THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 5—No. 8 "THERE IS NO SUBSTITUTE FOR WATER" *January 1959*

THREE DIRECTORS AND TWENTY-SIX COMMITTEEMEN ELECTED JAN. 13th

The annual election of Directors and County Committeemen for the High Plains Underground Water Conservation District was held January 13. Three Directors were elected and two Committeemen for each county were elected.

In District Precinct No. 1, consisting of Lubbock and Lynn Counties, Elmer Blankenship of Wilson was re-elected to continue serving on the five-man Board of Directors. He was elected to serve a two-year term of office. Mr. Blankenship is currently Vice President of the Board.

In District Precinct No. 3, which consists of Bailey, Castro and Parmer Counties, John Gammon of Lazbuddie, in Parmer County, was elected to replace A. H. Daricek of Maple, in Bailey County, on the Board of Directors. Mr. Gammon is presently chairman of the Parmer County Committee.

In District Precinct No. 4, consisting of Armstrong, Deaf Smith, Potter and Randall Counties, T. L. Sparkman, Jr. of Hereford was elected to replace Virgil E. Dodson, also of Hereford, on the Board of Directors. Mr. Dodson currently is President of the Board.

Two Committeemen were elected in each of the thirteen counties that comprise the High Plains Water District. Each was elected to serve a term of office of three years.

A list by counties of Committeemen elected follows:

ARMSTRONG COUNTY
County Commissioner's Precinct No. 3
Robert Adams
John Patterson

BAILEY COUNTY
County Commissioner's Precinct No. 1
Robert Blackwood
County Commissioner's Precinct No. 3
Doyle Davis

CASTRO COUNTY
County Commissioner's Precinct No. 3
Ernest Jones
County Commissioner's Precinct No. 4
Fred Annen

COCHRAN COUNTY
Committeeman-at-Large
Lloyd Miller
County Commissioner's Precinct No. 2
L. L. Taylor

DEAF SMITH COUNTY
County Commissioner's Precinct No. 3
Clinton Jackson
County Commissioner's Precinct No. 4
Jack Higgins

FLOYD COUNTY
County Commissioner's Precinct No. 1
Ernest Lee Thomas
County Commissioner's Precinct No. 3
Don Probasco

HOCKLEY COUNTY
County Commissioner's Precinct No. 1
Joe W. Cook
County Commissioner's Precinct No. 2
Earl G. Miller

LAMB COUNTY
Committeeman-at-Large
J. B. Davis
County Commissioner's Precinct No. 2
Price Hamilton

LUBBOCK COUNTY
County Commissioner's Precinct No. 1
W. W. Allen
County Commissioner's Precinct No. 4
Jack Noblett

LYNN COUNTY
County Commissioner's Precinct No. 1
Weldon Bailey
County Commissioner's Precinct No. 4
Robbie Gill

PARMER COUNTY
County Commissioner's Precinct No. 1
Dick Rockey
County Commissioner's Precinct No. 2
Carl Schlenker

POTTER COUNTY
County Commissioner's Precinct No. 4
James S. Line
E. L. Milhoan

RANDALL COUNTY
County Commissioner's Precinct No. 3
Jackie Meeks
County Commissioner's Precinct No 4
A. C. Evers

Chemicals Conference To Be Held At Tech February 11-12

The sixth annual Agricultural Chemicals Conference will be held February 11 and 12 in the Union Building at Texas Tech College in Lubbock.

The conference is jointly sponsored by Texas Technological College, Texas A & M College, West Texas Chamber of Commerce and the Lubbock Chamber of Commerce.

The 1959 Conference theme is, "The Place of Chemicals in West Texas Agriculture".

Many outstanding authorities will speak on various phases of the farm chemicals field during the two-day session. Among these will be W. L. Broadhurst, Chief Hydrologist for the High Plains Underground Water Conservation District. His topic will be "Economics of the Uses of High Plains Water."

Conference registration will begin February 11 at 8:30 a.m. and a $3.00 fee will be charged. The public is invited to attend.

AMENDMENTS TO STATE WATER DEVELOPMENT PROGRAM PROPOSED

An amendment to the bill which created the Texas Water Development Board has been drafted, and it will soon be presented to the State Legislature. The proposed amendment will ask the Texas law-makers to give the Board authority to sell State bonds in minimum lump amounts of $15 million. The sale of relatively large issues of bonds at one time will, according to bond experts, make the bonds more attractive to syndicate buyers, consequently, they likely will sell at a lower rate of interest. Cost of issuing and handling bonds would also be lessened. Funds, from bond sales, not immediately needed for making loans would be invested in government securities and the State would receive interest approximating the interest rate paid on the bonds.

Two other amendments have been discussed. Each has been proposed to improve the Water Development Board's service to Texas.

The first would give the Board authority to make loans for the development and use of underground water by Texas municipalities. The law now allows the Board to loan money only for the development and use of surface water.

The other amendment under discussion would change the law to give the

(Continued on Page 4)

Three area men have been elected to serve two-year terms of office on the Board of Directors of the High Plains Underground Water Conservation District. The new directors are pictured above. They are, left to right, Elmer Blankenship, Wilson, representing Lubbock and Lynn Counties; John Gammon, Lazbuddie, representing Bailey, Castro and Parmer Counties; and T. L. Sparkman, Jr., Hereford, representing Armstrong, Deaf Smith, Potter and Randall Counties.

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ALLAN WHITE
Editor

WHAT HAPPENS TO SEDIMENTS IN P

There are 95 multiple-purpose wells designed for irrigation and recharge in the South Plains of Texas, some of which have been operating for a period of 10 years[3]. The question of sediments entering a recharge well and sediments pumped during the pumping cycle frequently has been raised. The results of a preliminary study made in 1957 by the senior author on the recharge well installed at the intersection of Farm Roads 54 and 400, about 20 miles northeast of Lubbock, Texas, indicated that 75 percent or more of the silt sediments (0.5 - 0.005 mm.) entering the well during a 23-hour recharge period was removed during a 1-hour pumping cycle, that immediately followed the recharge period, whereas only 7 percent of the clay (smaller than 0.005 mm.) was removed. A preliminary recharge and pumping cycle was made at the Moreland recharge well near Levelland, Hockley County, Texas, on May 15, 1958, when a total of 215,000 gallons were recharged. Samples taken by the High Plains Water Conservation District and analyzed at Bushland indicated that only 11 percent of the clay material that entered the well was removed during the pumping cycle. Construction details for this well are described in the June 1958 issue of *The Cross Section.*

On October 1 and 2, 1958, 581,700 gallons were recharged at the Moreland recharge well. Sediment samples were taken of the lake water and of the water pumped during the 1-hour pumping cycle following the recharge period. Analyses of these samples, using the pipette procedure[4], indicated a very similar trend in quantity of clay sediments entering and pumped from the multiple-purpose well. Results of the sediment measurements that were made during the recharge period and pumping cycle are presented in the accompanying charts. The sediment sampler, which was built for collecting samples of sediments in the water pumped from the well, is shown in figure 1. The flow meter, pump, and all other necessary equipment were supplied by the land owner and the Water District and were operated by W. L. Broadhurst and Y. F. Snodgrass. The quantity of water entering the well with respect to time is shown in figure 2. The gate valve controlling water from the lake was adjusted to allow approximately 650 gallons per minute to enter the well during the day. This rate of flow gallons per minute to permit recharge operations to continue during the night without completely draining the lake. The total quantity of water entering the well during 22 hours was 581,700 gallons or 1.8 acre-feet of water.

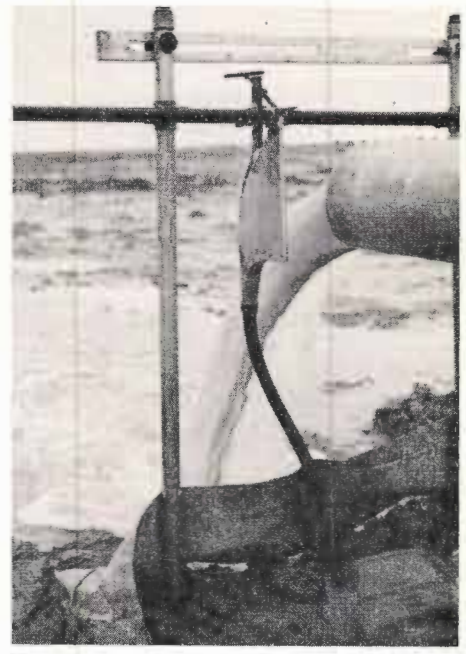
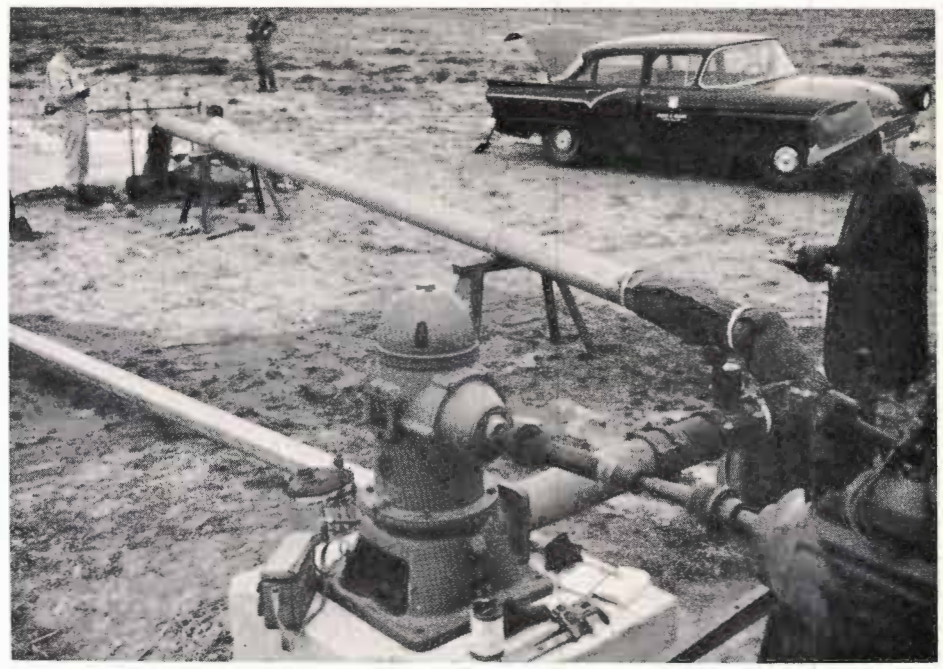


Figure 1—Sampler for obtaining sediment samples of water pumped from recharge wells during the pumping cycle.



Pictured, in the foreground above, is the Moreland recharge well. You will note the sampling device installed at the discharge end of the aluminum pipe. Also, note the flow-meter installed in the discharge line near the pump base.

The quantity of sand pumped from the well during the pumping cycle was similar to the quantity pumped from the other recharge well and represents the greater proportion of sediments pumped from the well. However, since there was practically no sand in the playa lake water, the sand pumped from the well must come from the underground strata. The total quantity of sand pumped during the 1-hour was adjusted to approximately 290

LAYA LAKE WATER WHEN USED FOR UNDERGROUND RECHARGE IN WELLS[1]

By M. E. JENSEN and W. CLYMA[2]

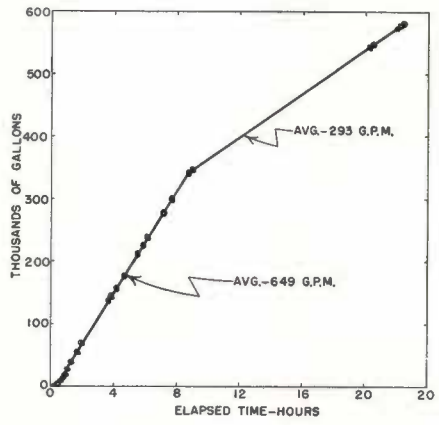


Figure 2—Accumulated water recharged. Moreland Lake, October 1 and 2, 1958.

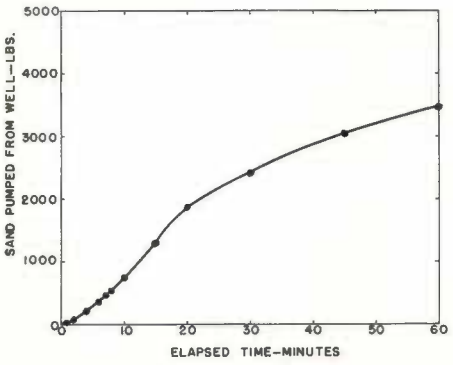


Figure 3 — Sand pumped from well during 1-hour pumping cycle. Moreland Lake, October 1 and 2, 1958.

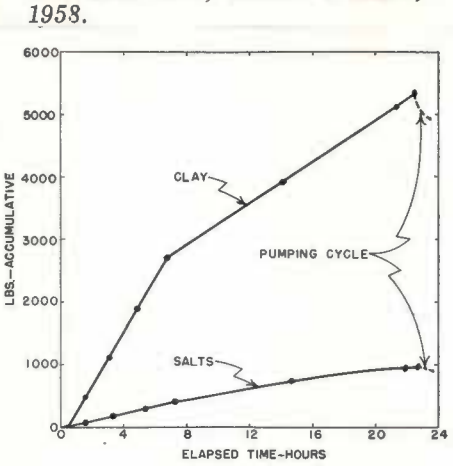


Figure 4—Quantity of clay and salts pumped during pumping cycle. Moreland Lake, October 1 and 2, 1958.

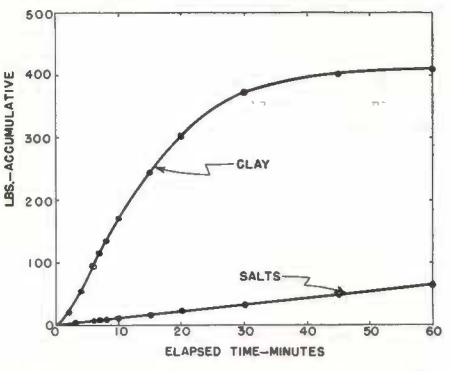


Figure 5—Quantity of clay and salts drained into the well during recharge, compared to the amounts removed during the pumping cycle. Moreland Lake, October 1 and 2, 1958.

period was 3,473 pounds, figure 3. Laboratory analyses of the sediment samples indicated that the quantity of silt entering the well represents only a small proportion of the total sediments. Therefore, only the quantity of clay or fine sediments entering the well and pumped from the well are shown in this report. The total quantity of clay sediments entering the well during the 22-hour recharge period was 5,471 pounds, figure 4. The quantity of clay removed during the pumping cycle is shown in figure 5. From figure 5 it is obvious that very little clay was removed after the first 30 minutes of pumping. Pumping from 30 to 60 minutes results largely in the removal of sand from the water-bearing formation. The percentage of clay removed during the 1-hour pumping cycle was 7.5 percent leaving 92.5 percent of the clay remaining in the water-bearing formation.

The concentration of salt and clay in the water pumped from the recharge well during the pumping cycle is shown in figure 6. The concentration of clay was greatest 4 to 8 minutes after the pumping cycle began. The

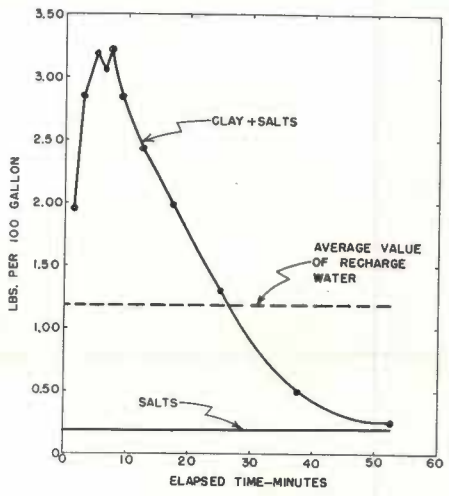


Figure 6—Concentrations of clay and salts in water pumped during the pumping cycle compared to the concentrations in recharge water. Moreland Lake, October 1 and 2, 1958.

quantity of clay in the water pumped from the well decreases with time and is approximately equal to the sediments in the lake water after 27 minutes of pumping. Adidtional pumping removes less clay per gallon than the lake water originally contained. After one hour of pumping the concentration of sediments in the water is considerably less than the recharge water. The pump was operated at a constant rate during the pumping cycle: If the well could have been surged during the pumping cycle, perhaps a larger portion of the clay sediments might have been removed. The total salt content of the lake water was similar to the total salt content of the underground water. Analysis of two lake water samples showed the following average concentrations of cations:

Cation	*Parts per millon*
Sodium	4.8
Potassium	11.8
Calcium	0.5

Detail pumping and recharge data are presented in tables 1 and 2.

The concentration of clay sediments in the Moreland lake was greater than that found in other lakes. The density of vegetation in a lake, wind velocity, and quantity of rainfall runoff will effect the concentration of sediments in the water. There was very little vegetation in the Moreland lake and very little surrounding the lake. The quantity of runoff water in the lake was relatively small when considering the watershed area was over 400 acres.

Present plans at the Southwestern Great Plains Field Station, Bushland, Texas, call for studying the quantity of sediments removed from multiple-purpose wells during the first irrigation period following a recharge period and the effect of sediments on the yield per foot of drawdown. There is a possibility that considerably more clay may be removed from the water-bearing sand as the well is used for irrigation. These measurements will be made when opportunity permits.

The results from the experiment conducted at the Moreland recharge well indicate that after long periods of recharge, the quantity of sediments entering the well and remaining in the water-bearing strata may become a serious problem in individual wells. No measurements have been made to determine the distance the sediments have travelled in the sand. It is quite probable that a multiple-purpose recharge well can be used for a number of years before accumulation of sediments will affect the recharge and pumping rate. When such a situation developes a new well may need to be installed some distance from the old recharge well. As reported by W. L. Broadhurst in the July 1957 issue of

(Continued on Page 4)

The authors, W. Clyma and M. E. Jensen, are shown, left to right, as they operate the sampling device. The sampler when pushed horizontally through the discharge stream allows a cross-section of the water to enter and drain through a rubber hose to a bottle used to contain the sample.

Table 1—Recharge data for Moreland recharge well, Hockley County, Texas, October 1 and 2, 1958.

Sample No.	Time	Gallons Per Interval	Lbs. Per 100 Gals. Sand	Lbs. Per 100 Gals. Clay	Lbs—Accumulative Sand	Lbs—Accumulative Clay
1	9:37 a.m.	1,950	0.00142	1.11	0.03	22
2 & 3	10:35 a.m.	43,754	0.00570	1.04	2.52	475
4 & 5	11:48 a.m.	57,331	0.00499	1.11	5.38	1,112
6 & 7	1:35 p.m.	74,765	0.00148	1.00	6.49	1,862
8	3:25 p.m.	74,675	0.00102	1.09	7.25	2,678
9 & 10	5:20 p.m.	181,550	0.00056	0.76	8.27	4,063
11 & 12	6:10 a.m.	121,714	0.00163	0.94	10.31	5,243
13	7:50 a.m.	21,961	0.00351	1.04	11.08	5,470
Total		581,700				

Table 2—Pumping cycle data for Moreland recharge well, Hockley County, Texas, October 2, 1958.

Sample No.	Time From Start—Min.	Gallons Per Interval	Lbs. Per 100 G. Sand	Lbs. Per 100 G. Clay	Lbs.—Acc. Sand	Lbs.—Acc. Clay	Perctg Of Clay Rmvd
14	1— 2	1,100	8.12	1.91	89	21	0.4
15	2— 4	1,370	10.38	2.67	232	58	1.1
16	4— 6	1,340	10.42	2.99	371	98	1.8
17	6— 7	680	14.29	2.88	468	117	2.1
18	7— 8	670	12.78	3.05	554	138	2.5
19	8—10	1,340	15.10	2.66	756	173	3.2
20	10—15	3,210	17.32	2.30	1,312	247	4.5
21	15—20	3,170	17.63	1.80	1,871	304	5.6
22	20—30	6,400	8.62	1.13	2,423	377	6.9
23	30—45	8,700	7.25	0.32	3,053	404	7.4
24	45—60	8,320	5.04	0.08	3,473	412	7.5
Total		36,300					

CONSERVATION CONVERSATION

Water levels in southern High Plains observation wells are currently being measured jointly by the U.S. Geological Survey and the High Plains Underground Water District. These measurements will be published by the District as soon as clearance is obtained from the U.S. Geological Survey.

Well owners who would like to have the static level of water in their wells measured each year, by the Survey, should contact Mr. R. W. Sundstrom, 807 Brazos Street, Austin 14, Texas.

* * * * *

The Lubbock Experiment Station and the High Plains Underground Water District are organizing plans to cooperate with one another in a program of water efficiency tests during the coming crop season.

Among the topics which probably will receive research time are, efficiency of alternate-furrow irrigation; factors which affect moisture penetration; and open-ditch water losses.

* * * * *

During the past 18 years, use of ground water in Texas has increased 20 times, according to R. L. Nace, Associate Chief hydrologist of the Department of Interior.

He stated in a speech presented to the American Association for the Advancement of Science in Washington, D. C. that about 83 percent of the ground water used in Texas annually is for irrigation, 7 percent for industry, 6 percent for municipal purposes and 4 percent for rural domestic and stock supplies.

According to Mr. Nace, ground water is the sole source of supply for nearly 600 towns and cities in Texas. Included in this list are: Amarillo, Lubbock, Midland, Odessa, Galveston, San Antonio, Baytown, Denton, and Sherman. Until recent years, Houston, El Paso, Texarkana and Brownsville also depended completely on ground water and still get a majority of their water from this source.

* * * * *

The Lubbock Agricultural Experiment Station is presently accepting bids for purchase of their research station.

According to C. E. Fisher, station Superintendent, the present location is being surrounded by City of Lubbock businesses and residences. This fact coupled with other considerations has prompted the decision to sell the present land and acquire new facilities consisting of more acreage.

Station officials are hopeful that adequate new facilities can be located in Lubbock County, at a price in line with their land budget.

Amendments—

(Continued from Page 1)

Water Development Board authority to make loans in amounts which could exceed the present maximum of one-third of a propect's total cost.

Well Drilling Statistics For December

During the month of December, 47 new wells were drilled and registered with the District office; 4 replacement wells were drilled; and 9 wells were drilled that were either dry or non-productive for other reasons. 207 permits were issued by the County Committees. The permits issued and completed wells follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Old Wells Deepened*	*Dry Holes Drilled*
Armstrong	4	2	0	0	2
Bailey	1	0	0	0	0
Castro	18	8	1	0	0
Cochran	11	0	0	0	0
Deaf Smith	4	3	0	0	2
Floyd	23	5	1	0	0
Hockley	54	8	2	0	3
Lamb	25	4	0	0	1
Lubbock	31	6	0	0	0
Lynn	18	1	0	0	0
Parmer	16	7	0	0	1
Potter	0	0	0	0	0
Randall	2	3	0	0	0

Well Drilling Statistics For 1958

Well drilling activity, within the High Plains Water District, decreased rather sharply during 1958. The reason for the reduction in numbers of wells drilled—879 in 1958, as compared with 2319, the number drilled in 1957, probably can be attributed to several factors.

The first of these contributing factors was more than likely simple economics of southern High Plains agriculture. The area's cotton harvest in the fall of 1957 was comparatively short and, due to poor grades, prices were low. Secondly, above normal rainfall in the winter and spring of 1958 decreased the need for irrigation. Thirdly, a general unrest, due to a slight recession in 1958, created a cautious attitude toward financial expenditures.

The yearly well drilling records of 1958 are shown below by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Old Wells Deepened*	*Dry Holes Drilled*	*Total For 1958*
Armstrong	4	2	0	0	2	4
Bailey	57	45	12	0	2	59
Castro	97	68	15	1	2	86
Cochran	36	29	1	0	3	33
Deaf Smith	118	85	17	0	4	106
Floyd	103	61	8	0	1	70
Hockley	232	110	12	0	17	139
Lamb	114	74	5	0	2	81
Lubbock	179	104	9	0	8	121
Lynn	68	29	0	0	10	39
Parmer	102	75	27	0	7	109
Potter	3	1	0	0	1	2
Randall	28	27	2	0	1	30
TOTALS	1141	710	108	1	60	879

Recharge Water—

(Continued from Page 3)

The Cross Section, a recharge well may recharge sufficient water to more than pay for the cost of the well in one or two years as well as prolong the supply of water for irrigation in the High Plains.

Studies are currently underway at the Southwestern Great Plains Field Station at Bushland to develop an economical filter that can be used with multiple-purpose w e l l s. Preliminary studies indicate that practically all the sediments can be removed when using a flocculating agent and a sand filter. Further study and development are needed to complete the sand filter. The use of a filter with multiple-purpose wells should alleviate the sediment problem when using playa lake water for recharge purposes or for irrigation.

(1) Contribution from the Soil and Water Conservation Research Division, Agricultural Research Service, U. S. Department of Agriculture, High Plains Underground Water Conservation District No 1, and Texas Agricultural Experiment Station cooperating.

(2)Agricultural Engineers, Western Soil & Water Management Research Branch, Soil and Water Conservation Research Division, Agricultural Research Service, U. S. Department of Agriculture, Bushland, Texas.

(3) Sherrill, D. W. High Plains Irrigation Survey, 1958.

(4) Kilmer, V. J. and Alexander, L. T. Methods of Making Mechanical Analysis of Soils. Soil Science Vol. 68, No. 1, pp. 15-24. 1949.

EDITOR
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ENGINEER ASSIGNED TO LUBBOCK BY STATE BOARD OF WATER ENGINEERS

The State Board of Water Engineers has established a field office in Lubbock, Texas. Their office is located in the High Plains Underground Water Conservation District's offices at 1628-B 15th Street.

Mr. Frank Rayner, geological engineer, has been designated the engineer in charge of Lubbock office activities, and he will represent the Board of Water Engineers in all matters that pertain to its business in the Lubbock area.

Mr. Rayner's duties will include, but are not limited to the following: (1) Familiarizing himself with all operations under cooperative agreement with the U. S. Geological Survey. (2) Collecting data on the uses of ground water for irrigation, municipal and industrial purposes. (3) Collecting records of water level fluctuations in wells. (4) Representing the Board at the local level on all matters involving contamination. (5) Investigating recharge projects in the area.

We are happy indeed to welcome Mr. Rayner to Lubbock and to the High Plains.

FRANK RAYNER

Above is pictured the Board of Directors of the High Plains Underground Water Conservation District. Standing, left to right, are: T. L. Sparkman, Jr., Hereford; J. R. Belt, Jr., Lockney; and John Gammon, Lazbuddie. Seated, are: Roy B. McQuatters, Sr., Littlefield, at left, and Elmer Blankenship, Wilson. Mr. Blankenship has been elected to serve as President of the Board for 1959. Mr. McQuatters will serve as Vice President, and Mr. Belt has been elected Secretary-Treasurer.

JUDGE ADMINISTERS OATH OF OFFICE TO NEW DISTRICT BOARD MEMBERS

Two High Plains men were recently sworn in as new members on the five-man Board of Directors of the High Plains Underground Water Conservation District. The highlight of a luncheon on February 13 came as Judge James G. Denton, 99th District Court, administered to these men the oath of office.

John Gammon of Lazbuddie, in Parmer County, by taking his oath of office, assumed his responsibilities as a board member, along with T. L. Sparkman, Jr. of Hereford, in Deaf Smith County. They were each elected in January to serve two-year terms of office.

Mr. Gammon replaces Mr. A. H. Daricek of Maple on the Board and will represent Bailey, Castro and Parmer Counties.

Mr. Sparkman replaces Mr. Virgil Dodson of Hereford, and will represent Armstrong, Deaf Smith, Potter and Randall Counties.

Elmer Blankenship of Wilson was re-elected and remains on the Board for an additional two years, representing Lubbock and Lynn Counties.

Virgil Dodson, out-going Board President, presided over the activities of the inaugural luncheon.

Newly-elected members of the Board of Directors of the High Plains Underground Water Conservation District are shown as they receive the oath of office. Judge James G. Denton, left, administered the oath to T. L. Sparkman, Jr., Hereford, center, and to John Gammon, Lazbuddie.

Blankenship Elected President Of HPUWCD Board

During the February meeting of the Board of Directors of the High Plains Underground Water Conservation District, Elmer Blankenship of Wilson was elected to serve as the Board's President for the year 1959.

Roy McQuatters, Sr. of Littlefield was elected to fill the office of Vice President. J. R. Belt, Jr. of Lockney was elected Secretary-Treasurer.

These newly-elected officers for 1959 will join and serve on the five-man Board of Directors with John Gammon of Lazbuddie, and T. L. Sparkman, Jr. of Hereford.

FOOD FOR THOUGHT

The land was here when we came. We helped change it from range to farm. We braved the blizzards and the drouths. We held on through the dust bowl days until it developed into the garden spot of the world.

Does this make the land
ours alone?

How will we leave it when it is time for us to go? Our own is only a little spot six feet by three feet. The rest will be for those who follow. Whether we leave a garden spot or a desert depends on the way we care for our trusts. The principal difference between a garden and a desert is the water. This land is not ours alone. We only use it a little while then turn it to those who follow. Do they not deserve more than a desert?

T. L. Sparkman, Jr.

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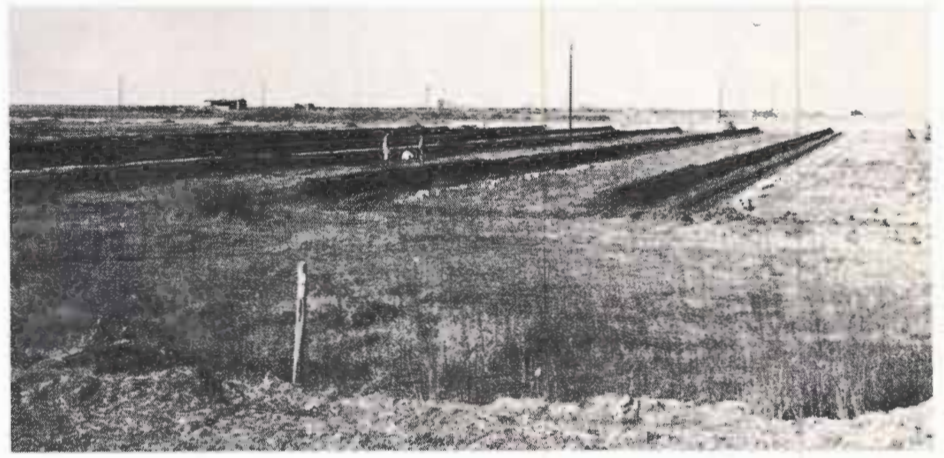
ALLAN WHITE
Editor

TEXAS TECHNOLOGICAL COLLEGE CO



Picture shows ditches that were cut across the bottom of the lake. Various backfill materials were used to cover the lateral lines. Rainfall that collects in the lake will filter through the backfill material and enter the lateral system through openings in the wall of the pipes. Tech Photo.

◀ Lateral line of 6-inch bituminous pipe is being installed in a ditch. Ultimately water that percolates into the lateral lines will flow by gravity into the recharge well.

The Departments of Animal Husbandry and Agricultural Engineering, in the School of Agriculture at Texas Technological College in Lubbock, are cooperating in an artificial recharge project.

Mr. William F. Schwiesow, Assistant Professor in the Agricultural Engineering Department, is in charge of the entire research program.

Experience indicates that the major problem in recharging the underground water reservoir by using wet-weather lake water, is one of siltation

Professor William Schwiesow, Tech Agricultural Engineering Department staff member, is shown at right. He and the unidentified gentleman above display lengths of the four types of pipe materials used as lateral lines in the drainage-filtering system. Mr. Schweisow is in charge of the Tech project. Tech Photo.

NSTRUCTS A DRAINAGE-FILTERING RECHARGE SYSTEM IN A PLAYA LAKE

The 36-inch concrete main-line metering station is shown above. Note that the main line, which transports water gathered from the lateral lines to the meter station, had not been connected at the time the picture was made. A flow-meter built into the meter station records the quantity of water entering the recharge well from the system. Tech Photo.

of the pore spaces of the formation through which the injection well is drilled. Rainfall, that collects in most lakes in the Texas High Plains contains very fine particles of suspended silt and clay. These particles are eroded from the land that surrounds the lake and they tend to stay in suspension in the lake water for a considerable length of time.

Silt and other particles suspended in the lake water are filtered from the water as it passes through the underground formations. In time, the quantity of filtered particles is sufficient to clog the pores of the formation. When this occurs, the rate of recharge intake by the well is significantly decreased.

At the present time, most recharge wells located in this area are pumped periodically in an effort to remove the filtered particles from the pores of the formation. However, in an attempt to develop a method of filtering the lake water economically before it is allowed to drain into the aquifer, Texas Tech has installed, in the bottom of a typical lake, a drainage-filtering system.

In February 1958, the College drilled a well on their land in the southeast quarter of Section 22, Block A, Lubbock County, Texas. This well is designated, Animal Husbandry Well No. 10. It was drilled 150 feet deep and cased with 16-inch steel pipe. The well is equipped with a 5-inch deep-well turbine pump and produces approximately 300 gallons of water per minute. The well was purposely drilled near the edge of a wet-weather lake that consists of approximately 35 acres, so that it might be used for both production and recharge purposes.

Through the cooperation of several business and governmental organizations, including: Johns-Manville Products, Line Materials Company, United Pipe and Tube Company, Standard Concrete Pipe Company, Gifford-Hill-Western Company, Acme Brick Company, Brown Supply Company, the Lubbock County Commissioner's Court and the High Plains Underground Water Conservation District, the drainage-filtering system is now attached to Animal Husbandry well No. 10 and will supply to it water from the lake for recharge.

The drainage-filtering system in the lake consists of 16 lateral lines which are each 600 feet in length and which are parallel to one another. The lines are 37 feet apart, buried an average depth of 3 to 4 feet below the lake bed surface, and are connected at their lower end to a main gathering line. The lake water, as it moves downward through the lake bed, will be filtered by the backfill materials and will then enter the lateral lines. From there the lake water will drain into the main gathering line and subsequently will move by gravity into the well No. 10 and out into the aquifer.

