RECR - 10
Windmill Oil

Hobbs Fresh Water
Sands Study

1957

Roswell, New Mexico
September 24, 1957

MEMORANDUM

TO: New Mexico Oil Conservation Commission
Attention: Mr. A. L. Porter, Jr., Secretary-Director

FROM: Committee Studying Protection of
Hobbs Fresh Water Sands

SUBJECT: Final Report of the Committee

Transmitted herewith is the completed final report of the Committee. This report contains no direct recommendations since it is the consensus of the Committee that the need for any corrective action is adequately shown in the Committee findings. In some instances this corrective action is outside of the jurisdiction of the Oil Conservation Commission. We trust that you will arrange to have these matters brought to the attention of the appropriate persons or agencies.

It was the decision of the Committee that attendance at its meetings should be restricted to representatives of the agencies and companies appointed to the Committee, and to guest speakers specifically invited to a particular meeting. Mr. E. G. Minton, Lea County Hydrologist, was the only such speaker. The need for closed meetings was indicated by the somewhat negative results observed at the general meeting held in Hobbs on July 9, 1957.

The official representatives designated by each of the agencies and companies appointed to the Committee are listed as follows:

Pan American Petroleum Corporation
C. L. Kelley, Chairman, Roswell, New Mexico
J. W. Brown, Alternate, Roswell, New Mexico

Continental Oil Company
R. L. Adams, Member, Roswell, New Mexico
F. T. Elliot, Alternate, Hobbs, New Mexico

Hobbs City Water Board
L. A. Calhoun, Member, Hobbs, New Mexico
W. G. Abbot, Alternate, Hobbs, New Mexico

New Mexico Oil Conservation Commission
R. F. Montgomery, Member, Hobbs, New Mexico
E. J. Fischer, Alternate, Hobbs, New Mexico

Samedan Oil Corporation
C. W. Putman, Member, Hobbs, New Mexico
C. E. Layne, Alternate, Hobbs, New Mexico

Shell Oil Company
W. E. Owen, Member, Hobbs, New Mexico
R. C. Cabaniss, Alternate, Hobbs, New Mexico

State Engineer's Office
Zane Spiegel, Member, Santa Fe, New Mexico
R. L. Borton, Alternate, Roswell, New Mexico

Tidewater Oil Company
H. P. Shackelford, Member, Hobbs, New Mexico
R. N. Miller, Alternate, Hobbs, New Mexico

Other representatives of the agencies and companies appointed to the Committee attended meetings as second alternates, served as members of subcommittees, or otherwise assisted in the work of the Committee.

R. C. Lannen	Continental Oil Company
E. V. Boynton	Continental Oil Company
R. J. Francis	Continental Oil Company
Joe Anderson	Continental Oil Company
Eric Engbrecht	New Mexico Oil Conservation Commission
J. W. Runyan	New Mexico Oil Conservation Commission
J. W. Montgomery	Shell Oil Company
J. W. Meek	Pan American Petroleum Corporation

All of the Committee meetings were held in the Oil Conservation Commission Conference Room in Hobbs, New Mexico. The first meeting was held on July 19, 1957; subsequent all day meetings were held on July 25, August 1, August 8, August 15, August 22, and September 5. In addition to meetings of the Committee as a whole, three subcommittees held numerous meetings to complete their work assignments.

All of the agencies and companies appointed to the Committee had representatives present at each of the Committee meetings, with the exception of one meeting when one organization was unable to have a representative present.

By Committee decision the initial distribution of this final report is being restricted. In addition to the copies furnished to the Oil Conservation Commission, each designated member and alternate is to receive one copy. All have agreed to hold their copies confidential pending your decision as to the proper disposition of the report.

J. W. Brown
Acting Chairman

FINAL REPORT OF COMMITTEE STUDYING PROTECTION OF HOBBS FRESH WATER SANDS SEPTEMBER 24, 1957

At the request of the City Commission of Hobbs, New Mexico, the New Mexico Oil Conservation Commission called a meeting of all operators in the Hobbs, Bowers, and Byers-Queen Pools on July 9, 1957, in Hobbs.

During that meeting and subsequently by Mr. A. L. Porter, Jr.'s letter dated July 10, 1957, a Committee was appointed to make a study of fresh water contamination in the Hobbs Pool area and make recommendations to the New Mexico Oil Conservation Commission, as to:

1. Any action that may be taken by the Commission in addition to what is presently being done to prevent further contamination;

2. Any corrective measures that may be employed to prevent further spread of present contamination.

The Committee consisted of representatives from the following companies and agencies:

Pan American Petroleum Corporation - Chairman
Samedan Oil Corporation
Shell Oil Company
Tidewater Oil Company
Continental Oil Company
Hobbs City Water Board
State Engineer's Office
Hobbs Commission Staff

After collecting additional information regarding water wells and contamination of water wells in the Hobbs Pool area, after giving consideration to existing information and all reports of fresh water contamination, and after obtaining advice and assistance from recognized authorities on ground water and from research organizations and from texts and reports on geology and petroleum engineering, the Committee concluded its study by making numerous findings with respect to the overall problem of fresh water contamination in the Hobbs Pool area.

I. The Physical Characteristics of the Ogallala Formation and the Movement of Water Through This Aquifer.

The Committee finds:

(1) The entire Hobbs Pool area is directly underlain by the Ogallala formation of Tertiary age.

(2) The Ogallala formation, in the Hobbs Pool area, is an effective fresh-water aquifer with a thickness of 175'-200' of which approximately 100'-150' is saturated with water.

(3) The regional dip of the Ogallala formation is approximately 15-20' per mile in a southeasterly direction.

(4) The Ogallala formation consists largely of fine-grained sand in varying stages of cementation and consolidation. The material of the upper 5-40' is often firmly cemented by calcium carbonate to form hard dense caliche which commonly underlies the land surface in the area. The basal portion of the Ogallala is often composed of coarse sand and gravel. Thin discontinuous clay lenses are often found interbedded within the sand of the Ogallala formation. The Ogallala is underlain by Red Beds.

(5) Clay lenses and thin zones of very fine sand which are relatively well-cemented occur within the Ogallala formation. These are not continuous or of great lateral extent. The Ogallala ground-water reservoir, therefore, is unconfined and acts as a unit.

(6) Water levels in the Hobbs Pool area have declined as much as 12' since 1940 due to large withdrawals and regional drought.

(7) Water level measurements made during August, 1957, show that water levels in the Hobbs Pool area stand at from 18-65' below the land surface. In many instances this level is below the base of the caliche.

(8) The pore space in the sand of the Ogallala formation above the water table would normally contain pellicular water and air.

(9) There would be some water saturation in the sand of the Ogallala formation above the water table due to capillary forces, depending upon the physical characteristics of the sand and the thickness of sand above the water table.

(10) Pressure in the sand of the Ogallala formation above the water table would be atmospheric unless affected by outside forces.

(11) The water table in the Ogallala formation has a gradient of 15' per mile in a southeasterly direction. The water is moving at 9 to 12" per day in that direction.

(12) A negative area of influence, called a cone of depression, is developed by wells pumping water from the Ogallala formation.

(13) The vertical and lateral extent of a cone of depression is dependent upon the rate of withdrawal, duration of pumping, and the lithologic characteristics of the aquifer within the cone of depression.

(14) Ground-water mounds, or positive areas of influence, can be created by injecting water into the Ogallala formation by recharge wells.

(15) The positive areas of influence around recharge wells probably would not be large and would exist only in the area of the recharge well.

(16) The introduction of a second or third phase, oil or gas, below the water table in the Ogallala formation would cause a reduction in the relative permeability in that portion of the Ogallala sand occupied by the oil-water-gas mixture.

(17) Where both oil and gas are present below the water table, relative permeability of the sand to oil and gas would be zero if the water saturation varied from about 88% to 100%. The relative permeability of the sand to oil and gas increases as water saturation decreases below about 88%. Therefore, oil and gas in the Ogallala formation would not move until water saturation is decreased to less than about 88% of the total pore space occupied by a mixture of water-oil-gas.

(18) Oil or gas introduced into the Ogallala formation would be free to move provided only that sufficient saturation by oil or gas occurred.

(19) Once a portion of the Ogallala sand is saturated by oil or gas, it would not be possible to reduce this oil or gas saturation below about 10-12% saturation by the reduction of pressure or by moving water through the sand.

(20) Any movement of oil or gas in the Ogallala formation below the water table would result in a minimum of about 12% of the oil or gas remaining trapped in the sand through which the oil or gas moved.

