - Vacuum pool, Yates formation, V. SA - Vacuum pool, San Andres formation, SWD - salt water disposal well, B. Abo - Buckeye pool, Abo formation, N. Reeves Qn. Prod. - North Reeves pool, Queen production, Inject. - injection well.

Battery Location; A facility on lease where produced oil is stored in tanks. This is given a letter designation and has been explained above.

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
Section 26, Township 17 South, Range 35 East				
Mobil - State P #3	660/N - 1980/E	(B)	P&A	-----
Phillips - Santa Fe #17	660/N - 1980/W	(N)	P&A	-----
Phillips - Santa Fe #73	990/S - 990/E	(P)	P&A	-----
Phillips - Santa Fe #89	2310/N - 330/W	(E)	V. Glor - Prod.	C
Phillips - Santa Fe #94	990/N - 335/W	(D)	V. Glor - Prod.	N
Phillips - Vacuum Abo Unit Btry 4 Tr. 5 #2	990/S - 2195/E	(O)	V. Abo Reef - TA Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 4 #5	990/N - 330/E	(A)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 4 #6	990/N - 1650/E	(B)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 5 #1	1980/S - 1980/E	(J)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6A #66	510/S - 560/W	(M)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6C #67	1882/S - 660/W	(L)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6D #69	1890/S - 1890/W	(K)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6E #70	2080/N - 1980/E	(G)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6B #71	1980/N - 760/E	(H)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6C #72	2080/S - 660/E	(I)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6A #74	760/S - 1980/W	(N)	V. Abo Reef - TA Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6E #76	2310/N - 2270/W	(F)	V. Abo Reef - Prod.	M
Phillips - Vacuum Abo Unit Btry 4 Tr. 6E #79	2311/N - 992/W	(E)	V. Abo Reef - Prod.	M
Phillips - E. Vacuum GB-SA Unit Tr. 2614 #1	2970/N - 2310/E	(J)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2614 #2	990/S - 2310/E	(O)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2622 #1	1460/N - 1310/W	(E)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2622 #30	1980/N - 660/W	(E)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2622 #31	1980/N - 1980/W	(F)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2622 #34	1980/N - 2200/E	(G)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2622 #41	990/N - 1980/W	(C)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2622 #43	990/N - 660/W	(D)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2622 #86	990/N - 2307/W	(C)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2631 #22	1980/S - 660/W	(L)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2631 #77	2310/S - 990/E	(I)	V. GbSA - P&A	-----
Phillips - E. Vacuum GB-SA Unit Tr. 2631 #110	2314/S - 333/W	(L)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2642 #1	2630/N - 1310/E	(H)	V. GbSA - Inject.	-----
Phillips - E. Vacuum GB-SA Unit Tr. 2642 #42	1980/N - 660/E	(H)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2648 #23	660/S - 660/W	(M)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2648 #126	990/S - 330/W	(M)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2658 #11	1980/S - 1980/W	(K)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2672 #4	660/N - 660/E	(A)	V. GbSA - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 2672 #8	990/N - 2310/E	(B)	V. GbSA - Prod.	F

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
	Section 27, Township 17 South, Range 35 East			
Chevron - State 4-27 #5	660/S - 2100/E	(O)	V. Glor - Prod.	K
Chevron - State 4-27 #6	1980/S - 2180/E	(J)	V. Glor - Prod.	K
Chevron - State 4-27 #7	1980/S - 1780/W	(K)	V. Glor - Prod.	K
Chevron - State 4-27 #10	1650/S - 330/W	(L)	V. Glor - Prod.	K
Chevron - State 5-27 #5	660/S - 2100/E	(F)	V. Glor - Prod.	K
Chevron - State 5-27 #6	2310/N - 330/W	(E)	V. Glor - Prod.	K
Chevron - State 5-27 #7	990/N - 2173/W	(C)	V. Glor - Prod.	K
Chevron - State 5-27 #8	990/N - 330/W	(D)	V. Glor - Prod.	K
Cities Service - State K #5	2310/N - 330/E	(H)	V. Glor - Prod.	H
Cities Service - State K #6	2310/N - 1750/E	(G)	V. Glor - Prod.	H
Cities Service - State K #7	990/N - 330/E	(A)	V. Glor - Prod.	H
Cities Service - State K #8	990/N - 2310/E	(B)	V. Glor - Prod.	H
Phillips - E.V. GbSA U. Tr. 2717 #001	1980/S - 660/E	(I)	V. GbSA - Prod.	P
Phillips - E.V. GbSA U. Tr. 2717 #002	660/S - 660/E	(P)	V. GbSA - Prod.	P
Phillips - E.V. GbSA U. Tr. 2717 #006	990/S - 890/E	(P)	V. GbSA - Prod.	P
Phillips - E.V. GbSA U. Tr. 2720 #001	1980/N - 1980/E	(G)	V. GbSA - Prod.	H
Phillips - E.V. GbSA U. Tr. 2720 #002	1980/N - 660/E	(H)	V. GbSA - Prod.	H
Phillips - E.V. GbSA U. Tr. 2720 #003	660/N - 1980/E	(B)	V. GbSA - Prod.	H
Phillips - E.V. GbSA U. Tr. 2720 #004	990/N - 660/E	(A)	V. GbSA - Prod.	H
Phillips - E.V. GbSA U. Tr. 2721 #007	660/S - 1980/W	(N)	V. GbSA - Prod.	N
Phillips - E.V. GbSA U. Tr. 2721 #020	660/S - 660/W	(M)	V. GbSA - Prod.	N
Phillips - E.V. GbSA U. Tr. 2738 #001	660/N - 660/W	(D)	V. GbSA - Prod.	K
Phillips - E.V. GbSA U. Tr. 2738 #002	1980/N - 1980/W	(F)	V. GbSA - Prod.	K
Phillips - E.V. GbSA U. Tr. 2738 #003	1980/N - 660/W	(E)	V. GbSA - Prod.	K
Phillips - E.V. GbSA U. Tr. 2738 #004	660/N - 1980/W	(C)	V. GbSA - Prod.	K
Phillips - E.V. GbSA U. Tr. 2739 #001	1980/S - 1980/W	(K)	V. GbSA - TA Prod.	K
Phillips - E.V. GbSA U. Tr. 2739 #002	660/S - 1980/E	(O)	V. GbSA - Prod.	K
Phillips - E.V. GbSA U. Tr. 2739 #003	1980/S - 1980/E	(J)	V. GbSA - Prod.	K
Phillips - E.V. GbSA U. Tr. 2739 #004	1980/S - 660/W	(L)	V. GbSA - Prod.	K
Phillips - E.V. GbSA U. Tr. 2739 #005	1330/S - 1380/W	(K)	V. GbSA - Prod.	K
Phillips - Santa Fe #90	330/S - 660/W	(M)	V. Glor - Prod.	N
Phillips - Santa FE #117	990/W - 1650/W	(N)	V. Glor - Prod.	N
Phillips - V. Abo Unit Btry 4 #8	330/S - 1650/E	(O)	V. Abo - Prod.	M_1
Phillips - V. Abo Unit Btry 4 #9	1650/S - 1650/E	(J)	V. Abo - Prod.	M_1
Phillips - V. Abo Unit Btry 4 #80	333/S - 2315/W	(N)	V. Abo - Prod.	M_1
Phillips - V. Abo Unit Btry 4 #3	330/S - 560/E	(P)	V. Abo - Prod.	M_1