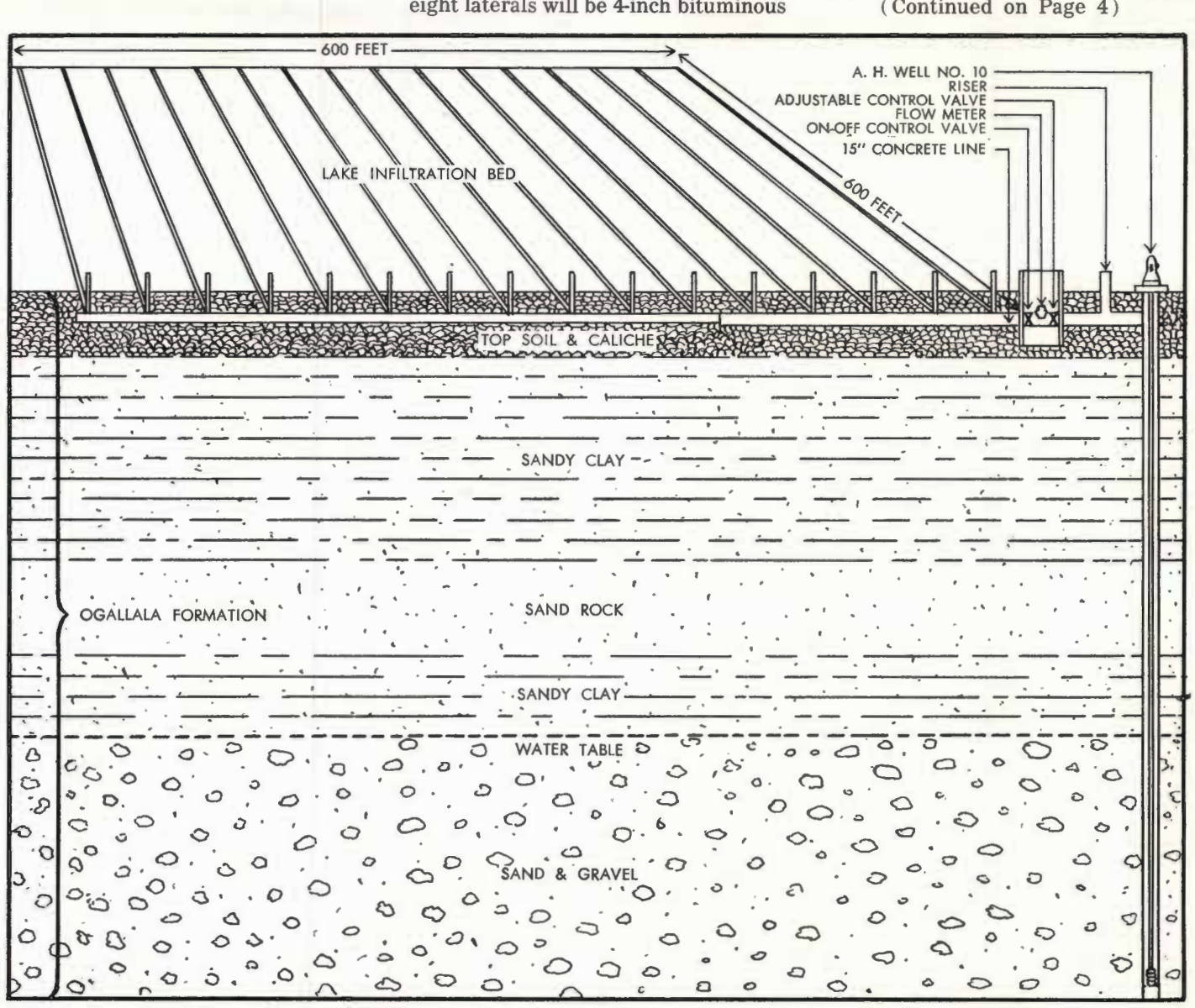
Four different materials were used as lateral lines for the experimental project and four different backfills were employed. The pipe materials and backfills used in various combinations should reveal the most practical combination, not only from a filtering standpoint but also from an economical standpoint.

Four of the sixteen lateral lines are made of 4-inch plastic pipe. Two laterals will be of 4-inch transite pipe and two other lines will be of 6-inch transite pipe. Two of the remaining eight laterals will be 4-inch bituminous pipe, and two will be 6-inch bituminous pipe. The last four lateral lines will be of regular clay drain tile—two lines of 4-inch clay tile and two of 6-inch clay tile.

A segment of the system's main line is shown above. Note the lateral line connection near the bottom of the picture. Water that enters the main line from the lateral line may be metered through the riser shown at the left.

The plastic pipe and the bituminous pipe have been drilled with small holes to allow the lake water to enter. Lake water will enter the transite pipe through slots in the pipe

(Continued on Page 4)



Tech Students Study Recharge Problem

In December 1958, the Board of Directors of the High Plains Underground Water Conservation District made a financial grant for the support of research on problems of artificial recharge to two Texas Technological College students.

The students, Thomas A. Cullinan and Robert M. Winn, were selected from the Department of Geology at Tech. The recharge work that they will do will be in connection with the college requirements for the Master's Degree. All their research and activities will be under the immediate supervision of Dr. F. A. Wade, head of the Geology Department at Tech, and W. L. Broadhurst, Chief Hydrologist for the Water District.

Research experiments will be concentrated around the problem of formation clogging when r e c h a r g i n g with wet-weather lake water.

The project will include work in the laboratory with a small scale model of the underground water-bearing formations. Attempts will be made in the laboratory and in the field to determine the per cent of clay particles that filter from the lake water as it travels various distances into the aquifer from the recharge well. The answers determined in these tests will indicate the approximate usable life of a recharge well.

It is anticipated that about five months will be required to complete the proposed project. Mr. Cullinan and Mr. Winn will each devote full time to the recharge work.

The total Water District grant will consist of $1700. Each of the two students will receive $200 per month for four months and they will receive an additional $100 to offset their joint expenses.

Most of the field work will be done at the Halfway Experiment Station's recharge project. The Experiment Station, located west of Plainview, has a complete recharge system, including wells drilled for observation purposes near the main recharge well.

Mr. Cullinan is a native Texan whose parents, Mr. and Mrs. Gerald Cullinan, now live in Washington, D. C. His father is an executive with a public relations firm.

Mr. Cullinan graduated from the University of Texas with a B.S. degree in Geology. He served in the far east with the U. S. Navy for two years. He is not married and presently resides at 2010 5th Avenue, Apartment 11, in Lubbock.

Mr. Winn comes to our area from Denver, Colorado, where his parents, Mr. and Mrs. John Winn, reside. His father is a carpenter and his mother works as a bookkeeper. Mr. Winn served in the Army Artillery for two years prior to his graduation at Texas Tech with a B.S. degree in Geology. He is married—his wife, Frances, teaches in the physical education department at Tom S. Lubbock High School in Lubbock. They live at 2807 55th Street.

BOB WINN and TOM CULLINAN

Filtering System—

(Continued from Page 3)

wall. The slots are narrow and are about 3-inches in length.

The lateral lines each slope toward the main concrete gathering line, which consists of 200 feet of 15-inch pipe and 400 feet of 12-inch pipe, with a gradient of two-tenths of a foot per each one hundred feet of length.

To determine the most economical backfill material when used as a filtering medium, four materials were used with which to backfill the lateral lines: (1) natural soil, (2) corn cobs, (3) cotton burs and gin trash, and (4) gravel. Each type of pipe will be subjected to each of the four different backfill materials, which will offer every possible combination.

Installed in each lateral line is a metering device, which will measure the amount of water that enters the main line from the lateral. A metering station constructed in the main line will offer the facility for metering the water from the entire gathering system before the water enters the well casing.

It is conceivable that more water could be gathered from the system than the well will take as recharge. Should this occur, in order to prevent the water from backing up in the lateral lines, a riser pipe is installed between the metering station and the well through which the excess water could be pumped from the system to surrounding farmland or back into the lake by using a centrifugal pump.

Through the construction of this drainage-filtering recharge s y s t e m, Texas Technological College hopes to obtain data that can be used to formulate intelligent recommendations concerning method of construction, types of materials that are practical, and number of acres of lake bottom that should be covered by lateral lines to make such a project successful.

LEGISLATIVE BRIEFS

A bill, which would require water well drillers in Texas to be registered with the State, has been introduced in the State House of Representatives by W. N. Woolsey of Corpus Christi, and H. J. (Doc) Blanchard of Lubbock.

The bill, if passed, would require that formation logs of water wells be provided the Board of Water Engineers by the driller. It further provides for an examining panel of drillers to be set up to determine that new drillers entering the well drilling contracting business are capable, experienced and responsible.

The registration fees of $25.00 each are thought to be sufficient to pay the costs of administering the provisions of the bill.

The bill specifically stipulates that nothing in the act shall affect the ownership of underground water.

A bill of this nature could be a good thing for both the well drillers and for those persons who will have wells drilled in the future. The driller's benefits are obvious. However, from the standpoint of the person who is having a well drilled, the benefits are not so o b v i o u s. Nevertheless, the bill should make drillers more responsible to the person for whom he is drilling. Also, the job of instructing and educating drillers in regard to contamination safeguards that they could and should employ would be made easier.

We think that the bill should specifically state, however, that logs of wells drilled within the bounds of underground water conservation districts need not be sent to the Board of Water Engineers since the water district, under law, is already required to provide copies of logs of wells drilled within the confines of its jurisdiction. The requirement as set out in the driller's bill would simply mean a duplication of this effort. "The Cross Section" believes that this provision actually was intended as a part of the bill by those drafting it.

WELL DRILLING STATISTICS FOR JANUARY

During the month of January, 107 new wells were drilled and registered with the District office; 8 replacement wells were drilled; and 4 wells were drilled that were either dry or non-productive for other reasons. 307 permits were issued by the County Committees. The permits issued and completed wells follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Old Wells Deepened*	*Dry Holes Drilled*
Armstrong	1	1	0	0	0
Bailey	26	4	0	0	0
Castro	7	10	1	0	0
Cochran	15	5	0	0	0
Deaf Smith	16	3	0	0	1
Floyd	23	10	2	0	1
Hockley	59	21	1	0	0
Lamb	45	15	1	0	0
Lubbock	58	25	0	0	0
Lynn	32	11	1	0	2
Parmer	17	2	2	0	0
Potter	0	0	0	0	0
Randall	8	0	0	0	0

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Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 5—No. 10 "THERE IS NO SUBSTITUTE FOR WATER" *March 1959*

SAVE WATER AND INCREASE PROFIT BY PLANTING GRAIN SORGHUM LATE

By N. W. KRAMER
Agronomist in Charge, Sorghum Investigations
Texas Agricultural Experiment Station

Most of the grain sorghum varieties grown in Texas mature 90 to 120 days from planting date. Since only part of the frost-free period in the southern High Plains is used to produce the crop, a wide range in planting dates is possible. Some parts of the growing season are much more favorable than others for the growing of the crop, so the yields produced may be affected considerably by planting dates.

Since the factor most commonly limiting sorghum yields is water, it would appear that yields would be increased if the crop could be planted at such a time that available water could be utilized more effectively by the plant. Research indicates that this is indeed true, and that yields can be affected greatly by planting dates, most probably because of the effects it has on water use.

Most of the water used in the production of sorghum or any other crop is lost by the plant into the atmosphere through a process known as "transpiration." The rate of transpiration is affected by the characteristics of the plant, the soil, and by the condition of the atmosphere around the plant. The loss of water from plants is increased by high temperatures, low humidity, wind movement and sunlight. The period of highest water use by the sorghum plant is from the pre-boot stage to about the soft dough stage; this period usually begins about 40 days after planting and continues for about 40 days in varieties of average maturity. Highest temperatures, highest solar radiation and lowest humidity usually occur on the Plains in June, July and early August. Therefore, sorghum should be planted so that as little as possible of the high water-use period of plant growth occurs during this period of high transpiration. More sorghum per unit of water is produced when this procedure is followed. Experimental data fully support this contention.

In 1958 temperatures in June and July were higher than average; consequently, water use also was higher than average. This caused 1958 data to indicate greater yield increases than usual from later planting dates. The following 1958 figures from six representative varieties on the Sandyland Experiment Field near Brownfield show this extreme effect:

Treatment	*Grain Yield*
Planted May 7, irrigated	1977
Planted June 19, dryland	2770
Planted June 19, irrigated	4348

A number of kafir varieties have been grown at Lubbock with planting dates as the only variable. In these tests irrigation was adequate and fertility was high. Results are shown below:

Planting date	*Grain yield*
May 20	4600
June 5	5643
June 20	6774

(Continued On Page 4)

DRILLING A WATER WELL?

Do you plan to drill an irrigation or commercial water well? If you do, and you expect to produce more than 69 gallons per minute from the well, you should head the following paragraphs.

The rules of the High Plains Underground Water Conservation District require that wells drilled within its bounds of jurisdiction and produce in excess of 69 gallons per minute be spaced certain minimum distances from wells in the immediate vicinity.

4-inch well must be a minimum distance of 200 yards from the nearest well.

5-inch well must be a minimum distance of 250 yards from the nearest well.

6-inch well must be a minimum distance of 300 yards from the nearest well.

8-inch well must be a minimum distance of 400 yards from the nearest well.

10-inch well must be a minimum distance of 440 yards from the nearest well.

The District's rules further provide that a person who desires to drill a well must first obtain a well drilling permit.

To assist either the landowner or his agent in filing an application for a well drilling permit, each county has an office and a Secretary.

Before contacting his local County Secretary, the well drilling applicant will need the following information:

1. Name and mailing address of the owner of the land on which the well will be drilled.
2. The legal description of the land.

(Continued On Page 4)

1958 Precipitation In Southern High Plains Tabulated

Precipitation data for the State of Texas have recently been released for 1958 by the U. S. Weather Bureau.

Conserving rainfall is a segment of water conservation that is most vital to the continued prosperity in the southern High Plains area. With apparent abundance of underground water this segment has all too often been neglected.

Better use of rainfall would help to prolong the supply of stored underground water which actually is limited. At the same time, erosion of valuable top soil is minimized when rainfall is stored in the soil where it falls.

To increase the water intake rate of a soil several recommended procedures are available. Among other methods is chiselling, land levelling and adding organic matter.

If no plan is made available to store the precipitation where it falls, then the next best thing would be to use the rainfall after it collects in a depression for direct use by pumping onto surrounding land or by using it for recharging the underground formations.

If every individual would make an honest effort to put the rainfall to beneficial uses our problems of mining underground water would be lessened.

What everyone should keep in mind is that precipitation is free merely for the preparing to use it.

Below is a break-down of 1958 precipitation from stations throughout the southern High Plains.

STATION	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	1958
Abernathy	2.25	.45	3.21	2.18	2.19	1.48	2.43	.44	3.68	.74	.41	.04	19.50
Amarillo	1.05	.58	2.36	1.74	2.45	4.22	6.16	2.08	1.60	.15	.60	.30	23.29
Brownfield, 2E	1.04	.84	2.13	1.71	1.68	2.01	3.30	1.45	1.76	1.83	.99	T	18.74
Canyon	1.58	.60	2.56	2.26	4.61	1.07	5.51	.80	1.46	.31	.63	.40	21.79
Claude	1.45	.44	2.64	2.27	2.23	4.68	6.76	1.50	2.27	T	.39	.17	24.80
Crosbyton	1.26	.68	2.34	2.68	3.16	1.25	3.84	.07	1.47	.69	1.03	T	18.47
Dimmitt, 6E	1.72	.34	2.38	2.11	1.24	1.94	3.16	1.70	2.20	.31	.85	.23	18.18
Floydada, 2SW	1.26	.37	E2.79	3.09	2.37	.88	2.90	.29	4.32	.39	.31	.04	E19.01
Friona	1.45	.39	2.11	1.78	.81	.64	3.40	1.16	3.38	.74	.59	.25	16.70
Hale Center	1.30	—	—	1.95	.26	—	—	—	—	—	—	—	—
Hart	1.51	.26	1.68	1.76	.56	1.82	2.09	1.82	2.97	.08	1.04	.15	15.74
Hereford	1.77	.73	2.81	1.98	1.36	2.63	5.68	2.45	2.85	1.00	.88	.17	24.31
Levelland	2.11	.54	3.01	1.97	3.68	1.37	1.96	.74	3.24	1.58	.48	.02	20.70
Littlefield	2.21	.28	2.61	1.65	2.04	.65	1.48	1.70	3.88	.65	.24	.14	17.53
Lorenzo	.87	.31	3.00	2.47	3.67	—	—	—	—	—	—	—	—
Lubbock	1.35	.33	3.23	1.97	2.94	.71	2.65	.21	2.90	.94	.34	.02	17.59
Morton	1.27	.26	2.41	1.44	2.43	1.36	2.11	1.99	4.36	1.53	.51	.02	19.69
Muleshoe	1.60	.36	1.75	1.46	2.86	1.73	2.07	1.51	3.48	.33	.75	.07	17.97
Plains	1.43	.54	2.55	1.31	1.09	1.28	2.37	.37	10.59	2.03	.90	.00	24.46
Plainview	2.38	.26	2.25	2.56	2.05	2.38	1.46	1.40	2.42	.64	.47	.16	18.43
Post	1.22	.92	1.55	2.30	3.76	1.23	1.20	1.13	1.27	1.57	.85	T	17.00
Silverton	1.26	.36	2.49	2.95	3.14	1.72	2.79	.64	3.76	.35	.48	.12	20.06
Slaton, 5-SE	.96	.64	2.39	2.38	2.95	2.53	3.02	.48	1.46	.89	.87	T	18.57
Tahoka	1.45	.59	2.48	1.76	2.55	2.26	2.01	.86	1.41	1.63	.78	T	17.78
Tulia	1.37	.25	2.22	2.38	1.99	2.04	1.60	2.60	2.32	.46	.41	.14	17.78
Umbarger	1.24	.41	2.21	2.32	2.12	.74	6.31	.68	2.12	.47	.57	.26	19.45
Vega	1.50	.66	2.46	1.21	1.60	.79	5.65	1.00	2.17	.23	.80	.30	18.37

MEASUREMENTS SHOW WATER-LEVEL CHANGES IN OBSE

EDITOR'S NOTE

Below are shown official water-level measurements for a majority of the observation wells in the southern High Plains of Texas. These wells are measured each year by the U. S. Geological Survey in cooperation with the State Board of Water Engineers and the High Plains Underground Water Conservation District. The map on the opposite page gives the locations of the observation wells together with identifying well numbers.

Many of the wells listed have a long-time record of water-level measurements even though we are listing only those for the last three years. Measurements are made in January each year prior to the beginning of pumping for pre-planting irrigation. The figures are in feet below land surface.

Complete water-level measurements are on record in the Austin offices of the State Board of Water Engineers and the U. S. Geological Survey.

ARMSTRONG COUNTY

Well No.	1957	1958	1959
463	159.47	157.64	158.95
464	175.11	171.16	172.52
465	117.90	116.58	115.95
467	155.92	155.65	154.55
468	133.41	133.22	132.96

BAILEY COUNTY

Well No.	1957	1958	1959
1b	109.80	112.41	114.80
2a	105.76	108.08	109.06
3b	63.00	65.94	68.32
5b	——	93.67	95.94
9	70.39	73.34	78.02
11a	51.79	54.29	56.70
21b	55.84	61.56	64.96
25	53.86	57.29	59.64
31	45.58	46.89	47.63
33	65.16	71.29	——
34c	84.78	87.70	89.86
36	48.15	50.51	52.49
45	48.46	47.55	——
49	48.48	51.70	53.67
53	58.12	58.44	60.14
57a	——	76.31	78.36
62	66.08	68.78	69.50
63	——	66.65	——
66	65.59	65.75	66.75
67	64.79	65.31	——
69	52.49	56.22	61.23
95	55.29	57.04	——
116a	57.14	59.75	61.76
117	——	——	71.82
130a	52.79	55.60	57.82
131	53.59	56.09	59.87
132	54.00	56.95	59.32
135	43.24	46.26	50.52
137	39.35	43.18	46.74
141	37.09	40.22	43.42
205a	72.07	73.21	71.90
207	88.59	88.71	88.34
450	35.53	36.33	37.28
495	——	87.13	88.84
572	98.40	101.99	104.13
573	25.55	27.32	27.57
573a	——	——	29.45
574	——	195.36	198.30
809	80.58	——	82.73
811	98.06	98.07	100.15
815	52.01	——	——

BRISCOE COUNTY

Well No.	1957	1958	1959
18	——	——	103.67
107	89.03	89.37	89.83
119	121.29	120.72	117.85
122	107.47	106.99	106.25
134	105.67	107.77	106.94
148	103.93	101.74	104.48
159	119.40	123.10	125.05
168	116.17	119.43	124.23
170	116.71	119.58	122.16
217	——	——	142.39
227	91.18	84.29	——
234	124.49	——	129.74
253	102.70	101.81	105.48
254	——	82.95	84.39
255	111.98	112.83	113.35
256	97.24	94.74	98.67
257	180.49	180.09	180.59
258	——	——	96.92

CASTRO COUNTY

Well No.	1957	1958	1959
8	103.26	105.24	——
20	101.03	103.74	107.38
32	92.34	93.64	98.81
36	123.55	126.44	——
40	——	——	——
C-42	——	148.65	150.10
48	91.29	83.20	——
52	103.06	102.79	99.50
53	99.18	101.37	——
57a	117.59	118.43	118.85
C-57	——	165.17	——
58a	169.03	172.28	170.67
C-60	——	154.05	151.48
201	176.19	178.67	178.85
202	112.77	116.45	——
202a	167.48	169.89	172.49
278a	181.07	183.29	186.99
321a	——	172.70	174.13
330a	——	——	——
394	——	121.53	123.98
410b	98.75	102.94	103.20
465	——	117.71	122.44
465b	——	118.22	121.64
508	103.59	105.64	106.90
524a	——	104.06	106.70
528a	116.30	117.62	118.20
529	111.58	114.82	119.66
544a	122.16	125.87	127.48
587	——	——	47.86
601	130.54	134.58	147.90
602	124.35	127.92	129.07
604	183.03	186.36	188.80
605	167.38	169.42	171.78
606	179.96	183.26	184.68
608	120.95	124.70	127.92
609	——	——	157.26
610	——	151.62	——
611	101.98	——	——
612	——	105.46	108.17
613	——	143.84	146.73
614	——	187.67	187.99

COCHRAN COUNTY

1	149.80	148.80	149.19
F-1	122.36	125.48	127.55
F-2	131.08	134.93	135.46
F-3	144.94	150.62	149.86
F-4	——	140.80	141.17
5	137.80	137.88	138.67
12	144.72	147.24	148.30
13	122.80	124.34	123.75
14	——	139.02	139.95
15	101.73	103.10	——
16	103.91	104.97	106.22
17	——	91.98	92.82
18	——	123.43	——
19	128.66	131.27	131.85
20	119.70	120.68	——
21	156.15	157.08	157.40
22	149.38	151.90	153.06
23	124.77	126.53	126.49
24	150.97	152.88	153.67
25	132.48	135.56	136.44
26	124.80	128.20	129.74
27	142.36	142.30	144.20
28	139.74	141.22	141.55
29	85.84	87.36	87.84
30	141.77	143.40	143.43
31	126.45	126.40	126.20
32	96.38	96.22	96.63
33	106.62	109.25	110.70
34	169.70	169.25	169.28
35	——	——	99.05
35a	——	104.31	103.55
36	90.54	91.73	92.89
37	131.12	133.73	135.00
38	177.12	179.79	180.20
39	160.35	163.21	162.35
40	119.10	119.22	118.60
41	109.91	113.63	115.25
42	127.75	131.04	131.98
44	103.97	110.93	112.82
45	137.90	140.25	140.85
46	145.13	147.15	147.58
47	120.63	121.09	120.89
48	123.53	127.25	125.65
49	168.40	169.51	169.10
50	175.73	176.08	176.05
51	——	93.87	94.10
52	——	87.35	87.54

CROSBY COUNTY

Well No.	1957	1958	1959
1	144.07	148.48	——
4	——	208.17	——
7	——	150.53	157.30
7b	190.61	191.92	191.35
8	125.97	138.39	140.54
10b	——	152.55	157.55
11b	132.81	135.64	140.95
11c	149.04	154.72	157.30
12b	168.40	172.92	173.25
13a	134.88	143.03	141.49
14	140.10	144.03	144.37
17a	141.91	149.14	148.76
21a	145.01	149.50	149.17
23b	153.85	155.74	157.76
340a	149.00	147.23	155.84
401b	104.47	126.41	126.58
412a	——	——	146.04
415a	——	100.79	99.25
416	——	——	247.60
417	——	——	242.24
G-6	——	195.95	198.98
G-7	——	190.97	192.57
G-8	——	183.37	——
G-9	——	210.59	211.05

DEAF SMITH COUNTY

Well No.	1957	1958	1959
44a	——	185.06	——
113a	125.03	126.54	——
121a	——	140.43	143.40
130a	158.64	163.02	——
134	166.67	169.38	——
140a	181.56	178.59	181.73
168	——	118.74	124.47
193	136.83	——	147.83
201	127.20	132.27	136.70
205	120.58	125.73	118.40
207	84.82	87.98	92.17
212	105.25	113.66	107.62
216	85.02	88.42	89.98
217	123.34	115.54	122.26
219	108.64	104.56	107.96
220	109.80	119.09	120.70
224	86.96	89.66	84.68
226	90.80	100.56	99.42
231a	66.40	65.67	——
234	59.00	57.22	——
235	——	70.14	73.56
241	68.45	67.07	——
245	74.10	68.40	55.36
247	48.80	45.82	46.90
258	93.78	——	——
261	87.30	88.75	89.46
272	117.79	121.77	117.74
283	95.60	93.45	88.66
288	112.32	119.11	110.14
302	73.20	73.37	——
305	124.72	132.21	129.26
311	78.65	80.97	——
315	89.44	87.28	88.76
322	100.18	114.32	111.95
326	135.05	138.25	139.68
331	110.60	110.60	115.54
336	123.85	127.21	136.50
342	121.20	121.45	118.12
394	95.01	96.04	106.86
431b	93.34	98.73	99.75
459a	138.80	137.18	——
486	121.90	112.79	122.01
502	147.10	147.27	149.35
506a	——	103.19	105.80
513a	102.74	106.83	——
514	143.10	154.71	141.30
546	140.56	143.75	——
558	84.00	——	80.40
566	201.00	206.49	208.58
919	108.29	112.76	115.85
934	128.76	130.15	134.92
D- 30	——	180.51	——
D-111	——	59.58	——
D-203	——	177.87	165.98
D-213	——	284.42	——
D-303	——	296.30	295.98
D-306	——	246.83	246.53

FLOYD COUNTY

Well No.	1957	1958	1959
5	85.57	88.74	93.10
5a	80.50	83.36	86.70
20	118.70	130.18	124.61
21a	116.30	118.27	120.74
32	129.60	137.16	140.30
42	114.44	114.10	121.77
55	——	——	107.41
56	94.63	——	100.06
57	108.84	115.86	118.61
106	——	123.20	141.05
108	129.05	——	126.00
110	125.94	132.22	122.12
111	——	109.16	——
120	——	145.29	144.63
138	138.39	137.81	——
139	133.07	138.76	135.80
140	123.67	135.65	127.40
143	133.74	136.02	141.93
157	120.05	128.60	134.60
161	131.84	——	134.50
185	127.90	129.68	130.48
216	——	216.10	215.55
263	119.93	121.92	126.60
264	94.65	98.59	103.90
265	117.86	120.65	123.40
315a	235.80	235.95	235.42
326	165.89	167.20	152.97
410a	121.00	126.28	121.17
414	——	138.16	139.15
416	137.74	138.52	139.85
420	——	144.79	146.29
421	137.40	138.95	140.65
423	——	137.70	138.68
428	——	128.58	130.20
435	145.24	146.53	149.24
448	139.08	141.11	141.42
463	125.40	128.57	131.87
467	104.88	108.25	110.64
472	125.57	126.10	128.85
486	39.28	38.27	38.74
502	——	114.88	120.05
510	102.77	107.02	109.54
511	126.76	124.55	128.97
519a	129.80	128.00	134.00
523	139.31	141.25	143.74
529	113.55	——	113.68
542	——	131.49	135.64
546	127.16	126.97	132.39
554	121.80	——	452
562a	——	158.44	168.40
610a	237.82	229.72	236.80
610b	236.08	225.82	234.69
612	——	174.10	178.09
627	112.80	123.44	——
630	144.28	149.30	151.42
652	131.55	133.04	134.72
701	132.00	130.90	133.24
704	——	138.92	142.68
720	121.30	123.15	127.22
726	105.01	111.70	108.70
727	127.10	124.35	127.14
728	130.89	130.80	134.27
729	119.83	119.94	129.11
730	——	158.38	163.13
732	——	255.83	259.81
733	——	247.00	253.80
734	——	142.99	147.01

HALE COUNTY

Well No.	1957	1958	1959
31a	95.98	100.30	105.65
36	——	126.07	127.87
40a	116.39	123.62	129.08
81	95.60	102.51	102.04
86	119.70	125.50	126.45
93	123.07	129.68	131.00
103	78.10	84.05	83.53
105	92.49	93.92	100.39
124b	121.00	119.98	128.60
138	77.72	87.65	84.66
154	105.45	——	108.75
159	104.55	107.11	107.54
163	94.52	98.84	103.50
202	115.42	118.88	120.56
206	118.28	117.15	118.77
212	98.94	101.92	103.38
220	101.20	102.09	104.74
225	106.37	114.15	110.77
238	107.23	113.49	112.75
241	102.69	103.47	106.87
285	102.37	106.57	108.88
305	110.79	114.25	112.81
316	89.13	91.62	94.65
317a	89.35	91.02	94.55
323	103.78	106.08	109.60
330a	94.12	97.31	99.65
331	95.27	95.84	98.95
334	98.54	101.73	104.05
338	87.95	92.84	91.66
367	111.47	111.38	111.05
370	94.89	97.10	98.35
389	105.24	107.92	110.20
427	106.58	109.07	109.67
435	105.50	——	115.50
436	——	117.48	118.25
449	114.87	123.16	124.02
454	121.65	126.02	124.78
463	105.82	105.45	105.23
467	65.94	69.24	71.57
511	78.34	81.15	82.94
539a	121.40	119.35	120.83
546	106.47	115.29	112.86
547a	108.50	113.76	115.14
553	111.80	112.14	115.50
564	112.94	113.56	115.98
569	80.13	85.49	89.75
641	105.87	110.00	112.90
661	107.72	108.83	114.25
704a	122.14	108.64	110.34
714	121.10	117.43	121.65
719c	116.10	119.24	112.74
724	127.73	130.39	132.30
798	119.78	122.18	124.87
816	81.68	82.41	85.34
824a	90.41	106.27	99.26
825a	104.12	106.40	107.24
829	110.00	107.67	110.08
848	122.85	——	129.32
852a	152.90	155.18	156.05
859	117.80	121.37	124.50
906a	67.79	69.33	73.45
923	83.90	87.83	89.65
929a	72.28	75.56	76.79
942	95.80	96.58	99.45
958	90.80	93.38	94.45
964	110.16	114.00	119.92
978	130.26	130.38	136.08
1223	101.68	104.39	105.26
1231	101.38	102.31	106.00
1336	97.09	99.48	102.24
1358	108.75	109.60	111.63
1403	93.60	103.18	96.20
1417	104.67	111.13	112.79
1430	86.73	90.48	95.90
1436	122.04	115.16	115.79
1604	——	108.04	105.15
1811	128.15	126.93	129.05
1921	105.75	110.11	111.10
1957	120.00	118.49	121.40
C-14	89.43	——	98.16
H-93	108.13	——	117.87
K-50	95.20	101.76	98.76
N-27	——	——	107.25
N-65	80.47	82.88	85.79
P-71	100.37	103.38	105.76
R-36	123.10	127.64	129.52
V-25	90.80	93.31	95.62
V-58	106.35	109.42	111.60
Y-36	70.74	75.10	77.61
Y-38	66.85	66.65	67.06
CC-31	138.00	140.88	133.30
DD-101	121.22	119.11	122.05
FF-78	101.80	104.52	106.45
HH-9	133.45	135.72	131.40
HH-107	121.15	127.50	119.80
HH-118	83.49	90.28	87.46
JJ-50	127.16	130.18	131.92
LL-35	115.54	121.88	124.65
LL-80	136.25	147.60	144.90
MM-104	132.14	135.17	136.88

HOCKLEY COUNTY

Well No.	1957	1958	1959
F-2	132.60	135.51	136.30
F-7	95.68	96.22	93.19
22b	——	——	89.15
24	42.03	41.50	42.26
25a	40.90	41.22	42.75
28	58.22	58.53	59.77
207a	——	——	77.53
247a	126.95	147.59	130.40
263a	——	136.48	138.14
263b	144.46	148.84	147.98
281a	——	——	83.85
429b	128.26	131.12	131.20
434	172.77	174.20	163.52
434a	165.40	174.39	167.95
434b	126.08	126.18	126.30
443a	97.88	106.64	99.20
443b	54.85	55.02	56.88
444	79.08	80.37	82.55
447a	73.46	92.11	76.80
452	96.46	101.67	96.36
453a	81.84	89.09	92.96
453b	93.29	95.81	97.40
458	111.24	114.86	114.24
458a	86.37	89.62	90.79
528a	168.68	171.96	171.05
576	113.15	115.85	117.43
587a	141.02	147.70	140.70
662a	116.08	121.50	118.39
717	110.45	111.80	111.47
735a	——	——	150.80
58-80	——	60.99	55.05
58-81	——	130.90	141.15