(21) Oil introduced into the Ogallala formation above the water table could result in the sand tending to become oil-wet thereby resulting in residual oil saturation much higher than if introduced below the water table.

(22) Gas produced with oil is soluble to some extent in the water of the Ogallala formation, depending upon the amount of gas in contact with the water and the pressure at the point of contact.

(23) Gas dissolved in the Ogallala water would have no effect upon the movement of the water unless free gas began breaking out of the water below the water table. In such a case a reduction in the relative permeability of the sand to water would result.

(24) Dissolved gas would move with the water in a southeasterly direction at a rate of approximately 9 to 12" per day.

(25) Gravitational forces would tend to move oil or free gas in the Ogallala formation upward toward the water table.

(26) A comparison of the water wells contaminated with oil and their relationship to the structure of the base of the caliche shows that these wells are located in the structural highs while water wells contaminated with gas are located both in structural highs and lows. Refer to Exhibit No. 1 which is a map of the Hobbs Pool area contoured on the base of the caliche.

(27) The structure of the base of the caliche could possibly affect the movement of oil and gas toward structural highs. Refer to Exhibit No. 1.

II. Apparent Contaminated Conditions Which Exist in the Ogallala Formation in the Hobbs Pool Area.

The Committee finds:

(1) A total of 378 water wells were located in the area. This includes temporarily abandoned and producing wells. It is believed that this represents about 80% of the total number of water wells in the Hobbs Pool area. The majority of these wells are plotted on Exhibit No. 1.

(2) Based on tests made by Committee members, 17 water wells are suspected to be contaminated by gas. This contamination is in varying degrees, from gas contamination sufficient enough to burn with a small intermittent flame, to a slight taste. The wells are as follows:

Name	Location		Degree of Contamination
Gibbins	SW SE NE	4-19-38	Slight Taste Gas
Easton	SW SE NE	4-19-38	Slight Taste Gas
Gackle	SE SE NE	4-19-38	Strong Taste Gas
Security Supply	NW NE NE	5-19-38	Slight Taste Gas
Ohio Oil	SE SE SE	32-18-38	Strong Taste Gas
Baker Tool	SW SE SW	32-18-38	Slight Taste Gas
Harwell	NW NE NE	28-18-38	Strong Taste Gas
Dowell	NE NE NE	28-18-38	Will Burn
Humble Oil	SW NE SW	30-18-38	Moderate Taste Gas
Bensing	NE NW NE	30-18-38	Very Slight Taste Gas

Name	Location	Degree of Contamination
Green	NE NE NE 30-18-38	Very Strong Taste Gas
Mertaugh	NW NE NE 30-18-38	Old Well Would Burn
Moon	NW NE NE 30-18-38	Moderate Taste Gas
Moon	SW NE NE 30-18-38	Moderate Taste Gas
Goins	NE SE NE 30-18-38	Strong Taste Gas
Ellison L-2230	SW SE NE 30-18-38	Moderate Taste Gas
Pacific Pump	NW NE NE 5-19-38	Slight Taste Gas

One of the above water wells (Ohio) is reported to have been contaminated with gas since 1930 when the nearest oil wells were more than a mile away,

The greatest degree of gas contamination was found in the Dowell (NE NE NE 28-18-38) water well. This well proved to be contaminated to such an extent that small sporadic flames of gas were observed when a lighted match was held over an opened water faucet.

(3) Of the 378 known water wells, 9 are known to have oil standing in the well bore and 3 are reported to be oil contaminated. The wells known to have oil in the well bore are as follows:

Name		Location	Degree of Contamination
Amerada Pet.		C N/2 29-18-38	19.4 feet
Ellison L-2230	# 1	SW NE NE 30-18-38	6.3 feet
"	# 2	SE NW NE 30-18-38	0.5 feet
"	# 3	SE SW NE 30-18-38	0.5 feet
"	# 4	SE SW NE 30-18-38	0.8 feet
"	# 5	NE SW NE 30-18-38	0.6 feet
"	#11	SE NW NE 30-18-38	Trace Oil
"	#12	SE SW NE 30-18-38	2.4 feet
"	#13	SE SW NE 30-18-38	3.8 feet

In the case of the Ellison wells, the owner reported the presence of oil to the New Mexico Oil Conservation Commission and subsequently Commission personnel confirmed the presence of oil in the degree indicated above.

The Amerada well in which 19.4 feet of oil was found was not being produced when first inspected by Committee members. Subsequently, pumping equipment was installed and the 19.4 feet of oil was recovered. As of this date the well is pumping water and no new oil has entered the well bore. Information reported to the Committee indicates the possibility that the oil entered the well bore from the surface and not from the fresh water aquifer.

The wells reported to be contaminated by oil are located as follows:

Name	Location	Degree of Contamination
Jackson	NE NW NW 20-18-38	Unknown
Phillips	NE NW NW 4-19-38	Unknown
Pacific Pump	NW NE NE 5-19-38	Trace

The Jackson well is reported to have oil in the well bore; however, it is the opinion of this Committee that it probably is lubricating oil from the water well pump.

(4) One well is reported to be contaminated by sewage. It is located as follows:

Name	Location	Degree of Contamination
Phillips #6	SE NE NW 4-19-38	Unknown

(5) Forty-two wells were sampled. These samples were analyzed for chloride and sulfide content. Among these 42 water wells

are all wells that were suspected to be contaminated, the remainder being water wells near these wells. The sulfide determination did not indicate any contamination although some of the wells are known to be gas contaminated. With samples collected and analyzed by different methods, the presence of gas contamination might have been detected. A list of the wells and the results of the analysis are shown on Exhibit No. 2. Exhibit No. 3 shows the analysis of a sample collected from one of the Ellison wells during 1956 by Mr. Charles Reider, then a member of the Commission Staff.

(6) In response to the Committee's request, water analyses on 9 water wells were received from oil operators that operate water wells in the Hobbs Pool area. These analyses are included as Exhibit No. 4.

III. Feasibility of Eliminating or Removing The Apparent Contamination.

The Committee finds that there are no practical nor feasible means, now known, by which the apparent oil and gas contamination can be completely removed from the Ogallala formation for the following reasons:

(1) Evidence available gives no clear indication of the exact extent of the apparent contamination.

(2) Oil and gas contamination can exist at various depths with the same or other depths in the same area showing little or no contamination.

(3) More shallow wells evidence oil or gas contamination than deeper wells, thereby tending to confirm that oil or gas entering the Ogallala will migrate upward toward the water table.

(4) To remove oil or gas from the Ogallala, it would be necessary to flush the contaminated portion of the sand with water, draw the oil or gas into a producing water well, permit the contamination to gradually migrate or disperse, or use a combination of these methods.

(5) The combination of high withdrawal rate water wells in an area of apparent contamination encircled by recharge wells would tend to create an extended area of influence. However, the expected results in moving or flushing oil or gas would not justify the large volume of water necessary to be handled to create such an extended area of positive and negative influence.

(6) In order to decontaminate an area of oil contamination, it would be necessary to essentially remove all of the oil to prevent any further show of contamination. While it is theoretically possible to flush out the oil down to an immobile residual saturation, in practice this would be impossible.

(7) An area of gas contamination could probably be decontaminated by the use of combined high rate withdrawal and recharge wells. Even so, it would be necessary to remove gas produced with water before injecting the water in the recharge wells. Under these conditions it would be more practical to simply remove the gas from water produced for domestic purposes without a recharge program.

(8) The general and areal movement of water in the Ogallala formation in a southeasterly direction will tend to migrate or disperse the dissolved gas away from an area of apparent contamination.

IV. The Possibility of Contamination of The Hobbs City Water Supply By Migration from the Area of Apparent Contamination.

The Committee finds:

(1) Certain of the City of Hobbs water wells are located in the path of ground-water movement from the contaminated area in NE/4 30-18-38.

(2) Existing oil contamination is expected to be immobilized within the aquifer, especially in the relatively "dry" zone at the top of the aquifer, before it reaches the city wells. Further, as the city wells are completed at or near the base of the aquifer, the possibility of oil contamination has been greatly reduced.

(3) Since gas in solution may travel a great distance, certain city wells may be subject to some gas contamination in the future.

(4) Observation wells should be established and maintained between the contaminated area and the city wells.

The Hobbs City Water Board advised that the City had purchased 6 sections of water rights located 3 or 4 miles to the north and northwest of the Hobbs Pool area. These water rights are considered to be outside of any possible contamination from the Hobbs Pool area.