1 - Section 26, Township 17 South, Range 35 East

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
	Section 28, Township 17 South, Range 35 East			
Exxon - N.M. "K" State #19	330/S - 330/E	(P)	V. Glor - Prod.	N
Exxon - N.M. "K" State #21	330/S - 1980/E	(O)	V. Glor - Prod.	N
Exxon - N.M. "K" State #23	2310/S - 330/E	(I)	V. Glor - Prod.	N
Exxon - N.M. "K" State #25	2310/S - 1980/E	(J)	V. Glor - Prod.	N
Exxon - N.M. "K" State #27	330/S - 1980/W	(N)	V. Glor - Prod.	N
Exxon - N.M. "K" State #29	2310/S - 1981/W	(K)	V. Glor - Prod.	N
Exxon - N.M. "K" State #31	2310/S - 330/W	(L)	V. Glor - Prod.	N
Exxon - N.M. "K" State #32	330/S - 330/W	(M)	V. Glor - Prod.	N
Phillips - E.V.U. Tr. 2801 #1	660/S - 660/E	(P)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2801 #3	1980/S - 660/E	(I)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2801 #4	1310/S - 1330/E	(O)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2801 #8	660/S - 660/W	(M)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2801 #9	660/S - 1993/W	(N)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2801 #10	660/S - 1980/E	(O)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2801 #11	1980/S - 1980/E	(J)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2801 #13	1980/S - 1980/W	(K)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2801 #14	1980/S - 660/W	(L)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 2819 #1	660/N - 1980/E	(B)	V. GbSA - Prod.	G
Phillips - E.V.U. Tr. 2819 #2	1980/N - 660/E	(H)	V. GbSA - Prod.	G
Phillips - E.V.U. Tr. 2819 #3	1980/N - 1980/E	(G)	V. GbSA - Prod.	G
Phillips - E.V.U. Tr. 2851 #1	990/N - 990/E	(A)	V. GbSA - Prod.	A
Phillips - E.V.U. Tr. 2864 #12	660/N - 1980/W	(C)	V. GbSA - TA Prod.	D
Phillips - E.V.U. Tr. 2864 #13	660/N - 660/W	(D)	V. GbSA - Prod.	D
Phillips - E.V.U. Tr. 2864 #51	663/S - 662/W	(E)	V. GbSA - TA Prod.	D
Phillips - Santa Fe #15	660/N - 660/E	(A)	V. GbSA - P&A	-----
Phillips - Santa Fe #37	1980/N - 1980/W	(F)	V. GbSA - P&A	-----
Phillips - Santa Fe #104	2130/N - 1980/W	(F)	V. GbSA - Prod.	N
Phillips - Santa Fe #105	2322/N - 660/W	(E)	V. GbSA - Prod.	N
Phillips - Santa Fe #106	990/N - 2310/W	(C)	V. GbSA - TA Prod.	N
Phillips - Santa Fe #108	990/N - 431/E	(A)	V. GbSA - Prod.	N
Shell - State "G" #3	(No footage)	(G)	V. GbSA - Prod.	G
Shell - State "N" #4	2180/N - 1980/E	(G)	V. GbSA - Prod.	H
Shell - State "N" #5	2310/N - 330/E	(H)	V. GbSA - Prod.	H
Shell - State "N" #6	990/N - 1680/E	(B)	V. GbSA - TA Prod.	H

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
	Section 29, Township 17 South, Range 35 East			
Crusader - Tex. Co. St. #1	2310/N - 1980/W	(F)	V. GbSA - P&A	F
Drilling & Expl. - State M #5	990/S - 990/E	(P)	V. GbSA - P&A	---
Phillips - E. V. GbSA #001	660/N - 1980/E	(O)	V. GbSA - Prod.	O
Phillips - E. V. GbSA #002	1650/S - 2310/E	(J)	V. GbSA - Prod.	O
Phillips - E. V. GbSA #003	330/S - 330/E	(P)	V. GbSA - Prod.	O
Phillips - E. V. GbSA #004	1650/S - 330/E	(I)	V. GbSA - Prod.	O
Phillips - E. V. GbSA #054	710/N - 1983/W	(C)	V. GbSA - Prod.	O
Phillips - E. V. GbSA #026	1980/S - 1980/W	(K)	V. GbSA - Prod.	D_1
Phillips - E. V. GbSA Tr. 2944 #049	660/N - 660/E	(A)	V. GbSA - TA Prod.	D_1
Phillips - E. V. GbSAU Tr. 2957 #001	1980/S - 660/W	(L)	V. GbSA - Prod.	L
Phillips - E. V. GbSAU Tr. 2963 #001	660/S - 660/W	(M)	V. GbSA - Prod.	B
Phillips - E. V. GbSAU Tr. 2963 #002	660/S - 1980/W	(N)	V. GbSA - Prod.	B
Phillips - E. V. GbSAU Tr. 2923 #052	1977/N - 1979/E	(G)	V. GbSA - Prod.	D_1
Phillips - Santa Fe Btry 4 #50	1976/N - 660/E	(H)	V. GbSA - TA Prod.	O_1
Phillips - Santa Fe Btry 7 #83	330/N - 660/W	(D)	V. GbSA - TA Prod.	O_1
Phillips - Santa Fe #103	1655/S - 1980/W	(K)	V. Glor - Prod.	N_2
Phillips - SaNta Fe #106	2323/N - 660/E	(H)	V. Glor - Prod.	N_1
Phillips - Santa Fe #109	2323/N - 2213/E	(G)	V. Glor - Prod.	N_1
Phillips - Santa Fe #124	520/N - 520/W	(D)	V. Abo - Prod.	D^4
Shell - State F #3	800/S - 800/W	(M)	V. Glor - Prod.	B_5
Shell - State F #4	330/S - 1980/W	(N)	V. Glor - Prod.	B_5
Shell - State H #2	1800/S - 660/W	(L)	V. Glor - Prod.	E
Shell - State I #1	1980/N - 660/W	(E)	V. SA - P&A	E
Shell - State I #2	2310/N - 330/W	(E)	V. Glor - Prod.	E
Shell - State M #1	1980/S - 1980/E	(J)	V. Glor - Prod.	I
Shell - State M #2	460/S - 1980/E	(O)	V. Glor - Prod.	I
Shell - State M #3	1980/S - 660/E	(I)	V. Glor - Prod.	I
Shell - State M #4	330/S - 450/E	(P)	V. Glor - Prod.	I
Texaco - N.M. CG St. #1	2310/N - 1750/W	(F)	V. Glor - Prod.	O_6