LAMB COUNTY

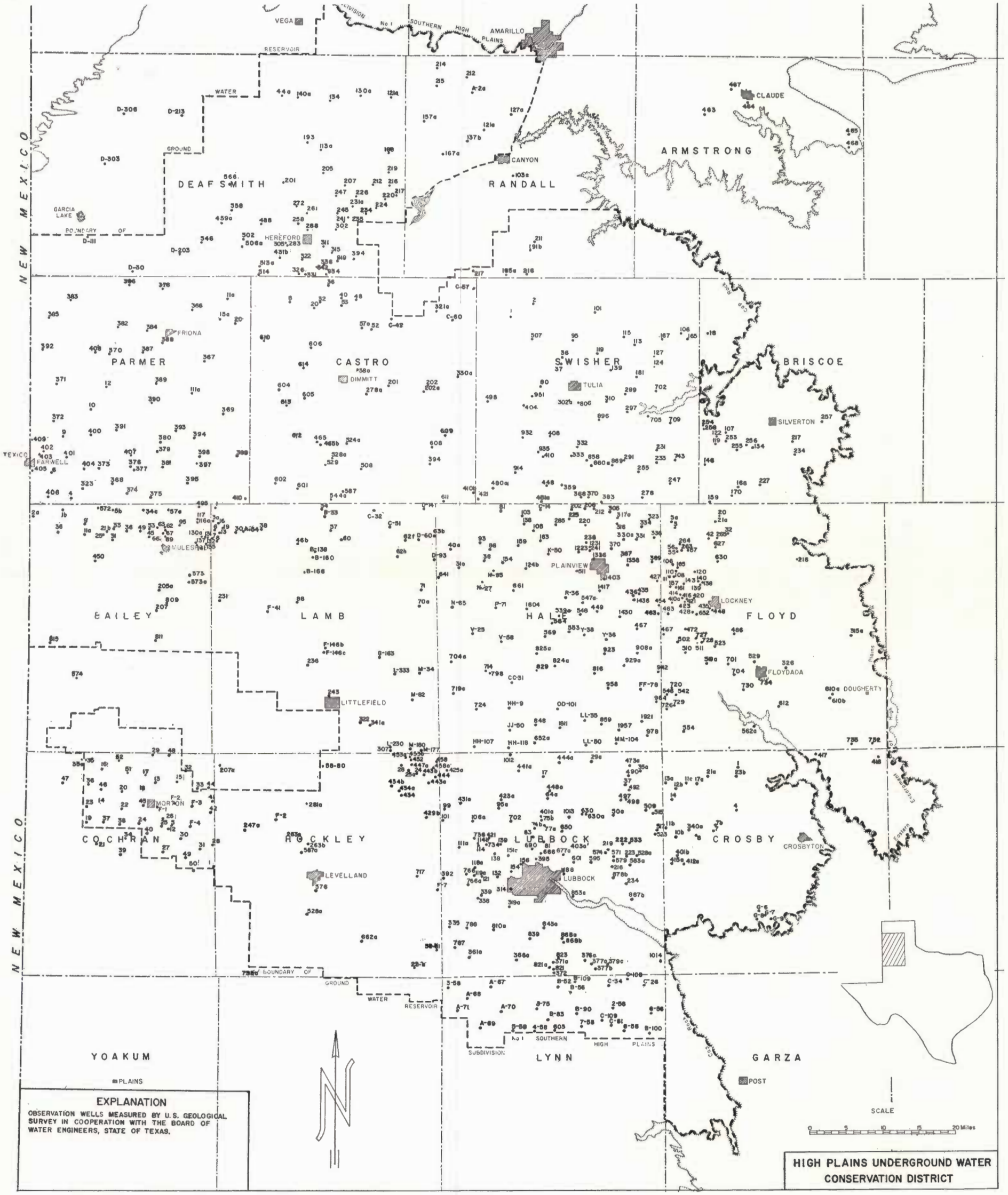
Well No.	1957	1958	1959
1	93.65	98.79	100.54
3a	61.59	58.71	——
6	54.59	58.71	60.66
7	48.78	53.98	58.86
8	48.38	51.91	54.20
13	58.06	62.36	62.42
16	67.61	71.52	72.36
19	54.79	——	61.82
30	57.40	58.30	60.05
38	60.01	62.79	64.52
46b	55.07	57.15	58.35
54	116.27	120.48	122.26
57	117.98	123.13	122.30
60	98.25	105.83	102.87
62f	131.73	134.88	135.90
62h	120.62	122.64	124.60
63b	131.91	140.04	140.38
70a	78.91	79.95	82.18
71	89.73	90.43	90.67
88	——	44.36	44.45
231	104.60	109.59	109.38
236	89.20	91.30	91.47
243	80.13	81.68	80.37
307	63.25	65.61	66.28
322	72.58	75.25	77.42
341a	81.71	86.99	——
A-54	——	80.09	77.06
B-33	120.17	124.63	126.63
B-138	66.58	72.54	68.90
B-160	64.56	66.59	65.73
B-166	——	35.94	36.81
C-32	107.78	110.34	111.94
C-51	129.55	132.36	133.38
D-14	——	111.74	111.34
D-60	113.27	119.42	119.57
D-93	130.24	133.33	135.08
F-41	50.98	44.90	53.76
F-146b	73.04	75.50	74.58
F-146c	103.39	106.59	103.18
G-163	114.93	115.34	115.89
L-230	62.59	63.20	65.09
L-333	126.23	126.23	126.45
M-34	111.13	111.13	111.95
M-82	129.89	140.49	131.85
M-177	117.23	118.56	124.90
M-180	108.18	110.39	110.33

LUBBOCK COUNTY

Well No.	1957	1958	1959
17	139.45	141.05	141.62
29a	135.25	141.75	142.30
35a	——	137.30	140.98
37	113.67	117.90	119.95
50a	121.53	126.90	128.22
64a	121.21	123.62	124.80
74b	47.86	49.08	51.07
75b	103.92	106.87	108.54
77a	102.96	107.25	108.55
81	62.32	64.09	65.78
83	67.70	69.70	71.11
95a	121.20	122.40	123.23
99	55.02	53.52	58.80
101	107.71	108.70	105.21
106a	63.50	65.03	66.05
111a	123.08	125.12	123.50
114	91.83	94.30	95.70
114b	88.20	86.30	——
118a	129.60	131.35	130.90
119a	126.00	——	——
121	124.67	127.16	127.34
132	96.85	95.53	91.80
138	76.06	73.30	——
139	55.44	53.87	55.31
151a	77.94	76.28	75.29
154	——	72.44	89.70
156	79.75	77.45	——
188	92.33	92.63	93.84
216	79.75	81.16	80.42
219	75.07	75.88	76.09
222	96.17	100.75	98.25
223	53.47	53.17	53.95

(Continued On Page 4)

RVATION WELLS THROUGHOUT SOUTHERN HIGH PLAINS



WATER LEVELS—(Continued From Page 2)—

234a	76.28	75.23	75.11
314	61.29	62.19	60.33
319a	108.70	108.93	105.95
335	111.74	112.30	——
338	107.45	107.36	106.56
339	99.63	100.66	100.78
361a	104.66	101.01	99.26
366a	106.08	99.90	99.65
371a	122.20	122.35	——
372	125.87	126.88	125.80
376a	112.95	113.57	113.67
377a	110.98	111.78	110.94
377b	113.95	115.68	115.33
379c	101.43	102.27	——
392	109.88	110.08	109.95
395	72.00	72.70	74.20
401a	106.72	110.30	——
403a	69.78	72.88	72.00
421	69.52	69.66	74.42
423a	122.88	124.09	125.29
425a	102.57	104.10	105.50
431a	118.72	120.96	122.20
441a	156.72	158.52	160.75
444a	153.95	152.45	154.05
448a	136.43	139.40	139.45
473a	132.00	138.60	139.53
490	133.52	136.96	137.47
492	113.00	117.06	119.13
497	131.20	135.95	137.60
498	129.79	134.70	137.73
509	131.94	127.00	128.75
515	131.34	——	——
517	142.78	145.15	146.82
523	116.50	124.00	122.72
528a	87.38	89.44	90.10
533	112.01	117.20	——
571	72.64	72.65	72.54
574	80.06	82.88	——
579	74.52	74.82	——
583a	65.06	66.74	67.50
595	86.06	87.15	86.85
601	86.16	87.51	87.52
630	115.47	119.74	120.62
630a	116.44	120.25	——
650	103.77	107.90	107.66
666	77.40	78.62	79.19
677a	87.58	88.78	89.70
690	74.26	75.81	76.33
702	104.75	107.27	107.18
734	77.45	78.78	——
736	77.20	79.32	77.82
766	——	122.50	——
766a	122.53	123.52	123.30
786	135.24	135.12	——
787	108.82	109.41	108.53
810a	120.11	121.57	121.30
821	122.80	——	——
821a	122.07	122.48	121.45
823	124.48	124.48	124.44
839	109.34	109.73	109.60
843a	103.09	103.46	103.26
853a	53.56	53.24	53.25
868a	107.41	107.41	106.89
868b	117.68	118.90	——
878b	76.35	78.20	77.60
887b	84.36	85.36	85.08
1012	112.35	113.79	——
1013	111.04	115.60	114.15
1014	178.50	182.60	182.35

LYNN COUNTY

Well No.	1957	1958	1959
2-58	——	69.35	——
3-58	——	91.58	93.27
4-58	——	92.29	93.05
5-58	——	121.13	120.17
6-58	——	59.65	58.77
7-58	——	46.55	46.50
8-58	——	65.84	64.02
A-67	90.72	93.17	92.56
A-68	108.16	107.78	108.67
A-69	82.41	85.86	83.36
A-70	81.30	70.45	71.80
A-71	83.25	84.93	86.64
B-52	117.34	118.65	119.50
B-56	——	102.52	104.12
B-75	104.15	106.55	106.94
B-83	90.15	90.10	92.80
B-90	77.62	78.04	77.40
B-100	66.77	72.55	77.04
B-109	117.66	119.77	118.07
C-26	——	63.16	63.15
C-34	39.07	35.51	33.17
C-81	77.22	78.67	80.24
C-108	84.26	85.47	86.09
C-109	74.53	75.00	74.38

PARMER COUNTY

Well No.	1957	1958	1959
4	124.23	127.30	——
6	163.12	166.70	——
9	227.66	230.22	——
10	183.90	189.38	——
11a	134.10	136.31	137.15
12	175.00	174.28	176.20
15a	164.90	171.32	175.69
20	138.20	133.41	135.98
111a	193.60	195.03	198.58
323	——	114.37	117.35
366	——	187.83	184.73
367	230.84	235.74	239.25
368	127.01	132.84	——
369	163.96	160.08	159.88
370	274.12	278.00	281.80
371	197.08	198.33	202.28
372	228.35	234.41	235.58
373	149.36	154.51	157.20
374	114.92	117.60	119.50
375	103.46	103.99	105.35
376	161.85	164.25	166.85
377	154.25	157.11	——
378	——	——	224.45
379	198.60	201.13	——
380	190.54	194.24	196.75
381	169.75	173.28	175.50
382	193.76	197.84	198.70
383	——	219.38	218.90
384	186.30	204.39	196.82
385	231.88	232.99	232.88
386	——	283.59	288.95
387	258.00	251.16	——
388	208.10	212.12	212.90
389	221.23	228.18	233.00
390	——	168.00	172.70
391	217.45	221.67	226.12
392	286.90	292.83	——
393	182.15	183.49	——
394	163.10	164.94	169.40
395	152.51	153.39	——
397	190.01	183.98	——
398	——	183.91	186.84
399	143.32	147.03	149.06
400	222.08	224.31	228.55
401	179.90	183.84	186.44
402	213.18	215.63	——
403	188.35	189.78	——
404	153.06	156.38	——
405	198.03	199.31	202.42
406	173.36	175.10	——
407	183.66	187.18	189.75
408	265.90	——	265.87
409	228.50	229.11	231.87
410	149.16	150.52	156.95

RANDALL COUNTY

Well No.	1957	1958	1959
A-2a	139.52	138.77	138.58
103a	8.12	6.53	5.50
121a	149.00	142.31	147.75
127a	145.90	144.30	145.05
137b	126.35	125.84	127.40
157a	118.30	118.99	119.30
167a	——	128.37	123.20
185a	——	172.67	174.50
191b	199.20	186.88	187.08
211	170.20	172.04	171.02
212	163.25	166.55	164.85
214	181.37	184.05	183.23
215	155.29	159.08	160.27
216	——	162.78	156.68
217	——	172.52	178.77

SWISHER COUNTY

Well No.	1957	1958	1959
1	106.32	106.60	105.90
2	——	79.43	78.34
36	80.37	81.82	85.34
37	97.57	——	105.90
80	99.70	95.49	95.82
95	97.26	99.50	102.18
101	——	97.35	100.57
108	101.24	——	105.77
113	82.76	79.02	——
115	——	82.39	86.58
119	87.94	79.85	80.04
124	75.18	——	77.57
127	94.72	98.23	——
139	82.70	75.75	——
165	——	111.75	115.10
167	78.84	78.30	——
181	85.11	87.93	89.53
231	111.00	109.41	102.15
233	101.42	99.79	105.78
247	97.92	98.94	100.17
255	79.47	83.03	84.08
278	110.64	109.25	111.40
291	83.78	——	87.64
297	75.57	——	79.50
299	62.99	60.59	58.30
302a	97.20	98.60	105.30
310	101.02	99.32	——
332	97.64	103.95	107.68
333	104.20	106.95	107.70
359	126.59	129.86	136.85
368	——	138.65	——
370	119.34	122.67	122.96
383	148.60	116.66	121.30
404	134.34	136.13	139.55
408	137.64	132.82	131.25
410	——	116.68	117.65
421	93.46	96.67	98.55
448	124.29	129.10	131.90
451a	——	86.34	90.39
480	——	110.67	113.80
498	121.14	122.68	123.68
507	111.65	110.45	112.30
702	49.63	47.83	——
705	79.37	76.51	78.45
709	108.62	108.70	107.51
743	80.48	80.48	84.16
806	97.40	92.90	96.02
853	106.03	——	105.30
860a	106.96	——	116.05
889	106.66	108.58	——
896	84.49	82.41	84.25
914	142.36	143.19	146.40
932	138.66	137.41	134.36
935	——	119.85	——
951	86.15	——	90.95

Sorghum planted June 25 is being inspected by Dr. Kramer. The field's abundant yield—7,000 pounds of grain per acre—is largely attributed to late planting.

Plant Late—

(Continued From Page 1)

The results from date-of-planting experiments are such that it can be recommended that grain sorghum should be planted from June 15 to June 25 in most of the High Plains area for highest yields and most efficient utilization of water, regardless of whether the crop is grown under irrigation or on dryland.

Exceptions to the June 15-25 dates should be made for certain conditions. Where the soil has a low water-holding capacity, especially in the sandy areas, early planting is advisable if the soil profile is full of water early in the season and it would appear that much of the normal April-May-June rainfall might be lost by percolation if a crop were not planted early. Under such conditions April plantings are usually better than May plantings. Where wind erosion is a serious hazard or where the water supply is inadequate to water all the acreage in a relatively short period of time, these factors may be as important in determining planting dates as are prospective yields.

In the northern part of the High Plains cotton area there should be less competition from cotton for water when sorghum is planted late than when it is planted early.

The reaction of sorghum to planting dates is so marked that the time of planting is one of the most important decisions to be made in sorghum production. In many cases, planting date alone may be enough to make the difference between a profit or a loss from the crop.

The choice of a favorable planting date is absolutely essential in obtaining maximum profit from a sorghum crop.

Rules—

(Continued From Page 1)

3. The measured distance from the proposed drilling site to the two nearest property lines or quarter-section lines.

4. The measured distance from the proposed drilling site to the three nearest wells. Distances to wells that are over 440 yards from the proposed drilling site are not required.

When the above information has been determined by the applicant, he is then prepared to contact his local county secretary and file his drilling permit application.

A deposit of $10 is required with the filing of each application.

When the application form is filled out completely and correctly, the applicant must then make certain that it is signed by three members of the local County Committee. This is most important, and it must be done before drilling operations are commenced.

When signed by the Committee, the permit is valid for the drilling of one well only, and it only at the location specified on the permit.

The drilling permit is valid for a period of 4 months from the date of filing.

When the well is completed and the log of the underground formations is supplied to the county office on forms furnished by the District, the $10 deposit will be refunded in full. The landowner is responsible for this information.

High Plains Underground Water Conservation District No. 1
1628-B Fifteenth Street
Lubbock, Texas

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THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 5—No. 11 "THERE IS NO SUBSTITUTE FOR WATER" *April 1959*

SAGA OF INFANT GIRL WHO DIED IN ABANDONED WELL IS RECALLED

Editor's note — The following Associated Press News story is being reproduced from the Lubbock Avalanche-Journal Newspaper in an effort to re-emphasize what can happen, and what did happen, due to carelessness in leaving an abandoned well open, or closed improperly.

We have for a number of years now attempted to bring to our readers the reasons for properly closing old unused wells. If we were to have an accident similar to the one revealed in the story following, we would certainly be aware of the necessity of closing open wells; however, then our realization of this fact would cost the life of some High Plains' child.

Don't be guilty of providing such a story for our nation's newspapers. Close any open well that you might have on your farm. It could save a young life.

SAN MARINO, Calif. (AP)—It was a narrow hole, 14 inches wide, its top almost covered with weeds.

Three children played around it, one pleasant spring day a decade ago, then, suddenly, only two children were there.

The hole was a 230-foot-deep abandoned well in a vacant lot. It had claimed Kathy Fiscus, age 3.

Kathy's cousin, Gus Lyon, then 5, heard her crying, and realized the sounds came from the ground. He ran for her mother.

Mrs. David Fiscus knelt by the hole. "Can you hear me, Kathy?" she asked.

Up came the faint reply: "Yes."

"Kathy, Kathy," cried her mother. "Are you standing up?"

"Yes," came the voice, "I am."

Mrs. Fiscus ran for help.

It was the beginning of one of the nation's greatest rescue operations—a futile one, almost from the first; an operation which the whole country watched.

On a warm Sunday, 52 hours later, the golden-haired child was brought from the well—dead. A nation wept.

Doctors said she apparently suffocated within two hours of her plunge into the well casing. She apparently slipped deeper into the hole after her last words to her mother.

A rescue worker—one of 132 who labored round-the-clock—found her 95 feet below the ground. The rescuers had to cut a parallel shaft and then back their way through the well casing to reach her body.

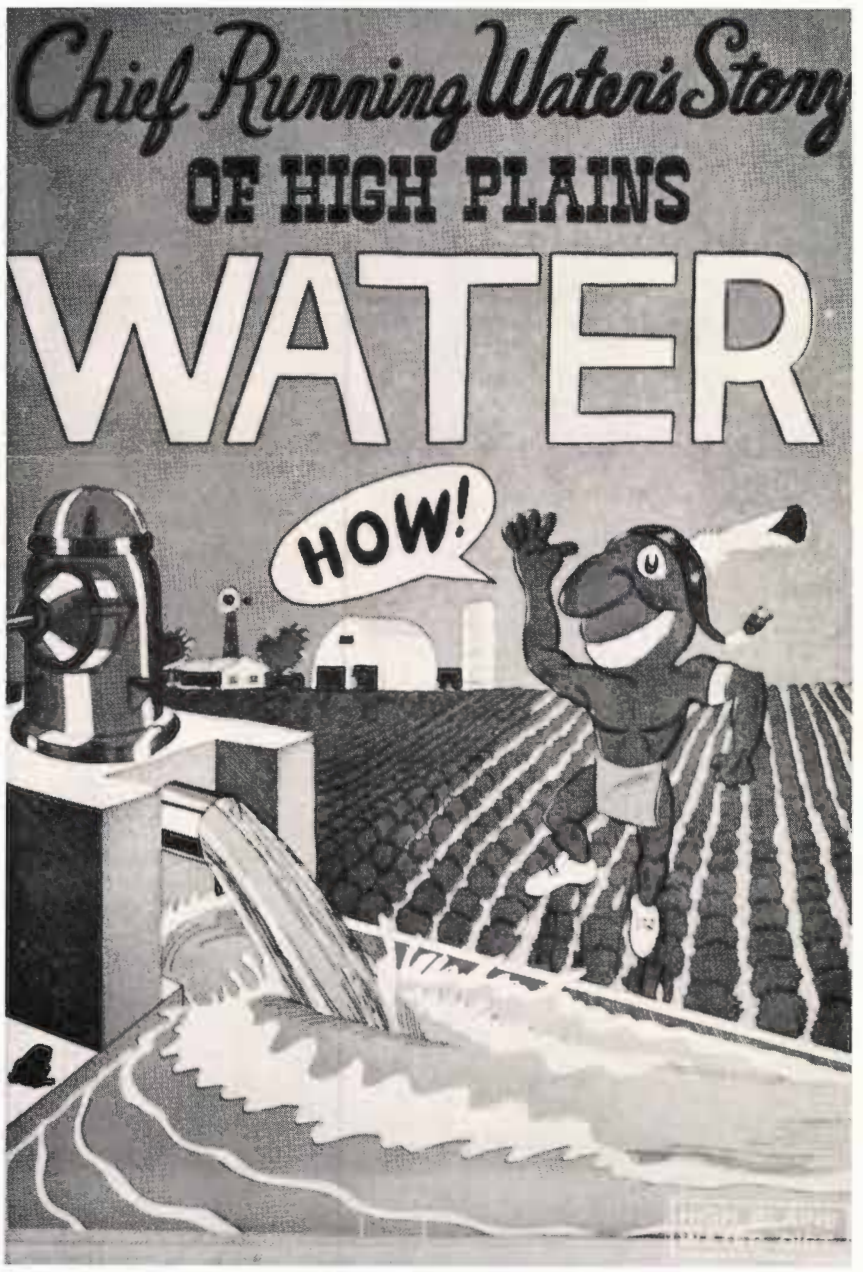
The incident touched off a nationwide move to cap abandoned wells throughout the country. Contributions totaling $44,139 came from all over the world for the rescue workers.

Some of the workers gave their share to the Kathy Fiscus Memorial Fund, which turned over almost $4,000 to the Society for Crippled Children.

From the fund enough was diverted for this plaque, which is at Children's Hospital in Los Angeles:

"Kathy Fiscus—August 12, 1945-April 8, 1949—in whose memory eternal vigilance in the field of child safety is hereby dedicated."

WATER DISTRICT PUBLISHES COMIC BOOK ON UNDERGROUND WATER



The High Plains Underground Water Conservation District has published a full-color comic book on underground water in the Texas High Plains. The comic book is entitled, "Chief Running Water's Story of High Plains Water."

A little Indian chief from the past appears on the present scene and explains to a young boy and girl who live in the High Plains area why they have need of water conservation. He discusses and illustrates the geologic formation of the region, the development of water for agricultural, municipal and industrial purposes and the various uses to which underground water is put. Chief Running Water also discusses many of the water conservation practices now being put to use in this area and presents information as to what we can expect in the future as High Plains' residents.

The comic book was designed for the fifth, sixth, and seventh-grade age children and is presently being distributed throughout the schools within the High Plains Water District. The

(Continued On Page 4)

Austin Is Site Of Water Conference

On May 22-23 the University of Texas' law school will hold its fifth annual water conference. The two-day meet will present talks and panel discussions on Texas water problems.

Sam Aldridge, Farwell attorney, will be among the noted lawyers on the program. He will serve on a panel discussing certain conference talks.

NO BILL ON WATER - USE FEE

High Plains water-users have been duly concerned over the possibility of having to pay a fee to the State of Texas for using underground water.

A proposal was offered before a sub-committee of the State Senate by the Texas Society of Professional Engineers to place a water-users fee on individuals and political sub-divisions using either underground water or surface water.

The proposal suggested that a fee of 3 cents be placed on underground water-users for each 100 gallons per minute capacity of their wells. Under this proposal, wells producing less than 200 gallons per minute would be exempt from paying the fee.

This would mean, for an example, that a well owner who produces a well that has a capacity of 1,000 per minute would pay to the State a water-users fee of $30 annually regardless of how much water was pumped from the well.

Under a proposal of this type, High Plains water-users would pay a goodly portion of the total fees which would go into the general revenue fund of the state treasury since the High Plains area has a majority of the irrigated land of the state. Some 4-3/4

(Continued On Page 4)

THE Cross SECTION

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ALLAN WHITE
Editor

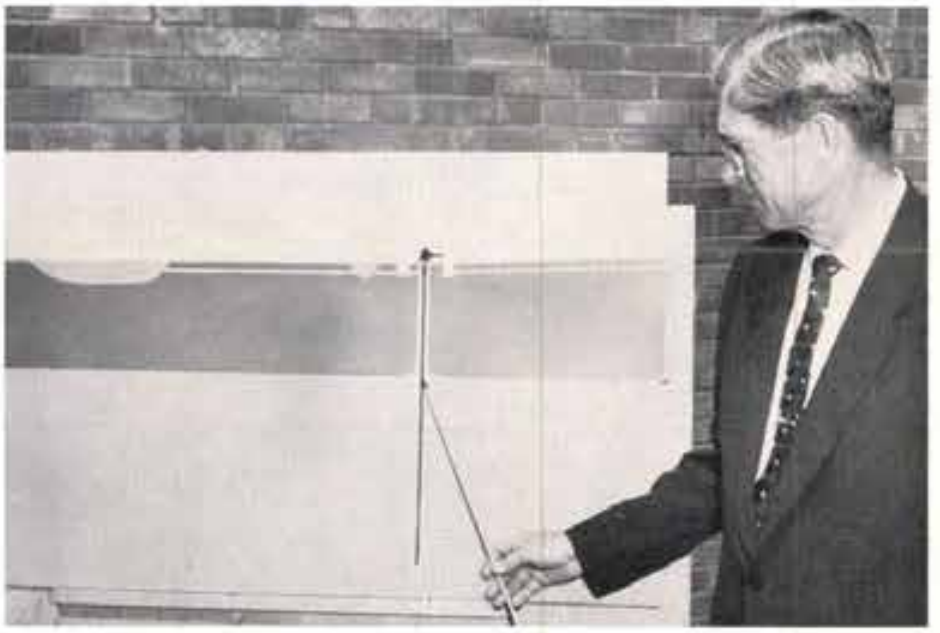
Chemical Offers New Approa

The High Plains Underground Water Conservation District in cooperation with the Dow Chemical Company is attempting to free lake-water of suspended particles before it is used for recharge purposes. This experimental work, under the direction of W. L. Broadhurst, Chief Hydrologist for the Water District, is being conducted at a recharge well and playa lake located on the Bill Sutton farm, five miles southeast of Dimmitt, Castro County.

Attempts are being made to coagulate, by chemical reaction, the suspended particles of silt and clay contained in the lake-water. The chemical used in the experiments, which is neither toxic nor corrosive, is called Separan AP-30. It is injected into the lake-water as the water passes from the lake into a gravity flow line, which in turn leads into an earthen pit approximately 150 feet long by 20 feet wide by 10 feet deep. When the chemically treated lake-water reaches the pit and slows in velocity, the coagulating process takes place. Within a period of a very few minutes the suspended particles have coagulated and are commencing to drop to the bottom of the pit. Then from the pit, the clear water is carried by gravity flow into the recharge well where it in turn moves out into the underground aquifer.

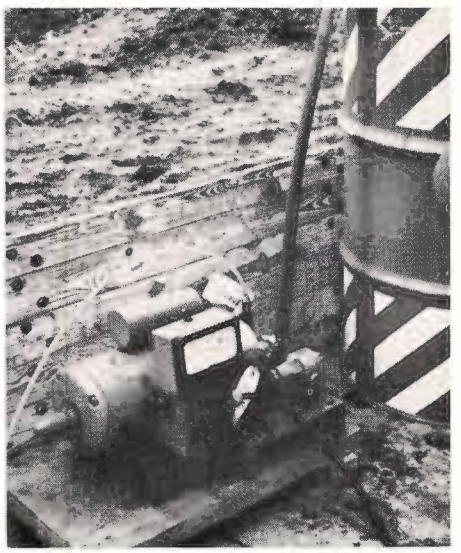
According to Willard C. Blackney, Jr. of Midland, Michigan, and Melvin F. Katzer, Pittsburgh, California, chemical engineers with the Dow Company, the flocculating, or coagulating, process can be accomplished with a minimum amount of machinery and at a cost of between $.50 and $1.50 per acre-foot of water treated.

Determinations to be made during the experimental work at Dimmitt will be the costs involved in flocculat-



W. L. Broadhurst, Water District Chief Hydrologist, indicates on a cross-sectional diagram how lake water is drained by gravity into a recharge well on the Bill Sutton farm near Dimmitt. The lake water moves from the well out into the underground formations.

Separan AP-30, a powdered flocculating chemical is mixed with water at a ratio of 2 pounds to 55 gallons.



The flocculating chemical, mixed with water, is pumped from a steel drum through a plastic hose to the lake intake. The pump is driven by a small electric motor, which in turn is powered by a gasoline motor generator.

ch To Solving Problem Of Sediments Suspended In Lake Water

ing the suspended particles from the lake water before recharge, the effects that wind velocity will have on the flocculating process, the techniques used in handling the chemical, the machinery required, and the practical results of using the chemical.

Attempts will also be made during the experimental work to apply the flocculating chemical by airplane to the surface of a wet-weather lake. This will be done in order to determine whether or not the coagulating reaction will take place over a large area with no more mixing action than the ordinary turbulence of the water due to wind action.

Should the experimental work be regarded as successful, after approaching the subject of cost from the individual farmer's standpoint, we in the High Plains will have passed another milestone toward eventual success in artificially recharging the underground formations by using playa lake water.

The picture above shows an overall view of the Bill Sutton lake and recharge well. Lake water drains by gravity into a concrete pipeline. The flocculating chemical is injected at the lake intake. The chemical and lake water mix thoroughly in the pipeline between the lake and a large earthen pit. The water slows in velocity when reaching the pit and the sediments in the water begin coagulating. In a matter of a few minutes the weight of the suspended particles pull them to the pit's bottom. Clear water then moves from the pit into the recharge well.

The flocculating chemical is pumped to the lake intake and injected into the mouth of the concrete pipeline.

As the lake water moves rapidly through the concrete pipeline from the lake into an earthen pit, the chemical and water become thoroughly mixed.

Periodic samples are gathered from the pit to determine the effectiveness of chemical reaction on the particles of silt and clay suspended in the lake water.

An adjustable pipe serves as an intake to the recharge well from the pit. Water is taken from the pit near the surface in an effort to draw into the well a minimum number of flocculating particles, which might remain in suspension.

As the chemically-treated water gravity flows into the recharge well from the pit it passes through a flowmeter which records the number of gallons of water entering the underground aquifer.

Comic Book—

(Continued From Page 1)

District is making available enough copies in each school for two grades.

In each booklet is a decal that can be used in any desired way to further stress the water use campaign. The decal shows a picture of Chief Running Water, and urges that "Water is Your Future, Conserve 'Um."

Area educators have been very enthusiastic in their reception of the comic book. Most have expressed their opinion that the comic book may probably be used for three or four years by supplementing the present curriculum with studies on the book's content and then retain it in the class libraries.

So far, the schools in about half the counties in the District have been furnished with the comic books.

Class 6-C of the Morton elementary school is shown above as the members each receive a copy of the Water District's new comic book from teacher Harold Drennan. At the right, Mr. Drennan explains to the class a particular portion of the full-color book on underground water.

Water-Use Fee—

(Continued From Page 1)

million acres are irrigated in the High Plains of Texas from more than 45,000 irrigation wells. This compares to a total number of acres irrigated in the state of near 7 million.

Tom McFarland, General Manager of the High Plains Water District, upon returning from a recent Austin visit to the Legislature, stated that he was unable to find that a bill has actually been drafted presenting the recommendations of the Texas Professional Engineers. Members of the Legislature from this area have also been unable to find such a bill and apparently none has been drafted.

Because it is now too late for a new bill to be introduced to the State Legislature during this session, we probably can look forward to hearing more of this proposal again in two years at the next session.

"WATER AND AGRICULTURE" TOURS OFFERED AT TEXAS TECH

Tours for the seventh-grade students of the Lubbock Independent School District are presently being conducted through the West Texas Museum on the Texas Technological College campus. The tours, entitled "Water and Agriculture," are jointly sponsored by the West Texas Museum and by the Lubbock Junior League.

Mr. Jerry Porter, Curator of Education for the museum is in charge of the program, and Mrs. W. D. McCoy, chairman of the Junior League's Museum Tour Guides Committee, acts in the capacity of Coordinator of the tours. The school classes are conducted on the tour by members of the Junior League.

Approximately 1300 students from 44 classes will participate in the tours this spring.

The purpose of the "Water and Agriculture" tour is to acquaint the seventh-grade child with facts pertaining to the geologic formation of the High Plains region; with facts concerning the hydrology of our area; the various uses to which water is put; the importance of rainfall in our agricultural program; conservation practices; and what the advent of irrigation, new equipment and greater technology on the agricultural scene has meant to the farmer, and subsequently to the entire population in the High Plains. The tour is also designed to make the student aware of the importance of grain sorghum, cotton, cotton seed, and other High Plains' crops and crop by-products to our economy.

Mr. Porter states that perhaps if enough interest were generated, the "Water and Agriculture" tour could be enlarged to include students from other schools in the area.

The new full-color comic book recently published by the High Plains Water District is being distributed during the tour to each of the children. According to Mrs. McCoy it has been received with enthusiasm.

We would like to acknowledge our appreciation to the West Texas Museum and to the Lubbock Junior League for the fine educational job that they are doing in cooperation with the schools and the youth of our area.

Well Drilling Statistics For February And March

During the month of February, 140 new wells were drilled and registered with the District office; 14 replacement wells were drilled; and 16 wells were drilled that were either dry or non-productive for other reasons. 325 permits were issued by the County Committees.

In March, 174 new wells were drilled; 18 replacement wells were drilled; and 22 wells were drilled that were dry. 267 permits were issued.

The permits issued and completed wells for both February and March follow by counties:

County	*Permits Issued*		*New Wells Drilled*		*Replacement Wells*		*Dry Holes Drilled*	
	Feb.	Mar.	Feb.	Mar.	Feb.	Mar.	Feb.	Mar.
Armstrong	0	0	0	0	0	0	0	0
Bailey	9	10	3	2	0	0	0	3
Castro	26	19	11	7	1	1	0	0
Cochran	18	10	5	6	1	2	2	1
Deaf Smith	20	15	4	9	5	3	1	1
Floyd	32	40	8	17	0	1	0	2
Hockley	62	52	36	49	0	1	3	6
Lamb	44	23	22	30	1	4	2	1
Lubbock	58	52	20	32	1	2	2	6
Lynn	23	19	12	7	0	0	5	1
Parmer	29	20	15	11	4	4	0	0
Potter	0	0	0	0	0	0	0	0
Randall	4	7	4	4	1	0	1	1

Mrs. John Cobb, Lubbock Junior League museum tour guide, explains a certain phase of water conservation to a Lubbock seventh-grade class. The J. T. Hutchinson Junior High class, taught by Mrs. B. Speck, was exposed to many interesting facts on the "Water and Agriculture" tour through the West Texas Museum.

High Plains Underground Water
Conservation District No. 1
1628-B Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 5—No. 12 "THERE IS NO SUBSTITUTE FOR WATER" *May 1959*

SCHOOL CHILDREN EXPRESS THEIR INTEREST IN WATER CONSERVATION

The following letters were received from members of the fifth grade of the Aikman School in Hereford, Texas. Mrs. Earl Holt, teacher of the fifth grade at the Aikman School, is the wife of Deaf Smith County Committeeman, Earl Holt.

The letters were received by the editor after having made a brief talk on water conservation before the fourth, fifth and sixth grade classes of the Aikman School. The letters are reproduced to show the interest that our children have in water conservation and the part that they will play in the continued prosperity of our irrigated agricultural economy. The Aikman Grades were given copies of a new full-color picture book recently published by the Water Conservation District entitled, "Chief Running Water's Story of High Plains Water."

* * *

Mr. Allan White
1628 15th Street
Lubbock, Texas

Dear Mr. White:

I enjoyed your talk very much, and I learned quite a bit about Ogallala. It was a very well told and interesting talk. I use to think that there was a huge lake below the ground and all kinds of fish in it, but you brainwashed me on that idea.

I sincerely thank you and the rest of the Board of High Plains Underground Water Conservation District No. 1 for *Chief Running Water's Story of High Plains Water*. It was very interesting. I learned how to use water more wisely.