V. Possible Contamination of the Fresh Water in the Ogallala Formation by Sources Other Than Oil or Gas Wells Such as Sewage, Waste Oil and Acid, Open Storm Sewer Ditches, Gas Plant Waste Water, Refuse, and Oil and Oilfield Brines Held in Earthen Pits.

The Committee finds:

(1) One water well was reported to be contaminated by sewage.

(2) It was found that many service companies operating in the Hobbs Pool area are dumping waste material in earthen pits at random, thus creating a source of possible contamination. The City of Hobbs maintains a supervised pit east of the city wherein such waste can be disposed, for a nominal fee, thus eliminating this source of possible contamination to the Hobbs fresh water supply.

(3) One large storm sewer ditch exists in the southern part of the Hobbs Pool area. The depth of this ditch is such that if it does not actually penetrate the aquifer it is very close to doing so, and is considered a hazard to the underlying fresh water. Although samples of water collected from the ditch by Committee members during August, 1957, did not indicate severe contamination, the open ditch is subject to accidental severe contamination from a number of sources at any time. The analyses of two samples of water collected from the ditch are shown in Exhibit No. 5.

(4) Analyses indicate that water coming directly from the Phillips Gasoline Plant is not a potential source of contamination (196 PPM CL) but that the lake in which it accumulates is high in chlorides (3450 PPM CL). It is possible that oilfield brines are also introduced into this lake. Disposal of such brines by other means may cause the lake to become gradually lower in chlorides. See Exhibit No. 6 for more complete analyses of plant waste water.

(5) No accumulation of refuse was found that could be considered as a source of permanent contamination to the fresh water sands.

(6) It was found that numerous sources of possible contamination exist in the form of pipeline drips, tank battery burn pits, and salt water disposal pits. The latter source is expected to be eliminated in the near future after installation of proposed salt water disposal systems. Holding or disposing of oil in earthen pits is considered a possible source of contamination to the fresh water sands. This possible source of contamination can be controlled by NMOCC under existing rules and regulations.

VI. Possible Need For Rules and Regulations Governing the Drilling, Completion, and Abandonment of Water Wells in the Hobbs Pool Area.

The Committee finds:

(1) There are no rules nor regulations governing the drilling, completion, and abandonment of water wells in the Hobbs Pool area.

(2) There is a definite need for rules and regulations governing water wells to prevent further contamination of water in the Ogallala formation and to minimize the risks of producing contaminants that are now in the aquifer.

(3) Rules and regulations should, in part, govern the location, depth, casing and cementing programs, surface and subsurface completion procedure, inspection, and abandonment of water wells.

(4) There is also a need for rules and regulations governing the drilling and abandonment of any boring or excavation that penetrates the fresh water sands.

VII. Establishment of a Water Well Observation Program To Detect Any New Contamination and to Observe the Movement, if any, of Contamination from the Area Northwest of Hobbs.

The Committee finds:

(1) At least 42 water wells, and probably more, are available for observation purposes in the Hobbs Pool area. Exhibit No. 7 is a tabulation listing these wells according to their location and accessibility to water level measurements and to water sample collection.

(2) As much information as possible should be collected regarding the potential observation wells. Such information should ideally include the driller's log, date drilled, depth, casing program, location of any perforations, and an accurate description of the well location.

(3) An effective network of observation wells can be established by evaluating the potential observation wells with regard to their location within the Hobbs Pool area and to information available regarding their completion.

VIII. The Possibility of, and Methods for, Obtaining Potable Water From the Areas of Apparent Contamination.

The Committee finds:

(1) It should be possible to obtain potable water at almost any location in the Hobbs Pool area provided that proper depth is penetrated, proper methods used to complete the water well, and reasonable caution is used in locating the well with respect to nearby possible sources of contamination.

(2) Since most contamination by oil and gas is evidenced in shallow wells, and since oil and gas will tend to migrate upward toward the water table, it would be advisable to complete water wells as deep as possible in the Ogallala, cement casing to the completion depth, seal around the top of the casing at the surface, and have the casing extend above the natural ground level.

(3) Since some evidence indicates that various depths may be contaminated, casing should be cemented so that shallower intervals can be tested if contamination is found in deeper intervals.

(4) If a water well in the Hobbs Pool area evidences contamination by oil and/or gas, this water can be made potable by removing the oil at the surface by a simple skimming or settling process. Gas can be removed by aeration. If gas contamination is severe, it might be necessary to flow the water over several cascade type trays with a layer of activated charcoal in the bottom of each. This charcoal should not require frequent replacement. If a disagreeable odor or taste of hydrogen sulfide remains a few PPM of chlorine added to the water should remove the odor and taste. Water from gas contaminated wells produced directly into and held in pressure tanks will retain gas in solution to be released when water is withdrawn.

IX, Causes of Oil and Gas Well Casing Deterioration.

The Committee finds:

Oil Conservation Commission records indicate that to this date defective casing has been repaired at 63 Hobbs Pool wells. There are numerous causes of this deterioration of casing in oil and gas wells. Some of these causes are listed as follows:

(1) Corrosive conditions are known to exist in the Hobbs Pool which can cause leaks in any casing string subjected to these conditions.

(2) Severe internal casing corrosion can result from the presence of hydrogen sulfide contained in gas produced with the Hobbs crude oil.

(3) External or internal casing corrosion can result from electrolytic action, action of sulfate reducing bacteria, or galvanic action.

(4) Stress concentrations resulting from even mild corrosion can cause failures of the well casing.

(5) Wear between the tubing and casing in pumping wells as is caused by the movement of tubing during the pumping cycle can cause casing leaks.

(6) Pressure in formations behind the casing can cause collapse of the casing.

(7) Casing will be subjected to continued high pressure from the producing formation throughout the foreseeable future. Hobbs Pool bottom hole pressures averaged 986 psig in 1954 and 941 psig in 1956, indicating very gradual decline. With continued high pressure on the casing and considering the age of the remaining Hobbs Pool wells where casing has not been repaired, the instance of casing leaks may be expected to increase during the 20-30 years remaining life of the pool.

X. Methods of Preventing or Minimizing Oil and Gas Well Casing Deterioration.

The Committee finds that there are numerous means and materials available to the oil industry by which oil and gas well casing deterioration can be minimized or eliminated. Some of these means and materials are listed as follows:

(1) Coatings applied to the interior and/or exterior of casing.

(2) Numerous and various chemicals injected into oil and gas wells to minimize corrosive attack.

(3) Induced electrical current or elimination of electrical current to minimize electrolytic corrosive attack.

(4) Spotting chemically treated mud outside of casing or circulating cement outside of casing to prevent corrosive attack by sulfate reducing bacteria.

(5) Setting packers in the casing in or above the producing formation and filling the annular space above the packer with non-corrosive liquid.

(6) Circulating cement between strings of casing.

(7) Using anchors or guides to prevent tubing-on-casing wear.

XI. Methods of Determining the Existence of Defective Casing.

The Committee finds that there are numerous methods available by which defective casing can be detected. Some are listed as follows:

(1) Internal caliper surveys to gauge the extent, depth and location of corrosive attack on the internal string of casing.

(2) Temperature surveys to locate temperature anomalies which are possible indications of casing leaks.

(3) Hydraulic pressure tests using packers to determine if a leak exists and to locate the leak.

(4) Potential profile surveys to determine the probability of external casing corrosion and thereby the likelihood of casing leaks.

(5) Bradenhead pressure surveys to determine by pressure observations on the several casing strings the possible existence of casing leaks.

(6) Chemical analysis of produced water as an indication of a casing leak through the presence of foreign water.

(7) Lack of normal clearance between tubing and casing as an indication of possible casing collapse or of parted casing.

(8) Any observed abnormal performance of the well with respect to bottom hole pressure, gas-oil ratio, water production, or oil production.

(9) Unusual performance or presence of foreign liquid or gas in shallower oil, gas, or water wells in the vicinity.

(10) Electical logs, permeability surveys, and radioactive tracer surveys to locate leaks or parted casing.

The method or combination of methods best adapted for any particular well will depend upon the conditions which exist at each individual well. The bradenhead pressure survey is least expensive, quicker, and very effective under proper conditions.

XII. Methods of Repairing Oil and Gas Well Casing Found to be Defective.

The Committee finds that there are numerous means by which casing can be effectively repaired. The method to be used will depend upon the conditions which exist at the individual well. Some of these methods are as follows:

(1) Recover the entire casing string found to be defective and run and cement an entirely new casing string.