1 - Section 28, Township 17 South, Range 35 East
2 - Section 19, Township 17 South, Range 35 East
4 - Section 27, Township 17 South, Range 35 East
5 - Section 31, Township 17 South, Range 35 East
6 - Section 36, Township 17 South, Range 34 East

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
Section 32, Township 17 South, Range 35 East				
Arco - State B-1576 #5	760/S - 2310/W	(N)	V. Glor - Prod.	K
Arco - State B-1576 #6	2310/S - 2310/W	(K)	V. Glor - Prod.	K
Arco - State B-1576 #7	2310/S - 660/W	(L)	V. Glor - Prod.	K
Arco - State B-1576 #8	660/S - 500/W	(M)	V. Glor - Prod.	K
Chevron - State 3-32 #5	2080/N - 1980/W	(F)	V. Glor - Prod.	E
Chevron - State 3-32 #6	1880/N - 660/W	(E)	V. Glor - Prod.	E
Chevron - State 3-32 #7	760/N - 1980/W	(C)	V. Glor - Prod.	E
Chevron - State 3-32 #8	760/N - 660/W	(D)	V. Glor - Prod.	E
Exxon - N.M. "K" St. #2	660/N - 1976/E	(B)	V. Gb - TA Prod.	J
Exxon - N.M. "K" St. #17	330/S - 330/E	(P)	V. Glor - TA Prod.	I
Exxon - N.M. "K" St. #18	1830/S - 510/E	(I)	V. Glor - Prod.	I
Exxon - N.M. "K" St. #20	330/S - 2308/E	(O)	V. Glor - Prod.	I
Exxon - N.M. "K" St. #22	1980/S - 2307/E	(J)	V. Glor - Prod.	I
Exxon - N.M. "K" St. #24	1865/N - 330/E	(H)	V. Glor - Prod.	I
Exxon - N.M. "K" St. #26	1980/N - 2306/E	(G)	V. Glor - Prod.	I
Exxon - N.M. "K" St. #28	330/N - 330/E	(A)	V. Glor - Prod.	I
Exxon - N.M. "K" St. #30	330/N - 2306/E	(B)	V. Glor - Prod.	I
Phillips - E.V.U. Tr. 3202 #1	1330/S - 1310/E	(I)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3202 #3	1180/N - 1480/E	(B)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3202 #4	1987/S - 660/E	(I)	V. GbSA - TA Prod.	J
Phillips - E.V.U. Tr. 3202 #5	1980/N - 660/E	(H)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3202 #6	662/S - 660/E	(P)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3202 #7	660/N - 662/E	(A)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3202 #12	1980/S - 1980/E	(J)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3202 #15	663/S - 1980/E	(O)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3202 #16	1980/N - 1980/E	(G)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3202 #33	990/N - 2306/E	(B)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3229 #1	1980/S - 660/W	(L)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3229 #2	660/S - 660/W	(M)	V. GbSA - TA Prod.	K
Phillips - E.V.U. Tr. 3229 #3	1980/S - 1980/W	(K)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3229 #4	660/S - 1980/W	(N)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3229 #5	1110/S - 1290/W	(M)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3236 #1	1980/N - 660/W	(E)	V. GbSA - Prod.	E
Phillips - E.V.U. Tr. 3236 #2	660/N - 660/W	(D)	V. GbSA - Prod.	E
Phillips - E.V.U. Tr. 3202 #3	660/N - 1980/W	(C)	V. GbSA - Prod.	E
Phillips - E.V.U. Tr. 3236 #4	1980/N - 1980/W	(F)	V. GbSA - Prod.	E

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
	Section 33, Township 17 South, Range 35 East			
Getty - Skelly "P" St. #3	779/N - 2285/W	(C)	V. Glor - Prod.	C
Getty - Skelly "P" St. #4	810/N - 660/W	(D)	V. Glor - Prod.	C
Getty - State "BC" #3	990/S - 330/W	(M)	V. Glor - TA Prod.	M
Marathon - Warn St. Ac-1 #3	2080/N - 1908/W	(F)	Com. Penn & Wolf - Prod.	F
Marathon - Warn St. Ac-3 #4	1880/N - 560/E	(H)	V. Yates - Prod.	H
Marathon - Warn St. Ac-3 #6	1980/N - 1650/E	(G)	V. Glor - Prod.	H
Marathon - Warn St. Ac-3 #7	2310/N - 2310/W	(F)	V. Glor - Prod.	H
Marathon - Warn St. Ac-3 #8	1650/N - 991/E	(H)	V. Glor - Prod.	H
Mobil - State "O" #2	1700/S - 990/W	(L)	V. Glor - Prod.	SW/4
Phillips - E.V.U. Tr. 3308 #1	660/N - 660/W	(D)	V. GbSA - Prod.	C
Phillips - E.V.U. Tr. 3308 #2	660/N - 2200/W	(C)	V. GbSA - Prod.	C
Phillips - E.V.U. Tr. 3308 #3	1150/N - 1510/W	(C)	V. GbSA - Prod.	C
Phillips - E.V.U. Tr. 3315 #1	1980/S - 660/E	(I)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3315 #2	1980/S - 1980/E	(J)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3315 #4	990/S - 990/E	(P)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3315 #11	890/S - 2300/E	(O)	V. GbSA - Prod.	J
Phillips - E.V.U. Tr. 3328 #1	660/S - 660/W	(M)	V. GbSA - TA Prod.	M
Phillips - E.V.U. Tr. 3328 #2	1310/S - 1160/W	(M)	V. GbSA - Prod.	M
Phillips - E.V.U. Tr. 3332 #21	660/N - 660/E	(A)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 3332 #32	660/N - 1980/E	(B)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 3333 #1	1980/N - 660/E	(H)	V. GbSA - Prod.	G
Phillips - E.V.U. Tr. 3333 #2	1980/N - 1980/W	(F)	V. GbSA - Prod.	G
Phillips - E.V.U. Tr. 3333 #3	1980/N - 1980/E	(B)	V. GbSA - Prod.	G
Phillips - E.V.U. Tr. 3333 #4	1380/N - 1280/E	(H)	V. GbSA - Prod.	G
Phillips - E.V.U. Tr. 3345 #35	660/S - 1980/W	(N)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3366 #29	1980/N - 660/W	(E)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3373 #28	1980/S - 1980/W	(K)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3374 #1	1980/S - 660/W	(L)	V. GbSA - Prod.	L
Phillips - Santa Fe #97	990/S - 1980/W	(N)	V. Yates - Prod.	N
Phillips - Santa Fe #91	860/N - 660/E	(A)	V. Glor - Prod.	N
Phillips - Santa Fe #92	2105/S - 1980/W	(K)	V. Glor - Prod.	N
Phillips - Santa Fe #95	990/N - 1980/E	(B)	V. Glor - Prod.	N
Phillips - Santa Fe #96	2180/N - 660/W	(E)	V. Glor - Prod.	N
Phillips - V.A.U. Tr. 6 #57	330/S - 1980/W	(N)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 9 #5	2310/N - 330/E	(H)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 11 #5	330/S - 1980/E	(O)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 11 #6	330/S - 660/E	(P)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 11 #7	1650/S - 660/E	(I)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 11 #8	1650/S - 1650/E	(J)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 12 #2	330/S - 990/W	(M)	V. Abo - Prod.	M