Sincerely yours,
Stephen Knox
Box 305
Hereford, Texas

* * *

Mr. Allan White
1628 15th Street
Lubbock, Texas

Dear Mr. White:

I want to thank you for coming and talking to us about the High Plains Underground Water Conservation District No. 1. I enjoyed it very much. I didn't realize how important water is. I know now that I have an important part in conservation of water, too.

I like the book you gave us. It is very nice. It had a lot of things I didn't know about.

I am a fifth grader. Thank you for everything.

Yours truly,
Linda Shelton
106 George
Hereford, Texas

Bill Signed Amending Water Development Act

Senate Bill No. 213 sponsored by Senator George Parkhouse of Dallas, which amends the original State Water Development Board Act, has recently been signed by Governor Price Daniel.

The State Water Development Board was established two years ago by a vote of the people to serve as a lending agency for political subdivisions of Texas—making money available for a portion of the construction costs of dams and certain other phases of the development of water supplies.

Principal change from procedure outlined in the original act gives the Development Board authority to issue State bonds in 15 million dollar units each six months. The original act made it mandatory that only bonds in the amounts of final approved loans could be sold. The amendment will make the State bonds more attractive and should lend to a lower interest rate. The Board is hopeful that the State bonds will now carry a triple A rating and that they will attract syndicate bidding.

The financing of water filteration plants is permitted under the new act. Also surplus funds in the State Water Development Fund must be invested in federal securities. The interest from such securities should pay the interest on the State bonds.

COMANCHE WATER DISTRICT HEARING SET

The State Board of Water Engineers has called a public hearing for June 11 at the Pecos County Courthouse Annex in Ft. Stockton to delineate boundaries of the proposed Comanche Underground Water Conservation District.

The Board in cooperation with the U. S. Geological Survey and Pecos County Commissioner's Court has been making geological studies of the Comanche Underground Reservoir since 1956, when over fifty Pecos County landowners signed a petition to the Water Board to form an underground water conservation district. Delineation of the reservoir boundaries is required as the initial step in formation of a district.

Data indicate that the most extensive part of this aquifer underlies the western part of Pecos County. However, parts of it also underlie Reeves, Jeff Davis and Brewster Counties.

FINANCING IRRIGATION FARMERS

By HARRY MOORE, El Paso National Bank, El Paso, Texas

The changing agricultural situation and recent farm legislation make it necessary for the lender to take a second look at farm financing. This is particularly true in irrigation farming with high fixed costs and usually higher cost of farming. Although irrigation takes a lot of the risk out of farming, it does not change it from a gamble to a cinch. And it does not, by the resulting increase in yields, offer a substitute for government price supports.

Financing must be available to all farmers, but I will limit my remarks to the financing of cotton farming by irrigation. I do that because (1) it is the leading agricultural commodity of the country, with Texas being the largest producer; (2) cotton production is rapidly moving west where irrigation is essential; (3) it has the stability to justify the high cost of irrigation farming; (4) production problems of cotton irrigation farming are reasonably typical; and (5) I hail from the area that produces the World's Finest Cotton.

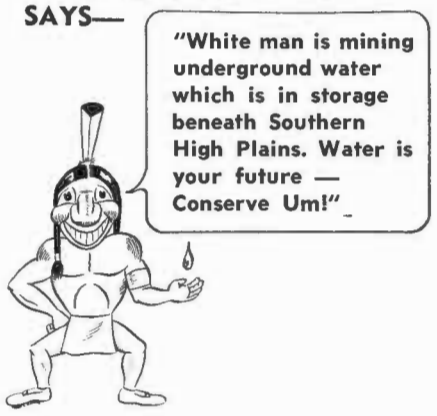
In irrigation farming, as in any other, credit worthiness of the applicant is of prime importance. Other necessary qualifications such as production history of the farm, value of collateral, availability and quality of water, can usually be determined with reasonable accuracy.

With these qualifications met and with agreement between the farmer and banker that some margin between loan and collateral exists, financing can usually be arranged.

To take a case which may be fairly typical, let's consider the case of the fictitious Richard Roe. Early in the year he makes arrangements for his financing. By that time he knows his acreage allotment, and his previous

(Continued On Page 4)

"CHIEF RUNNING WATER," SAYS—



Nuclear Contamination May Become Problem

The contamination of water by nuclear blasts is of major concern to the Civil Defense program in the event of war. Solutions to the problem are being handled rather ingeniously in several places. For an example, Kensington, Pennsylvania, has recently arranged for a local dairy to produce enough one-quart cartons for deep-well water to supply its entire population if the town's surface water supplies are contaminated. In New Jersey, a firm named, The Survival Company, is selling kits containing vacuum packed tin cans of water good for 25 years.

WELL DRILLING STATISTICS FOR APRIL

During the month of April, 230 new wells were drilled and registered with the District office; 19 replacement wells were drilled; and 14 wells were drilled that were either dry or non-productive for other reasons. 188 permits were issued by the County Committees.

The permits issued and wells completed for April follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	29	16	2	1
Castro	15	25	3	0
Cochran	15	10	0	2
Deaf Smith	15	10	3	0
Floyd	11	24	5	0
Hockley	23	32	1	4
Lamb	12	27	1	1
Lubbock	33	50	0	5
Lynn	9	14	0	0
Parmer	23	18	4	1
Potter	0	0	0	0
Randall	3	4	0	0

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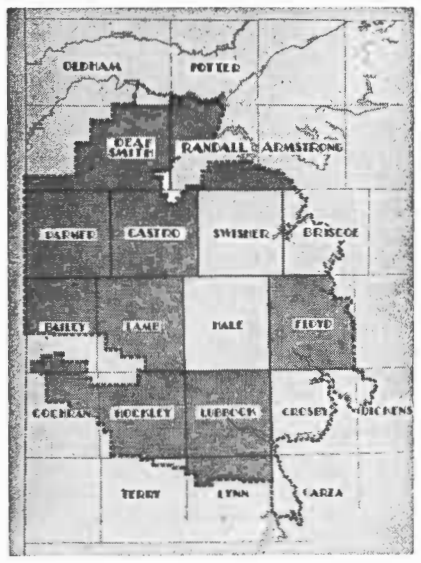
ALLAN WHITE
Editor



INEFFICIENCIES IN

Underground pipelines are a popular means of eliminating water losses common to open ditches in irrigation systems on the High Plains. Irrigation is easier, water control generally is better, valuable water is saved from deep percolation and evaporation waste, and farming is often more profitable where underground pipelines are used to convey irrigation water.

Conveyance of water from the pump discharge to the pipeline has presented several problems, and at least in part, High Plains farmers have devised effective ways to solve the problem. Unfortunately, some of these systems cost the farmer money every hour that his pump is running.

There are three main problems encountered in connecting a steel pump discharge pipe to the pump stand of a concrete pipeline system:

1. Vibration of the pump.
2. Expansion and contraction of the pump discharge pipe due to temperature changes.
3. Provision for a fast easy way to disconnect the pump from the pipeline system during pump or well repair work.

Figures 1, 2, and 3 show connections which fulfill the three requirements stated above. However, the systems shown in figures 1 and 2 waste horsepower because the water is lifted higher than necessary (figure 1) and sharp bends increase friction loss (figure 2).

A misconception held by some individuals is that the pumping plant does less work if the discharge pipe is above the surface of the water in the standpipe as shown in figure 4. This is not true. Where the discharge is above the surface of the water, the pump works against a total static head equal to the vertical distance from the water surface in the well when pumping to the centerline of the discharge opening. If the pump discharge is below the surface of the water in the standpipe, the pump

FIGURE 1. Pump discharge which lifts water higher than necessary and increases chances for mechanical damage to discharge pipe by tractors and machinery. The discharge could be below the ground surface.

FIGURE 2. Sharp bend (foreground) increases horsepower required for pumping. Discharge pipe (background) lifts water higher than necessary.

IRRIGATION PIPELINES WASTE POWER[1]

By VICTOR L. HAUSER [2]

works against a total static head equal to the distance from the water surface in the well when pumping to the water surface in the standpipe. Therefore, the pump must raise the water higher than necessary, when the discharge is located above the surface of the water in the standpipe, thereby increasing the power required for pumping. The extra distance or head (h) is shown in figure 4.

Table 1 has been prepared to show the approximate horsepower waste for a system discharging water above the water level in the standpipe. The table has been prepared assuming a pumping plant efficiency of 50%. The efficiency of a new pumping plant may be 60% or more, and for an old plant may be 40% or less. To use the table, two things must be known.

1. Pumping rate, in either gallons per minute or cubic feet per second.
2. The distance "h" shown in figure 4. (If the distance "h" is not known it can be obtained with a carpenters rule or tape measure.)

The following example will demonstrate the use of the table:

A pump produces 800 gallons per minute and the water is raised and discharged 8 feet above the water level in the pump stand. Enter the table on the left hand side at 800 g.p.m. and read across to the 8 foot column to find that 3.23 horsepower is being wasted. If the pump is operated 24 hours per day for 100 days per year, the extra cost for fuel or power alone may be calculated as follows:

100 days x 24 hrs. equals 2,400 hrs.
2400 hrs. x 3.23 hp. equals 7,752 hp.
—hrs.

Fuel and power costs vary in different areas. Figures shown in table 2 are believed to be reasonable and near the actual cost to most farmers for the specific example shown. The cost of fuel is not the only added expense imposed on the irrigator by pumping water higher than necessary, however, it is probably the largest.

Reducing the continuous load on an irrigation engine even one horsepower may increase engine life and enable the engine to pump water longer before an overhaul becomes necessary. This is particularly important for light-duty engines which usually have a smaller reserve of potential power.

Sharp bends in the pump discharge pipe such as the one in figure 2 also use more power and increase the farmer's pumping cost. When water passes through a sharp bend, friction and turbulance losses occur in the bend. In the case of a pump discharge sharp bends create a greater back pressure or head on the pump than would occur with smooth circular bends. Sharp bends should be avoided wherever possible.

The three main problems of connecting a pump discharge to the pumpstand (vibration, expansion and contraction, and easy disconnection) can be solved with a flexible coupling as shown in figures 3, 4, and 5. The pump discharge pipe should be kept as straight, and as short as possible to reduce friction power loss. The pump discharge pipe should enter the pumpstand at or below the water level in the standpipe to eliminate horsepower waste.

TABLE 1
Horsepower required to lift different quantities of water to elevations from 1 to 10 feet. (Based on pumping plant efficiency of 50%).

Gal. per Minute	Horsepower required for elevations of 1 ft.	2 ft.	3 ft.	4 ft.	5 ft.	6 ft.	7 ft.	8 ft.	9 ft.	10 ft.	Cubic feet per Second
100	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.22
150	0.08	0.15	0.23	0.30	0.38	0.46	0.53	0.61	0.68	0.76	0.33
200	0.10	0.20	0.30	0.40	0.50	0.61	0.71	0.81	0.91	1.01	0.45
250	0.13	0.25	0.38	0.50	0.63	0.76	0.88	1.01	1.14	1.26	0.56
300	0.15	0.30	0.46	0.61	0.76	0.91	1.06	1.21	1.36	1.52	0.67
350	0.18	0.35	0.53	0.71	0.88	1.06	1.24	1.41	1.59	1.77	0.78
400	0.20	0.40	0.61	0.81	1.01	1.21	1.41	1.62	1.82	2.02	0.89
450	0.23	0.46	0.68	0.91	1.14	1.36	1.59	1.82	2.02	2.27	1.00
500	0.25	0.50	0.76	1.01	1.26	1.52	1.77	2.02	2.28	2.53	1.11
600	0.30	0.61	0.91	1.21	1.52	1.82	2.12	2.42	2.73	3.03	1.34
700	0.35	0.71	1.06	1.41	1.77	2.12	2.48	2.83	3.18	3.54	1.56
800	0.40	0.81	1.21	1.62	2.02	2.42	2.83	3.23	3.64	4.04	1.78
900	0.45	0.91	1.36	1.82	2.27	2.73	3.18	3.64	4.09	4.55	2.01
1000	0.50	1.01	1.52	2.02	2.52	3.03	3.54	4.04	4.54	5.05	2.23
1250	0.63	1.26	1.89	2.52	3.16	3.79	4.42	5.05	5.68	6.31	2.78
1500	0.76	1.52	2.27	3.03	3.79	4.54	5.30	6.06	6.82	7.58	3.34

TABLE 2
Estimated yearly cost of pumping 800 g.p.m. 8 feet higher than necessary.

Power Source	Work Output per Unit of Power or Fuel	Quantity of Fuel or Power Used	Cost of Fuel Per Unit	Cost of Fuel Total per Year
Gasoline	11.3 hp-hr/gal.	686 gal.	$0.245	$168.07
Propane	8.92 hp-hr/gal.	870 gal.	$0.095	$ 82.65
Natural Gas	81.9 hp-hr/1,000 cubic feet	94,650 cubic feet	Sliding Scale (Avg. $0.486)	$ 46.00
Electricity	At 88% motor efficiency	6580 KW-hrs	Sliding Scale (Avg. $0.014)	$92.12

FIGURE 3. A good connection from pump to standpipe. Note straight discharge pipe with flexible coupling.

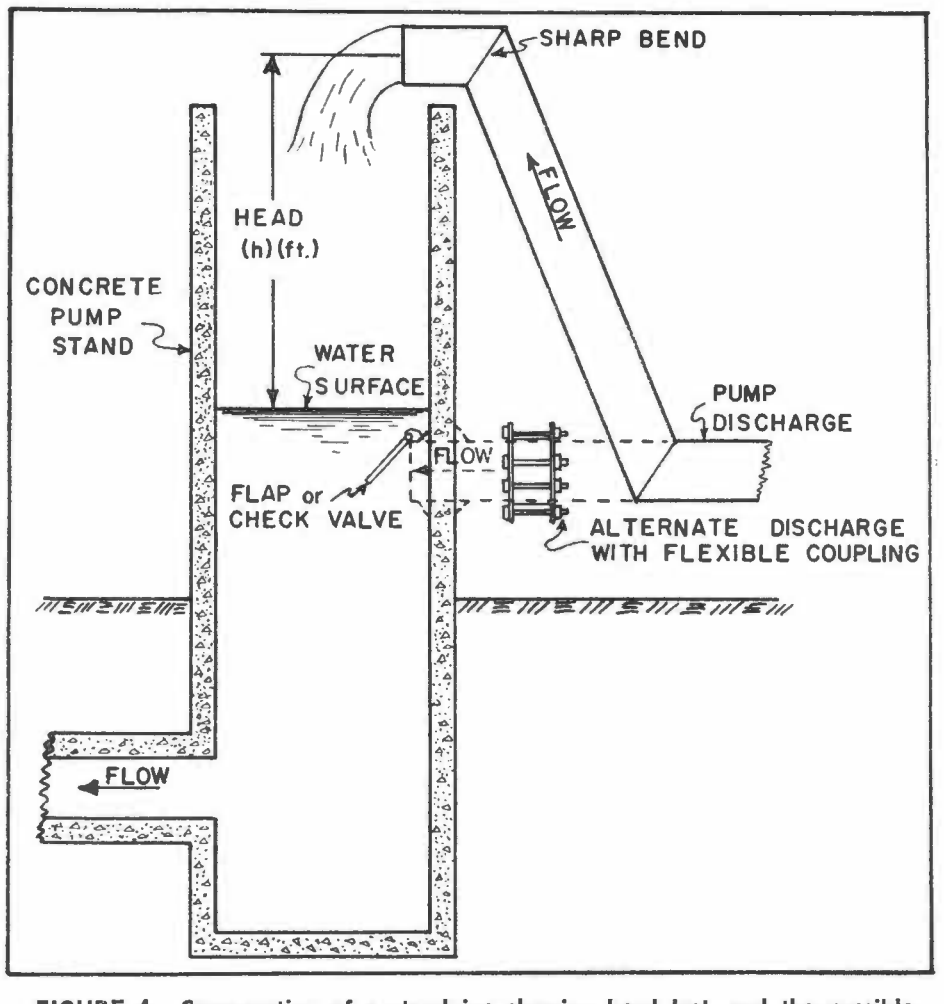


FIGURE 4. Cross-section of a standpipe showing head lost, and the possible solution to the problem.

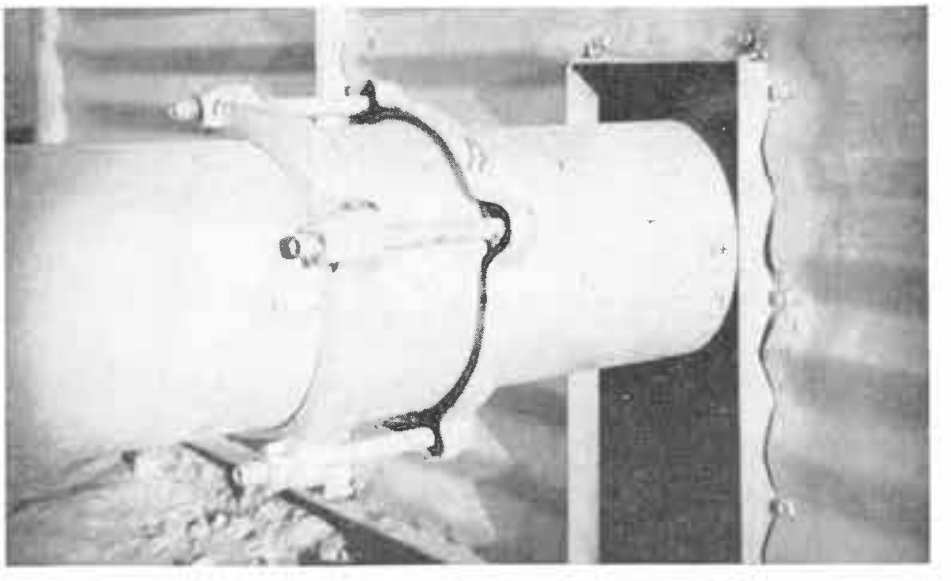


FIGURE 5. Closeup of a commonly used flexible coupling which provides protection from pump vibration, expansion and contraction, and allows easy disconnection of the pump from the system.

1. Contribution to "The Cross Section" from Soil and Water Conservation Research Division, Agricultural Research Service, U. S. Department of Agriculture, Texas Agricultural Experiment Station cooperating.
2. Agricultural Engineer, Western Soil and Water Management Research Branch, Soil and Water Conservation Research Division, Agricultural Research Service, U. S. Department of Agriculture, Bushland, Texas.

Finance—

(Continued From Page 1)

crop loan is, we hope, paid off. He's ready to start the grind again.

Mr. Roe has, let's say, a cotton allotment of 100 acres. He approaches his banker and goes through a procedure which has become fairly routine.

First of all, he and the banker fill out a new financial statement. Just to get the overall picture—Is he losing ground or gaining? Are his land payments up to date?

Chances are that it's going to show a *smaller* net worth than the previous year. Land values are likely to be down and his products aren't bringing what they did just a few years ago. And the land payments still have to be paid, even if set up in more prosperous days.

But we're primarily concerned with a production loan. The banker, knowing the situation, is not too alarmed about the lower net worth, because he knows that what is happening is happening slowly and you can usually see a year ahead as far as prices are concerned.

So let's get the budget fixed. We hope we know already about what it will cost to farm, but Richard Roe's banker has to justify the full amount.

First of all, there's labor. The industrial revolution has come to farming but it hasn't completely overtaken it. A man can chop about as much cotton with a hoe as he could 50 years ago. But his wages are necessarily higher. Let's put labor down at $50.00. Five thousand for the year. How much for chopping? For irrigating? Let's not get too detailed. But—just so our budget will prove to the loan committee or head office we know what we're doing, let's divide it up by months. To do this you can pore over past records or studies or you can divide 70% equally among the months February through September, eliminating picking, then use the 30% as additional money needed in the late spring and summer.

Let's put down $15.00 now for the expense of running the tractors. Add another $1,500.00. Then, there's water to pump and Richard Roe says he needs about $25.00 an acre here—$2,500.00 total. Asked how he arrives at the figure he says, "Well, I figured that it costs about a nickel per acre foot per foot of lift to water my farm. I can't do that well with my little well, but the big one is real good, and it averages out O.K."

Then he puts in $35.00 for fertilizer and poison, a little lower than the previous year because part of the cotton is being planted on ground just out of alfalfa. Add $3,500.00. But the banker had better stay flexible here, because "Not quite enough poison" is a real big shortage.

Planting seed will take a few dollars, insurance fourteen to fifteen dollars; legal and audit, miscellaneous supplies, taxes other than water will run about fifteen dollars. Interest on the loan we'll leave out and take it off the other end so it won't be so obvious.

Let's see now how much we have:

$ 50.00	—Labor, Wages
15.00	—Tractor Expense, Fuel
25.00	—Water Pumping
35.00	—Fertilizer, Poison & Seed
15.00	—Taxes, Miscellaneous Supplies
10.00	—Labor Recruiting, Etc.
$150.00	

It's a good trick if you can pick cotton for $30.00 a bale, so it's going to cost $50.00 an acre, at the *least*. We've spent $200.00 to farm an acre of cotton.

Now let's look at collateral: If he makes a bale and a half of cotton per acre it ought to be worth $240.00. Make it a good year—2 bales—$350. The added production costs a little more, but pays considerably more. It is hard to tell, especially in advance, how well additional expenditures will pay off. And, it's a fairly slow process to convince the banker that you ought to add $50.00 or so an acre to the budget.

Now, in this situation, we show a nice profit. Let's split the difference and say $75.00 an acre. That's $7,500. Let's make the payment which is probably due on the land note—about $1,500.00. Leaving $6,000.00. Income tax, $500.00; leaves $5,500.00. Even figuring a big year—adding a few thousand—you don't find him with a surplus after he sends a couple of kids to college.

The farm and equipment producing this crop probably represents an investment of $125,000.00 to $150,000.00. Add the $15,000.00 crop production loan and you have $140,000.00 to $165,000.00.

He has worked all year. He has fought bugs, drought, rain and hail. He scratched his fingers raw to see if the cotton would ever sprout, and he nearly developed ulcers trying to get it picked. And he made a whopping 5% to 6% on his investment, before taxes.

There are some years when he won't pay back the production loan, but he and the lender hit it again the next year, *hoping* for a better year with maybe a 10% return. (Those are the years when he gets that rich farmer reputation.)

Does this mean he's a bad risk? Not by a long shot. A good friend of mine, heading one of the largest cotton financing organizations in our area, told me that they don't worry as much about a crop loss as they do about a man quitting. "If they'll keep farming, they'll usually pay out" was what he told me. If farmers were quitters, this would be a hungry nation. As a group they're good credit risks and I'd rather finance them than anyone I know, and I don't think a choice of Plan B over Plan A will necessarily change this.

Incidentally, I think original predictions of what Plan cotton farmers would choose indicated a very large acreage in 1959 as a result of widespread use of Plan B. Recently, there seems to be considerable thought given to Plan A, with the farmers in my area definitely favoring that Plan. Many good studies have been made indicating that *slightly* more money might be realized from B than A. I believe the architects of the bill had a pretty sharp pencil and came up with two plans which are about an offset, either of which means less income in 1959.

What is the outlook? Are we going to have to take a second look at financing irrigation farmers? Aren't increased yields and modern practices enough to offset losses which are likely in the future?

Yes, we are taking a second look. Generally, I doubt that increased yields will completely offset the loss in price. Lower cost production methods must be found. That's almost universal advice these days.

Well, I'm no economist. Bankers have to look at the value of the collateral and what the costs of producing it might be. And they're *getting closer together.* How about trimming costs? Labor, for example. Fine—but prepare for a capital investment in more machinery and better irrigation systems—both considered a MUST. And the machinery isn't likely to get cheaper—what with all steel companies being able to, coincidentally, raise the price of steel. Just for a good example, the price of alfalfa hay was cut in half in our area. Balers, bailing wire and the cost of a man to operate them all went up.

I don't know what the answer is, but I think I know a direction the farmer will be looking in. He's looking at the middlemen—and all the way to the consumer. As he is squeezed, he's going to have to see how close he can get to the consumer. Suppliers, including bankers, processors, merchants and even retailers, have something at stake.

Along with many old time farm operators, I agree that the agricultural economy is a barometer and that no law or economist's new theories have changed that.

Agricultural financiers, equipment houses, processors and merchants can prosper only if the farmer does.

These men are specialists; most of them also caught in the squeeze. They operate on the lowest margin of profit to keep a farmer's business. But the fact that the allied industries are a necessary part of the farm economy does not prevent the farmer from casting his eye in their direction. The feeder looks at the packer and wonders if he could do better without this "middle-man." Should he be his own packer? The farmer looks at the merchant, even to the mill, and wonders if he could fare better by cutting these men out. If he does, he could well deprive himself of the service of the specialists, whose service remains high because of skill and competition.

All of we suppliers will do well to become interested in the farm program—because our welfare is also at stake.

I see nothing in the picture that indicates a lack of financing any more than I see a shortage of machinery or fertilizer. But I do see a need for a solution to a problem which affects all of us.

The challenge in the field of financing will be met mainly because the enterprising farmer will meet his challenge and comparing these two challenges, makes me feel very humble and insignificant. To me, the farmer at work is still the best example of "America at its best."

The foregoing article was prepared by Mr. Moore for the irrigation conference held November 20-21, 1958 in San Antonio, Texas, sponsored by the Texas Irrigation Council.

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

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THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 6—No. 1 **"THERE IS NO SUBSTITUTE FOR WATER"** *June 1959*

DE-SALTING WATER IN DESERT OF NORTH AFRICA IS REALITY

The Resources for the Future, a Ford Foundation entity, reports, in its May 1959 newsletter, the interesting progress of a de-salting water project in Libya.

Tobruk, a town in Libya near the Mediterranean Sea at the edge of the Libyan Desert, has a population of about 5,000 people. Annual rainfall there amounts to less than five inches, and no surface streams or lakes are in the area. Well water is high in salt content and is used only for sanitary purposes. Drinking water for the community has to be trucked from a distance of 75 miles. Even this water is about twice as salty as is considered tolerable in this country. It costs $14 a thousand gallons as compared with an average cost under 25 cents a thousand gallons in most of the United States.

Within the last few months the British foreign aid program in Libya has installed an electrodialysis system for desalting 5000 gallons of the salty well water per day. This method produces fresh water for a cost of approximately $2.00 per 1000 gallons of demineralized water.

Operating costs using the electrodialysis method are high and have prompted Resources for the Future, Inc. to explore the possibilities of desalting water by solar distillation. Construction costs for solar distillation are greater, but operating costs are lower. Mainly, a lot of sun and spare ground are needed. Labor for digging basin-type pools for solar distillation costs less than a dollar a day, and sunpower is free.

In the solar distillation method of desalting water, brackish or salty water is run into large shallow basins and covered with inclined transparent glass or plastic. The sun's rays warm the salty water and when the water evaporates and rises from the pool the salt remains in the basin. The salt-free water vapor then condenses on the underside of the glass or plastic and runs to a trough which carries it to storage.

A solar still can desalt sea water as readily as brackish well water with no increase in minimum operating costs.

Because of high fuel bills for operating the present electrodialysis still, Resources for the Future engineers believe that the prospects for producing potable water economically by sunpower in parched lands such as Libya appear nearly within reach.

An Editorial . . .

Perhaps the most significant paper presented at the Texas University Water Laws Conference held in May at Austin was one that outlined a "Model Water Use Act."

The National Conference of Commissioners on Uniform State Laws has drafted the model water use act, and it has been distributed to state legislatures throughout the nation.

The model water use act is "designed for widespread study and consideration by state governments in order to protect, conserve, fairly allocate for use, and where necessary reserve water resources in the interest of the health and welfare of the people."

The act would first recognize that all water resources of the state, both surface water or ground water, are property of the state and should be developed on a beneficial-use basis.

The act provides for a five-man Water Resources Commission to be appointed by the Governor of the state. This five-man Commission would make determinations as to the most beneficial uses for the water of that state. It would control the development and use of the water resources including underground water "to effectuate full utilization, conservation, and protection of the water resources of the state." All water used in the state would be under control of the Commission with the exception of domestic supplies. No water could be used by an individual before first having been granted a permit by the Commission for such water. Even riparian uses of stream water would be subject to permit requirements.

The Commission would have as its objective the most beneficial use of the water resources of the state. The Commission's opinion in this instance might deviate considerably from the viewpoint of those taking a contrary outlook. To the industrialist who might serve on the Commission, industrial use of water would perhaps be the most beneficial; whereas, to the agriculturist serving on the Commission, the use of water for irrigation might seem more beneficial; and to one serving who leans toward rapid municipal growth, the preservation of water resources of the state for future municipal use would perhaps be the most beneficial. It appears that if a water use act such as the one here described were employed in Texas it might have a drastic curbing effect on the growth of our state.

The Commission would be the official state voice in all dealings with the federal government on matters pertaining to state water resources. Also it would negotiate and formulate all interstate water compacts.

Each permit granted by the Commission would be limited in duration. The duration of permit validity would be determined by the Commission. It can readily be seen that by limiting the time that the permit will be valid might definitely impair the growth of an area. If the permits were not valid for an appreciable length of time, those individuals granted permits to use water would perhaps not feel justified in spending money for improvements of their operation.

In granting permits the Commission would give no preference whatsoever to applications filed first in time, but rather it would be governed strictly by the standard of beneficial use.

At any time before the permit has expired, the permit holder may be required by the Commission to relinquish his rights to the water granted him by the Commission upon receipt of reasonable compensation for his loss. If the Commission should decide that one or more applications for permits have been filed that would create uses for water which are adjudged as more beneficial or would provide a more complete utilization of available water than the permit holder is making with the water, the Commission would then determine that the prior permit should be relinquished and be granted for the more beneficial uses.

A fee, of course, would be charged for each permit based upon the class of the permit, the duration of validity of the permit, and the capital investment to be made by the permit holder. The fee could be waived at the discretion of the Commission.

If a shortage should occur or if the ground-water table in any area of the state is progressively declining, the Commission may upon its own initiative establish rules, regulations, or orders forbidding the construction of any new wells or diversion facilities or by modifying existing uses of water. The Commission may regulate the use of ground water by proportioning, limiting or rotating uses of water, or the Commission may even find that

(Continued on Page 4)

Legislature Submits Resolution Asking Congress To Protect Water Rights

The Texas State Legislature has adopted a resolution asking that the United States Congress preserve state and individual rights in federal water legislation.

Certain instances are on record where the federal government has not complied with state regulations as they pertain to water use, but rather they have taken a paramount-right attitude in stating that the federal government does not have to comply with state or local rules or laws in the development and use of water resources.

Other states have joined Texas in adopting resolutions in an attempt to safeguard state and individual rights in water.

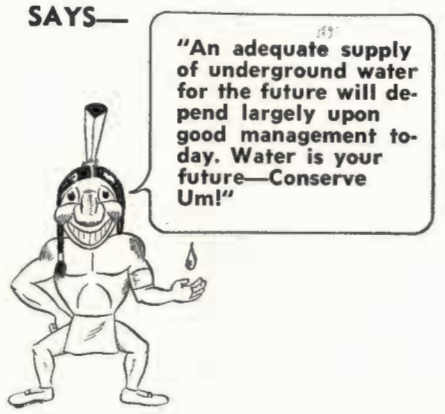
High Plains Man Elected To Board

Frank Gray of Lubbock, an agricultural leader in the southern High Plains area, has been elected to the State Soil Conservation Board. He replaces S. J. Payne of Tulia who has served on the Board for fourteen years.

Mr. Gray is a former supervisor in the Lubbock Soil Conservation District and a director of the Association of Texas Soil Conservation Districts.

Mr. Gray farms east of Lubbock and has a unique agricultural operation in that he irrigates by using sewage effluent from the City of Lubbock.

"CHIEF RUNNING WATER," SAYS—



Please Close Those Abandoned Wells!

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

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ALLAN WHITE
Editor

DATA REVEAL FLOCCULATING

EDITOR'S NOTE—The following letter was written by Melvin F. Katzer, research engineer with The Dow Chemical Company of Pittsburgh, California, to W. L. Broadhurst, Chief Hydrologist for the High Plains Water Dstrict.

Mr. Katzer and William Blackney, also with The Dow Chemical Company, worked in cooperation with the Water District for several days in April 1959 in Castro County attempting to develop a satisfactory method for distributing and mixing a flocculating chemical, called Separan AP-30, with playa lake water. The chemical, when mixed properly with the usually dirty water found in the playa lakes, causes the suspended clay and silt particles to adhere to each other and the large masses drop to the lake bed.

Relatively free from silt and clay particles the lake water is more suitable for draining into the underground formation through recharge wells.

The letter outlines procedures followed in preliminary experiments and the results obtained.

The Water District has concentrated recently on application of the chemical by airplane.

* * * * *

Mr. W. L. Broadhurst
High Plains Underground Water District
1628 15th Street
Lubbock, Texas

Dear Bill:

Although I know you are familiar with what was done, the following description is sufficiently detailed so that anyone reading this should be able to understand what we did and why.

As you remember, we hired the crop dusting service in Dimmitt, Texas to fly over the area and locate three lakes which appeared dirty and which were close enough to each other to permit easy sampling. One was to be treated with regular Separan AP30, one with ground Separan AP30 and one was to be sampled as a control. No such triplet was found because most of the lakes were dry. No rain had fallen for six months. Two lakes were located near Hart, Texas. Permission was obtained to treat them even though the water was exceptionally clean. The weather had been extremely hot and there had been no wind for two days. The lakes were as smooth as glass. This unusual condition had permitted the silt to settle out and the lakes were clearer than ever before. Samples were taken of both lakes and Table I shows they had 68 and 76 ppm —(Parts per million) suspended solids near the shore.

The crop duster did not have equipment for spreading a dry powder. Therefore, paper bags were obtained from the grocery store and one pound of regular Separan AP30 was placed in each. Jarrott Lake was estimated to be four to five acres in area and one to three feet deep and to have a supply of seven acre feet of water. Seven bags were prepared and one was dumped onto Jarrott Lake each time the plane flew over it. Some of the chemical was lost by being dumped over dry ground before the proper timing was developed. In view of these rough estimates and technique it can only be said that the treatment level was between 0.5 and 1.5 pounds per acre foot of water. Photograph of this dusting operation is shown in Figure 1.

The second lake was about five miles away on the Cooper farm. It was larger, but again was very quiet and unusually clean. It was 20-30 acres in area and three to four feet deep. Silt stirred up from the bottom was easily flocculated with 0.5 ppm Separan AP30. A photograph of Cooper Lake is shown in Figure 2.

The following afternoon the wind was very strong and a storm was starting. Each lake was again sampled and Cooper Lake was badly riled and turbid. Jarrott Lake, however, was almost as clear as before treatment. The wa-

FIGURE 1—Chemical in powdered form is applied to Jarrott Lake surface by hand from low flying airplane.