(2) Run and cement a full string of smaller casing inside the defective casing.

(3) Recover that portion of the casing string found to be defective, replace casing, and re-run casing string using casing bowl overshot or other method to tie back on to and seal with casing left in the hole.

(4) Run and cement a liner covering that portion of the casing found to be defective.

(5) Circulate cement to the surface between casing strings during completion or repair operations.

(6) Squeeze cement through casing leaks and obtain a solid final build up squeeze pressure.

XIII. Programming of Bradenhead Pressure Tests on Oil and Gas Wells In the Hobbs Pool Area.

The Committee finds:

(1) Bradenhead pressure surveys, where the several casing strings are open for pressure measurement, should indicate whether or not a casing leak exists and therefore the possibility of fresh water sand contamination at the well being tested.

(2) Bradenhead pressure surveys conducted annually are too infrequent to provide adequate warning of possible contamination of the fresh water sand.

(3) Bradenhead pressure surveys conducted quarterly should provide more adequate warning of possible contamination of the fresh water sand.

(4) It should be necessary for the NMOCC to witness only one of the quarterly bradenhead pressure surveys each year.

(5) The operators of the individual wells should conduct the other three surveys, recording and saving the test results, and filing a certification with NMOCC that all wells operated by that operator have been tested and whether or not leaks were found.

(6) All producing oil and gas wells, abandoned wells, temporarily abandoned wells, and salt water disposal wells, should be scheduled for the quarterly bradenhead surveys.

(7) There are a number of old oil wells in the Hobbs Pool area with the intermediate casing set on open surface casing with clamps, thereby preventing pressure observation. Such open surface casing is a possible source of fresh water sand contamination since the top of the surface casing is in the bottom of cellars. In order to obtain valuable information during bradenhead pressure surveys and to eliminate one possible source of contamination, the top of the annular space between the clamped intermediate casing and the surface casing should be sealed and vented to the surface.

EXHIBIT NO. 2

ANALYSIS OF 42 SELECTED WATER WELLS IN HOBBS POOL AREA

Analysis was to include only sulfide and chloride content. However no sulfides were identified.

Name and Source	Location		Date Obtained	Chloride mg/l
BLACKBURN, Tap at well	SW SE SW	32-18-38	8-14-57	56
CONTINENTAL, Abd. Hole	NE SW	13-18-37	8-14-57	72
HOBBS ICE CO.	NW SE SW	34-18-38	8-15-57	112
SUN OIL CO., Tap at Kuth's	SW NE NE	5-19-38	8-14-57	96
OHIO OIL CO. NO. 2, Tap by Storage Tank	NW SE SE	32-18-38	8-14-57	48
YATES SHELL STATE, Abd. Well	NW SE SE	23-18-37	8-14-57	80
HOBBS IRON & METAL, Tap	NW SE NW	3-19-38	8-14-57	80
ROBERT OWINGS, Tap	NW NE NE	31-18-38	8-13-57	80
BRIANT, From well	NE SW NE	30-18-38	8-13-57	56
R. D. MOOR, Well	NE NE	30-18-38	8-13-57	72
RYBANT, Tap	NE NE NE	30-18-38	8-13-57	48
HOBBS GAS CO., Tap	NW NE NE	28-18-38	8-13-57	112
C. MYERS, Tap	SE SE NE	4-19-38	8-14-57	48
SIMON, Tap	SE SE SE	32-19-38	8-14-57	64
PHILLIPS NO. 3, Well Tap	NW NE NW	4-19-38	8-14-57	104
PHILLIPS NO. 2, Pump Tap	NW NE NW	4-19-38	8-14-57	88
BROWN WELL SERVICE, Tap	NE NW NE	5-19-18	8-14-57	112
Water from Phillips Gasoline Plant from ditch to W-most pond	NW SE NW	4-19-38	8-12-57	749
PHILLIPS NO. 6, Tap at Well	NW NE NW	4-19-38	8-13-57	327
HUMBLE OIL, Tap at Well	SW NE SE	30-18-38	8-13-57	72
JACKSON, Sample from earth ditch 10 yds. S. of pump	NE NW NW	20-19-38	8-13-57	494
STEELE, Tap sample	SE NE SW	4-19-38	8-12-57	96
CAZEE, Tap	SW NE NE	30-18-38	8-13-57	64
PACIFIC PUMPS, Tap Sample	NW NE NE	5-19-38	8-12-57	64
SECURITY, Tap Sample	NE NW NE	5-19-38	8-12-57	80
H. EASTON, Tap Sample (S.House)	SW SE NE	4-19-38	8-14-57	64
GIBBONS, Tap Sample (N.House)	SW SE NE	4-19-38	8-12-57	40
BAKER TOOL, Tap Sample	SE SE SW	32-18-38	8-12-57	40
OHIO OIL CO., Tap Sample	SE SE SE	32-18-38	8-12-57	128
E. W. BENSING, Tap Sample	NE NW NE	30-18-38	8-13-57	80
ROBERT BENSING, Tap Sample	NE NW NE	30-18-38	8-13-57	80
JESS HARWELL	NW NE NE	28-18-38	8-13-57	104
DOWELL, INC., Tap Sample	NE NE NE	28-18-38	8-13-57	56
MAYFIELD, Tap Sample	NE SE NE	30-18-38	8-13-57	72
GOINS, Tap Sample	SW NE NE	30-18-38	8-13-57	343
W. E. MOON, Tap Sample	NW NE NE	30-18-38	8-13-57	104
MERTAUGH, Tap at new well	NW NE NE	30-18-38	8-13-57	56
BLAKLEY, Tap	NE SE NE	30-18-38	8-13-57	80
L. DEVERS, Tap Sample	SW SE NE	30-18-38	8-13-57	64
P. L. RIEVE, Tap Sample	SW SE NE	30-18-38	8-13-57	104
COX, Well Sample	NE SE NE	30-18-38	8-13-57	48
*DOWELL, Gas in line and spurting as sample was taken	NE SE NE	30-18-38	8-22-57	80

*Contained sulfide present as ferrous sulfide in trace quantity. No free hydrogen sulfide was found in this sample nor in any of the other samples listed above.

With samples collected and analyzed by different methods, the presence of gas contamination might have been detected.

EXHIBIT NO. 4

ANALYSIS OF WATER IN PARTS PER MILLION FROM WATER WELLS IN HOBBS POOL AREA

NAME	LOCATION		DATE	Na	Ca	Mg	SO_4	Cl	CO_3	HCO_3
Pan American	NE SW NW	33-18-38	9-1950	35	74	18	77	50	0	226
			7-1951	54	57	16	82	53	0	202
			7-1952	32	80	21	82	57	0	232
			8-1957	9	103	21	89	60	12	201
Pan American	SE NE SE	4-19-38	9-1950	51	123	25	56	181	0	256
			7-1951	45	128	29	53	195	0	256
			7-1952	56	137	27	30	227	0	268
			8-1953	32	139	25	72	163	0	262
			6-1956	63	80	12	63	78	0	256
Pan American	NW NE NE	9-19-38	10-1950	67	89	18	109	82	0	262
			7-1951	52	79	21	93	67	0	250
			7-1952	52	86	21	96	71	0	262
			8-1953	31	124	19	114	85	12	238
			8-1955	58	80	17	103	78	0	218
			5-1956	66	86	17	113	71	0	256
Humble Federal Bowers No. 3			7-1957		190	46	22	66		
Sun Oil Co. McKinley No. 1	NE NE	5-19-38	11-1953	56	95	15	80	120	0	205
McKinley No. 2	NE NE	5-19-38	11-1953	47	81	14	98	53	0	227
Gulf Oil Corp. West Grimes			9-1952	36	70	7	48	31	0	229
			7-1953	50	59	7	44	33	0	235
			7-1954	50	62	5	45	32	0	235
			7-1955	46	65	6	45	31	0	238
			7-1956	65	96	19	119	92	0	250
East Grimes			7-1953	78	93	12	130	82	0	244
			7-1954	60	92	12	102	74	0	244
			7-1955	53	94	14	99	74	0	244

EXHIBIT NO. 3

ANALYSIS OF SAMPLE
FROM ELLISON WELL
AUGUST, 1956

Air and Water	95.37%
Methane	2.30%
Ethane	0.15%
Propane	0.49%
CO_2	1.49%
Butane (plus)	0.14%
H_2S	0.06%

Analysis made by Permian Basin Pipeline using Mass Spectrometer. Sample collected by Mr. Charles Reider, then a member of the Commission Staff.