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
	Section 33, Township 17 South, Range 35 East (Continued)			
Shell - State "T" #3	990/S - 1980/E	(O)	V. GbSA - TA Prod.	Center of Lease
Shell - State "T" #9	2310/S - 660/E	(I)	V. Glor - TA Prod.	J
Shell - State "T" #10	2310/S - 1980/E	(J)	V. Glor - Prod.	J
	Section 34, Township 17 South, Range 35 East			
Chevron - State 6-34 #4	1980/S - 1980/E	(J)	V. SA - P&A	---
Chevron - State 7-34 #11	2310/S - 330/W	(L)	V. Glor - Prod.	K
Mobil - State M #5	660/N - 1888/W	(C)	V. Yates - Prod.	NW/4
Mobil - State M #6	660/N - 760/W	(D)	V. Yates - Prod.	NW/4
Mobil - State M #7	1889/N - 660/W	(E)	V. Yates - Prod.	NW/4
Mobil - State M #8	1986/N - 1889/W	(F)	V. Yates - Prod.	NW/4
Mobil - State M #13	330/N - 330/W	(D)	V. Glor - Prod.	NW/4
Mobil - State M #14	330/N - 1650/W	(C)	V. Glor - Prod.	NW/4
Mobil - State M #15	1980/N - 380/W	(E)	V. Glor - Prod.	NW/4
Phillips - E.V.U. Tr. 3440 #1	1980/S - 660/W	(L)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3440 #2	1980/S - 1980/W	(K)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3440 #3	990/S - 330/W	(M)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3440 #10	940/S - 1650/W	(N)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3440 #12	2310/S - 2310/E	(J)	V. GbSA - Prod.	K
Phillips - E.V.U. Tr. 3456 #1	660/N - 1980/W	(C)	V. GbSA - Prod.	D
Phillips - E.V.U. Tr. 3456 #2	660/N - 660/W	(D)	V. GbSA - Prod.	D
Phillips - E.V.U. Tr. 3456 #3	1980/N - 660/W	(E)	V. GbSA - Prod.	D
Phillips - E.V.U. Tr. 3456 #4	1980/N - 1980/W	(F)	V. GbSA - Prod.	D
Phillips - E.V.U. Tr. 3467 #18	660/N - 1980/E	(B)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 3467 #27	1980/N - 1980/E	(G)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 3467 #44	1650/N - 990/E	(H)	V. GbSA - Prod.	N
Phillips - E.V.U. Tr. 3467 #121	330/N - 990/E	(A)	V. GbSA - Prod.	N
Phillips - Santa Fe Btry 8 #24	660/N - 660/E	(A)	V. GbSA - Prod.	N
Phillips - Santa Fe #113	330/N - 2310/E	(B)	V. Yates - Prod.	B
Phillips - Santa Fe #127	1650/N - 2310/E	(G)	V. Yates - Prod.	N
Phillips - V.A.U. Tr. 6 #61	2080/N - 2080/E	(G)	V. Abo - TA Prod.	M
Phillips - V.A.U. Tr. 6 #64	760/N - 760/E	(A)	V. Abo - TA Prod.	M
Phillips - V.A.U. Tr. 13 #65	2310/S - 660/W	(B)	V. Abo - TA Prod.	M
Phillips - V.A.U. Tr. 6 #68	1735/N - 990/E	(H)	V. Abo - TA Prod.	M
Phillips - V.A.U. Tr. 8 #9	2316/N - 1980/W	(F)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 10 #10	2310/N - 990/W	(E)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 8 #11	990/N - 2310/W	(C)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 8 #12	990/N - 990/W	(D)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 8 #5	330/S - 330/W	(M)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 10 #6	1650/S - 330/W	(L)	V. Abo - Prod.	M

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
	Section 34, Township 17 South, Range 35 East (Continued)			
Phillips - V.A.U. Tr. 10 #7	1980/S - 1650/W	(K)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 10 #8	990/S - 1650/W	(N)	V. Abo - Prod.	M
Phillips - V.A.U. Tr. 10 #9	1980/S - 230/E	(J)	V. Abo - Prod.	M
	Section 35, Township 17 South, Range 35 East			
Cities Service - State BJ #1	2310/S - 990/E	(I)	V. Abo - Prod.	I
Cities Service - State BJ #2	2310/S - 1650/W	(K)	V. Abo - P&A	---
Cities Service - State BJ #3	990/S - 2310/E	(O)	V. Abo - Prod.	I
Mac Jones - State #2	990/N - 990/E	(A)	V. Abo - P&A	---
Phillips - Santa Fe #19	660/N - 1980/E	(B)	V. SA - P&A	---
Phillips - Santa Fe Btry 5 #40	660/N - 660/W	(D)	V. SA - Prod.	F
Phillips - Santa Fe #47	330/N - 1650/W	(C)	V. SA - P&A	---
Phillips - V.A.U. Btry 4 Tr. 6 #78	350/N - 350/W	(D)	V. Abo - TA Prod.	M[1]
Phillips - V.A.U. Btry 4 Tr. 6 #85	380/N - 1650/W	(C)	V. Abo - TA Prod.	M[1]
Rice Eng., - Vacuum SWD #F-35	1986/N - 1982/W	(F)	SWD - SWD	F[1]
Rice Eng. - Vacuum SWD #G-35	1986/N - 1982/E	(G)	SWD - SWD	G
Rice Eng. - Vacuum SWD #H-35	2310/N - 990/E	(H)	SWD - P&A	---
Don H. Wilson - State "BJ" #1	990/S - 330/W	(M)	V. GbSA - Prod.	K
	1 - Section 26, Township 17 South, Range 35 East			
	Section 36, Township 17 South, Range 35 East			
Gil-Mc Oil - State G-36 #1	1980/S - 660/W	(L)	V. GbSA - Prod.	L
Southwestern, Inc. - State VC #1	2051/S - 589/W	(L)	V. Abo - Prod.	L
Sunray Mid Cont. - N.M. St. "AC" #1	660/N - 1980/W	(C)	V. SA - P&A	---
T.P. Oil - State AB #1	1980/N - 660/W	(E)	V. Abo - P&A	---