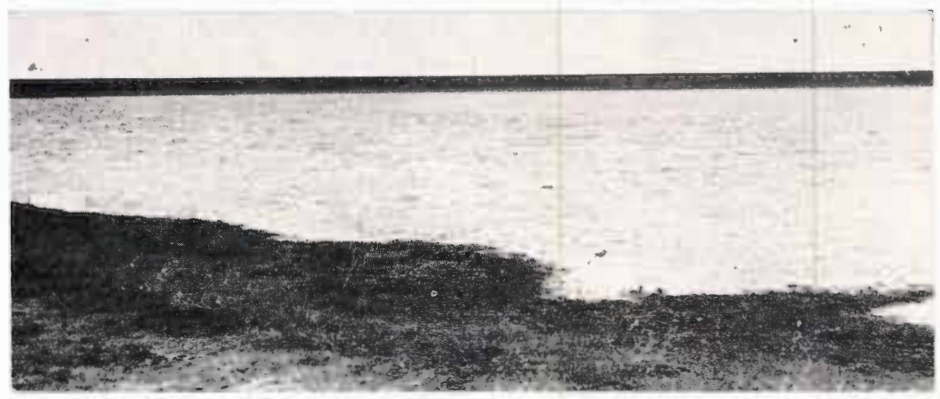

FIGURE 2—Samples were periodically taken from untreated Cooper Lake to use as comparison with nearby Jarrott Lake.

CHEMICAL CLEARS LAKE WATER OF MOST SUSPENDED MATTER

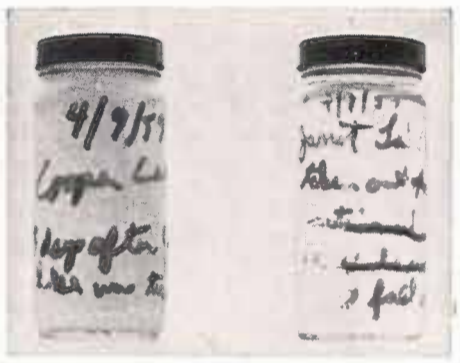

FIGURE 3 — Cloudy water sample from untreated Cooper Lake is shown at left. Clear sample at right is from Jarrott Lake which was chemically treated.

ter was very clear but there were some fairly large flocs being held in suspension by the turbulence.

That night there were heavy rains and very high winds with tornado storm warnings. The following day the weather was still windy and cold. No samples were obtained. The third day the wind was still blowing moderately hard so that the surface of the water was choppy and rough rather than smooth, but Jarrott Lake was almost sparkling clear. Cooper Lake was still very turbid and brown. Figure 3 is a photograph taken in the field to show the difference in appearance between the two samples. Table I shows the suspended solids in each of the samples as determined by laboratory filtration of the samples.

These data show that the chemical treatment was very successful in clarifying the water. The silt must have become riled in both lakes during the storm on April 7-8, 1959, but the Separan AP30 in Jarrott Lake successfully flocculated it and redeposited it.

Solution treatment at Sutton Lake was attempted and showed only moderate success. Figure 4 is a view of the lake and the trailer on which was mounted the solution tanks and pumps and is a view of the sump or settling basin. Figure 5 is a picture of the irrigation well modified to function also as a recharge well. A 0.5% solution of Separan AP30 was prepared and fed through 250 feet of saran tubing to the inlet of the 15 inch pipe (pipe connecting lake with sump). A dynamatic Adjusto-speede motor was used for controlling the flow rate of the Separan solution. The rate at which the lake water enters the sump was controllable with a large gate valve, but there was no way to measure the rate. A flow meter exists between the sump and the recharge well so that flow rates will be known only when equilibrium conditions are reached.

A sample of the untreated lake water was obtained and then an estimated flow of 1000 gpm was started and the Separan flow rate was adjusted to 400 cc per minute. This represents a treatment level of 0.5 ppm. The sump was permitted to fill to equilibrium and a sample of the water in the sump was taken for analysis. The suspended solids in each of these samples is shown in Table II. Samples taken of the sump water were very cloudy even though the bulk of the material was flocculated and did settle easily. A sample of the lake water was treated with 0.5 ppm by adding Separan AP30 with an eye dropper. It also showed a very cloudy residual water. At first it was thought that much of this was due to organic material in suspension. However, one of the men observed that on the morning following these initial tests, the heel of water in the sump was remarkably clear. He could see the bottom very clearly through three feet of water. It was also observed that all of the samples which had Separan AP30 in them did become clear by the time they were filtered in the laboratory. The untreated samples were still somewhat turbid when they were filtered. This was a week after the samples had been taken. In view of this it is believed that the essential factor missing in the solution treatment test was sufficient lapse of time to produce good clarification. Additional work was attempted at this installation on April 9, 1959 and one series of samples taken in the lake, at the sump influent and at the recharge well influent as shown in Table II, above. Again the samples show that considerable material remains in suspension under these conditions. The weather was too cold and windy to continue testing, but it was decided that the High Plains District would continue this study to determine if higher treatment levels or additional agitation through the use of baffles in the pipe would be beneficial.

TABLE I
Suspended Solids In Treated And Untreated Playa Lakes

Date	Description of Sample	Jarrott Lake ppm	Cooper Lake (control) ppm
4/6/59	Sample taken 30' out in lake before any chemical treatment	32	—
4/6/59	Sample taken at shore line before any chemical treatment	68, 63	76
4/6/59	Jarrott Lake was then treated with 1 pound Separan AP30 per acre foot of water		
4/7/59	Sample taken one day after treatment (wind blowing very hard)	93	369
4/9/59	Sample taken three days after treatment (wind blowing only moderately hard)	36	340

TABLE II
Samples Of Sutton Lake Water

Date	Description of Sample	Suspended Solids, ppm
4/7/59	Lake water "as is" (Before treatment)	1280
4/7/59	Water at inlet end of sump (Before treatment)	1690
4/7/59	Water at outlet of sump but before recharge was started (After treatment)	157

FIGURE 4—View of Sutton Lake and settling sump. Chemical in solution form was mixed with lake water using equipment on trailer shown at left.

Although the application of the dry Separan AP30 powder to a lake by use of crop dusting planes appears very promising, continued efforts will be expended to improve the results obtainable with solution feed. Besides flowing the lake water into a sump it was suggested that the water be treated and then flowed down a long channel (possibly one-half mile long) and see if the water becomes clear. This will necessitate lifting the water to high ground and therefore may be of only academic interest, but it would show what clarity can be accomplished with extensive gentle agitation. In addition to solution treatment of the water as it flows to the well, the treatment of the whole lake with Separan solution dispersed from a motorboat should be considered. It is believed that the high viscosity of a 0.1 to 0.5% solution would make it difficult to use airplane sprays. Also, small aircraft are limited to 800 pounds per trip and the spraying of dilute Separan solutions would entail too much volume to be feasible.

The dusting of the dry powder will be repeated on several more lakes. Both the regular grade and the fine grind material will be used. In addition, some thought should be given to blowing dust across the lake by use of an electric blower from the upwind shore of the lake. Another method suggested was the use of a small hand operated "cyclone" duster with which the farmers are familiar. It is possible that the excellent results obtained with this one test are partially due to the storm and the very high winds and turbulence which continued for 24-36 hours after the chemical was added. Therefore, the future testing program should include crop dusting of more lakes just before high winds are forecast and also during periods of normal winds.

Another suggestion considered was the application of the powder over a dry lake bed by the use of regular spreaders. It probably would be necessary to dilute the powder by first mixing it with several tons of gypsum or lime, but the farmer would not object to this. It is possible that the first rain that falls would dissolve the Separan AP30 and it would all stick to the soil. Then silt carried in with the runoff water would be untreated. However, this may not be the case and since the application would be so simple and could be done by the farmer himself, it is suggested that this method be tested.

If we can be of any further assistance feel free to call us.

Sincerely yours,

MELVIN F. KATZER
Research Department

FIGURE 5—Sutton recharge well is also used as normal irrigation well.

QUESTIONS AND ANSWERS

Q. How much water is an acre-foot?
A. *An acre-foot of water is the amount required to cover one acre of land a foot deep, or 325,872 gallons.*

Q. How is the High Plains Underground Water Conservation District financed?

A. *By an ad valorem tax collected from the property owners within the Disrtict boundaries. The tax rate is 5 cents on each $100. valuation.*

Q. From where does the underground water which is found beneath the southern High Plains receive replenishment?

A. *From precipitation that falls in the local area and percolates downward to the underground water table.*

Q. At what rate of speed does the underground water in the southern High Plains move under natural conditions?

A. *Leading hydrologists estimate that it moves at a rate of approximately 300 feet to 500 feet per year, depending upon the transmissibility of the formation.*

Q. How much money is an acre-foot of water worth to the individual user in the southern High Plains?

A. *That depends on the use to which the water is put. Agriculturally, it is estimated that an acre-foot of water is worth $10.13 in additional income over dry land farming if applied to grain sorghum or will result in an additional $62.88 if used in the production of cotton.*

Q. When was the first irrigation well put down in the southern High Plains?
A. *In Hale County during the year 1910.*

Q. Is there any water below the Ogallala formation in the High Plains?

A. *Yes. However, for the most part, the water contained in formations below the Ogallala formation in the High Plains is either highly mineralized or is salty.*

Q. How much fresh water is in storage beneath the Texas High Plains?

A. *Approximately 300 million to 400 million acre-feet.*

WELL DRILLING STATISTICS FOR MAY

During the month of May, 158 new wells were drilled and registered with the District office; 33 replacement wells were drilled; and 13 wells were drilled that were either dry or non-productive for other reasons. 114 permits were issued by the County Committees.

The permits issued and wells completed for May follow by Counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	10	4	1	0
Castro	10	10	3	0
Cochran	7	12	1	1
Deaf Smith	13	6	1	0
Floyd	10	17	3	1
Hockley	11	32	4	4
Lamb	9	20	2	3
Lubbock	8	22	9	3
Lynn	1	14	0	1
Parmer	16	18	9	0
Potter	0	0	0	0
Randall	19	3	0	0
Total	114	158	33	13

Editorial—

(Continued from Page 1)

uses have ceased to be reasonable or beneficial. Even after having been granted the right to use certain waters of the state, the permit holder could still not be assured that his supply of water would not be taken from him.

It can readily be seen that by vesting such broad powers in a five-man Commission that anything could befall our State. To base a priority of water on a criterion of most beneficial use and to allow the determination of beneficial use to be made by a five-man Commission, the future of any particular business in our state might well depend upon the prevailing moods of this Commission.

Emergency powers of the act outlines procedure which gives the Commission the privilege of establishing rules which could prohibit the use of the State's water resources. The Commission could, under these same emergency powers, authorize any state or local governmental agency to enter upon public or private lands and remove any amount of water necessary to protect the public health, safety and welfare. In times of emergency the Commission shall give preference to uses of water initiated prior in time unless by the election of the Commission it determines that such a preference might impair or be detrimental to the public interest in the utilization of the State's water resources.

The Commission would have authority to pass rules and regulations prohibiting the pollution of waters of the state.

A breakdown of this model water use act, which has been introduced to Texas for study and comment, is published to show "The Cross Section" readers how some people think and a view of things with which we will assuredly be faced in time to come. Because of a rapidly increasing trend toward centralized control, it is most important that each of us as individual water users manage our water carefully and use every gallon that we pump to produce income. It will become increasingly important in the future for us to be able to point to our area and be able to say that our problems are cared for adequately and that we do not have need for a centralized agency dictating policy to us. We have definite individual responsibilities in seeing that our water is managed properly and not wasted. We cannot expect to continue to exploit the water resources of our area and at the same time expect to retain private ownership of these resources.

Let's look at the problem realistically. Either we're going to take care of this underground water upon which we are most dependent, or else someone will do it for us. We cannot have our cake and eat it too.

CONSERVATION CONVERSATION

With the irrigation of growing crops just around the corner, the subject of whether to water every furrow or alternate furrows will be considered. The practice of irrigating alternate furrows has been on the increase particularly in the southern counties of the Water District due to decreased well outputs.

The Agricultural Experiment Station at Lubbock has released a summary of three years of research on the subject of alternate-furrow irrigation. The data seem to indicate that there is no appreciable difference in irrigation efficiency whether the water is applied in every furrow or in alternate furrows.

The Experiment Station summary reads as follows:

"... The land used in this test was pre-watered in 1956 and 1957 and was at field capacity in the spring of 1958 due to favorable rainfall.

Method of Application	Irrig. Ins.	Water Per acre	Cotton Lint per acre 1956	1957	1958
Alternate furrow	4		456	463	593
Every furrow	4		456	492	557
Alternate furrow	2		386	448	544
Rainfall, Inches during, growing season			4.42	7.19	4.54

"For the three year period of study the application of two acre inches of water, irrigating every other row, once during the summer, produced slightly more cotton per inch of water than irrigating every row of cotton which required 4 acre inches of water. In 1956 when the distribution of rainfall during the summer was less favorable irrigating every row gave more efficient use of water. On the other hand, in 1957 and 1958 with more favorable summer rainfall the reverse was true.

"Under conditions of limited water irrigation of alternate rows during the summer offers the opportunity of more timely application at critical periods of crop growth.

"The application of 4 acre inches in alternate furrows did not increase the yield of lint produced per inch of water. Moreover, it was very difficult to apply this amount of water in the average water furrow during the summer. Apparently, the cotton plant can use the same amount of water equally well whether it is applied in every row or in alternate rows."

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

High Plains Underground Water Conservation District No. 1
1628-B Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 6—No. 2 "THERE IS NO SUBSTITUTE FOR WATER" *July 1959*

GOVERNOR - FOR - DAY PROCLAIMS JULY 9, "UNDERGROUND WATER DAY"

State Senator Andy Rogers of Childress was the Governor of the State of Texas for one day—July 9, 1959.

As the State's chief executive, one of Acting Governor Roger's official acts was to declare the 9th as "Underground Water Day" in Texas.

The official memorandum commended the people of the High Plains area for having recognized the importance of underground water evidenced by their having banded together through such organizations as the High Plains Underground Water Conservation District in order to promote conservation of underground water and to maintain private ownership of this resource.

As President Pro Tem of the State Senate, Senator Rogers was honored by his fellow legislators in the traditional "Governor for a Day" festivities.

To climax these festivities, a dinner was given in Austin to honor the Senator and Mrs. Rogers. Judge Otha Dent of Littlefield, member of the State Board of Water Engineers, served as master-of-ceremonies.

OFFICIAL MEMORANDUM

BY

ANDY ROGERS

ACTING GOVERNOR OF TEXAS

GREETINGS: AUSTIN, TEXAS

WHEREAS, underground water has played a most significant role in the progress and development of the Great Plains area of the State of Texas; and

WHEREAS, the citizens of this garden area of the High Plains have recognized the importance of this wonderful natural resource; and

WHEREAS, through such organizations as the High Plains Underground Water District this resource has been conserved and utilized to its fullest extent for the benefit not only of this area but for the entire State of Texas; and

WHEREAS, it is incumbent on all Texans to aid in the preservation of private ownership and control of these valuable underground water resources;

NOW, THEREFORE, I, Andy Rogers, Acting Governor of Texas, do hereby designate this day, July 9, 1959, as

UNDERGROUND WATER DAY

in Texas, and do hereby commend the citizens of the High Plains area for their constructive use of this natural resource for the good of all citizens of this Lone Star State.

In official recognition whereof, I hereby affix my signature this 9th day of July, 1959.

Acting Governor of Texas

Looking on as Governor-for-a-Day Andy Rogers of Childress signs an official memorandum proclaiming July 9, 1959 as "Underground Water Day" in Texas, are, left to right, Senator Preston Smith, Lubbock; Rep. Will Ehrle, Childress; Rep. H. G. Wells, Tulia; and Rep. Ted Springer, Amarillo.

Pictured above are the three very capable secretaries employed by the High Plains Underground Water Conservation District at the District office in Lubbock. At left is Mrs. Jean Lancaster, District Secretary, who is in charge of all well records and files. She has worked for the District for 4 years. Her husband, Eldon, farms south of Lubbock in the Woodrow Community. They live at 2304-26th Street, Lubbock. Center is Mrs. Mayme McVay, bookkeeper and receptionist. Mrs. Mac, as she is known, has been a member of the Water District staff for 6 years. She has three sons who each have families. Bob and Van live in Lubbock and Glenn, the eldest, lives in Flint, Michigan. Mrs. Mac resides at 1508 - 25th Street, Lubbock. At right is the newest member to the glamorous section of the District staff, Miss Peggy Burkett. She was employed in February of this year. Peggy plans to be married in November to a lucky lad in the Air Force. Her folks, Mr. and Mrs. Jake L. Burkett, farm near Portales, New Mexico, and have only recently moved from O'Donnell, Texas. Peggy takes care of all stenographic work for the office. She lives at 2113 - 15th Street, Lubbock.

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
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ALLAN WHITE
Editor

"The Cross Section" takes this opportunity to introduce to its readers one of the newest members on the Board of Directors of the High Plains Underground Water Conservation District. Mr. John Gammon of Lazbuddie took office in January 1959. He is the Director from District Precinct No. 3, which consists of Bailey, Castro, and Parmer counties.

Mr. John Gammon of Lazbuddie represents Precinct No. 3, which consists of Bailey, Castro, and Parmer counties, on the Board of Directors of the High Plains Underground Water Conservation District.

Mr. Gammon was born August 8, 1909, in Seminole County, Oklahoma. The Gammon family lived in Oklahoma during his early years. In 1927, he graduated from high school at Maud, Oklahoma, and then attended the University of Oklahoma at Norman for one year majoring in engineering. He is the son of Mr. and Mrs. W. H. Gammon who live in the Lazbuddie community and who only recently celebrated their 50th wedding anniversary. His father has been a farmer and cattleman through the years.

In 1929, the family moved to the South Plains area of Texas and Mr. Gammon transferred to Texas Tech College. He attended two years majoring in animal husbandry. Because of the depression in 1932, he left Tech and went home to Lazbuddie to work with his father on the farm.

On October 29, 1933, he was married to Miss Grace Jennings. At that time she was teaching school in the Lazbuddie Public School system. Miss Jennings is the daughter of the late Reverend and Mrs. W. P. Jennings. Reverend Jennings was Pastor of the First Christian Church at Lubbock from 1922 to 1929. Mrs. Jennings lives in Lubbock.

The young Gammons moved into the house where they presently reside. Mr. Gammon ran cattle on his home place. About a hundred acres were in cultivation to raise feed for his cows. He broke out an additional one hundred acres shortly thereafter and also rented land nearby for raising wheat. The east line of Mr. Gammon's combination farm and ranch was originally the east line of the old XIT Ranch. Parts of the original fence which the XIT put there in about 1870 still remains.

In 1952 Mr. Gammon drilled his first irrigation well. He presently irrigates 350 acres from two wells.

He also has been in the registered Hereford business for about 15 years. He has only recently sold his herd.

The Gammons have three children. Jean Louise, the oldest, was born in 1938. After graduating from Lazbuddie High School she attended North Texas State College in Denton for one year and then transferred to Texas Tech where she received an additional year of education before leaving school to marry Joe Briggs. Mr. Briggs farms in the Lazbuddie community. A young daughter, Melissa Jean, was born to the Briggs only recently in June of this year.

John, Jr., the only son, was born in 1939 and he presently attends Oklahoma State University where he majors in agricultural engineering. This coming fall he will be classified as a Junior.

Marianna, the youngest of the Gammon clan, was born in 1947 and will attend the seventh grade at Lazbuddie this fall.

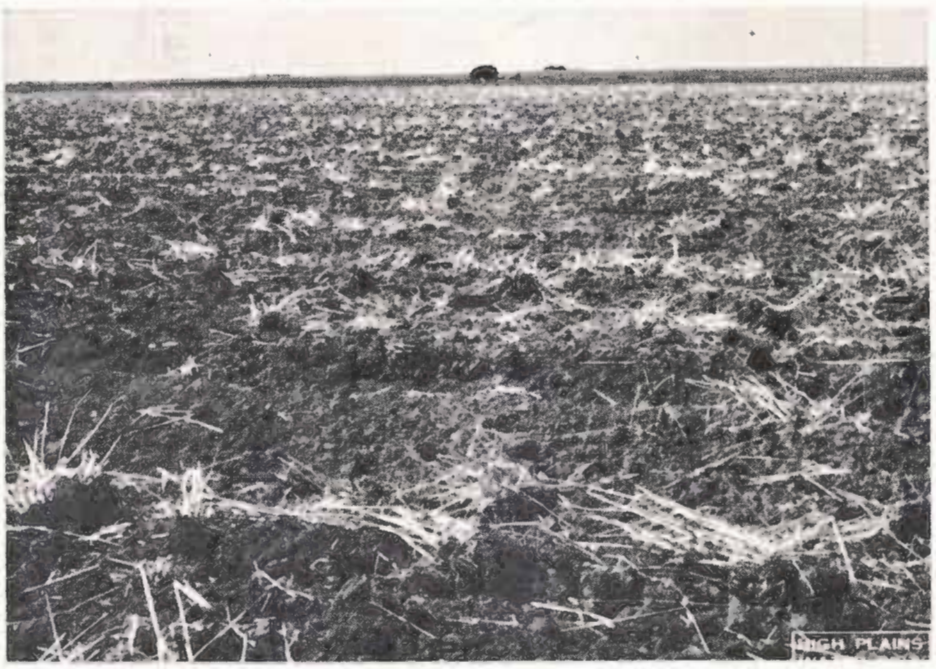
The Gammons attend the Lazbuddie Church of Christ. Mr. Gammon is an elder.

Before being elected by the people of District Precinct No. 3 to serve on the

SOIL MANAGEMENT---A KEY TO WATER CONSERVATION

Picture above shows rows of cotton growing in the background. In the foreground, grain sorghum is planted perpendicular to the cotton. The sorghum was planted with a wheat drill. This land is located in Parmer County, 3 miles west and 4 miles north of Lazbuddie, and is farmed by W. R. Broadhurst. Mr. Broadhurst planted the sorghum along the lower end of the cotton field instead of running the cotton rows to the road along the property line as he had done in the past. The sorghum makes use of irrigation "tail-water" from the cotton.

To aid in controlling irrigation water and to keep it from running off his land, J. F. Miller of Olton, in Lamb County, has contoured the last 200 yards of his rows at their lower end. Don Franks, farm operator, says the contours work well in slowing down the irrigation water so it can penetrate into the soil. Even in periods of runoff from heavy rains, the contours have washed in only two locations and Mr. Franks states that this was caused by improper contouring. Only 1/2 acre of land was lost to point rows and can not be irrigated.



The field shown above is in Castro County. After harvesting the wheat which had been planted, the farmer has plowed the remaining stubble into the soil. As the wheat stubble decays, important humus matter is added to the soil. The stubble also serves to separate the soil, improving penetration rate of rainfall and irrigation water.

The farm shown above is bench-levelled to control soil erosion and to conserve water. The land is owned and operated by A. J. Commons of Earth, in Lamb County. Each "bench" is perfectly level. Original dirt work was done at a cost of $40 per acre. Mr. Commons reports that higher yields of grain sorghum can be derived from bench-levelled land because of improved moisture penetration. Cotton yields are comparable to yields from unlevelled land. Fuel costs for operating irrigation wells are lower on the level land because better use is made of rainfall, and irrigation "tailwater" is a thing of the past. There are, of course, disadvantages to farming bench-levelled land. Mr. Commons reports that about 11 per cent of his land is lost to turnrows and borders. He further reports that cultivation and irrigation is a more tedious job and requires closer management.

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

Dear Sir:

I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.

Name_____

Street Address_____

City and State_____

(Please cut out and mail to our address)

Board of Directors, Mr. Gammon served two terms on the Parmer County Committee of the High Plains Water District. He also served for twelve years on the Lazbuddie School Board.

Mr. Gammon is athletically inclined as evidenced by the fact that during the school year 1930-31 he lettered on the Tech Freshman football team. He plays golf at the Muleshoe Country Club and does some fishing for relaxation.

We are proud to have Mr. Gammon serving on the Board of Directors, and the people of District Precinct No. 3 are fortunate indeed to have a man of his caliber representing them.

Board Publishes Water-Level Measurements

The Texas Board of Water Engineers has released 1958-59 water-level measurements together with maps for 23 of the southern High Plains counties.

The water-level measurements in observation wells throughout the southern High Plains counties show the decline or rise of the static water level in the wells below the land surface.

These data were compiled in Bulletin 5908, "Water-Level Measurements And Maps Southern High Plains, Texas, 1958 and 1959," by Mr. Frank A. Rayner, Geological Engineer, under the direction of Mr. W. O. George, Chief of Ground Water Division, State Board of Water Engineers.

Anyone interested in receiving Bulletin 5908 without charge may request it by writing the Texas Board of Water Engineers, 1410 Lavaca Street, Austin, Texas, or by contacting Mr. Rayner at 1628-B 15th Street, Lubbock, Texas.

Survey Reveals Irrigation Statistics For 1959

The June 1959 High Plains Irrigation Survey has been published and released by the Texas Agricultural Extension Service.

D. W. Sherrill, Irrigation Agent for the Extension Service stationed at Lubbock, compiled the statistical data with assistance of High Plains' County Agricultural Agents.

The survey shows that there are 47,275 irrigation wells in the Texas High Plains, an increase of 1753 wells over the June 1958 figure.

Underground pipe was installed at a rapid rate during the year, more than doubling the amount of pipe in the area last year. The survey shows 6,404 miles of underground pipe in the 42-county High Plains' area today, as compared with 3,106 miles in 1958.

Total number of irrigated acres in the area have increased by only 25,790 acres. This acreage increase reveals that only 15 acres of new land were put under irrigation by the drilling of each new well. This would tend to indicate that most of the new wells drilled during the past year are not used to increase total irrigated acreage but rather are used as supplemental supplies to allow the irrigator to either water his cropland at a more rapid rate or else regain the total quantity of irrigation water that was originally pumped from fewer wells.

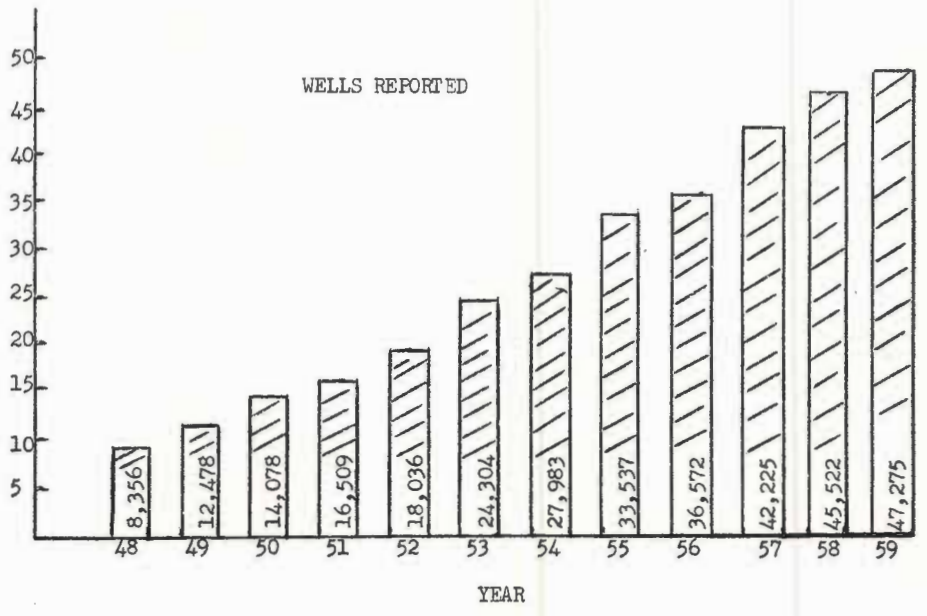
The total number of irrigated acres as shown by the new survey is 4,778,-360.

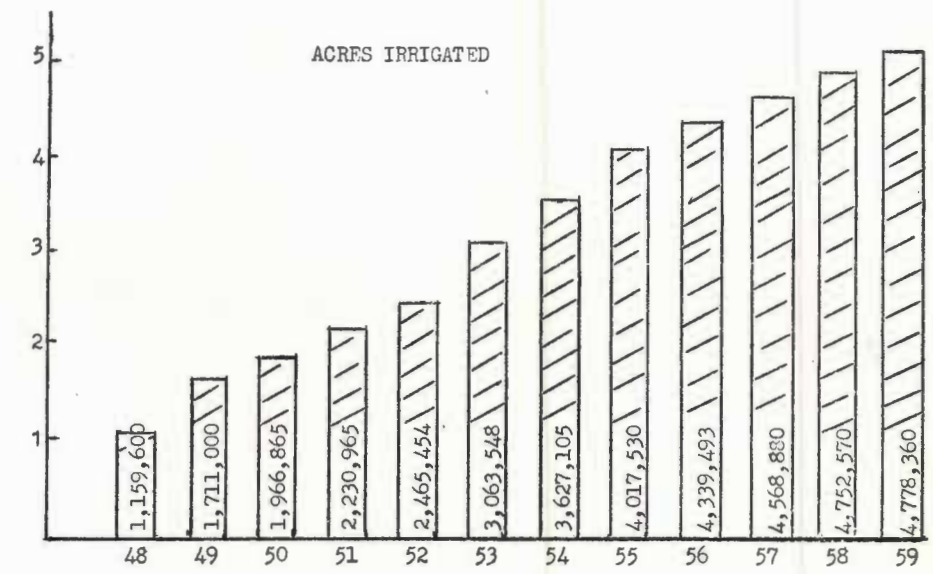
The survey also shows that 124 recharge wells are in use in the High Plains. This represents an increase of 29 wells over 1958.

Other data shown in the survey for counties within the High Plains Water District are as follows:

County	Farms Irrgtd.	Total Acres Irrgtd.	Mls. of Undg. Pipe	Irrig. Wells	Rechg. Wells	Acres of Irrigated Crops Cotton	Grain Sorghum	Wheat	Others
Armstrong	99	25,050	20	155		300	18,850	3,500	2,400
Bailey	875	190,000	160	1,600		80,000	70,000	4,000	38,000
Castro	1,250	407,393	500	3,900	4	58,323	200,000	85,000	64,070
Cochran	385	68,000	90	1,100		55,000	10,000	2,000	6,495
Deaf Smith	700	320,000	200	2,300		9,500	145,000	80,000	77,000
Floyd	1,300	305,500	260	2,650	25	77,274	130,000	40,000	55,726
Hockley	1,350	263,500	475	4,700	3	165,000	85,000	50	7,330
Lamb	2,000	370,000	1,000	5,078	8	154,125	156,650	3,700	54,525
Lubbock	1,800	350,000	1,262	5,055	18	200,000	134,215	1,000	16,785
Lynn	575	75,000	100	1,400	7	70,000	4,800		200
Parmer	1,160	400,000	400	2,400	5	40,000	230,000	85,000	50,404
Potter	21	14,500	10	34			8,000	5,500	1,100
Randall	440	95,000	60	740		1,600	60,000	18,160	15,240
Total	11,945	2,883,943	4,537	31,112	70	911,122	1,252,515	327,910	389,275

NOTE: Increase in number of irrigation wells, as shown for most counties in the High Plains Water District from June 1958 to June 1959, do not correspond to records filed with the District.





WELL DRILLING STATISTICS FOR JUNE

During the month of June, 132 new wells were drilled and registered with the District office; 15 replacement wells were drilled; and 15 wells were drilled that were either dry or non-productive for other reasons. 86 permits were issued by the County Committees.

The permits issued and wells completed for June follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	5	4	0	1
Bailey	22	21	2	2
Castro	1	3	1	0
Cochran	4	4	0	2
Deaf Smith	11	12	2	1
Floyd	3	5	2	0
Hockley	10	27	5	5
Lamb	13	12	0	0
Lubbock	11	16	0	1
Lynn	1	15	1	2
Parmer	3	9	2	1
Potter	0	0	0	0
Randall	2	4	0	0
Totals	86	132	15	15

Please Close Those Abandoned Wells!!!

WHEN YOU MOVE . . .

Please notify High Plains Water District, 1628-B - 15th Street, Lubbock, Texas, on Post Office Form 22S obtainable from your local postmaster, giving old as well as new address, to insure no interruption in the delivery of your Cross-Section.

High Plains Underground Water Conservation District No. 1
1628-B Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 6—No. 3 "THERE IS NO SUBSTITUTE FOR WATER" *August 1959*

VITAL ISSUES BEFORE CONGRESS

Individual And States Rights In Water Resources, Or Central Control?

Who has control over the water resources in this country? The Federal government or the state governments?

There was a time when the answer to this question was simple—the state governments. However, with each succeeding year, the answer becomes less apparent.

We who live in Texas are fortunate to have state laws which set forth a private ownership doctrine concerning underground water and state control over storm and flood waters of surface streams. But how long will it be before the Federal government is powerful enough to over-ride state laws and render them worthless? This is not merely a remote possibility, but rather it is an actuality—it has already come to pass in a few isolated cases involving water rights. But if it can gain even such a shaky toehold, then it can spread right into our own backyard.

The Federal government already has had favorable decisions rendered by the Supreme Court in matters of control over water resources. In 1940, the Supreme Court held that the Federal government should have control over all navigable streams of the nation and even further declared that any stream that could be made navigable by construction would come under this catagory even though no construction had yet taken place that would make the stream navigable.

In 1955 the Supreme Court held that the Federal government could by-pass complying with state water laws concerning public lands by simply classifying the public lands as "reserve lands." Under this classification, the public lands are fully and completely exempt from any state laws concerning water or any rights acquired by individuals from the states.

The Court has only recently rendered a decision in another case involving the Federal government and the subject of compliance with state water laws. It held in this case that a federal military installation was *not* required to comply in any respect with the water laws of the state in which the installation was located.

Representative Walter Rogers of Pampa, Congressman from the 18th District, heads a House Subcommittee on Irrigation and Reclamation. The committee has recently held public hearings on States' Water Rights Bills presently before Congress.

Two bills under discussion before Mr. Rogers' Committee are: (1) H. R. 5555—this bill acknowledges authority of the states relating to the control, appropriation, use, or distribution of water within their boundaries and declares that Congress recognizes such state authority in the administration of federal programs for the conservation, development and use of land and water resources.

(2) H. R. 4567—this bill provides that the withdrawal or reservation of public lands shall not affect any right to use water acquired pursuant to state law either before or after the establishment of such withdrawal or reservation.

Rep. Rogers states concerning H. R. 4567, "that although there were no federal public lands in Texas originally, the federal government has acquired much property in recent years, and can acquire such additional amounts as it desires simply by condemnation procedures. Hence, every state of the Union is a potential victim of possible complete servitude to the Federal government." H. R. 4567 would protect individual rights granted by the state.