EXHIBIT NO. 5

ANALYSIS OF WATER SAMPLES FROM LARGE STORM SEWER DITCH

The chloride and sulfide content of the two water samples, each designated "open sewer, Hobbs, New Mexico", submitted August 21, 1957, was negligible. Both samples gave a negative Endo Agar Test, indicating they were free of fecal contamination. They contained organic matter, both dissolved and in suspension, and considerable dissolved iron. The sodium, potassium, and calcium content was 12, 4, 24 and 9, 4, 28 parts per million, respectively.

EXHIBIT NO. 6

ANALYSIS OF WASTE WATER

Phillips Gasoline Plant

Sample No. 1 - Waste water direct from plant
Date Collected - 8/6/57

Phenolphthalein end point = 550 ppm
Methyl orange (M-orange) = 620 ppm
Total hardness = 0
Chlorides = 196 ppm
Ph = 11.55
Orthophosphate = 45 ppm
Hydrogen sulfide = 0 ppm

Not considered potable but is soft. Will not scale.

Sample No. 2 - Waste water from large pit behind Phillips Plant
Date Collected - 8/6/57
Algae growth moderate

Phenolphthalein end point = 0 ppm
Methyl orange (M-orange) = 196 ppm
Total hardness = 1700 ppm
Chlorides = 3450 ppm
Ph = 7.55
Orthophosphate = 20 ppm
Hydrogen sulfide = 0 - 1.7 ppm

Not considered potable due to hardness and chlorides.

EXHIBIT NO. 7

WATER WELLS IN THE HOBBS POOL AREA WHICH COULD BE UTILIZED FOR OBSERVATION PURPOSES

	Accessibility of Well				
		For Collection of Water Sample			
Well Location	For Measurement Of Water Level	From Tap or Discharge Pipe	By Thief or Trip Sampler	Present Use	Remarks
NE SW 13-18-37	x		x	Abandoned	Sampled 8/14/57
NW SW SE 13-18-37	x	x		Stock	Windmill
NW SE SE 23-18-37	x		x	Abandoned	Sampled 8/14/57
SE SE SE 24-18-37		x		Domestic	Windmill
SW NE SE 17-18-38	?	?	?		Not checked
SE SE SW 18	?	?	?		Not checked
SW SW SW 19	x		x	Abandoned	
NE NW NW 20		x		Irrigation	Sampled 8/13/57
SE/4 21	?	?	?		Many wells. Not checked
NW NW 27	?	?	?	Standby	City Well #13
SW SW SE 27	?	?		Municipal	City Well
N/2 28	?	?	?		Many wells. Not checked.
NW SW NE 29	x		x	Abandoned	Contained oil 8/14/57
SW NE SE 29	x		x	Abandoned	N' most of two wells

EXHIBIT NO. 7

Well Location	Accessibility of Well: For Measurement Of Water Level	For Collection of Water Sample: From Tap or Discharge Pipe	For Collection of Water Sample: By Thief or Trip Sampler	Present Use	Remarks
SW NE NW 30	x	x		Domestic	
NE/4 30	x	x	x	Domestic, Irrig.	Many Wells, Contaminated area.
NE NE SW 30	x		x	Abandoned	
SW NE SW 30-18-38	x		x	Abandoned	
SE SE SW 30	x	x		Domestic	Windmill
SW NE SE 30	?	x		Domestic	Three wells present. Sample from contaminated well.
NE NE SW 31	x		x		
SE SW SE 31	x	?			Not checked
NE NE NE 32	x		x	Abandoned	
NE SW NE 32	x		x	Abandoned	Plugged with timber
NE NE NE 32	x		x	Abandoned	Plugged with bull plug
S/2 32	?		?		Many wells. Not checked.
NE/4 33	?	?			Many wells. Not checked.
SW SE SW 33	x			Domestic	

EXHIBIT NO. 7

Well Location	Accessibility of Well: For Measurement Of Water Level	For Collection of Water Sample: From Tap or Discharge Pipe	For Collection of Water Sample: By Thief or Trip Sampler	Present Use	Remarks
NE SW SW 34	X		x	Domestic	
SW SW SW 34	x		x	Abandoned	
NW SE SW 34		x			
N/2 34	?	?			Many wells. Not checked
S/2 3-19-38	?	?			Many wells. Not checked
N/2 4	?	?			Many wells. Not checked
SW SW SW 4-19-38	x		x	Abandoned	
SE NE SE 4	?	x		Domestic	Sampled 8/12/57
N/2 5	X	X			Many wells. Not checked
NE NE SE 6	x		x	Abandoned	Timber plug
SW NE NE 6	?	x		Stock	Windmill
NE/4 9-19-38	?	?			4 wells here. None checked.
SW NE SE 10	?	x		Domestic	Windmill
SE SW SE 10	x		x	Abandoned	

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		19		38	00
2	Blueline	3 1/2	7		
2	Blueline	5	10		
2	Blueline	10 1/2	21		
			38	26	60
				64	60
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HOBBS, NEW MEXICO

	P.P.M.	Reacting Values Percent
SO_4	1010	8.8
Cl	3370	40.3
CO_3	0	0.0
HCO_3	134	0.9
Total P.P.M.	7147	100.0

Total Solids by evaporation 6740
Sp. Gr. 1.004
Organic Matter Present
Sodium Calculated

C O P Y

Santa Rosa Water On December 21, 1927, Sample by bailer from 1,235 - 50' T.D. 1,250 analysis by H. K. Frank from discovery well. Analysis run January 5, 1928.

	P.P.M.	Reacting Values Percent
Na	730	49.5
Ca	6	0.5
Mg	Trace	0.0
SO_4	716	23.4
Cl	143	6.3
CO_3	51	2.7
HCO_3	685	17.6
Total P.P.M.	2,331	100.0

Total Solids by evaporation 1,660
Sp. Gr. 1.005
Sodium Calculated.

Big Gas Pay (Queen)
The chemical composition of the water from the "Bowers sand" is probably nearly identical with that from the big gas pay. Both are very salty.

On July 15, 1930, a sample of water from the big gas pay was taken from the bailer of Midwest Byers #33, NE/4 of Sec. 4, Township 19 South, Range 38 East, depth of water 3,720 - 25', depth of hole 3,725'. Analyzed August 7, 1930, by H. K. Frank.

	P.P.M.	Reacting Values Percent
Na	84,292	34.9
Ca	14,200	6.8
Mg	10,500	8.3
SO_4	682	0.14
Cl	185,000	49.81
CO_3	0	0.00
HCO_3	279	0.05
Total P.P.M.	294,953	100.00

Total Solids by evaporation 284,700
Sodium calculated
Analysis not corrected for specific gravity, hence actual salinity is approximately reported 50,000 P.P.M. less than above.

OIL CONSERVATION COMMISSION

HOBBS, NEW MEXICO

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White Lime (San Andres)

On November 8, 1928, a sample of water was obtained from the discovery well, at a T.D. of 4,220'. Analyzed November 16, 1928, by H. K. Frank.

	P.P.M.	Reacting Values Percent
Na	2,733	38.4
Ca	280	4.6
Mg	262	7.0
SO_4	41	0.3
Cl	4,107	37.8
CO_3	0	0.0
HCO_3	2,240	11.9
Total P.P.M.	9,663	100.0

Total Solids by evaporation 7,960
Sodium Calculated
Specific Gravity 1.010
H_2S Present
No Iodine

Analysis of water from Ohio State #1 SW/4 of Sec. 9, Township 19 South, Range 38 East, an extreme edge well, which first found water at 4,208' was deepened to 4,312' finding more water. This sample was analyzed after one year production at an approximate rate of 20 barrels daily. Analyzed December 5, 1930, by R. E. Thurn, U. S. Bureau of Mines.

	P.P.M.	Reacting Values Percent
Na	3,026	40.66
Ca	222	3.42
Mg	233	5.92
SO_4	315	2.02
Cl	4,681	40.78
CO_3	0	0.00
HCO_3	1,421	7.20
OH	0	0.00
Total Solids	9,898	100.00

Specific gravity @ 15.6°C (60°F) 1.0082

OIL ANALYSIS

Bowers ss	White Lime
37-40% A.P.I.	33-37° A.P.I.
Paraffine base	Verges on Asphaltic
Large Percent N_2	CO_2 & H_2S little N_2
700 BTU per cu ft	1000 BTU per cu ft
Oil analysis by-	Oil analysis by-
J. G. Crawford	J. G. Crawford (U.S.G.S. Midwest, Wyo.)

OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO

Bowers ss (contd)
July 12, 1930
Humble Bowers #4-A SE/4 30-18-38
Tp. ss. 3,161 - T.D. 3,260

I.P. 234 bbls oil per day
1,500,000 cu ft daily

White Lime (contd)
September 25, 1929
Midwest #1-A 9-19-38
Tp. Wh. Lm. 4045' T.D. 4245'
P.B. 4217'
I. P. 700 bbls oil per day

Sample	I	II	Analysis
Gr. of Crude	39.4	38.3	34.8° API
Centrifuge BS&W	0.80%	0.15%	0.1%
Sulfur	1.07%	0.34%	1.47%
Universal Saybolt Visc. @ 100°F	43 Sec.	46 Sec.	43 Sec.
Distillation by Air			Distillation by Air
1st drop	106°F	99°F	115°F
Up to 392°F	37.5%-58.4°	34.3%-57.2°API	34.7%-56.6°API
392°F to 482°F	9.3%-44.0°	10.7%043.7°API	9.0%-38.6°API
482°F to 527°F	6.0%-40.4°	5.5%-40.2°API	6.0%-34.3°API
Vacuum Distillation at 40MM			
Up to 392°F	4.7%	4.8%	4.7%
392°F to 482°F	9.3%	10.2%	8.3%
482°F to 527°F	5.7%	4.8%	5.0%
527°F to 572°F	4.7%	4.9%	4.7%
Residuum	23.0%	14.8%	27.6%
Base	Paraffine	Paraffine	Intermediate B is a base Verging on Asphaltic.

GAS ANALYSIS

Big Gas

Average analysis of a sample containing the combined gases from the big gas pay, the "Bowers Sand", and the "Brown Lime".

H_2S	Nil
CO_2	0.07%
O2	0.07%
CH_4	56.00%
C_2H_6	21.00%
N_2	20.00%

White Lime Gas (San Andres)

Sample I	Sample II
Meter Station #13	Midwest
Phillips Gas Plant	Byers #33

OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO

White Lime Gas (San Andres) Continued

	Sample I Midwest State #8 NW/4 Sec. 10, T-19-S, R-38-E	Sample II NE/4 Sec. 4 T-19-S, R38-E
H_2S	2.27%	1.05%
CO_2	4.00	5.25
O_2	1.06	0.81
CH_4	52.19	63.30
C_2H_6	7.16	3.34
Propane	13.31	9.09
Isobutane	2.49	1.32
Normal butane	6.99	5.29
Pentanes & Heavier	4.55	4.18
N_2	5.98	6.37
	100.00	100.00
Observed Gravity	1.050	0.933
Calculated Gravity	1.044	0.938

The above analysis if from gas produced with the oil from the white lime pay. These samples were collected in aluminum containers and were analyzed by H. W. Young, at the Midwest Refining Company's gas plant, Salt Creek, Wyoming.

If we can obtain any other information for you please let us know.

We thank you very much for your help in this matter.

Yours very truly,

OIL CONSERVATION COMMISSION

Eric F. Engbrecht
Oil & Gas Inspector

EFE/eb
cc- Proration Manager
District Engineer
File

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VII. Establishment of a water well observation program to detect any new contamination and to observe the movement, if any, of contamination from the area northwest of Hobbs.

1. At least 42 wells, and probably more, are available for observation purposes in the Hobbs Pool area. The attached tabulation lists these wells according to their location and accessibility to water level measurements and to water sample collection.

2. As much information as possible should be collected regarding the potential observation wells. Such information should ideally include the driller's log, date drilled, depth, casing program, location of any perforations, accurate location of the well with reference to the land net and to relatively permanent landmarks, and an accurate description of the measuring point.

3. It is believed that an effective network of observation wells can be established by evaluating the potential observation wells with regard to their location within the Hobbs Pool area and to information available regarding their completion.

WATER WELLS IN THE HOBBS POOL AREA WHICH COULD BE UTILIZED FOR OBSERVATION PURPOSES

Well Location	Accessibility of Well: For Measurement Of Water Level	Accessibility of Well: For Collection of Water Sample: From Tap or Discharge Pipe	Accessibility of Well: For Collection of Water Sample: By Thief or Trip Sampler	Present Use	Remarks
NE SW 13-18-37	X		X	Abandoned	Sampled 8/14/57
NW SW SE 13-18-37	X	X		Stock	Windmill
NW SE SE 23-18-37	X		X	Abandoned	Sampled 8/14/57
SE SE SE 24-18-37		X		Domestic	Windmill
SW NE SE 17-18-38	?	?	?		Not checked
SE SE SW 18	?	?	?		Not checked
SW SW SW 19	X		X	Abandoned	
NE NW NW 20		X		Irrigation	Sampled 8/13/57
SE/4 21	?	?	?		Many wells. Not checked.
NW NW 27	?	?	?	Standby	City Well #13
SW SW SE 27	?	?		Municipal	City Well
N/2 28	?	?	?		Many wells. Not checked.
NW SW NE 29	X		X	Abandoned	Contained oil 8/14/57
SW NE SE 29	X		X	Abandoned	N' most of two wells
SW NE NW 30	X	X		Domestic	
NE/4 30	X	X	X	Dom., Irrig.	Many wells. Contaminated area.
NE NE SW 30	X		X	Abandoned	

WATER WELLS IN THE HOBBS POOL AREA WHICH COULD BE UTILIZED FOR OBSERVATION PURPOSES (Continued)

Well Location	Accessibility of Well: For Measurement Of Water Level	For Collection of Water Sample: From Tap or Discharge Pipe	For Collection of Water Sample: By Thief or Trip Sampler	Present Use	Remarks
SW NE SW 30-18-38	X		X	Abandoned	
SE SE SW 30	X	X		Domestic	Windmill
SW NE SE 30	?	X		Domestic	Three wells present. Sample from contaminated well.
NE NE SW 31	X		X		
SE SW SE 31	X	?			Not checked
NE NE NE 32	X		X	Abandoned	
NE SW NE 32	X		X	Abandoned	Plugged with timber
NE NE NE 32	X		X	Abandoned	Plugged with bull plug
S/2 32	?		?		Many wells. Not checked.
NE/4 33	?	?			Many wells. Not checked.
SW SE SW 33	X			Domestic	
NE SW SW 34	X		X	Domestic	
SW SW SW 34	X		X	Abandoned	
NW SE SW 34		X			
N/2 34	?	?			Many wells. Not checked.
S/2 3-19-38	?	?			Many wells. Not checked.
N/2 4	?	?			Many wells. Not checked.

WATER WELLS IN THE HOBBS POOL AREA WHICH COULD BE UTILIZED FOR OBSERVATION PURPOSES (Continued)

Well Location	Accessibility of Well: For Measurement Of Water Level	For Collection of Water Sample: From Tap or Discharge Pipe	For Collection of Water Sample: By Thief or Trip Sampler	Present Use	Remarks
SW SW SW 4-19-38	X		X	Abandoned	
SE NE SE 4	?	X		Domestic	Sampled 8/12/57
N/2 5	X	X			Many wells. Not checked.
NE NE SE 6	X		X	Abandoned	Timber plug
SW NE NE 6	?	X		Stock	Windmill
NE/4 9-19-38	?	?			4 wells here. None checked
SW NE SE 10	?	X		Domestic	Windmill
SE SW SE 10	X		X	Abandoned	

OIL CONSERVATION COMMISSION

HOBBS, NEW MEXICO

C O P Y

Item 10: Methods of determining the existence of defective casing in oil and gas wells.

Study Committee on Item 10 was composed of the Oil Conservation Commission and Pan American Petroleum Corporation.

Mr. Bill Meek with Pan American Petroleum Corporation
Mr. E. J. Fischer with the Oil Conservation Commission

It was decided that to the best of our knowledge the below listed methods may be employed in determining the possible existence of defective (leaking) casing.

1. Packer pressure test utilizing the bridge plug and retrievable packer method to test casing to locate leaks.

2. Bradenhead Pressure Tests

3. Temperature Survey- Another technique used to attempt to verify and locate leak(s).

4. Changes in wells productivity as a clue to possible existence of a leak in the well. Such as increase in water production, marked variation in GOR, marked variation in production, changes in fluid level as another clue, water analysis (to compare with formation water to see if formation water or leak water).