Operator and Well Name	Location from Section Line (In Feet) and Unit Letter		Pool, Formation and Production Status	Battery Location
Section 1, Township 18 South, Range 35 East				
None				
Section 2, Township 18 South, Range 35 East				
Arco - Lea 946 St. #1	1980/N - 660/W	(E)	B. Abo - Prod.	E
Arco - Lea 946 St. #3	660/N - 1980/W	(C)	B. Abo - Prod.	E
Hanagan Petro. Corp. - Superior "A" State #1	1980/S - 660/W	(L)	B. Abo - P&A	---
Herb Hobson Co. - R. D. Lee #1	330/N - 2310/E	(B)	V. SA - P&A	---
V. H. Westbrook - Quebedeaux #1	330/N - 990/E	(A)	V. SA - P&A	---
H. E. Yates - Hanlad St. #1	1980/S - 1980/W	(K)	N. Reeves Qn - Prod.	K
Section 3, Township 18 South, Range 35 East				
Arco - Lea 946 St. #2	2301/N - 330/E	(H)	B. Abo - Prod.	E[1]
Energy Reserves Group, Inc. - Amoco St. #2	660/S - 660/W	(M)	B. Abo - Prod.	M[1]
Phillips - Santa Fe #114	2310/S - 330/E	(I)	B. Abo - P&A	---
Phillips - Santa Fe #116	1980/S - 1658/E	(J)	B. Abo - P&A	---
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #9	330/N - 660/W	(D)	V. Abo Reef - Prod.	F[2]
Section 4, Township 18 South, Range 35 East				
Phillips - Santa Fe Btry 2 #46	330/N - 1980/W	(C)	V. GbSA - P&A	---
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #2	1980/N - 660/W	(E)	V. Abo Reef - Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #3	660/N - 2080/W	(C)	V. Abo Reef - Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #6	330/N - 660/E	(A)	V. Abo Reef - Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #4	330/N - 1980/E	(B)	V. Abo Reef - Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #8	330/N - 990/W	(D)	V. Abo Reef - Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #11	1650/N - 1980/W	(F)	V. Abo Reef - Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #12	1650/N - 1980/E	(G)	V. Abo Reef - Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #14	1650/N - 660/E	(H)	V. Abo Reef - Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #15	2310/S - 660/W	(L)	V. Abo Reef - TA Prod.	F
Phillips - Vacuum Abo Unit Btry 2 Tr. 13 #18	2310/S - 1980/W	(K)	V. Abo Reef - Prod.	F
Phillips - E. Vacuum GB-SA Unit Tr. 434 #1	330/N - 2310/E	(B)	V. GbSA - Prod.	I[3]
Phillips - E. Vacuum GB-SA Unit Tr. 449 #39	660/N - 660/W	(D)	V. GbSA - Prod.	J[4]
Phillips - E. Vacuum GB-SA Unit Tr. 449 #115	330/N - 1650/W	(C)	V. GbSA - Prod.	I[3]
Phillips - E. Vacuum GB-SA Unit Tr. 449 #128	330/N - 330/W	(D)	V. GbSA - Prod.	I[3]
Standard Oil - Vac Edge Unit #1	760/S - 1980/E	(O)	V. Glor - P&A	---[3]

1 - Section 2, Township 18 South, Range 35 East
2 - Section 4, Township 18 South, Range 35 East
3 - Section 33, Township 17 South, Range 35 East
4 - Section 32, Township 17 South, Range 35 East

Appendix H

STATE ENGINEER'S WELL SCHEDULE

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 10-2 19 80 Record by GROSECLOSE & JONES

LOCATION: County LEA Map 180, 1.0

OWNER SOUTHWESTERN PUBLIC SERVICE CO.

DRILLER SCARBOROUGH Completed 8-24 19 80

TOPO SITUATION _____ SEO. Elev 3938.4

DEPTH 324 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: 59.87 ft rept meas 10-3 19 80 above (below)

TOP OF CASING

_____ which is 1.89 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 SW-1 Loc. No. 17.35.33.224113

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date 10 2 1980	60.00			59.87
Hour ____ AM (PM) Obs JCC/PT	0.13			1.89
Not POA ( ) POA ( )	59.87	59.87		57.98

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

Remarks MW-3 in MW-5 corr.

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 10-2 19 80 Record by GROSECLOSE & JONES

LOCATION: County LEA Map 180.1.D

OWNER SOUTHWESTERN PUBLIC SERVICE CO.

DRILLER SCARBOROUGH Completed 8-25 19 80

TOPO SITUATION _____ SED Elev 39.30.4

DEPTH 244 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: 56.12 ft rept (meas) 10-3 19 80 above (below)

TOP OF CASING

_____ which is 1.62 ft (above) below LS

PERMANENT RP is _____

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

REMARKS _____

AQUIFER(S): Tog

Well No. ___ on Photo _____ DPN _____

File No SW-2 Loc. No. 17.35.34.121412

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date 10 2 1930	55.00			56.12
Hour AM (PM) Obs JCC/RT	+1.12			1.62
Not POA ( ) POA ( )	54.12	56.12		54.50

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

Remarks MEAS WITH M-SCOPE

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 10-2 1980 Record by GROSECLOSE & JONES

LOCATION: County LEA Map 180.1.0

OWNER SOUTHWESTERN PUBLIC SERVICE CO.

DRILLER SCHARBOROUGH Completed 8-25 1980

TOPO SITUATION _____ SE/O Elev 3924.2

DEPTH 244 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: 51.08 ft rept (meas) 10-3 1980 above (below) _____

TOP OF CASING

_____ which is 1.55 ft (above) below LS

PERMANENT RP is _____

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

REMARKS _____

ADDRESS: T.J

Well No. ___ on Photo _____ DPN _____

File No SW-3 Loc. No. 17.35.34.22134/11

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below LS
	1st	2nd	3rd	
Date 10 2 1980	51.00			51.08
Hour ____ AM (PM) Obs JCG & RJ	+.08			1.55
Not POA ( ) POA ( )	51.08	51.08		49.53

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 10-2 1980 Record by GLORIECLDOC & JONES

LOCATION: County LEA Map 180.1.0

OWNER SOUTHWESTERN PUBLIC SERVICE Co.