Rep. Rogers points out, "that this controversy concerning water resources only serves to point out another trend toward centralization of the government in all facets of the economy. Unless these trends can be successfully checked, it will be only a short time before state governments will be governments in name only and wholly without power."

Still think that it is only a remote possibility that the Federal government can take over the control of our water resources?

What can be done to stem this rising tide toward central control and check the Federal government's power? Several things—(1) A letter to your Congressman expressing your personal views concerning the matter of the Federal government being exempt from compliance with state laws. (2) Discuss this problem with your neighbor and make him aware of the facts presented in this article. (3) Write to the Texas Water Conservation Association, 605 Littlefield Bldg., Austin 15, Texas, for specific information concerning the Supreme Court decisions discussed in this article and for additional information pertaining to bills H. R. 4567 and H. R. 5555. (4) Make certain that you are holding up your individual responsibilities as they pertain to local control of our water resources. Do not waste water—waste is ammunition to those who believe in central control.

Otha F. Dent Is Re-Appointed As Member Of State Board Of Water Engineers

Governor Price Daniel recently announced the reappointment of Judge Otha F. Dent of Littlefield to the Board of Water Engineers, for a six-year term extending to August 19, 1965.

Judge Dent has served on the Board since 1953. Prior to that time he was County Judge of Lamb County from 1938 until his appointment to the Board. He is a past President of both the West Texas County Judges and Commissioners Association and the Texas County Judges and Commissioners Association.

A native of Coke County, Judge Dent attended Southwestern State Teachers College in Weatherford, Oklahoma. He and his wife, Hettye, are the parents of six children.

In announcing the appointment, Governor Daniel praised the work of Judge Dent in helping to establish a statewide water conservation and planning program for Texas. Judge Dent was also active in the passage of legislation establishing a code of laws for conservation of ground water.

QUESTIONS AND ANSWERS

Q. How many irrigation wells are there in the High Plains of Texas?

A. According to information compiled by the Texas Agricultural Extension Service, there were 47,275 irrigation wells in use in the High Plains of Texas in June 1959.

Q. Do cities and towns in the High Plains of Texas use a large portion of the total amount of underground water pumped annually?

A. No. Municipal and industrial use of underground water in the High Plains of Texas equals less than 2 per cent of the total annual amount pumped in the area for all purposes.

Q. Can water from the Rocky Mountains enter the Ogallala formation?

A. No. According to W. N. White, W. L. Broadhurst and J. W. Lang, writing in U. S. Geological Survey Water Supply Paper 889-F, "The Ogallala formation has been completely eroded away west of the western escarpment (caprock) and east of the eastern one and from the canyon-like valley of the Canadian River. The water-bearing sands and gravels of the Ogallala in the South Plains in Texas, therefore, are cut off in all directions from any underground connection except through the underlying older rocks which contain highly mineralized water entirely unlike the fresh water in the Ogallala."

EDITOR'S NOTE—"The Cross Section" welcomes questions from its readers. All questions received will be reproduced on the pages of this paper together with our answers. Send your questions to: EDITOR, The Cross Section, 1628-B 15th Street, Lubbock, Texas.

WELL DRILLING STATISTICS FOR JULY

During the month of July, 78 new wells were drilled and registered with the District office; 15 replacement wells were drilled; and 2 wells were drilled that were either dry or non-productive for other reasons. 70 permits were issued by the County Committees.

The permits issued and wells completed for July follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	0	2	0	0
Castro	9	6	3	0
Cochran	0	1	1	0
Deaf Smith	19	5	2	0
Floyd	6	6	3	0
Hockley	6	10	0	0
Lamb	11	9	2	0
Lubbock	6	15	1	2
Lynn	2	4	0	0
Parmer	11	18	2	0
Potter	0	0	0	0
Randall	0	2	1	0
TOTALS	70	78	15	2

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ALLAN WHITE
Editor

E. J. KING---ONE OF MANY HIGH PLA

It's good sound business to irrigate with lake water.

This is the conclusion derived by many High Plains' irrigators, including E. J. King of the Becton Community in Lubbock County.

Mr. King farms a half section of land on which he has four 6-inch irrigation wells, all of which are now relatively weak wells. There is about three-fourths of a mile of 12-inch underground pipe on the half section, and it connects the four irrigation wells. Adjoining the half section is a 60-acre tract of native pasture with a lake in its center. This land also belongs to Mr. King. When filled with water, the lake covers approximately 35 acres of land.

After heavy rains in June 1959, that

Aerial photograph shows a portion of the E. J. King farm near the Becton community in northeastern Lubbock County. Left of the road shown at center is a 60-acre tract of native pasture land on which is situated a wet-weather lake. Mr. King installed a centrifugal pump at the lakes' edge with which surface runoff water in the lake could be pumped across the paved farm-to-market road and up the slope to cotton and grain sorghum crops.

An 8-inch centrifugal pump and irrigation well power unit are mounted on a cotton trailer chassis. When the water in the lake recedes a distance of 30 feet, the trailer is then pushed to the waters edge and another length of aluminum pipe is added to the discharge side of the pump.

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

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INS' IRRIGATORS WHO SALVAGES SURFACE WATER FROM PLAYA LAKES

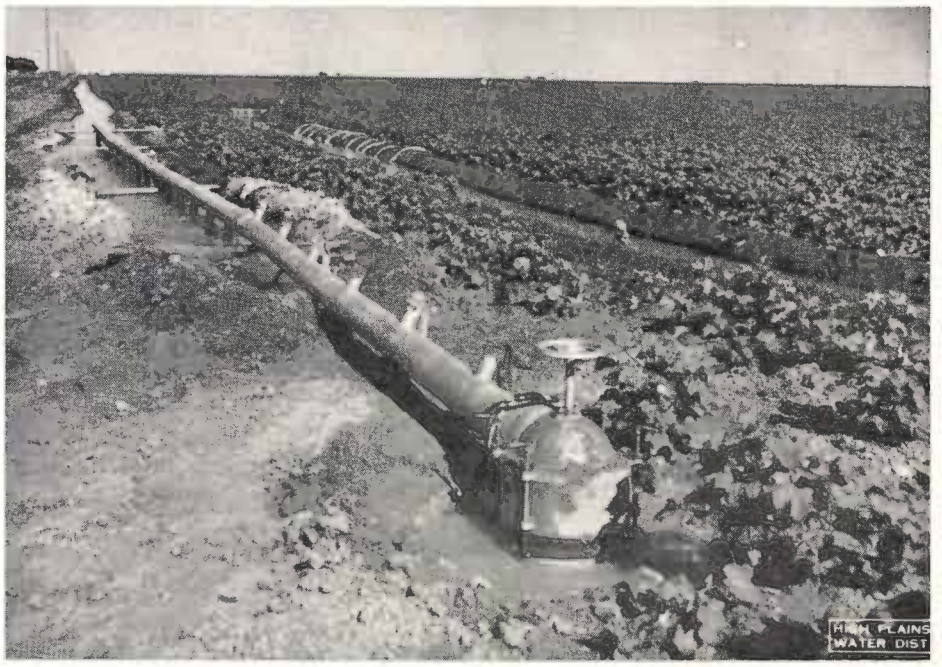
Water is pumped to growing crops from the lake through 6-inch aluminum pipe under the paved road through a metal culvert.

was decided that only two of the wells would be used in conjunction with the lake pump. Consequently, one of the idle deep well pump engines and fuel systems was used to supply power necessary to operate the experimental lake pump.

The engine and centrifugal pump were mounted on the trailer chassis. The aluminum pipe was laid on the surface from the pump to the half section tract by going under a farm-to-market road through a culvert. Additional surface pipe was then laid up the hill and connected to a hydrant in the underground pipeline system.

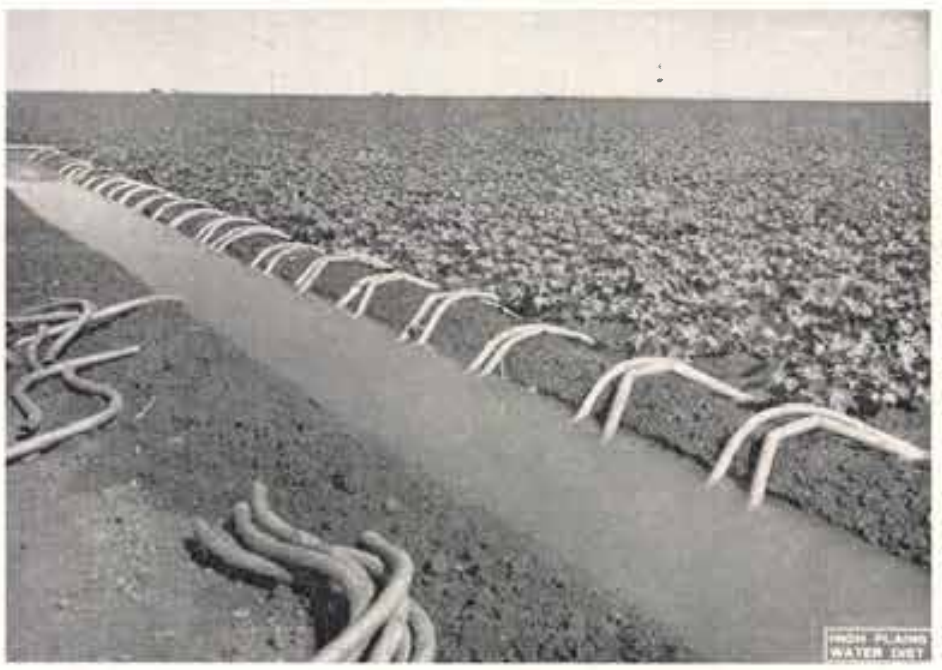
The intake of a suction pipe from the pump to the lake water was under about four feet of water. With everything in readiness, the centrifugal pump was started. Mr. King primed the pump and operation-"lake pump" was underway.

When the irrigation ditch filled with water from the two wells and the lake, about sixty 2-inch irrigation syphon tubes were set to take care of the tremendous quantity of water. It was supposed that probably the two wells were supplying water enough to



A permanent underground irrigation pipeline directs the lake water to almost any point on the King's 320-acre farm. The picture shows the lake water as it is discharged into an open irrigation ditch from the underground pipeline.

The picture above shows the 6-inch aluminum pipe that transports the lake water to a point on the King farm where it enters the permanent underground pipeline system. The hydrant shown is approximately 30 feet higher in elevation than the lake in the background.



Irrigation tubes are set along the earthen ditch to syphon the lake water into individual crop rows. Note the cloudiness of the lake water in the ditch. In periods of surface water runoff, particles of soil are eroded from the area surrounding the lake. Many of them are so minute that they remain in suspension even after the runoff water reaches the lake. These suspended particles create the cloudy appearance of the lake water.

filled the lake, Mr. King decided that he would buy a lake pump with which he could pump and utilize the runoff water contained in the lake which would otherwise largely be lost to evaporation.

His idea was to install, on a temporary basis, a lake pump with which he could prove to himself whether or not irrigating with surface water that collects in a wet-weather lake is an economical undertaking.

He bought an 8-inch centrifugal, pump, 2200 feet of 6-inch spliced aluminum surface pipe in 30 feet lengths, and a used cotton trailer chassis.

Because it was necessary to lift the lake water approximately 30 feet in elevation to get it to Mr. King's cotton and grain sorghum crops where it could be used, and because the permanent underground pipe system was not designed to transport the quantity of water that could be pumped by the 8-inch centrifugal pump and the four 6-inch deep well turbine pumps, it fill about 15 tubes while the lake was supplying the remainder.

In fifteen days of pumping, Mr. King irrigated 75 acres of cotton and 120 acres of grain sorghum. After this had been done there still remained enough water in the lake for about five days pumping and additional acres remained to be irrigated. From an operational standpoint the lake pump uses about 100 gallons of butane fuel, at 9 cents per gallon, every twenty-four hours.

Mr. King's experimental lake pump, temporary surface pipe and trailer chassis cost approximately $2000. He furnished all the installation labor himself.

Mr. King states that he is convinced, from results obtained during the pumping experiment, that a permanent lake pump installation would definitely be a good investment. He plans to do a considerable amount of work this winter in converting the temporary installation to one which will be permanent.

Mr. King says that when his permanent lake-pump system is completed he will then have an irrigated farm as long as it continues to rain and fill the lake. No longer will he be completely dependent upon a depletable underground supply of water.

"CHIEF RUNNING WATER," SAYS—

"Water For Texas" Conference At Texas A&M College

The fifth annual "Water For Texas" conference will be conducted September 9-11 on the Texas A & M College campus.

The conference will be divided into three catagories—(1) Water Uses and Standards. (2) The Reclamation and Reuse of Water. (3) Equities in Water Utilization.

Speakers for the three-day program will come from all areas of the nation and will discuss water problems of agriculture, industry and municipalities.

WATER PUMPED BUT NOT USED MEANS DOLLARS LOST

EDITOR'S NOTE—The following article was written in 1954 by W. L. Broadhurst, Chief Hydrologist for the High Plains Water District. We are reprinting it to show the worth of underground water from an economic standpoint. Next month we will show what Mr. Unfred has done on his Lynn County farm in an effort to conserve underground water pumped for irrigation purposes.

On July 8 and 9, 1954, a test was made on the Joe D. Unfred farm near New Home in northwestern Lynn County to determine the loss resulting from running water in an open ditch from his irrigation wells to his field. Two wells were used in the study: well No. 1 is in the southwest corner of the quarter section and well No. 2 is 1,250 feet east of well No. 1. Water from the two wells was discharged into the ditch connecting the wells and was diverted from the ditch to a field at a point approximately midway between the wells. Sparling flow meters were used to measure the discharge from the wells. A Parshall flume, which was furnished by the Soil Conservation Service, and a two-foot rectangular Weir were used to measure the discharge from the ditch to the field. The wells had been pumped 7 days and nights continuously into this same ditch before the test was started.

Well No. 1 is equipped with a 6-inch deep-well turbine pump and well No. 2 is equipped with a 4-inch deep-well turbine pump. The pumps are driven by small Allis Chalmers engines using butane for fuel.

Well No. 1 produced 250 gallons a minute. The motor used 2.5 gallons of butane per hour. At 8 cents a gallon, cost for butane was 20 cents per hour or $4.80 for 24 hours. This unit used 1 quart of motor oil at 35 cents per quart and one pint of drip oil at 5 cents per pint. Total cost for butane and oil was $5.20 per day. 250 gallons a minute for 1,440 minutes in a day is 360,000 gallons a day at a cost of $5.20 equals 1 44/100 cents per thousand gallons.

Well No. 2 produced 185 gallons a minute. The motor used 2.18 gallons of butane per hour. At 8 cents a gallon, cost for butane was 17 1/2 cents per hour or $4.20 per day. This unit also used one quart of motor oil at 35 cents per quart and one pint of drip oil at 5 cents per pint. Total cost for butane and oil was $4.60 per day. 185 gallons a minute for 1,440 minutes in a day is 266,400 gallons a day at a cost of $4.60 equals 1 72/100 cents per thousand gallons.

The combined discharge of the two wells (250 and 185) was 435 gallons a minute. 435 gallons a minute times 1,440 minutes in a day is 626,400 gallons a day divided by 325,829 gallons in an acre-foot equals 1.92 acre-feet per day pumped. In other words, the pumpage from the two wells was sufficient to cover 1.92 acres to a depth of one foot.

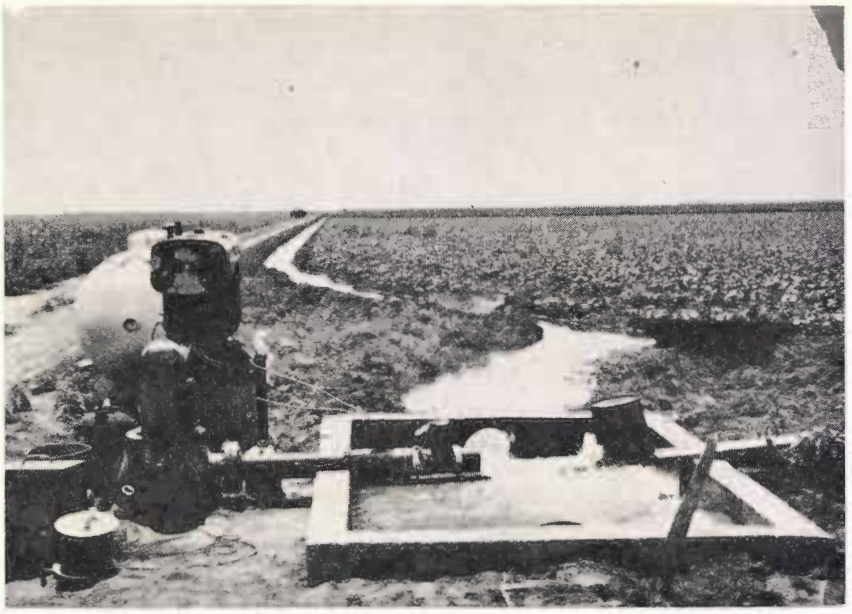
The total flow from the 1,250 foot ditch at a point about midway between the wells was 366 gallons a minute. This indicated that evaporation and seepage loss from the ditch was 69 gallons a minute (5 1/2 gallons a minute for each 100 feet of ditch). 366 gallons a minute times 1,440 minutes in a day is 526,040 gallons a day divided by 325,829 gallons in an acre-foot equals 1.61 acre-feet per day delivered to the field. The difference between the amount pumped (1.92 acre-feet per day) and the amount delivered to the field (1.61 acre-feet per day) was 0.31 acre-foot. The loss from this 1,250 foot ditch was 0.31 acre-foot or 3 3/4 inches over one acre every 24 hours.

The cost of butane and oil was $9.80 per day to pump 1.92 acre-feet of water. The cost of pumping the 0.31 acre-foot that was lost was only $1.58 per day, but in 120 days it would amount to $189.60. This, however, is only an insignificant part of the loss.

Mr. Unfred reported that the two wells were pumped an average of 120 days a year. If each dav he loses from this 1,250 foot ditch enough water to put 3 3/4 inches on one acre of land, in 120 days he will lose enough water to put 12 inches on 37.5 acres. If the 37.5 acres would produce 3/4 bale of cotton per acre, that means a loss of 28 bales of cotton. If the cotton would net $50.00 a bale, it means a loss of $1,400 a year.

If we add the $189.60 for butane and oil plus the $1,400 we did not produce, plus the extra wear and tear on the equipment, plus the costs of maintaining the ditch, plus the inconvenience of not being able to cultivate the field while the ditch is full of water, plus the additional time required to irrigate the field, the loss of 69 gallons a minute from the quarter mile of open ditch may exceed $2,000 per year.

Here it may be advisable to take another close look at the "tail water" problem. If the salvage of 69 gallons a minute from 1,250 feet of open ditch on one farm during a single season is sufficient to pay for 2,000 feet of pipe line, it is evident that salvaging the same quantity of "tail water" in one pumping season would be sufficient to pay for a sump-pump and pipeline to pick up the tail water and put it back on the field year after year. In numerous locations throughout the Plains a sump-pump can salvage as much water as can be obtained from an additional well and at less initial cost and also less operating cost. Hence, it makes sense to save dollars through efficient use of pumped water.



Well No. 2 on Joe D. Unfred farm. Note 4-inch flow-meter on discharge pipe and the open ditch in the background.

Rectangular Weir and Parshall flume used to measure discharge from the irrigation ditch to the field.

High Plains Underground Water
Conservation District No. 1
1628-B Fifteenth Street
Lubbock, Texas

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THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 6—No. 4 "THERE IS NO SUBSTITUTE FOR WATER" *September 1959*

Changes In Water Levels Are Registered During Recent Montana Earthquake

The U. S. Geological Survey reports that the recent earthquake in Montana has caused momentary changes in water levels in wells throughout the nation.

These changes were registered by automatic water-stage recorders which are operated by the Geological Survey for hydrologic studies.

Naturally, large fluctuations occurred in States near the epicenter of the quake. However, even distant States experienced water-level changes.

Among distant points of observation, a well in Union County, New Jersey, had the largest fluctuation — 17 inches. In four other New Jersey wells the fluctuation was only about an inch. These wells are about 1,900 miles from the epicenter of the earthquake.

The earthquake was registered in Hawaiian wells, about 3,200 miles from the epicenter. Preliminary reports from the Geological Survey's Honolulu office show that in three wells on the island of Oahu the water levels rose and fell about a quarter to three-quarters of an inch.

The Florida office reports that in wells around Miami water-level changes ranged from 1.7 to 5.8 inches. These wells are about 2,100 miles from the earthquake epicenter.

WATER DISTRICT ENLARGED, BOARD ANNEXES BAILEY COUNTY LAND

M. C. Street of Littlefield in Lamb County is the first landowner to have land annexed to the High Plains Underground Water Conservation District that was not originally included.

Mr. Street owns six labors of land in south Bailey County. The land adjoins the original Water District boundary. He asked the Board of Directors of the Water District, by petition, to include his land in the District and to levy the maintenance tax of 5 cents on each $100 valuation.

Because there were no other landowners involved in this transaction, the District Board at their regular meeting September 4, 1959, did, on their own motion, pass a resolution which brought Mr. Street's land into the District.

Mr. Street has two small irrigation wells that were drilled on the land prior to its being annexed to the District. The wells were drilled in accordance with the well spacing rules of the High Plains Water District.

Mr. Street states that he believes in conserving water and that the benefits of the High Plains Water District are evident, and that he wants to become a part of the organization to help foster water conservation and actively support efforts designed to maintain control of ground water in Texas on the local level.

M. C. Street of Littlefield is shown above as he signs a petition asking the Board of Directors of the High Plains Water District to annex his farm land in Bailey County to the District. Arthur P. Duggan, Jr., left, Littlefield attorney who prepared the petition and Roy B. McQuatters, Sr., member of the Board of Directors of the Water District, look on as the petition is signed.

GEOLOGISTS TO DISCUSS UNDERGROUND WATER

Underground water in West Texas and Eastern New Mexico, together with numerous other geologic problems in the Southwest, will be discussed by prominent speakers at the coming annual convention of the American Association of Petroleum Geologists in Lubbock on October 9 and 10, 1959.

Dr. F. Alton Wade, head of the geology department at Texas Tech, says the public is invited to the technical sessions which will be held in the Municipal Auditorium on the Tech Campus.

Agricultural Waste Water — Road Hazard

Above is pictured a county road in the southern High Plains which has been completely inundated by agricultural "tail-water." This is not only a nuisance and a waste but also a hazard to the safety of persons who might be driving on this road. The picture was taken during the early part of September 1959.

WELL DRILLING STATISTICS FOR AUGUST

During the month of August, 62 new wells were drilled and registered with the District office; 20 replacement wells were drilled; and 5 wells were drilled that were either dry or non-productive for other reasons. 73 permits were issued by the County Committees.

The permits issued and wells completed for August follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	4	11	2	3
Castro	3	4	1	0
Cochran	0	2	0	0
Deaf Smith	22	12	9	1
Floyd	13	5	2	0
Hockley	3	6	0	0
Lamb	7	4	0	0
Lubbock	13	8	4	0
Lynn	0	4	0	1
Parmer	2	0	0	0
Potter	0	0	0	0
Randall	6	6	2	0
Totals	73	62	20	5

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ALLAN WHITE
Editor

"The Cross Section" takes this opportunity to introduce to its readers another of the five men who serve so loyally on the Board of Directors of the High Plains Underground Water Conservation District. This month we would like for our readers to meet T. L. Sparkman, Jr. of Hereford. Mr. Sparkman represents District Precinct No. 4, which consists of Armstrong, Deaf Smith, Potter and Randall counties. He has served on the District Board since January 1959 when elected by the people of his precinct.

T. L. Sparkman, Jr. of Hereford represents District Precinct No. 4, which consists of Armstrong, Deaf Smith, Potter and Randall counties, on the Board of Directors of the High Plains Underground Water Conservation District.

Mr. Sparkman was born at Childress, Texas, on November 23, 1915. He is the only son of Mr. and Mrs. T. L. Sparkman, Sr.

When Mr. Sparkman was only two years old, his family moved onto a section of land near the Jumbo community in Castro County. Mr. Sparkman's grandfather, G. F. Springer, owned the grassland section. Mr. Sparkman's father raised cattle on the land. He cultivated just enough land on which to grow feed for his cows.

Mr. Sparkman began public school in 1922 at the Jumbo Elementary School. He attended there until 1925 at which time the family moved to the Frio community in the northwestern part of Castro County. His father bought a half-section of land on which he raised wheat and maize. After completing elementary school at Frio, Mr. Sparkman attended the Hereford High School.

In 1933 his father drilled an irrigation well. The well was drilled to a depth of 110 feet below the land surface. It was among the first wells to use the new type high-capacity turbine pumps (the type presently used). In 1935, Mr. Sparkman's father produced a kaffir grain crop that yielded an almost-unheard-of 60 bushels of grain per acre. This showed him the real potential of irrigation farming.

On December 26, 1936, Mr. Sparkman married Miss Ruby Andrews. The Andrews' family also farmed near Frio and were neighbors to the Sparkmans.

The following spring the young Sparkman couple bought a half-section tract of land which adjoined the Sparkman's home farm. An 8-inch irrigation well was on the land. They also rented a nearby half-section of land from H. E. Ritch and he too put down an irrigation well.

In 1938 Mr. Sparkman began building a herd of registered Hereford cattle. He also raised some feeder stock. Today Mr. Sparkman's herd consists of about 60 grown cows and over 40 calves and bulls.

On September 14, 1942 a son, Tommy, was born to Mr. and Mrs. Sparkman. Tommy is now classified as a junior in the Hereford High School. He is active in F. F. A. work. The eldest daughter, Bonnie, was born on August 22, 1944. She is a sophomore in high school.

In 1945 the Sparkman's bought a section of grassland near Dawn in Deaf Smith County and moved there from Frio. They cultivated 140 acres on the section to raise feed for the livestock herd.

Darlene, the youngest of the Sparkman's three children, was born on November 1, 1949. At present she attends the fourth grade at the Aikman Elementary School in Hereford.

The tract of irrigated land at Frio was sold in 1950 and the nalf-section of land on which the Sparkman's now make their home was purchased in 1951. This place is irrigated and is located 3 miles northeast of Hereford. Principally, Mr. Sparkman raises crops for ensilage to feed his livestock.

The Sparkman's are presently in the process of building a new home on their farm.

The family attends the Frio Baptist Church where Mr. Sparkman is a mem-

From Inefficiency To Conservation

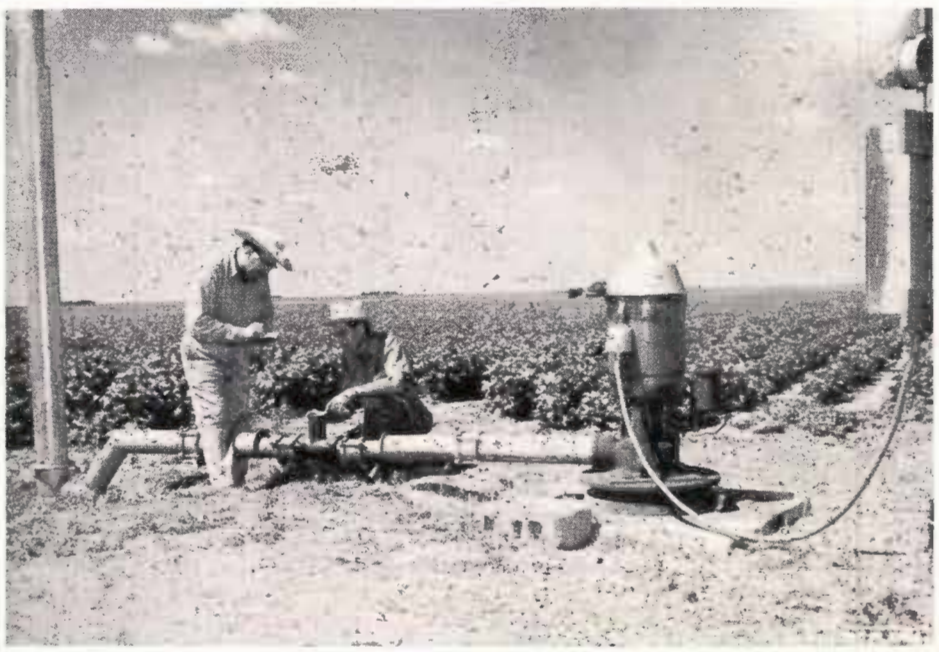
Irrigation on the Joe D. Unfred farm near New Home in northwestern Lynn County was done entirely from open ditches in 1954. On one quarter section of the farm, two wells which had a combined discharge of 435 gallons a minute were used to irrigate about 80 acres of cotton and grain sorghum.

On July 8 and 9, 1954, a test showed that seepage and evaporation losses from a 1250-foot open ditch amounted to 69 gallons a minute (an average of 5-1/2 gallons a minute for each 100 foot of ditch). The two wells were equipped with turbine-type pumps which were driven by internal combustion engines using butane for fuel. The fuel cost for pumping the water amounted to 1 58/100 cents per thousand gallons. The wells were operated an average of 120 days a year. From these data it was computed that the cost of pumping the water plus the value of the water pumped but which never reached his field were sufficient to pay for a closed distribution system.

In 1959, this same tract of land had no open ditches. Instead, the water was transported through 2,800 feet of underground concrete pipeline plus 2,000 feet of surface aluminum pipe, a total distance of 4,800 feet. The combined discharge of the two wells in August 1959 was only 256 gallons a minute. The pumps were driven by small electric motors and, although the output was 42 per cent less than in 1954, the energy cost for pumping the water amounted to only 1 64/100 cents per thousand gallons.

The significant point in this follow-up study is that through the pipeline system, even with the reduced yields of his wells, Mr. Unfred effectively irrigated about 15 acres more land in 1959 than in 1954. Without the pipelines, his operations would have been drastically reduced because, with a ditch loss of 5-1/2 gallons a minute per 100 feet, the entire output of the two wells would have been lost from 4,800 of open ditch.

As stated in Southwestern Crop and Stock, May 1959, "Joe Unfred grows cotton and hybrid grain sorghum on his 840 acre farm. 520 acres are irrigated by 6,383 feet of concrete pipeline, 10 and 12 inches in diameter, with water coming from his nine wells. He's planning more pipelines each year and will eventually eliminate all surface (open ditch) irrigation."



A flow-meter was used to calculate the amount of water pumped from one of the wells on the Joe D. Unfred farm. Mr. Unfred and W. L. Broadhurst, Water District Hydrologist, are shown as they record the amount pumped.

Open ditches have been replaced by closed surface pipe. Irrigation water is released to individual crop rows through spigots in the pipe. Each spigot is equipped with a valve for controlling the quantity of water desired.

Irrigation water is pumped from the wells on the Unfred farm to the growing crops through a system of underground pipe lines. Outlets are spaced over the farm through which irrigation water may be transferred to the surface at any time.

By eliminating open surface ditches, mechanical crop cultivation may be commenced in a minimum length of time following an irrigation. Note above the tractor operating between one of the farm's irrigation wells and the point at which water from the well is being used.

ber of the Board of Deacons. He also teaches a Sunday School class of young people and is a past Superintendent of the Sunday School.

Mr. Sparkman served for one year on the Deaf Smith County Committee of the High Plains Water District before being elected by the people of his precinct to serve on the Board of Directors.

His main hobby is collecting guns—he has twelve—mostly rifles. He has one old .35 caliber rim-fire revolver that was made about 1875 and was given to him by his grandfather. He keeps horses which are ridden for both pleasure and work. Mr. Sparkman also enjoys taking color pictures with his 35mm camera.

We are privileged to have Mr. Sparkman serving on the Board of Directors of the Water District, and the people of District Precinct No. 4 are indeed fortunate to be represented by such a well qualified man.

EDITOR
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Lubbock, Texas

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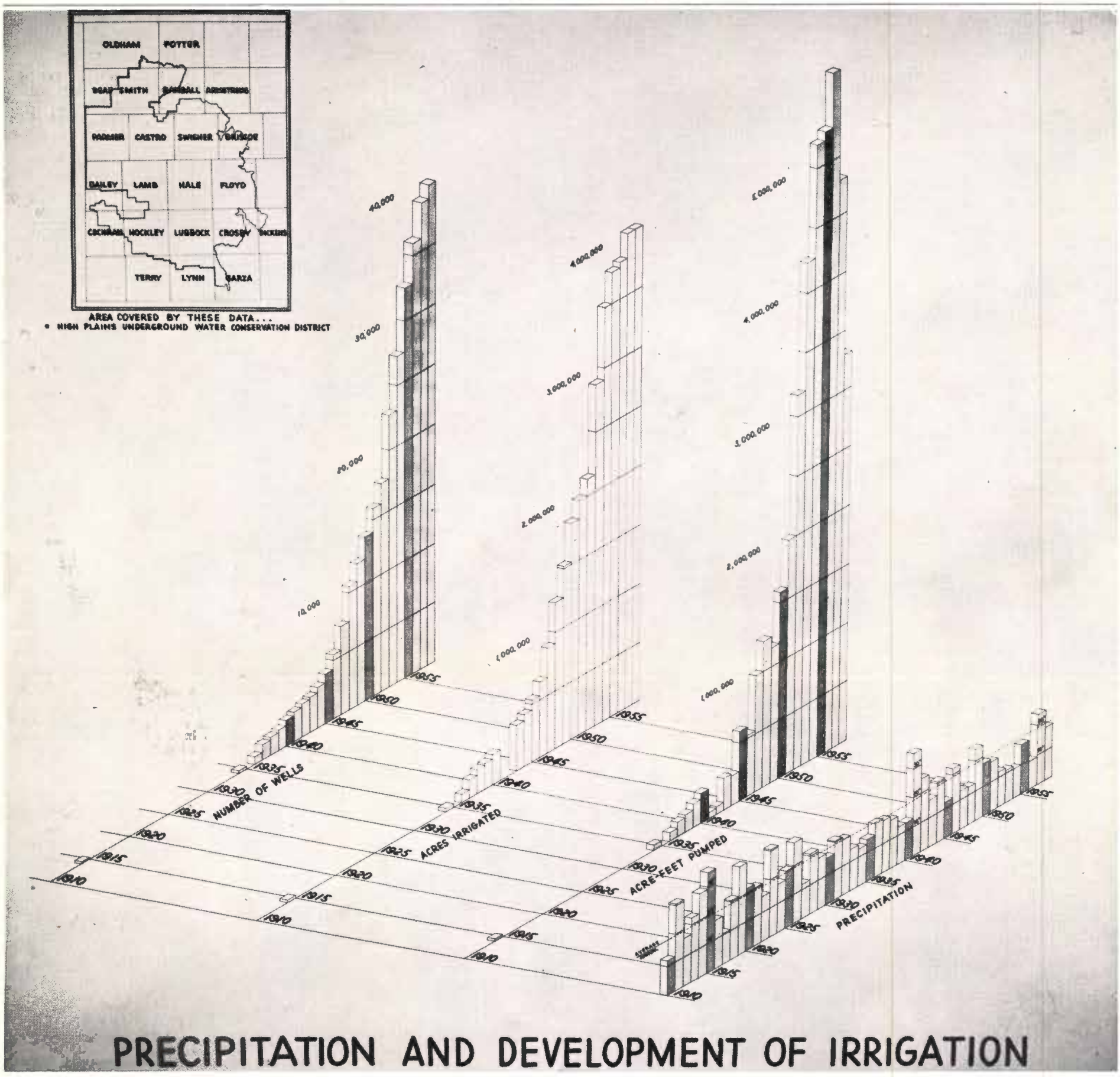

PRECIPITATION AND DEVELOPMENT OF IRRIGATION

High Plains Underground Water
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1628-B Fifteenth Street
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THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 6—No. 5 **"THERE IS NO SUBSTITUTE FOR WATER"** *October 1959*

District Urges Irrigators To Place Guards On Pump Drive Shafts

One of the most dangerous omissions that an irrigation farmer can be guilty of is that of leaving the drive shaft between his irrigation pump and engine exposed.