5. Caliper Survey

6. Electric Log- Possibly to locate complete break in pipe.

7. Contamination of fresh water well as an indication of defective casing in a nearby oil or gas well.

Most of the above listed items may be primary clues to the existence of defective casing to the extent of leaks. Items 2, 3, 4, 5, 6, and 7, are not in themselves conclusive evidence of leaking casing in a well. The only conclusive test is the one mentioned in Item 1.

OIL CONSERVATION COMMISSION

HOBBS, NEW MEXICO

COPY

September 6, 1957

Mr. Robert Hoyle, Chief Chemist
El Paso Natural Gas Company
Box 1384
Jal, New Mexico

Dear Mr. Hoyle:

In regard to our conversation of August 21, 1957, about fresh water, oil & Gas analysis, I hope that the enclosed information is what you had in mind.

This information was obtained from the "Hobbs Pool Proration Engineering Report," March 25, 1931.

Water Analysis

Tertiary Water October 16, 1927, T.D. 50 - 62' Sample from bailer Ogallala Formation, Discovery Well, Analysis by Midwest Refining Co. Gas Plant, Salt Creek Field, Wyoming, By H. K. Frank.

	P.P.M.	Reacting Values Percent
Na	29	9.1
Ca	72	27.3
Mg	22	13.6
SO_4	82	13.0
✓ Cl	42	9.0
CO_3	0	0.0
HCO_3	226	28.0
Total P.P.M.	473	100.0

Total Solids by Evaporation 420
Sp. Gr. 1.002
Sodium Calculated, not actually determined

Upper Dockum Group- March 28, 1929, Sample 455 - 462 by bailer, Midwest Capps #31 SW/4 of Section 3, Township 19 South, Range 38 East. T.D. 465' Analysis by H. K. Frank on April 13, 1929.

	P.P.M.	Reacting Values Percent
Na	2363	43.3
Ca	200	4.2
Mg	70	2.5

OIL CONSERVATION COMMISSION

HOBBS, NEW MEXICO

Section II

Two structural maps were prepared to study several problems involved in the four local water contaminated areas within the Hobbs Pool.

The findings of this study are:

1. The structural map on the base of the caliche differs locally with the structural map contoured on the top of the red beds, but they are regionally similar.

2. A comparison of the contaminated water wells and their relationship with the structure of the base of the caliche shows that the water wells with oil are located in structural highs, while water wells with gas are located both in structural highs and lows.

3. The map on the top of the red beds shows that the four main areas of water contamination (both oil and gas) occupy the same structural positions for each particular area.

4. In preparing the maps from water well and oil well sample logs, it was noted that evidence existed in some local areas that more than one water zone could be present within the Ogallala sand. In the Ellison area (NE/4 of Section 30, Township 18 South, Range 38 East) that the top of the water sand is somewhat isolated from the remaining Ogallala sand. The fluid level in these water wells is almost a constant 25 feet, where as in the rest of the Hobbs Pool, the fluid level ranges from 18 to 65 feet.

5. Being that the top of the fluid level in the Ellison area is 25 feet, the structure of the base of the caliche could possibly effect the movement of water, oil, and gas, and confine movements to structural highs.

6. In the other three areas in which contamination exists the water level is generally low enough that the structure of both the caliche and Red Beds would have, little if any, influence on the local migration movements of fluids. The influence of fluid movements would be effected by lithology and general direction and dip of the Ogallala formation.

7. In structurally comparing the relationship between the large number of oil wells which have been repaired and other possible sources of fresh water contamination with the water wells which are contaminated, it is practically impossible to trace and pick the exact source or sources which have definitely contaminated the Ogallala sand.

8. There are numerous accessable water wells which lie in the path of migration from the contaminated water area which could be used for observation and test wells. Refer to brown circled water wells on the maps.

9. (a) A total of 378 water wells were recorded.
   (b) 31 water wells were contaminated.
   (c) 12 water wells contained oil.
   (d) 18 water wells contained gas.
   (e) 1 water well contained organic material.

OIL CONSERVATION COMMISSION

HOBBS, NEW MEXICO

Item 10: Methods of determining the existence of defective casing in oil and gas wells.

Study Committee on Item 10 was composed of the Oil Conservation Commission and Pan American Petroleum Corporation.

Mr. Bill Meek with Pan American Petroleum Corporation
Mr. E. J. Fischer with the Oil Conservation Commission

It was decided that to the best of our knowledge the below listed methods may be employed in determining the possible existence of defective (leaking) casing.

1. Packer pressure test utilizing the bridge plug and retrievable packer method to test casing to locate leaks.

2. Bradenhead Pressure Tests

3. Temperature Survey- Another technique used to attempt to verify and locate leak(s).

4. Changes in wells productivity as a clue to possible existence of a leak in the well. Such as increase in water production, marked variation in GOR, marked variation in production, changes in fluid level as another clue, water analysis (to compare with formation water to see if formation water or leak water).

5. Caliper Survey

6. Electric Log- Possibly to locate complete break in pipe.

7. Contamination of fresh water well as an indication of defective casing in a nearby oil or gas well.

Most of the above listed items may be primary clues to the existence of defective casing to the extent of leaks. Items 2, 3, 4, 5, 6, and 7, are not in themselves conclusive evidence of leaking casing in a well. The only conclusive test is the one mentioned in Item 1.

OIL CONSERVATION COMMISSION

HOBBS, NEW MEXICO

Paragraph 11

Programming of bradenhead pressure tests on oil and gas wells in the Hobbs Pool area:

Findings:

1. A minimum of 4 surveys per year, to be held in the following months; January, April, July & October.

    a. Three of these surveys should be the direct responsibility of each operator for his own wells.

    b. One of the surveys should be witnessed by an Oil Conservation Commission representative.

        1. A schedule should be set up, beginning in April of each year by the Commission, for the witnessed test, to be assisted by a Company representative or representatives.
        2. All wells should be allowed approximately 15 minutes per well for the witnessed test, and be shut in 24 hours before testing.
        3. There are approximately 304 producing wells in the Hobbs area, which will take 76 field hours for a witnessed test, which will consume about five weeks.
        4. All wells should have risers, with working valves for safety's sake, for making these tests.
        5. Risers should be so constructed, that blow-downs can be made safely, without hazard to personal or adjacent property.
        6. Operator should furnish guages of adequate pressure ranges, so all pressures may be safely observed and recorded.

2. Operators should record pressures, and other data of all surveys, and these shall become a permanent part of the operators' well records, for inspection at any date.

3. All producing wells should be tested.

4. All shut-in wells should be tested.

5. All temporary abandoned wells should be tested.

6. All plugged and abandoned wells should be observed.

7. All salt water disposal wells should be tested.

TABLE NO. 2

Analysis of Water in Parts per Million from Water Wells in Hobbs Pool Area

NAME	LOCATION	DATE	Na	Ca	Mg	SO_4	Cl	CO_3	HCO_3
Pan American	NE SW NW 33-18-38	9-1950	35	74	18	77	50	0	226
		7-1951	54	57	16	82	53	0	202
		7-1952	32	80	21	82	57	0	232
		8-1957	9	103	21	89	60	12	201
Pan American	SE NE SE 4-19-38	9-1950	51.	123	25	56	181	0	256
		7-1951	45	128	29	53	195	0	256
		7-1952	56	137	27	30	227	0	268
		8-1953	32	139	25	72	163	0	262
		6-1956	63	80	12	63	78	0	256
Pan American	NW NE NE 9-19-38	10-1950	67	89	18	109	82	0	262
		7-1951	52	79	21	93	67	0	250
		7-1952	52	86	21	96	71	0	262
		8-1953	31	124	19	114	85	12	238
		8-1955	58	80	17	103	78	0	218
		5-1956	66	86	17	113	71	0	256
Humble Federal Bowers No. 3		7-1957		190	46	22	66		
Sun Oil Co. McKinley No. 1	NE NE 5-19-38	11-1953	56	95	15	80	120	0	205
McKinley No. 2	NE NE 5-19-38	11-1953	47	81	14	98	53	0	227
Gulf Oil Corp. West Grimes		9-1952	36	70	7	48	31	0	229
		7-1953	50	59	7	44	33	0	235
		7-1954	50	62	5	45	32	0	235
		7-1955	46	65	6	45	31	0	238
		7-1956	65	96	19	119	92	0	250
East Grimes		7-1953	78	93	12	130	82	0	244
		7-1954	60	92	12	102	74	0	244
		7-1955	53	94	14	99	74	0	244

The wells reported to be contaminated by oil are located as follows:

Name	Location	Degree of Contamination
Jackson	NE NW NW 20-18-38	See Footnote #2
Phillips	NE NW NW 4-19-38	Unknown
Pacific Pump	NW NE NE 5-19-38	Trace

4. One well is reported to be contaminated by sewage. It is located as follows:

Name	Location
Phillips #6	SE NE NW 4-19-38

5. Forty-two wells were sampled with a chloride and sulfide analysis made. Among these 42 water wells are all wells that were found to be contaminated, the remainder being water wells near the reported contaminated wells. The sulfide determination did not indicate any contamination although many of the wells are known to be gas contaminated. See Table No. 1

6. In response to the Committee's request water analyses on 9 water wells were received from oil operators that operate water wells in the Hobbs Pool area. These analyses are included as Table No. 2

Footnote (1) The Amerada well in which 19.4 feet of oil was found has been pumped off. As of this date no new oil has entered the well bore. Due to the facts this Committee obtained it is probable that the oil entered the well bore from the surface and not from the fresh water aquifer.