DRILLER SCARBOROUGH Completed 9-8 1980

TOPO SITUATION _____ SEO Elev 3908.1

DEPTH 220 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: 47.88 ft rept (meas) 10-3 1980 above (below)

TOP OF CASING

_____ which is 1.78 ft (above) below LS

PERMANENT RP is _____

_____

_____

_____

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

REMARKS _____

AQUIFER(S): Tqs

Well No. ___ on Photo _____ DPN _____

File No SW-4 Loc. No. 17.35.35.34/3411

Remarks cont. _____

SKETCH:

INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below
	1st	2nd	3rd	LS
Date 10 - 2, 19 80	50.00			47.88
Hour ____ (AM) (PM) Obs TG/KT	2.12			1.78
Not POA ( ) POA ( )	47.88	47.88		46.10

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

Remarks MEAS. WITH M-SCOPE

FE-1 State of New Mexico
State Engineer

WELL SCHEDULE

Source of data: Obser ☒ Owner ☐ Other _____

Date 10-2 1980 Record by GROSECLOSE & JONES

LOCATION: County LEA Map 180.L.O

OWNER SOUTHWESTERN PUBLIC SERVICE CO.

DRILLER SHARBOROUGH Completed T-8 1950

TOPO SITUATION _____ SEO. Elev 3930.0

DEPTH 244 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: 58.91 ft rept (meas) 10-3 1980 above (below)

TOP OF CASING

_____ which is 1.70 ft (above) below LS

PERMANENT RP is _____

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

REMARKS _____

AQUIFER(S) Tog

Well No. ___ on Photo _____ DPN _____

File No SW-5 Loc. No. 17.35.34.332 17.11

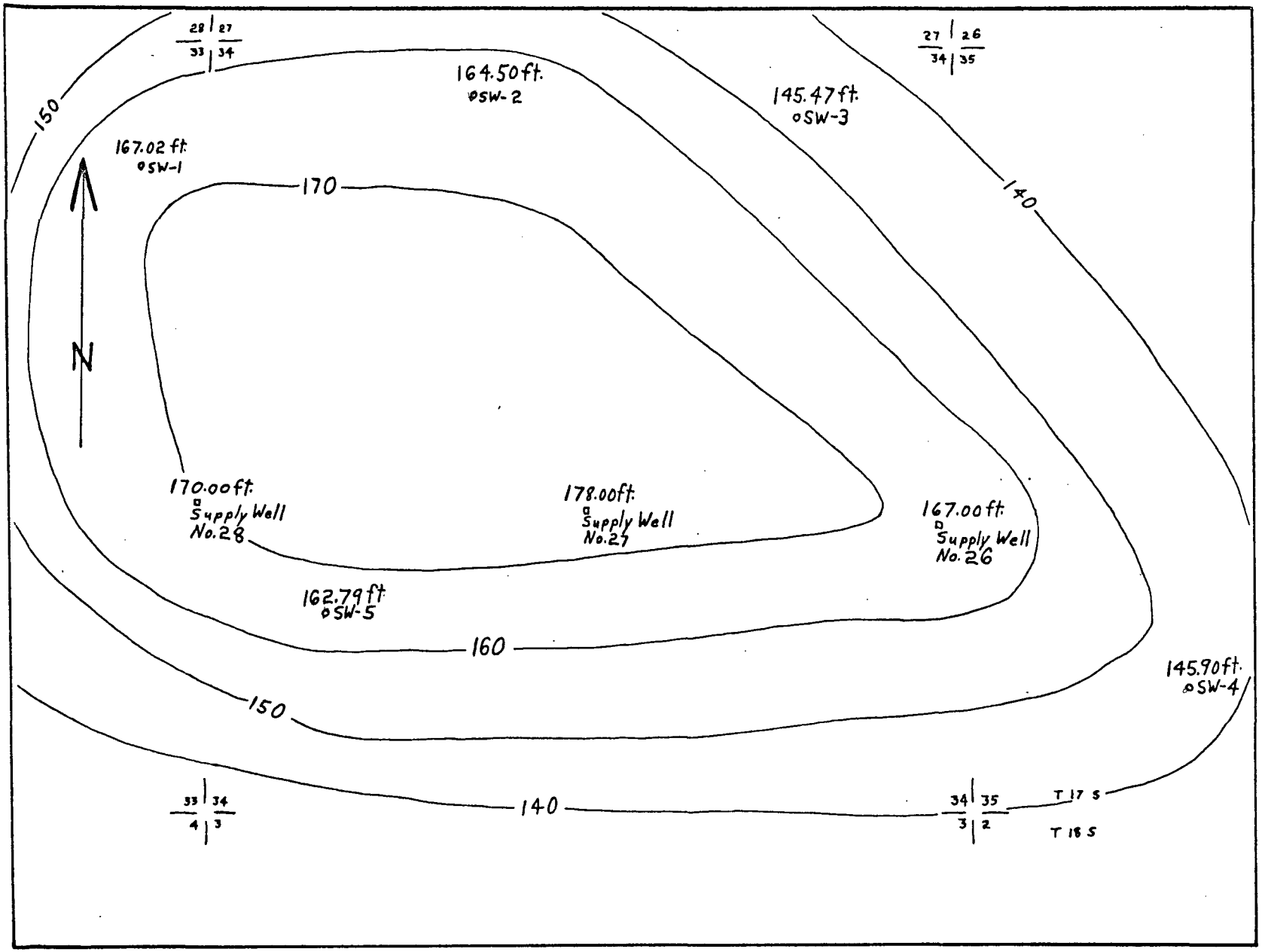
Remarks cont. _____

SKETCH:

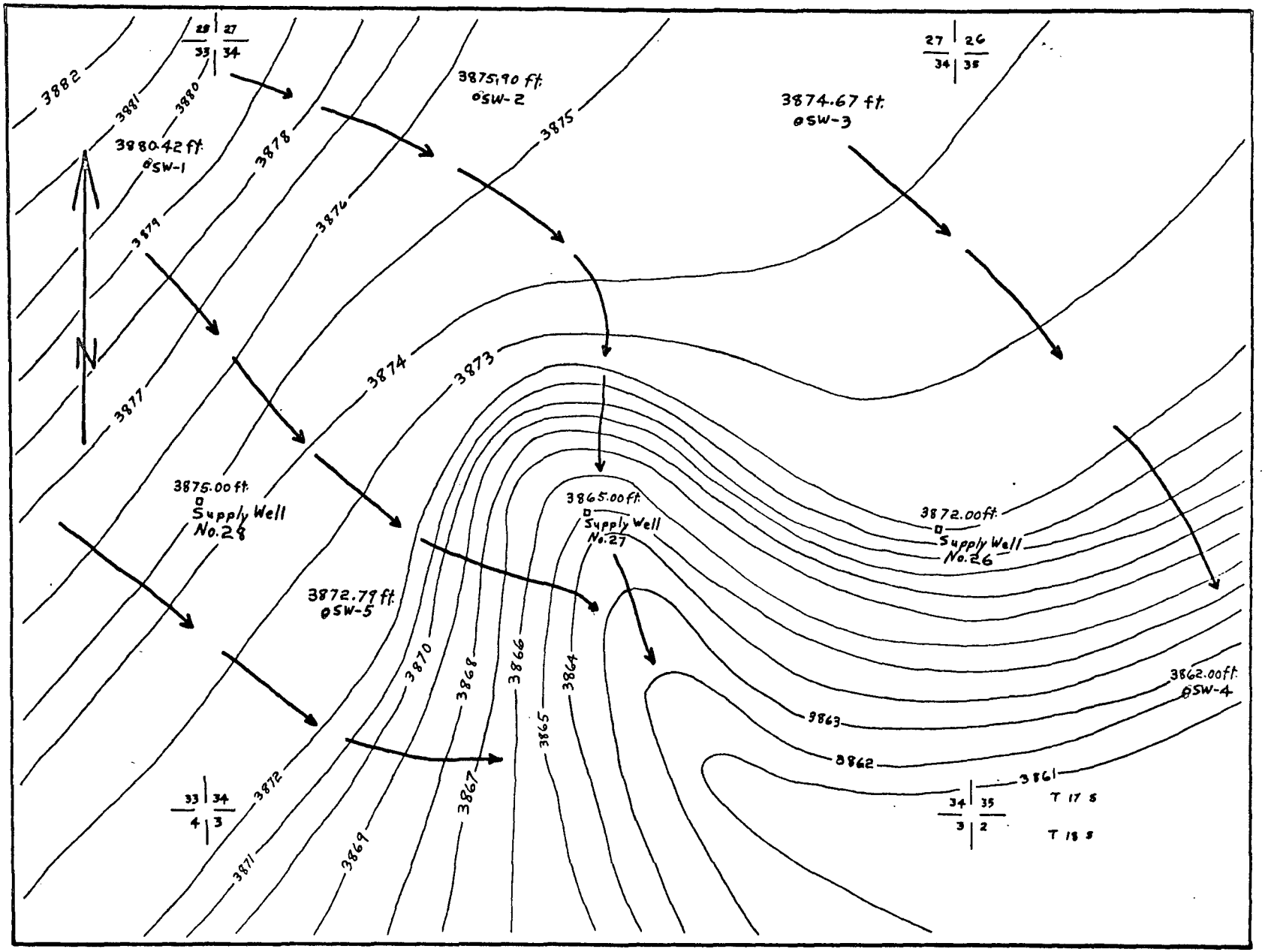
INITIAL WATER-LEVEL MEASUREMENT	DEPTH TO WATER			
	Below MP			Below
	1st	2nd	3rd	LS
Date 10 2 19 80	60.00			58.91
Hour ____ AM (PM) Obs 1451 PJ	1.09			1.70
Not POA ( ) POA ( )	58.91	58.91		57.21

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

Remarks MEAS. WITH M-SCOPE



MAP 1 SOUTHWESTERN PUBLIC SERVICE CO. WATER PROBLEM AREA
WATER SATURATION MAP (IN FEET)



MAP 2 SOUTHWESTERN PUBLIC SERVICE CO. WATER PROBLEM AREA

GROUND WATER FLOW MAP

WATER LEVEL MEASUREMENTS IN FEET FROM SEA LEVEL

SOUTHWESTERN PUBLIC SERVICE CO.

Hobbs, New Mexico

WATER CONTAMINATION PROBLEM

Oil Conservation Division

Hobbs New Mexico

John W. Runyan - Geologist

December 1, 1979

GENERAL

The Southwestern Public Service Co. first became aware that their water source well #26, located in the NW/4 of SW/4 section 35 - Township 17 South - Range 35 East, was becoming contaminated with chlorides in 1975.

The S.W.P.S. first contact with the Oil Conservation Division was with the Santa Fe office about mid 1977, and as a result, in March 1977, a Casing leak survey was run on all S.W.D. wells in the Vacuum Field area. All nine SWD in area were found to be in good Shape. (copy report inc this report). In may 1978 there was an additional exchange of letters with this office, which resulted in a series of water analysis and the gathering of data for this report.

Originally water source well #26 was reported to have reached a maximum of 300 PPm Chlorides during a pumping test to determine how high the chloride content would go, since this date water source wells #25, 27 and 28 have developed some degree of contamination, based on 35 PPm chlorides as the natural salt content of the ogallala for this

immediate area.

S.W.P.S. reported that they found well #26 as becoming cominated 4 years ago, wells #s 27 and 28 becoming contaminated 3 years ago and well #25 about one year ago. Recent 48 hour pumping test and 48 hour shut-in tests show that all four water source wells have changed from their original status, wells 25 and 26 have had a drop in chloride content, while wells Nos. 27 and 28 have slight increases in chloride content. Wells #25, 27 & 28 are all below 80 ppm chlorides at this time.

300 ppm chlorides is low by EPA standards but for cooling tower water this amount of chlorides apparently is a problem.

AREA STUDY

Geology / Hydrology:- The ogallala formation in the immediate area of study is approximately 180 feet thick and has a water saturation thickness of 130 to 145 feet, with the water level at 60 to 65 feet from surface. The aquafer consists of a medium fine brown sand. The average draw down of the four S.W.P.S wells (#25, 26, 27 & 28) is 21 gals/min per foot at a rate of 750 G.P.M. discharge, based on 48 hour pumping tests.

In very local areas the base of the ogallala apparently does not carry water even though gravel is present in some areas, there is a brown sandy clay layer which overlies the gravel (where present) and acts as a berrier for recharge of the lower zone (Refer to lithlogic crossection).

Formation dip is from NW to SE at a gradient of 19 feet to the mile, based on Triassic "redbed" structure map.

The base of the Ogallala formation - top of Triassic "Redbed" is an erosional surface consisting of bright red clay, this clay is an impervious barrier which prevents ogallala

water from migrating down into the Triassic formation, and it's surface structure basically controls the direction in which the water in the ogallala moves.

The S.W.P.S. water source wells Nos. 25, 26, 27 and 28 are located, in relation to Triassic surface, on the south slope of a small nosing high and on the north slope of a barried drainage channel. This channel dips from the NW to SE and ~~would~~ basically controls the direction of water flow past these four water wells. Due to the structure of area, the source of chloride contamination would have had to originate northwest of these four water wells and the contamination would be confined to a narrow width as it moves to the Southeast.

CHLORIDE ANALYSIS:- The available history on the chloride content of S.W.P.S. water wells Nos. 25, 26, 27 and 28 indicates that peak contamination was reached in 1976. well 26 reached 300 PPM chlorides in 1976, in 1977 a peak of 157 PPM was recorded, and in 1979 a peak of 106 PPM; well 25 has also dropped

in chloride content. Wells Nos. 27 and 28 have both increased very slightly in the past four years, for a total of +6 ppm and +10 ppm respectively, this increase is so small that it is insignificant at this time. Wells Nos 25, 27 and 28 all contain less than 80 ppm chlorides at this time (Refer to chloride data sheet).