We all remember the recent story that appeared in our nations' newspapers that told of a 12-year old girl whose pony-tail became entangled in the moving parts of a potato-digging machine. As a result of this tragic accident, she lost her ears, eyebrows and scalp. Death ultimately claimed this 12-year old.

This was a terrible thing, and we found ourselves saying that it is difficult to understand how such an accident could happen and why the moving parts on the digger were not covered to prevent such an occurrence.

Well, the answer as to "why" may never be evident; however, one thing is certain—the potentially dangerous gears, etc. of that particular potato digger are no doubt adequately guarded today. The regretable thing about it is that the safeguards came too late. The cost of this lesson was too expensive.

Parallel this incident with the picture here in our own backyard, so to speak. We literally have thousands of irrigation wells in the southern High Plains of Texas that do not have any form of cover or guard that would offer protection from contact with the high speed drive shaft that transmits power to the pump from the engine.

If any model, of the many guards that are manufactured to cover exposed drive shafts, was expensive, an irrigator would perhaps have an excuse for not having one on each well that he operates, but all are probably under $10 in price. Therefore, the expense is not much of a factor.

What is the reason then for these many drive shafts remaining exposed?

Probably the principal reason can be traced back to our old friend "complacency." He can be a bitter foe. Most of us simply can not feature tragic things happening to us. Oh, sure, these things occur every day, but always to someone else.

That's probably what a lady who lives in Lubbock today thought, until her hair became accidentally entangled in an irrigation pump drive shaft back in 1948. This particular woman was observing a pumping well on her husband's farm near Anton in Hockley County at the time of the accident. She leaned in to get a better view of the water being pumped from the well. The next thing that she remembered was regaining consciousness in a Lubbock hospital. The agonizing pain that she felt was caused by the fact that one of her eyebrows and her entire scalp had been ripped from her head by the irrigation well's treacherous drive shaft. For weeks she lay at the brink of death. When finally the ordeal of facing death itself had passed, the months of expensive and painful plastic surgery began.

This is not a fictitious story. It actually happened, and it happened here at home.

Don't shrug your shoulders and say to yourself that this is a one-chance-in-a-million occurrence. You have children who are looking to you for the proper decision in this matter. Consider them—their very lives may depend on your decision. Consider also the adult friends who come by your well to watch and visit. Their safety too may well depend upon your decision.

Today place a protecting guard on every irrigation well drive shaft that is exposed on your farm. It might well be one of the wisest things that you will ever have an opportunity to do.

Think about it—then act.

BOARD MOVES TO NEW OFFICES

The State Board of Water Engineers has moved into new quarters at Austin. Offices are now located on the seventh and eighth floors of the new State Office Building. The Board will occupy the entire seventh floor and part of the eighth floor.

The Water Board's new mailing address is Capitol Station, Austin 11, Texas. Their telephone number will remain the same, GReenwood 6-6791.

Texas Water Conservation Association Holds Fifteenth Annual Convention

The Texas Water Conservation Association during its Fifteenth Annual Convention in Dallas, October 18 and 19, passed a resolution congratulating Governor Price Daniel on the progress toward a program of statewide water resources development which would be fair and equitable to all water users and to all segments of the State's economy.

The T.W.C.A. added, however, in this same resolution, "that it is generally known throughout the State that there is a lag in water resources planning at the State level, even though there was a large appropriation made by the Texas Legislature for such planning.

"It is apparent that the delay is caused by the lack of unanimity of the Board of Water Engineers. The T.W.C.A. respectfully recommends that such action be taken by the Governor as will be helpful in alleviating this situation."

The T.W.C.A. further stated that the organization, made up of men throughout Texas who are interested in water conservation and orderly development of the State's water resources, would

(1) continue to oppose the creation of Federal Valley Authorities

(2) continue to work for enactment by the Congress of a "State's Water Rights Bill" to guarantee to the states the preservation of their authority and right to administer and protect the water within their respective boundaries

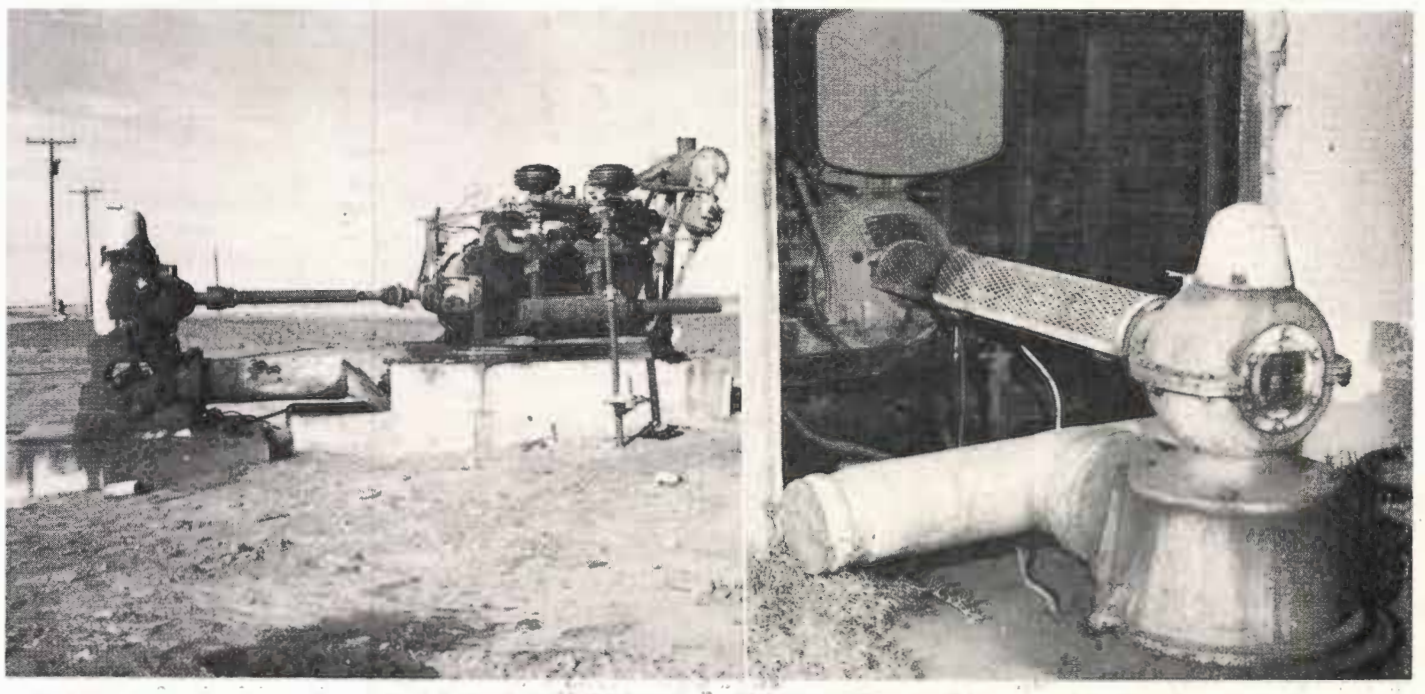
(3) continue to support the authorization of all engineeringly sound and economically feasible, soil, water, river and harbor and flood control projects by the Congress.

(4) continue to support the appropriation by the Congress of adequate planning and construction funds for all authorized projects

(5) continue to work for adequate appropriations by the Texas Legislature to enable the State Board of Water Engineers to effectively and efficiently administer the water laws of this State and to formulate a long-range, statewide water conservation and flood control program.

(6) urge the Texas Legislature to amend the Enabling Act for the $200 million Financial Aid Amendment to the State constitution by removing the

(Continued on Page 4)



At left, above, is pictured a typical irrigation well operating in the southern High Plains of Texas without a guard covering the high speed drive shaft between the engine and the pump. The shaft is covered in the picture on the right, minimizing the possibility of a person accidentally being injured by contact with the drive shaft.

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ALLAN WHITE
Editor

Underground Water Di

"Water Conservation" is a meaningless phrase to those who are not acquainted with basic facts as they pertain to the occurrence and supply of water, the relationship of plants and soils to moisture, and to the efficiency of water use. However, when water-users do become aware of these basic truths, then "water conservation" becomes something more than a meaningless phrase; it becomes something real and personal to the individual and to his way of life.

The High Plains Underground Water Conservation District stands today as an example of what can be accomplished on the local level in the realm of water conservation. It has in the past and it continues to point the way to those throughout the Lone Star State who are interested in meeting and solving their own problems, in their own way, with their own finances.

The High Plains District has been in operation for over seven years. The District consists of all or parts of thirteen southern High Plains Counties, Armstrong, Bailey, Castro, Cochran, Deaf Smith, Floyd, Hockley, Lamb, Lubbock, Lynn, Parmer, Potter, and Randall.

The District is divided into five separate "precincts." Each "precinct" is represented by one man on a governing Board of Directors. Each director is elected by the people of his respective "precinct" and each serves two-year terms of office. Elmer Blankenship, Wilson farmer, is currently president of the Board. The four other members are, J. R. Belt, Jr., Lockney farmer; John Gammon, Lazbuddie farmer; Roy B. McQuatters, Sr., Littlefield farmer and businessman; and T. L. Sparkman, Jr., Hereford farmer. Residents within the High Plains District also elect five men to serve three-year terms in each county as County Committeemen. The County Committees accept well drilling permit applications for the Board of Directors. They also act in an advisory capacity to the Board.

The District maintains its headquarters in Lubbock and its staff consists of Tom McFarland, General Manager; W. L. Broadhurst, Chief Hydrologist, who also has charge of all field work and research; Allan White, Director of Publicity and Public Relations; Y. F. Snodgrass, Field Representative; and three very capable young ladies, Mrs. Mayme McVay, Mrs. Jean Lancaster, and Miss Peggy Burkett. Wayne Wyatt, Field Representative, is in charge of a District field office located at Hereford.

The District is financed by an ad valorem tax assessed and collected from property owners within the thirteen member counties. The tax is five cents on each hundred dollar valuation. The tax valuations are the same as those used for state and county purposes.

The High Plains District is, by law, concerned with the prevention of waste and the preservation, conservation, and recharge of underground water contained within the Ogallala water-bearing formations underlying the aforementioned area.

The District has from the beginning of its operation required that new wells drilled in the area be spaced from those already in use. This is a basic underground water conservation practice. Spacing wells one from another not only lessens competition between the wells for water by increasing the distance between them, but also it tends to provide more nearly a uniform lowering of the water table. Approximately 15,000 wells have been drilled during the seven years of District operation, bringing the estimated total number of wells in the District to about 30,000. (This includes only the wells in the Water District and is not the total for the entire Texas High Plains.) Approximately 2,270,000 acres of farm land are irrigated in the District.

In late 1954, the District filed with the United States Internal Revenue Service a formal request for a ruling to allow High Plains' water users the legal right of claiming an income tax deduction for the depletion of underground water when used to produce income. When allowed by the Federal Government, the deduction will probably be based on the cost apportioned

Thousands of depressions, or wet-weather lakes, dot the High Plains of Texas. Most surface runoff from rainfall collects in these depressions and represents the only known economic source of surface water that is available for artificial recharge.

strict Promotes Water Conservation Programs

By ALLAN H. WHITE, JR.

to the water which underlies a claimant's farm or parcel of land.

The District has also instigated a cooperative agricultural experiment program between itself and several area farmers. Flow-meters to calculate the amount of water pumped to various crops have been attached by the Water District to each irrigation well on the cooperating farms. The farmers themselves maintain complete and continuous irrigation records. In this manner the District obtains information that can be distributed to every irrigator in the area, thereby improving individual management and efficiency.

Surface water that collects in the many wet-weather lakes, under normal conditions, is mostly lost into the atmosphere by evaporation. Many multi-purpose wells (production and recharge) have been drilled near lakes in order to drain the lake water into the underground reservoir through th well.

Artificial recharge is a topic of much discussion and interest in the High Plains. Since 1954, the High Plains District has conducted experimental research in this field. The recharge method found to be most satisfactory in this area is that of draining wet-weather lake water into the underground formation through normal production wells. Several thousand wet-weather lakes, or depressions, dot the Texas Plains country into which practically all surface run-off collects. Run-off water collected in these depressions represents the only known economic source of surface water that can be used for artificial recharge. Rivers and creeks in the area have practically no normal stream flow, and in times of storm run-off they drain only a minute percentage of the total acreage. Of approximately 35,000 square miles, or 22,400,000 acres, in the Texas High Plains, about 20,400,000 acres drain into the wet-weather lakes, leaving only about 10 percent of the total to be drained by rivers and streams.

Salt water that is pumped with oil from far beneath the earth's surface, has in the past been disposed of in earthen pits. The Water District passed rules forbidding this type of disposal when it was discovered that the salt water was percolating from the pits to the fresh underground water.

The combination artificial recharge and production well must be pumped at intervals during the recharge operation to clear the pores of the underground formations of silt and other suspended materials. Most suspended particles that are present in the wet-weather lake water filter from the water as it passes from the well out into the aquifer. Clogging of the formations results unless these particles are recovered from the well. This is accomplished by pumping the well using the production pump. Research is presently being conducted that may make it economically possible to clear the lake water of suspended particles before it is used for recharge.

The High Plains Water District is experimenting with a flocculating chemical which when introduced to lake water causes the suspended particles to adhere to one another. As the small particles join together through this chemical attraction they create larger masses which settle to the lake bed. In a comparitively brief period of time the lake water is relatively free of solid matter.

It is estimated that if all the water that collects in the Texas High Plains' wet-weather lakes during an average rainfall year could be drained into the underground aquifer, approximately one and a half million acre-feet of water could be salvaged. In lakes where recharge wells are not in use, as much as ninety percent of the run-off water that collects is lost through evaporation and vegetative transpiration. Artificial recharging will undoubtedly be called on to play a very important role in prolonging the excellent economic condition of agriculture in the High Plains of Texas. Its importance is accenuated because of the negligible amount of natural recharge to the underground reservoir.

Recently, the District spearheaded a campaign designed to protect the underground water of the reservoir from salt-water pollution. The pollution in this instance originated from earthen surface pits into which oil-field brines were disposed.

Judicial decisions have shown that oil-field brines disposed of in an earthen pit can percolate downward through the underlying formations causing pollution of the fresh water that is in storage far beneath the pit.

Disposal of salt water in any matter that might pollute fresh water supplies is now a violation of the District's rules as well as being classified as "waste" under present state statutes.

Rather than diminish, problems seem to multiply with time. At least, that is the way it seems when dealing with water conservation. A new problem that has recently come to the attention of the High Plains District is one of a bacterial or algal growth occurring in wells.

Pictured above are irrigation well oil tubes covered with an algae or bacteria growth. The growth has been found in several wells and represents a potential threat to continued normal pump operation.

The growth apparently does not present a health hazard as much as a potential obstacle to the continued normal operation of the mechanical pumping equipment in the wells. The growth has been reported, in at least one instance, to have become so concentrated inside a pump that is completely clogged it and prevented its operation. It is felt in some circles that perhaps the growth could even clog the perforations in the well casing and pores of the water-bearing formation, thereby preventing water from entering the well. Should this occur, the contaminated well might possibly have to be abandoned, resulting in a heavy financial loss to the well owner.

The High Plains District is presently attempting to interest various groups in research programs that could study prevention of the foreign growth and control its spreading to uncontaminated wells.

To assist the schools within the southern High Plains in their jobs of education, the High Plains District has published and distributed to them a full-color picture book entitled, "Chief Running Water's Story of High Plains Water." The book was prepared to aid in teaching the subject of water conservation to High Plains' children while they are still in the elementary grades.

Other educational pamphlets and brochures have been published by the Water District. All are designed to present facts pertaining to underground water in the Texas High Plains and to foster interest in water conservation.

The gathering of basic data relating to the underground water supply and its occurrence, represents an important part of the District's continuing technical efforts. Ground-water inventories have been completed for each county that comprises the District and maps have been prepared and published that reveal this information.

To disseminate such basic data and other beneficial water news, the District publishes "The Cross Section." Any interested person may receive the newspaper free of charge by sending his mailing address to the Water District office. Correspondence should be addressed to 1628-B 15th Street, Lubbock, Texas.

The High Plains Water District has recently published a full-color picture book on water conservation. The book has been distributed to all elementary schools in the District.

Is Your Water Supply Contaminated?

W. R. Bradford, Sanitarian for the Lubbock City-County Health Unit. located at 1118 Jarvis Street, Lubbock, Texas, has stated that many domestic water supplies on our High Plains' farms are contaminated and their water not suitable for human consumption. Home sewage escaping or percolating into water wells is thought to be the cause of most contamination.

During the past year, Mr. Bradford has checked 180 domestic water wells in Lubbock and Lynn counties and has found that 40 percent of them are contaminated.

Water samples are checked for bacteria known as coliform organisms. These organisms are known to be associated with bacteria which cause four major diseases, (1) typhoid (2) para-typhoid (3) polio and (4) dysentary. These coliform organisms originate in the intestines of humans and other warm-blooded animals.

Mrs. Ray Chaney, Lubbock Health Unit Laboratory Assistant, prepares to analyze a sample of water taken from a domestic well by W. R. Bradford. She will check the water for coliform organisms which, if present, will indicate contamination.

Does this mean that everyone who drinks water from a contaminated well will contract a terrible disease? No. But it does mean that those drinking the contaminated water are taking into their bodies organisms that may cause human illness under the proper set of physical circumstances.

Mr. Bradford states that there are several ways in which domestic water wells become contaminated—among these reasons are:

1. Pumps and pump bases are improperly installed leaving openings where debris can be carried into wells along with surface water.
2. Nearby abandoned wells are permitted to remain open.
3. Locating wells near cesspools, outdoor toilets, and other sources of potential contamination.
4. Drilling deep cesspools to collect home sewage near water wells.

Some recommendations that should be followed in the construction and maintainence of a sanitary well are these:

1. Carefully select the well site, making certain that it is as far away from potential contamination sources as possible.
2. The well should be cased and cement should be run beween the well wall and the casing from about the water level to the surface. This will assure against lateral movement below the land surface of contaminates into the well.
3. Design pump base so that surface water will drain away from the well instead of toward it.
4. The pump should be sealed in place where it contacts the pump base.
5. The well and the entire system should be disinfected with one of many chlorine solutions designed to sanitize wells.
6. All abandoned wells in the vicinity should be completely plugged.
7. Cesspools should be replaced by properly constructed septic tanks.
8. Samples of water should be drawn from the well twice a year and sent to the Health Unit for coliform organism analysis.

In connection with the last recommendation, the Lubbock Health Unit is a District unit; it not only serves Lubbock but the entire area. The Health Unit will analyze water samples for anyone in the southern High Plains without charge.

Those who are interested in having their well water analyzed should contact the Health Unit in Lubbock and ask for a sterile sample bottle. Then when the water sample is drawn from the well it should be returned to Lubbock immediately. In a matter of hours a card will be mailed to you relating the results of the analysis. If coliform organisms are present in your well water you will know that a serious problem exists on your farm. If the test is negative, you can then rest assured that the health of your family is not threatened by contaminated water.

WELL DRILLING STATISTICS FOR SEPT.

During the month of September, 35 new wells were drilled and registered with the District office; 17 replacement wells wer drilled; and 6 wells were drilled that were either dry or non-productive for other reasons. 68 permits were issued by the County Committees.

The permits issued and wells completed for September follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	8	2	0	0
Castro	5	4	3	1
Cochran	1	2	0	0
Deaf Smith	4	6	1	2
Floyd	12	6	1	1
Hockley	3	2	0	0
Lamb	12	2	3	0
Lubbock	9	3	2	1
Lynn	4	1	0	0
Parmer	7	3	7	1
Potter	0	0	0	0
Randall	3	4	0	0
Totals	68	35	17	6

T. W. C. A. —

(Continued from Page 1)

one-third limitation of the cost of water conservation projects, and thus provide for granting assistance up to $5.000,000, in the form of loans, to political subdivisions for the construction of water supply projects

(7) recommend to the Governor and the next Texas Legislature that the laws pertaining to surface water in Texas be completely modernized to make for a sane and sensible surface water Code which will be fair and equitable to all

(8) recommend an expanded cooperative program of topographic mapping, stream measurements, and underground and quality of water investigations in Texas between the U. S. Geological Survey, and the State Board of Water Engineers and other State and Federal agencies.

Tom McFarland, High Plains Water District Manager, was re-elected First Vice-President of the T.W.C.A. for 1960. Max Starcke, Austin, was re-elected President for the coming year.

A hot water faucet that leaks 60 drops a minute will waste 200 gallons of hot water a month. According to Harold Massey, managing director of the Gas Appliance Manufacturers Association, if it leaks twice as fast it will waste enough water to supply an average family with hot water for 11 days. So, when fuel bills seem high, it's time to take a close look at hot water faucets and get the leaky ones repaired.

U.S. Senate Committee To Hear Water District

The High Plains Underground Water Conservation District is at this time in the process of requesting an opportunity to appear before the U. S. Senate Select Committee on National Water Resources at a field hearing scheduled November 20, 1959 at Santa Fe, New Mexico.

The Committee will hold several such hearings across the nation in an effort to determine the future water needs of the United States.

The High Plains Water District will attempt to impress upon Senator Robert Kerr of Oklahoma, committee chairman, and the sixteen other senators that comprise the committee membership, on the importance of underground water to the continued high economic level of High Plains' agriculture.

The District's report on the future needs of this area will include a recommendation for continued research in the field of irrigated agriculture.

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County Committee Secretaries Discuss Office Procedures And Problems

The County Secretaries of the High Plains Underground Water Conservation District, met for an all-day conference on November 18 at the Plainsman Hotel in Lubbock. Office procedures were discussed and the rules and regulations of the District were studied.

Mrs. Jean Lancaster, District Secretary, was in charge of the program and arrangements.

Those attending the conference were: Mrs. Billie Downing of Muleshoe, representing Bailey County; Mrs. Ida Puckett of Floydada, representing Floyd County; Mrs. Casey Thomas and Mrs. Pauline Lovan, Hereford, representing Deaf Smith County; Mrs. True Bell and Mrs. Frank Cummings, Littlefield, representing Lamb County; and Mrs. Connie Ivey, Dimmitt, representing Castro County.

Mrs. Eutha Hamblen of Randall County, W. M. Butler of Cochran County, Z. O. Lincoln of Hockley County, and Aubrey Brock of Parmer County were unable to attend.

County Committee secretaries of the High Plains Water District gathered at the Plainsman Hotel in Lubbock on November 18 to discuss office procedures. Those who attended the all-day conference were, left to right: Mrs. Connie Ivey, Dimmitt; Miss Peggy Burkett, Lubbock office secretary; Mrs. Mayme McVay, Lubbock office receptionist and bookkeeper; Mrs. Jean Lancaster, District Secretary; Tom McFarland, District Manager; Mrs. Billie Downing, Muleshoe; Mrs. Ida Puckett, Floydada; Mrs. Casey Thomas, Hereford; Mrs. Pauline Lovan, Hereford; Mrs. Frank Cummings, Littlefield; and Mrs. True Bell, Littlefield.

Organic Fertilizers Increase Yields

H. C. Lane and H. J. Walker, staff members at the Lubbock Experiment Station, have stated that in 1958 the following results were obtained from applications of cotton burs, sorghum residues and barnyard manure.

"Cotton burs and barnyard manure are organic fertilizers available in this area for use on cotton. Rates of 2, 4, and 6 tons of cotton burs per acre have produced lint yield increase of 105, 160, and 216 pounds of lint respectively. Thirty to sixty pounds of nitrogen per acre should be used in the first and second season of bur application on the same land. The organic matter level of land treated annually with 6 tons of burs for six years has not increased more than .05 percent. This fact indicates that the amount of nutrients added by the burs is responsible for the increase yields. Barnyard manure at 6, 11 and 15 tons per acre has produced lint increases of 72, 103, and 108 pounds respectively. Profit with the use of manure should be compared closely with that from inorganic fertilizers before deciding which one to use.

"Sorghum residue or stalks applied on cotton land at rates of 2, 4, and 6 tons per acre have lowered lint yields. An application of 60 pounds of nitrogen with sorghum residue maintained yields where two tons of residue was applied. Four and six ton rates of sorghum residue require more than 60 pounds of nitrogen to maintain yields. When it is considered that an average sorghum crop will produce one and one-half tons to three tons of residue it is immediately evident that 60 pounds of nitrogen, or more, will be necessary to get maximum lint yields."

WELL DRILLING STATISTICS FOR OCTOBER

During the month of October, 33 new wells were drilled and registered with the District office; 12 replacement wells were drilled; and 7 wells were drilled that were either dry or non-productive for other reasons. 52 permits were issued by the County Committees.

The permits issued and wells completed for October follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	6	5	0	3
Castro	2	2	2	0
Cochran	1	2	0	1
Deaf Smith	3	9	4	0
Floyd	8	5	3	0
Hockley	9	2	0	0
Lamb	0	1	0	1
Lubbock	14	5	1	1
Lynn	3	0	1	0
Parmer	4	1	0	0
Potter	0	0	0	0
Randall	2	1	1	1
Totals	52	33	12	7

"SOIL TESTING" — GAGE THAT REVEALS SOIL FERTILITY

"Don't Guess—Soil Test," is the slogan for this year's soil fertility campaign. The campaign is sponsored by the Texas Agricultural Extension Service, County Agricultural Agents, and the Texas Plant Food Educational Committee. It is designed to stress the importance of soil testing for the maintenance of optimum farm production.

The proper soil fertility balance must be maintained in order to obtain maximum efficiency from irrigation water and rainfall.

This is a good time of the year to take soil samples from your farm and have them checked. From the soil sample analysis, recommendations can be made explaining the proper fertilizer to apply for best results.

HOW TO TAKE SAMPLES

A soil test is as accurate as the sample sent to the Soil Testing Laboratory. Therefore, it is very important that a representative soil sample be made.

1. Take 10-15 samplings scattered over the field being tested.
2. Taking the sample—each sampling should be about plow depth (5 to 7 inches deep) and placed into a clean bucket or some other clean container. All of the samplings of the field being tested should be thoroughly mixed and a portion placed into a soil bag, which can be obtained at the County Agent's office.
3. Tools to use—any tool that will take a thin vertical slice of soil about 6" deep is suitable—a spade, soil tube or soil auger will do the job.
4. Information sheet—fill out the information sheet giving past cropping history, fertilization and type of crops to be grown on fields tested, as well as other information requested. The soil testing laboratories must have this information to determine fertilizer recommendations.

WHERE DO I SEND IT?

The soil sample and the information sheet filled out may be brought to the County Agent's office. The County Agent will furnish mailing instructions.

SOIL TEST BAGS AND INFORMATION SHEETS

These can be obtained at the County Agent's office at no cost.

HOW MUCH DOES IT COST?

Cost of testing is $1.00 per sample — the best investment you can make in a fertilizer program.

WHEN SHOULD SAMPLES BE TAKEN?

A soil sample can be taken any time of the year. The soil sample should be sent to the soil testing laboratories at least one month before planting time of the crop to be grown. This will allow sufficient time to obtain the results of the soil test and to purchase any necessary fertilizer before planting time.

For spring plantings, take samples in October, November, December, and January. For fall plantings, take samples in June, July, and August.

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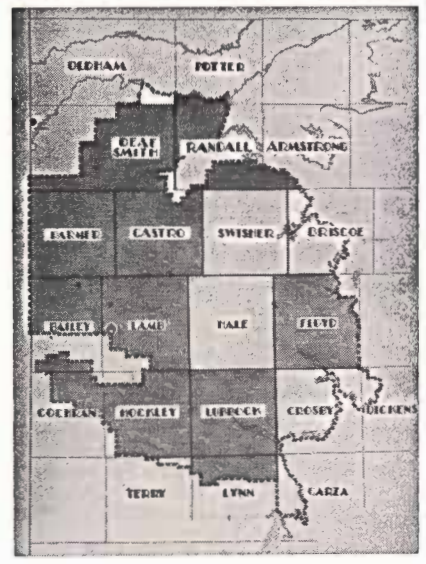


MOISTURE MANAGEMENT PAYS OFF

By DAVE SHERRILL

A necessary and important phase of moisture management is the spreading of cotton burs, distributing manure or shreading sorghum or cotton stalks and plowing or chiselling deep enough to break up any existing plow pan or compacted soil layer, leaving residue as near the surface as possible and adding nitrogen to aid decomposition. Thus, the soil will be conditioned to better soak up rainfall. Organic matter make humus. Humus increases plants' ability to extract nutrients from the soil, and conserving rainfall pays dividends.

Cotton burs spread on farmland before plowing or chiselling will add valuable humus to the soil, necessary for continued optimum production.

Care of Pump and Engine

During the winter when the irrigation pump is usually idle is a good time to get the system ready for the preplanting irrigation season. A house over the pump and engine is a good investment. Build it so it can easily be removed for work on the pump or engine. Much repair, of the pump gearhead, can be avoided if the used gearhead oil is replaced by new clean oil. It is advisable to change oil in the engine too. If the pump and engine are allowed to set for the winter, condensation of moisture on the vital parts of the pump gearhead and on the pistons and rings of the engine will take place and cause rust. A good practice for every irrigator to follow is to start up the engine and pump once each month in order to distribute oil to the working parts and thereby eliminate condensation which causes rust and needless repair bills.

If underground concrete pipe is used, it is best to fill the lines once each month so that air which can change the temperature of the pipe causing expansion and contraction can be eliminated. Leaks in the concrete line can be a result of expansion and contraction. If possible it is a good idea to keep the concrete irrigation pipe full of water.

If a sprinkler system is used, the sprinkler pipe should be stacked to avoid damage. Nozzles should be checked and couplings repaired.

Measure Water Level and Well Yield.

If the static water level in a well has not lowered appreciably, but yet the well has decreased in yield, indications are that the impellars in the bowls have become worn. The pump should be pulled and the impellars inspected and replaced if necessary. Measure the static water level in all wells each winter. Know the number of gallons per minute your well will yield.

Grain sorghum stubble is another readily available source of humus. The disc plow is shown above as it mulches the stubble into the soil.

Use Closed Conduits

Eliminate open ditches which are water wasters. Investigate the cost of an underground pipeline system. Get your county agent's help and in-

formation. Obtain technical assistance from the Soil Conservation Service. Secure information relative to financial assistance from the Agricultural Conservation Program. Talk over this investment with your banker or credit people.

Distribute Water Uniformly

Land should be as level as is economically possible. It should be contoured on grade, or bench leveled if necessary, to uniformly distribute rainfall and irrigation water over the entire field without waste.

Use Lake Water

If all the rainfall cannot be stored in the soil where it falls, and if these excessive amounts fill a lake on the farm frequently, then a centrifugal pump should be provided at the edge of the lake which can pump the lake water to a point on the farm where it can be utilized. When the lake is dry is the proper time to prepare the lake bed in such a way that all water will drain to one particular point. Then, the water that collects in the lake can be pumped without moving the pump as the water level in the lake fluctuates.

Do Not Waste Water

In cases where hardlands slope more than usual and water runs out the lower end of the field before the soil is sufficiently wet, the use of a pit to collect tailwater and a centrifugal pump and pipe to redistribute the water should be investigated.

Do A Good Preplanting Irrigation Job

Finally, each irrigator should do a good job of preplanting irrigation. The soil should be wet to a depth of five feet. If the soil is not five feet deep, then wet down to the caliche. A good preplanting irrigation is the most efficient of any irrigation.

Underground water in the High Plains of Texas is a capital asset and is exhaustible. Use it wisely and effectively to increase net profits.

Soil test, water management, balanced fertility and crop management are four good horses. Put them to work and use them for increased net profits.

STATES' WATER RIGHTS LEGISLATION

The following is a report of the Legislative Committee of the National Reclamation Association, presented at their annual convention in Denver, Colorado, October 28-30, 1959. John R. Clayton of Greeley, Colorado, member of the Committee, presented the report.

My name is John R. Clayton. I am a practicing attorney in Greeley, Colo. I am a member of the legislative committee of the National Reclamation Association. In private practice our firm is general counsel for the Northern Colorado Water Conservancy District—an area of over 700,000 acres of land in Northern Colorado receiving a water supply from the Colorado-Big Thompson project. We also represent numerous ditch and reservoir companies and individual water users.

The National Reclamation Association was organized in Salt Lake City in 1932 primarily for the purpose of saving the reclamation program for the West. It has included among its membership continuously since that time not only the representatives of all of the major irrigation districts and canal companies of the West but also without question the outstanding leaders of reclamation from each of its 17 member states. Included also among its membership during all of these years have been the leading irrigation engineers, as well as irrigation and reclamation attorneys, men who are well versed in all of the problems inherent in western water law.

The question of control and jurisdiction over the streams of the West by the 17 Western States comprising the area lying west of the 98th meridian has long been a matter of concern to the National Reclamation Association.

Our association is appearing here today because of a controversy which has arisen in the past few years, regarding the respective rights and responsibilities of the reclamation States and the Federal Government. This controversy is State against Federal control in the establishment, use and administration of western water rights. From 1866 to 1955, you gentlemen passed over 17 pieces of congressional legislation concerning this matter. These statutes evidence a century of congressional action regarding water law in which Congress has consistently made provision for the policy of following of the laws of the States by the Federal agencies.

These statutes are as follows:

1. In the act of July 26, 1866 (14 Stat. 253), Congress said that water rights for mining, agricultural, manufacturing and other purposes which had vested and accrued under the laws of the States on the public domain should be maintained and protected.