Inorder for these four water wells to reach peak chloride content it is necessary to pump them continuous for two to six days, then when pumping ceases the chlorides rapidly drop back to low values, this strongly indicates that the bulk of the original mass of contamination has passed by these wells and that prolonged pumping brings up residual chlorides deposited at the base of the aquifer when ~~the bulk~~ the contamination passed through the area. Also, the drop in chlorides in well 26 from 300 ppm to 106 ppm, in four years, indicates that the residual chlorides are being slowly flushed out by freshwater and that the contamination should be minimized within the next three to five years.

POOLS and PITS:- The S.W.P.S. Water Source wells Nos. 25, 26, 27 and 28 are located on the southeastern edge, just inside, the Vacuum-Grayburg, San Andres Pool, and this immediate area is in the Phillips-East Vacuum GbSA Unit waterflood. As of this date there hasn't been any injection of water in the unit.

In 1977 a casing leak survey was run on all Salt Water Disposal wells in the Vacuum-Gb, SA Pool, and all nine wells were found to be in good shape.

Due to the nature of the water contamination there is a strong indication that a pit or pits were the source of the contamination, and that only small amounts of brine water ever reached the fresh water aquefer, and that source has long been stopped due to the O.C.D. No pit order of Nov. 1967.

RESULTS of STUDY

(1) With the data available - The source of contamination was probably caused by brine water being put into a pit or pits, then the brine perculated down into the fresh water aquater.

(2) Apparently the main bulk of the Contaminated water has passed by the water source wells in question and only residual chlorides remain deposited on bottom of aquater.

(3) That the remaining residule chlorides are being diluted and flushed from the area by incoming fresh waters and the water around water well should be usable in 3-5 years.

Recomendations

(1) That water test well drilling should not be used unless there is a large unexpected increase in chlorides in these wells. (Test well drilling probably would not) (yield any useable results with chlorides) (being as low as they are.)

(2) S.W.P.S. Water source wells Nos 25, 26, 27 and 28 should be monitored every six months, by taking water samples before pumping, Then take samples after pumping wells for Minimum of 3 days. And compare results with existing analysis to determine nature of existing chlorides

Appendix

WATER ANALYSIS

Southwestern Public Service

All values in P.P.M. Chlorides

Well #26

9-14-76	40		9-29-76	135	
9-16-76	100		10-8-76	44	
9-17-76	110	(+95) (6 days)	10-11-76	125	(+84 6 days)
9-20-76	157		10-13-76	126	
9-23-76	112		10-14-76	128	

well #26 was Reported to have reached a high of 300 ppm Cl.

Date:	Wells:	#25	#26	#27	#28	
March 23, 1976		54.0	56.0	62.0	58.0	static
9-12-79	OCD	35.5	106.5	71.0	67.5	After pumping for 48 hours
	SWPS	35.0	100.0	72.0	60.0	
9-14-79	OCD	78.1	78.1	71.0	56.8	wells shut-in 24 hours after pumping.
	SWPS	71.0	62.0	68.0	48.0	

CHANGES IN CHLORIDE VALUES

Change from 3-76 SI. 1979	OCD	+24.1	+22.1	+ 9.0	−1.2
	SWPS	+17.0	+ 6.0	+ 6.0	−10.0
Change from 3-76 pumped 1979	OCD	−19.5	+50.5	+9.0	+9.5
	SWPS	−19.0	+44.0	+10.0	+2.0
Change from 1979 shut-in to SI 1979	OCD	−42.6	+ 28.4	± 0.0	+10.7
	S.W.P.S.	−36.0	+ 38.0	+ 4.0	+12.0

WATER ANALYSIS

Southwestern Public Service

All values in P.P.M. Chlorides

Well #26

9-14-76	40		9-29-76	135	
9-16-76	100		10-8-76	44	
9-17-76	110	(+95) (6 days)	10-11-76	125	(+84 6 days)
9-20-76	157		10-13-76	126	
9-23-76	112		10-14-76	128	

well #26 was Reported to have reached a high of 300 P.P.M.

Date:	Wells:	#25	#26	#27	#28	
March 23, 1976		54.0	56.0	62.0	58.0	static
9-12-79	OCD	35.5	106.5	71.0	67.5	After Pumping for 48 hours
	SWPS	35.0	100.0	72.0	60.0	
9-14-79	OCD	78.1	78.1	71.0	56.8	wells shut-in 24 hours after pumping.
	SWPS	71.0	62.0	68.0	48.0	

CHANGES IN CHLORIDE VALUES

Change from 3-76 SI. 1979	OCD	±24.1	+22.1	+ 9.0	−1.2
	SWPS	+17.0	+ 6.0	+ 6.0	−10.0
Change from 3-76 Pumped 1979	OCD	−19.5	+50.5	+9.0	+9.5
	SWPS	−19.0	+44.0	+10.0	+2.0
Change from 1979 Pumped to SI 1979	OCD	−42.6	+ 28.4	± 0.0	+10.7
	S.W.P.S.	−36.0	+ 38.0	+ 4.0	+12.0

SOUTHWESTERN PUBLIC SERVICE

WATER WELL DATA

Well # 25; — 17.35.36.42311 — 12¾" casing set at 214'(TD), perforated from 74' to 194'; 6" suction pipe set at 169'. Turbine motor. 72 hour test - drawdown from 51' (water level) to 90'. Average 19 gal/min/foot. Average discharge 750 gal/min. Elev. 3841' GL Triassic "Red bed" at 208'. per foot.

Well # 26: — 17.35.35.31131 — 12¾" casing set at 220'(TD), perforated from 80' to 200', 6" suction pipe set at 169'. Turbine motor. 48 hour test - drawdown from 48' (water level) to 88', average 19 gal/min per foot. - average discharge 750 G.P.M. Elev. 3915' GL, Triassic "Redbed" at 215'

Well # 27: — 17.35.34.411331 — 12¾" casing set at 234'(TD) perforated from 114' to 234', 6" suction pipe set at 169'. Turbine motor. 48 hour test - drawdown from 51' (water level) to 80', Average 26 gal/min per foot. average discharge 750 G.P.M. Elev. 3926' GL. Triassic "Redbed" 229'

Well # 28: — 17.35.33.42244 — 12¾" casing set at 234'(TD) perforated from 114' to 234', 6" suction pipe set at 169'. Turbine motor. 48 hour test - drawdown from 60' (water level) to 103', Average 18 gal/min/ft. Average discharge 750 gal/min. Elev. 3935' GL Triassic "Redbed" 230'

Refer to Crossection for well completions in relation to