2. The act of July 9, 1870 (16 Stat. 218), further expanded and confirmed the act of 1866.

3. The Desert Land Act of March 8, 1877 (19 Stat. 377).

4. Section 8 of the Reclamation Act of 1902 (32 Stat. 390).

5. The act of June 4, 1897 (30 Stat. 36), establishing the national forests apparently confirmed the right to appropriate waters from the national forest lands.

6. Sections 9(b) and 27 of the Federal Power Act of 1920 (41 Stat. 1077) made clear that nothing in that act "shall be construed as affecting or intending to affect or in any way interfere with the laws of the respective States relating to the control, appropriation, use, or distribution of water."

7. Section 18 of the Boulder Canyon Project Act of December 21, 1928 (45 Stat. 1057), clearly provides that nothing shall be construed as interfering with water rights which the States now have to the waters within their boundaries.

8. Section 3 of the Taylor Grazing Act of 1934 (48 Stat. 1269) says that nothing shall be construed as diminishing or impairing any State water rights.

9. The Great Plains Water Conservation and Utilization Projects Act of October 14, 1940 (54 Stat. 1119), reiterates the same principle.

10. The Water Conservation Act of 1939 (53 Stat. 1419) provides that the Secretary shall only proceed as the water rights have been acquired under State law.

11. Section 1 of the Flood Control Act of December 22, 1944 (58 Stat. 887), acknowledges State Law and in addition provides (the O'Mahoney-Millikin amendment) that the uses of water for navigation west of the 97th meridian shall be subordinate to consumptive uses (under State law).

12. The Mexican Water Treaty, U. S. Treaty Serial No. 994 (59 Stat. 1219 (1945)) provides that nothing shall be done to control the distribution of water contrary to the uses within individual States.

13. The National Parks Act of 1946 (60 Stat. 885) requires "establishment of water rights in accordance with local custom, laws, and decisions of courts."

14. Section 208 of the act of July 10, 1952 (66 Stat. 560), consents that the United States be joined as a defendant in the course of acquiring or contesting water rights secured under State law.

15. Subsection 3(e) of the Submerged Lands Act of May 22, 1958 (67 Stat. 31) says that it shall not "be construed as affecting or intended to affect or in any way interfere with or modify the laws of the States—relating to the ownership and control of ground and surface waters" which shall continue in accordance with State law.

16. The act of July 28, 1954 (68 Stat. 577), authorizes the Secretary of the Interior to "construct facilities for the Santa Margarita River Project" and provides that "the basis, measure, and limit of all rights of the United States of America shall be the laws of the State of California."

17. The Act of July 23, 1955 (the multiple use of lands) (69 Stat. 368), provides that it shall not "be construed as affecting or intended to affect or in any way interfere with or modify the laws of the States—relating to the ownership, control, appropriation, use and distribution of ground and surface waters."

Court decisions in the Pelton Dam case in Oregon and the Hawthorne case in Nevada, together with contentions of certain executive departments of the Federal Government, lead us in the West to fear our water rights, as we have known them, are in jeopardy.

This committee is considering numerous bills in connection with certain water rights, the numerous bills themselves are evidence of the strong concern of not only the reclamation States, but of other States as well, over this vital question.

We appear here today to support corrective legislation for the reestablishment of policy. Due to the Pelton Dam case, the Hawthorne case, and contentions of certain executive departments before our courts, we are entering an era of water law and water administration by executive interpretation or judicial decision. The long line of congressional acts since 1866 recognize the State laws of water yet by judicial decision or executive interpretation, the State water laws now are confused and in jeopardy.

We seek a return to the policy of the Government as evidenced by congressional legislation for 100 years. You gentlemen represent the policymaking branch of the Federal Government, yet by what we consider an improper invasion of policymaking by certain executive departments, no longer is policy determined by our elected representatives. We feel the establishment of policy is properly a function of Congress and should not be left to judicial decisions or administrative interpretations.

We are here, seeking through you gentlemen, the reestablishment of governmental policy regarding western water rights.

As early as 1937, the National Reclamation Association has been concerned with the threatened invasion of western water law; within the past 8 years, this threatened invasion has become an actuality through certain judicial decisions. Consistently since 1937, the National Reclamation Association, at their conventions, has taken definite stands regarding this problem. The latest resolution was passed at the 27th annual meeting of the National Reclamation Association in Houston, Texas, in November 1958.

At that annual meeting, Resolution No. 2 was adopted, which is as follows:

"RESERVED OR WITHDRAWN LANDS LEGISLATION

"Whereas the National Reclamation Association has repeatedly urged as a basic objective, the passage of Federal legislation recognizing the sovereign rights of the States to regulate and control the appropriation, distribution, and use of waters within the States and to require Federal agencies and licensees to acquire rights to the use of water under State Laws: and

"Whereas the decisions of the Federal courts indicate that the most critical area of Federal-State relationships is related to the claims of the Federal Government to the use and control of water which arises upon, or flows over or under, withdrawn or reserved lands; and

"Whereas it now appears that an effective way to accomplish the basic objective is by simple and direct legislation aimed at the specific problems: Now, therefore, be it

"RESOLVED, That the National Reclamation Association:

"1. Supports the passage of Federal legislation to recognize the sovereign rights of the States to regulate and control the appropriation, distribution, and use of the waters of the States and to require compliance with such laws by Federal agencies and their licensees; and

"2. Recommends as a first step toward these objectives that a bill be introduced and supported to the effect that the Federal Government shall not be deemed to have acquired or reserved any water rights as a result of the reservation or withdrawal of public land whether made heretofore or hereafter, nor shall such withdrawal or reservation be deemed to exempt any water from the provisions of the Desert Land Act (Act of Mar. 3, 1877, 19 Stat. 377, as amended)."

Our association strongly recommends the passage of H.R. 4567, the Aspinall bill, as the first step toward accomplishing clarification of States' water rights. As pointed out in Resolution No. 2, we feel the imperative necessity of a congressional declaration of policy concerning reserved or withdrawn lands legislation. Other bills before this committee go further and are more all-inclusive than H.R. 4567. We agree with many of the principles in these other bills. We feel, however, that as a necessary first step, the passage of the Aspinall bill would be a starting point in clarifying western water law.

As you gentlemen know, practically all of the water beneficially used in the Western States, falls on or travels through reserved or withdrawn lands. We feel the most immediate threat to our economy, as developed in the West, is the claim of the executive de-

(Continued on Page 4)

Texas Irrigation Continues To Expand

A survey just completed by the Texas Agricultural Extension Service shows a continued increase in irrigated acreage in Texas. The area irrigated in June 1959 was 7,140,443 acres. Similar surveys in 1955 and 1957 showed an irrigated area of 6,208,022 and 6,962,234 acres, respectively. The data in each survey were compiled from information furnished by county agents from each Texas county.

Reports from the counties show that some irrigation is practiced in 239 of the State's 254 counties. An estimated 6,445,155 acres are irrigated by surface methods and 695,288 by sprinkler systems. Irrigation is used to some extent on 48,110 farms. Ground water is obtained from 60,708 wells and used on 5,914,753 acres.

Cotton is the leading irrigated crop with 2.2 million acres, and grain sorghum is second with just over 2 million acres. Wheat ranks third with 637,000 acres. Other important irrigated crops are rice, 436,000 acres; vegetables, 375,000 acres; and pastures, 200,000 acres. Corn, forage sorghum, alfalfa, oats and many other crops also are produced on irrigated farms.

According to the Extension Service, irrigation did not expand as rapidly the last two years as in the previous two year period, probably because of more favorable rainfall during 1955 and 1957. The increase during a period of more favorable rainfall seems to indicate an acceptance of irrigation by farmers as a sound management practice instead of simply an emergency practice to maintain production in drouth periods.

The growth of irrigation not only indicates the farmer's continuing effort to increase his production efficiency, but also demands continued emphasis on conservation and efficient use of one of our greatest natural resources—water.

Editor's Note: It is pointed out by the Extension Service that the above statistics are estimates only and should not be interpreted as actual inventories.

Water Rights—

(Continued from Page 3)

partment as to their right to regulate and control the appropriation, distribution, and use of waters falling on reserved or withdrawn governmental lands.

In conclusion, we again reiterate our strong support of and urge the passage of, H. R. 4567, the Aspinall bill, as a first step toward the objectives of not only the National Reclamation Association, but of the 17 Western States, so that all of us may feel secure in our uses of water. This bill is basically the same as the interdepartmental bill, or Federal Agencies bill, with certain minor amendments. If the executive departments of the Government have strenuous objections to the amendments, we still urge passage of the Aspinall bill, minus the amendments.

BOARD SURVEYS STATES' GROUND-WATER SUPPLY

If a man comes to your farmhouse door wanting to check your water well, give him permission. He is a part of the joint state—federal water—planning program in progress throughout the State of Texas.

Every part of Texas is being checked by engineers from the State Board of Water Engineers or the U. S. Geological Survey as a part of a mammoth inventory of water supplies from the vast underground reservoirs which supply water for so much of Texas. To figure out how much water a reservoir can produce, the engineers need information from many key wells over the state. They presently are in the field working in an effort to piece together the ground water information by the deadline of Sept. 1, 1962, set by the State Board of Water Engineers for completion of the field data gathering work.

Since 75 per cent of the cities and most of the farm and ranch areas of Texas obtain their water supplies from wells, the ground water study is a vital part of the overall master planning study being carried out by State and federal agencies.

Judge Otha Dent of Littlefield, the West Texas member on the Water Board, states that ground water planning is making satisfactory progress. As a representative of West Texas, Judge Dent takes a particular interest in ground water matters. He provides below an exclusive roundup of ground water studies to show that this important phase is not being overlooked in studying the overall water situation in Texas.

The Board's "progress report" to the Legislature last December contained a map, with the counties of Texas printed in red, blue, yellow or white. More than half the counties were in white, which meant for these counties that there was no useful information available on ground water supplies. Only 47 counties were in blue, which means that the generalized studies have been made in these counties. Another 77 counties will assume the representative blue status by Sept. 1, 1962.

Cities, counties and river authorities are helping to finance the program of ground-water reconnaissance which is costing $411,700 this year, of which half is put up by the U. S. Geological Survey and the remaining half by the state and local units of government. Federal and state men are working together on the Rio Grande River basin survey. State personnel are making the field surveys in the Sabine, Neches, Trinity and Colorado River watersheds. Federal men are working on the Red and Brazos River basins and coastal watersheds, including the San Jacinto and Lavaca River basins. Field work on ground-water supplies has already been completed in the Guadalupe and Nueches Rivers watersheds, and is now being put into finished form for inclusion in the overall water supply figures for each of the river basins.

The main job right now is to determine the extent of the underground reservoirs, the quality of the water, and the amount of water that can be produced from each. When these figures are added to the surface water supplies in each basin, and then compared to the water-need figures of the area, the planners will then be able to determine which areas of Texas will have enough water for future needs and where to get it at the least cost. Also, they can then determine which areas will need to "borrow" from the eastern quarter of the state which gets half of the state's total rainfall.

Reports have been completed in manuscript form on many of the "red" counties, the ones where reasonably thorough data have been compiled and are in process of being published so that they will be available to citizens seeking information. These data are presently available at the Austin offices of the Board of Water Engineers and the U. S. Geological Survey. The study on Bexar County is being published now and will be available by Dec. 1. Grayson County's study is being put into manuscript form and will go to Washington for approval this month. The Hale County report is being reviewed in the Washington USGS office. McCullock County's study has been written and will be published in March. The Winkler County study will be published by Jan. 1. The Pecos County report will be in manuscript form in December. The Live Oak County report has been written. Victoria and Calhoun Counties reports will be ready in February. The El Paso County report is due for completion next August. The Reeves County report is set for June 1960.

"Yellow" counties are numerous throughout the State, this color represents areas where outdated scattered or generalized coverage is available.

State field men, including one yet to be assigned to Rio Grande work at Del Rio area are: Frank Rayner at Lubbock; Victor Shamburger at Colorado City and Big Spring; John Wesselman at San Angelo; Donald Draper at Austin; Hollin Harden at Denton; Joe Dillard at Tyler; Richard Peckham at Palestine; Daroyl Curry at Henderson, and Walter Jarrell at San Antonio.

Where study of water wells and their logs will not reveal the information needed, oil company logs and records supplied by the Railroad Commission and company geologists are used. Dent reported that the oil industry is very helpful to the Board's ground water studies. From 40 to 50 oil well logs are filed with the Board each week under its surface-casing program, operated in conjunction with the Railroad Commission, and many give valuable information on fresh water strata.

Piecing together the jigsaw puzzle of the quantity and quality of water which lies under the soil of Texas will wind up in 1962. The data are being supplied to the U. S. Study Commission as fast as it is available, so it can be taken into account in that agency's studies of the Texas water problem. McDonald D. Weinert, Chief Engineer for the State Water Board and L. G. McMillion, Head of the Ground-Water Division for the Board, serve on "collaboration groups" of the new federal agency, along with representatives of other state and federal agencies interested in one phase or another of the water problem.

Completion of the 1962 program will not finish the work by any means. It is merely a beginning. The Board of Water Engineers estimated that to make complete ground water studies in all counties will require an additional $4,932,000 and 398 man-years of work, besides the $797,000 cost of the present two-year reconnaissance surveys. However, the present surveys will provide enough information for generalized planning, looking toward a solution to a major problem confronting most Texas cities, industries and farmers, which is:

"Where will we get the water that Texas' expanding economy will need?"

Adapted from a story by Star Austin Bureau.

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

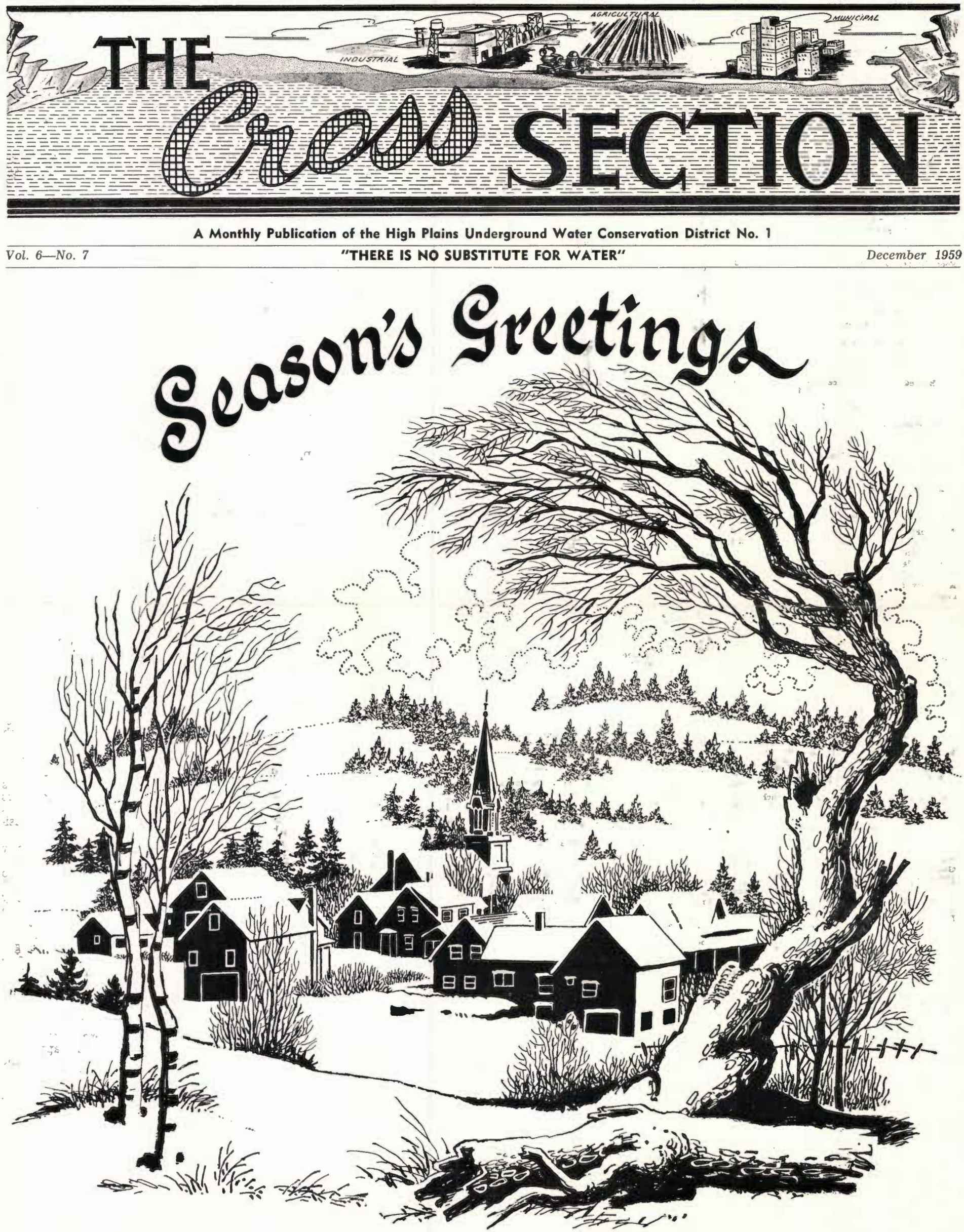
High Plains Underground Water Conservation District No. 1
1628-B Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Vol. 6—No. 7 **"THERE IS NO SUBSTITUTE FOR WATER"** *December 1959*



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ALLAN WHITE
Editor

Former Water District Director Appointed To Red River Authority

Governor Price Daniel has recently announced the appointment of Virgil E. Dodson of Hereford to the Board of Directors of the Red River Water Authority of Texas.

The bill that created the Red River Authority was passed by the last Texas Legislature, and the Authority's jurisdiction extends throughout the Red River drainage basin in Texas from the New Mexico border to Texarkana.

The Act creating the Authority was authored by Senator Andy Rogers of Childress, with Senators George Moffett of Chillicothe, Floyd Bradshaw of Weatherford, and Ray Roberts of McKinney as co-authors. The bill was sponsored in the House by Rep. Jack Connell, Jr. and Vernon J. Stewart of Wichita Falls, and Will Ehrle of Childress.

The Authority has power to approve the construction of dams and other feasible projects along the river which could make better use of available water. All projects passed by the Authority are subject to approval by the State Board of Water Engineers.

Mr. Dodson is a former member of the Board of Directors of the High Plains Underground Water Conservation District. He served for six years in that capacity. He also served as a member of the Deaf Smith County Committee of the High Plains Water District.

Others named to the Red River Authority Board were: Joe M. Leonard, Jr. of Gainesville, Tom Foley of Wichita Falls, Jerome Johnson of Amarillo, Dick Fowler of Memphis, Harry E. Frye of Shamrock, Col. John Anderson of Denison, W. A. Bond of Vernon, and C. O. Glenn of Nocona.

VIRGIL E. DODSON

State Water Board Announces Changes

McDonald Weinert, Chief Engineer for the State Board of Water Engineers, has submitted his resignation to the Board. H. A. Beckwith, former Board member and now Assistant Chief Engineer, will assume Mr. Weinert's duties. Mr. Weinert's resignation became effective December 18.

In other recent changes on the Water Board staff, L. G. McMillion has been moved from acting head to head of the Ground-Water Division, and S. D. Breeding has been named acting head of the Surface-Water Division.

Mr. McMillion has been with the Board since October 1, 1956 and has served as acting-head of the Ground-Water Division since August 9, 1959.

Mr. Breeding was employed by the Board on August 1, 1959, shortly after he retired from the U. S. Geological Survey with whom he was a surface-water engineer.

Ground - Water Recharge Subject of Theses

The High Plains Water District has two new pieces of literature in its library — "Clarification of Lake Water Prior to Artificial Recharge by Wells," by Robert M. Winn, and "Preliminary Study on the Movement of Silt and Clay in a Water-Bearing Formation," by Thomas A. Cullinan.

Both pieces are geology theses written for the partial fulfillment of the requirements for Master of Science degrees from the Texas Technological College.

The two studies were made possible through the financial assistance of the High Plains Underground Water Conservation District.

Both theses deal with the major problems involved in artificial recharge using playa lake water.

Copies of the two theses are also on file in the Texas Tech library.

Water — Important To Bossy's Production

Water is not really a feed but it is one of the most important and usually cheapest factors in milk production. Yet, all too frequently, according to the Texas Extension Service, milk production is limited just because old Bossy cannot get enough water.

Water makes up 75 percent or more of the animal's body, carries food nutrients into the body and carries waste materials away. Also water helps control body temperature and makes up about 87 percent of the composition of milk.

Of all farm animals, the dairy cow in milk production requires the greatest amount of water in proportion to her size. The amount of water she will drink depends on her size, her daily milk yield, the air temperature and humidity, and the amount of water in the feed she eats. From 100 to 120 pounds of water (12-1/2 to 15 gallons) per head is an average daily consumption for a dairy herd, including both cows in milk and dry cows. Cows producing 100 pounds of milk a day may drink as much as 35 gallons of water a day—or even more.

Therefore, dairy herds should have free access to fresh, clean, appetizing water that is conveniently located and of a desired temperature 365 days a year. In other words, it should be

Annual Water District Elections January 12

On January 12, 1960, the High Plains Underground Water Conservation District will conduct its annual election of Directors and County Committeemen.

A total of five men serve on the Water District's Board of Directors. Also, each County Committee consists of five men. This year, the two-year terms of office of two Directors expire and the three-year term of office of one Committeeman in each county expires.

Voters in District Director's Precinct No. 2—consisting of Cochran, Hockley and Lamb Counties — will elect one Director from their three-county area to serve for two years on the District Board. Voters in Director's Precinct No. 5—consisting of only Floyd County — will also elect one man from their area to serve for two years on the District Board.

Each county in the Water District will elect one Committeeman to serve a three-year term on the respective County Committee.

The nominees for each place are listed below by counties.

All qualified resident voters are urged to cast their ballot in the Water District elections on January 12. Voting places in each county are shown below. Voters may cast their ballot at any one of the voting places within the county in which he resides.

VOTING PLACES

Armstrong County
1. School House in Wayside, Texas

Bailey County
1. Community House in Muleshoe, Texas

Castro County
1. County Courthouse, Dimmitt, Texas
2. School House in Hart, Texas

Cochran County
1. County Activities Building, Morton, Texas
2. Star Route Co-op Gin, Star Route 1, Morton, Texas

Deaf Smith County
1. County Courthouse, Hereford, Texas

Floyd County
1. County Courthouse, Floydada, Texas
2. City Hall, Lockney, Texas

Hockley County
1. City Hall, Anton, Texas
2. County Courthouse, Levelland, Texas
3. Farmer's Co-op Gin, Whitharral, Texas
4. City Hall, Sundown, Texas
5. Farm Center Gin, Ropesville, Texas

Lamb County
1. County Courthouse, Littlefield, Texas
2. City Hall, Olton, Texas
3. Springlake Elevator Office, Springlake, Texas
4. City Hall, Sudan, Texas
5. Farmer's Co-op Gin, Spade, Texas

Lubbock County
1. Old County Courthouse, Lubbock, Texas
2. City Hall, Slaton, Texas

Lynn County
1. Community Center, New Home, Texas
2. City Judge's Office, Wilson State Bank, Wilson, Texas

Parmer County
1. County Courthouse, Farwell, Texas

Potter County
1. School House in Bushland, Texas

Randall County
1. Hollywood Service Station, on Highway 87, north of Canyon, Texas

NOMINEES FOR DISTRICT DIRECTOR

DIRECTOR'S PRECINCT NO. 2
(Cochran, Hockley and Lamb Counties)
(Vote for only one)
1. Roy Hickman, Morton, Texas
2. Henry Schmidly, Route 2, Levelland, Texas
3. Roy B. McQuatters, Sr., Box 295, Littlefield, Texas
4. _____

DIRECTOR'S PRECINCT NO. 5
(Floyd County)
(Vote for only one)
1. J. R. Belt, Jr., Lockney, Texas
2. _____

NOMINEES FOR COUNTY COMMITTEEMEN

Armstrong County
(Voters residing in Commissioner's Precinct No. 3, vote for only one)
1. Dewitt McGehee, Wayside, Texas
2. Wayne McNeill, Route 1, Happy, Texas
3. _____

Bailey County
(Voters residing in Commissioner's Precinct No. 2 vote for only one)
1. Ross Goodwin, Route 2, Muleshoe, Texas
2. Joe Smallwood, Route 2, Muleshoe, Texas
3. _____

Castro County
(Voters residing in Commissioner's Precinct No. 1 vote for only one)
1. E. E. Foster, Box 193, Hart, Texas
2. Rodney Smith, Box 81, Hart, Texas
3. _____

Cochran County
(Voters residing in Commissioner's Precinct No. 4 vote for only one)
1. Roy Greer, Star Route 1, Morton, Texas
2. W. C. Millsap, Star Route 2, Morton, Texas
3. D. A. Ramsey, Star Route 2, Morton, Texas
4. _____

Deaf Smith County
(Voters residing in Commissioner's Precinct No. 2 vote for only one)
1. L. E. Ballard, 120 Beach St., Hereford, Texas
2. A. R. Dillard, Route 4, Hereford, Texas
3. _____

Floyd County
(Voters residing in Floyd County vote for only one for Committeeman-at-Large)
1. Forrest Mickey, Route M, Lockney, Texas
2. Chester Mitchell, Lockney, Texas
3. _____

Hockley County
(Voters residing in Commissioner's Precinct No. 4 vote for only one)
1. M. H. Newton, Anton, Texas
2. Frank Motl, Jr., Anton, Texas
3. _____

Lamb County
(Voters residing in Commissioner's Precinct No. 3 vote for only one)
1. N. E. (Early) Hall, Star Route 2, Littlefield, Texas
2. Albert Lockwood, Star Route 2, Littlefield, Texas
3. _____

Lubbock County
(Voters residing in Commissioner's Precinct No. 2 vote for only one)
1. Bill Alspaugh, Box 555, Slaton, Texas
2. C. J. Rhoads, Route 1, Slaton, Texas
3. _____

Lynn County
(Voters residing in Commissioner's Precincts 1 and 4 vote for only one for Committeeman-at-large)
1. Erwin Sander, Box 34, Wilson Texas
2. L. C. Unfred, Route 4, Tahoka, Texas
3. _____

Parmer County
(Voters residing in Commissioner's Precinct No. 1 vote for only one)
1. Lee Jones, Route 1, Farwell, Texas
2. Walter Kaltwasser, Route 1, Farwell, Texas
3. _____

Potter County
(Voters residing in Commissioner's Precinct No. 4 vote for only one)
1. W. J. Hill, Sr., Bushland, Texas
2. _____

Randall County
(Voters residing in Commissioner's Precinct No. 1 vote for only one)
1. Joe H. Berntsen, Route 2, Box 218, Canyon, Texas
2. J. R. Parker, Canyon, Texas
3. _____

"CHIEF RUNNING WATER," SAYS—

known that milk production is not being limited by an inadequate water intake. This may mean fencing creeks and pools, cleaning water troughs more frequently, controlling moss or scum, piping for more convenient access, shade repair and/or construction, heating, and constructing or extending aprons around watering troughs. The Extension Service adds that attention to details which insure an adequate water supply will always pay off.

WELL DRILLING STATISTICS FOR NOVEMBER

During the month of November, 36 new wells were drilled and registered with the District office; 3 replacement wells were drilled; and 2 wells were drilled that were either dry or non-productive for other reasons. 123 permits were issued by the County Committees.

The permits issued and wells completed for November follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	9	2	0	0
Castro	0	1	1	0
Cochran	2	0	0	0
Deaf Smith	11	6	2	0
Floyd	10	3	0	0
Hockley	26	6	0	2
Lamb	11	5	0	0
Lubbock	22	7	0	0
Lynn	14	1	0	0
Parmer	14	5	0	0
Potter	0	0	0	0
Randall	4	0	0	0
Totals	123	36	3	2

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

Dear Sir:

I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.

Name_____

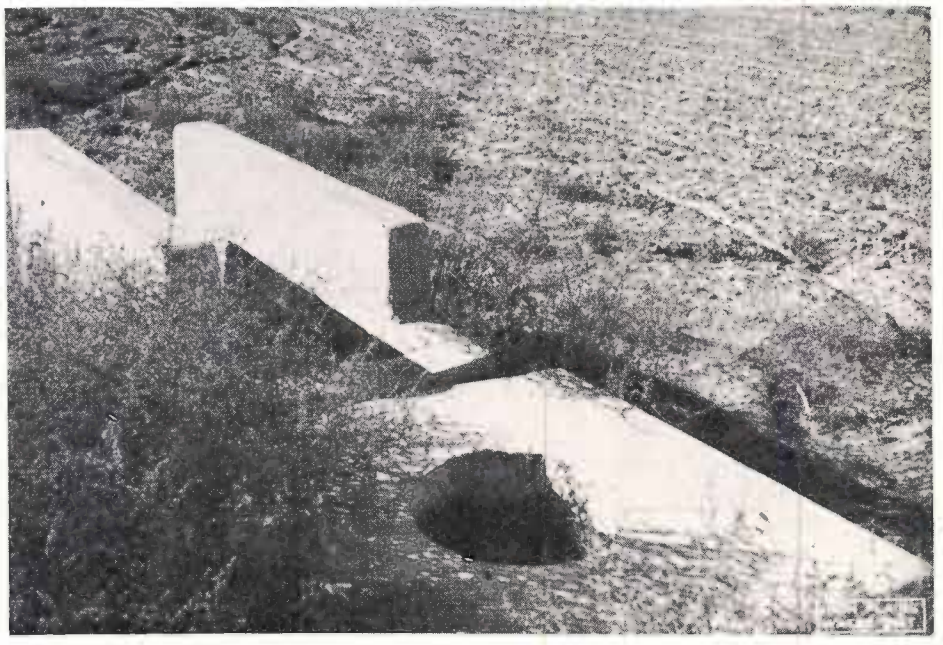
Street Address_____

City and State_____

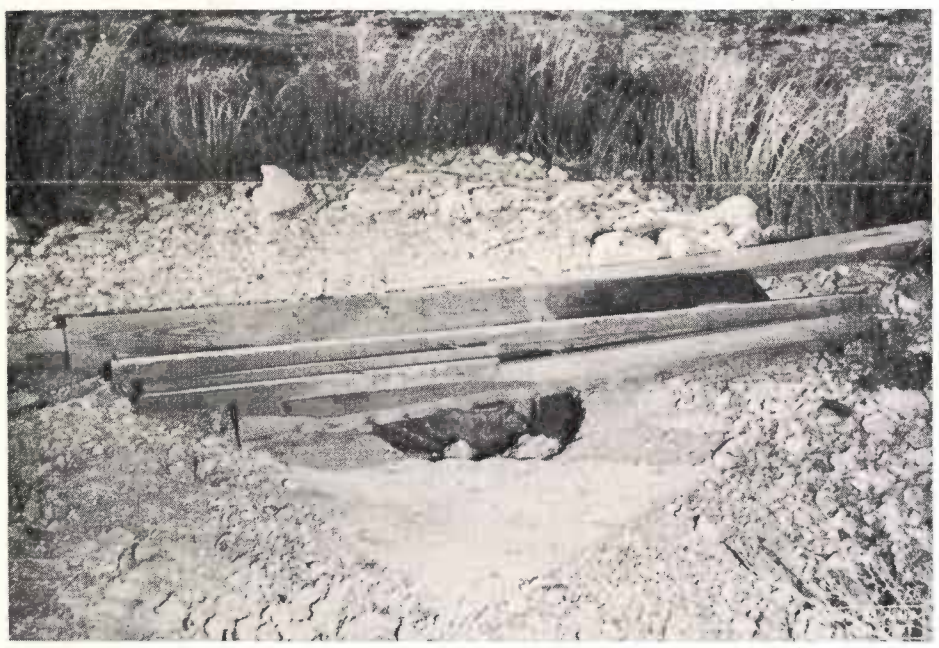
(Please cut out and mail to our address)

Is Your Abandoned Well A Potential Death Trap?

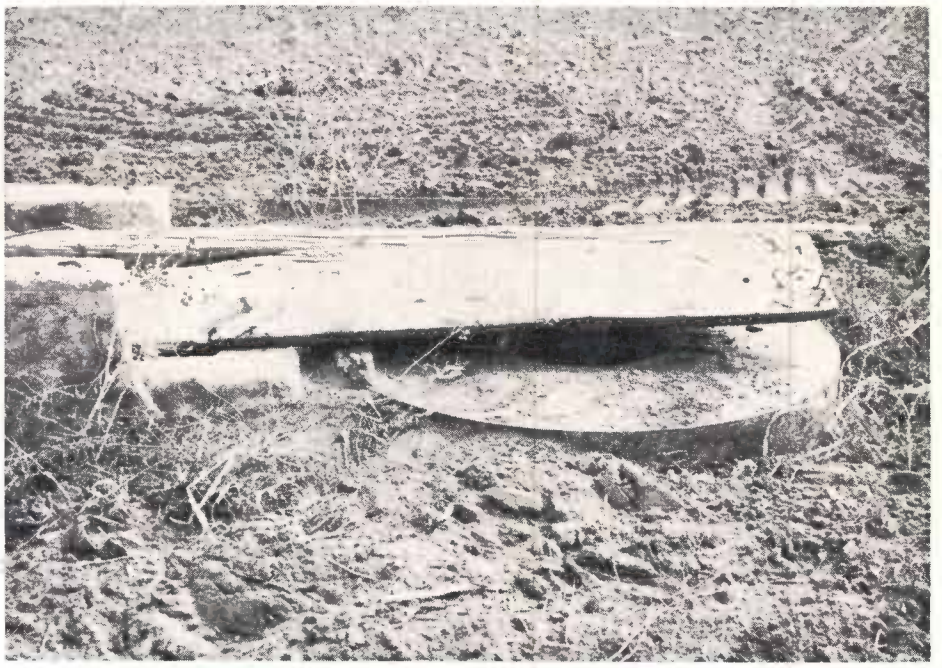
Pictured above is an abandoned well in the yard of a southern High Plains' house. It has not been properly closed—only a thin slab of concrete covers the open well shaft. Enterprising youngsters at play could remove the slab.



The irrigator who abandoned the well shown above has not even made a pretense of closing it properly or improperly. An excellent way for each landowner to begin the new year would be to resolve that all abandoned wells on his farm are properly closed.



This abandoned well has been closed in a very dangerous manner. Only a bucket suspended from a metal stave and filled with rocks, separates the open well from inquisitive children.



If you have an abandoned well that is not closed properly, don't wait until an accident occurs to jar you from your complacency—do something about it. You know, its possible that you could save someone's life by closing that well today.

A LITTLE LIFE IS WORTH MORE THAN A LITTLE TIME, CLOSE THOSE ABANDONED WELLS!

High Plains Underground Water
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Second Class Permit