Footnote (2) The Jackson well is reported to have oil; however it is the opinion of this Committee that it is lubricating oil from the water well pump.

COPY

II. Apparent contaminated conditions which exist in the Ogallala formation in the Hobbs Pool area

1. A total of 378 water wells were located in the area. It is believed that this represents about 80 % of the total number of water wells in the Hobbs Pool area

2. Field examination by Committee members discovered 18 water wells suspected to be contaminated. This contamination is in varying degrees, from gas contamination sufficient enough to burn with a small intermittent flame to a slight taste. The wells are as follows:

Name	Location		Degree of Contamination
Gibbins	SW SE NE	4-19-38	Slight Taste Gas
Easton	SW SE NE	4-19-38	Slight Taste Gas
Gackle	SE SE NE	4-19-38	Strong Taste Gas
Security Supply	NW NE NE	5-19-38	Slight Taste Gas
Ohio Oil	SE SE SE	32-18-38	Strong Taste Gas
Baker Tool	SW SE SW	32-18-38	Slight Taste Gas
Harwell	NW NE NE	28-18-38	Strong Taste Gas
Dowell	NE NE NE	28-18-38	Will Burn
Humble Oil	SW NE SW	30-18-38	Moderate Taste Gas
Bensing	NE NW NE	30-18-38	Very Slight Taste Gas
Green	NE NE NE	30-18-38	Very Strong Taste Gas
Mertaugh	NW NE NE	30-18-38	Old Well Would Burn
Moon	NW NE NE	30-18-38	Moderate Taste Gas
Moon	SW NE NE	30-18-38	Moderate Taste Gas
Goins	NE SE NE	30-18-38	Strong Taste Gas
Ellison L-2230	SW SE NE	30-18-38	Moderate Taste Gas
Pacific Pump	NW NE NE	5-19-38	Slight Taste Gas

One of the above water wells (Ohio) is reported to have been contaminated with gas since 1930.

The greatest degree of contamination was found in the Dowell (NE NE NE 28-18-38) water well. This well proved to be contaminated to such an extent that small sporadic flames of gas were observed when a lighted match was held over an opened water faucet.

3. Of the 378 known water wells, 9 are known to be contaminated by oil and 3 are reported to be contaminated oil. The wells known to be contaminated by oil are as follows:

Name		Location		Degree of Contamination
Amerada Pet.		C N/2	29-18-38	19.4 feet (See Footnote #1)
Ellison L-2230	#1	SW NE NE	30-18-38	6.3 feet
"	#2	SE NW NE	30-18-38	0.5 feet
"	#3	SE SW NE	30-18-38	0.5 feet
"	#4	SE SW NE	30-18-38	0.8 feet
"	#5	NE SW NE	30-18-38	0.6 feet
"	#11	SE NW NE	30-18-38	Trace Oil
"	#12	SE SW NE	30-18-38	2.4 feet
"	#13	SE SW NE	30-18-38	3.8 feet

Roswell, New Mexico
September 24, 1957

MEMORANDUM

TO: New Mexico Oil Conservation Commission
Attention: Mr. A. L. Porter, Jr., Secretary-Director

FROM: Committee Studying Protection of
Hobbs Fresh Water Sands

SUBJECT: Final Report of the Committee

Transmitted herewith is the completed final report of the Committee. This report contains no direct recommendations since it is the consensus of the Committee that the need for any corrective action is adequately shown in the Committee findings. In some instances this corrective action is outside of the jurisdiction of the Oil Conservation Commission. We trust that you will arrange to have these matters brought to the attention of the appropriate persons or agencies.

It was the decision of the Committee that attendance at its meetings should be restricted to representatives of the agencies and companies appointed to the Committee, and to guest speakers specifically invited to a particular meeting. Mr. E. G. Minton, Lea County Hydrologist, was the only such speaker. The need for closed meetings was indicated by the somewhat negative results observed at the general meeting held in Hobbs on July 9, 1957.

The official representatives designated by each of the agencies and companies appointed to the Committee are listed as follows:

Pan American Petroleum Corporation
C. L. Kelley, Chairman, Roswell, New Mexico
J. W. Brown, Alternate, Roswell, New Mexico

Continental Oil Company
R. L. Adams, Member, Roswell, New Mexico
F. T. Elliot, Alternate, Hobbs, New Mexico

Hobbs City Water Board
L. A. Calhoun, Member, Hobbs, New Mexico
W. G. Abbot, Alternate, Hobbs, New Mexico

New Mexico Oil Conservation Commission
R. F. Montgomery, Member, Hobbs, New Mexico
E. J. Fischer, Alternate, Hobbs, New Mexico

Samedan Oil Corporation
C. W. Putman, Member, Hobbs, New Mexico
C. E. Layhe, Alternate, Hobbs, New Mexico

Shell Oil Company
W. E. Owen, Member, Hobbs, New Mexico
R. C. Cabaniss, Alternate, Hobbs, New Mexico

State Engineer's Office
Zane Spiegel, Member, Santa Fe, New Mexico
R. L. Borton, Alternate, Roswell, New Mexico

Tidewater Oil Company
H. P. Shackelford, Member, Hobbs, New Mexico
R. N. Miller, Alternate, Hobbs, New Mexico

Other representatives of the agencies and companies appointed to the Committee attended meetings as second alternates, served as members of subcommittees, or otherwise assisted in the work of the Committee.

R. C. Lannen	Continental Oil Company
E. V. Boynton	Continental Oil Company
R. J. Francis	Continental Oil Company
Joe Anderson	Continental Oil Company
Eric Engbrecht	New Mexico Oil Conservation Commission
J. W. Runyan	New Mexico Oil Conservation Commission
J. W. Montgomery	Shell Oil Company
J. W. Meek	Pan American Petroleum Corporation

All of the Committee meetings were held in the Oil Conservation Commission Conference Room in Hobbs, New Mexico. The first meeting was held on July 19, 1957; subsequent all day meetings were held on July 25, August 1, August 8, August 15, August 22, and September 5. In addition to meetings of the Committee as a whole, three subcommittees held numerous meetings to complete their work assignments.

All of the agencies and companies appointed to the Committee had representatives present at each of the Committee meetings, with the exception of one meeting when one organization was unable to have a representative present.

By Committee decision the initial distribution of this final report is being restricted. In addition to the copies furnished to the Oil Conservation Commission, each designated member and alternate is to receive one copy. All have agreed to hold their copies confidential pending your decision as to the proper disposition of the report.

J. W. Brown
Acting Chairman

FINAL REPORT OF COMMITTEE
STUDYING PROTECTION OF HOBBS
FRESH WATER SANDS
SEPTEMBER 24, 1957

At the request of the City Commission of Hobbs, New Mexico, the New Mexico Oil Conservation Commission called a meeting of all operators in the Hobbs, Bowers, and Byers-Queen Pools on July 9, 1957, in Hobbs.

During that meeting and subsequently by Mr. A. L. Porter, Jr.'s letter dated July 10, 1957, a Committee was appointed to make a study of fresh water contamination in the Hobbs Pool area and make recommendations to the New Mexico Oil Conservation Commission, as to:

1. Any action that may be taken by the Commission in addition to what is presently being done to prevent further contamination;

2. Any corrective measures that may be employed to prevent further spread of present contamination.

The Committee consisted of representatives from the following companies and agencies:

Pan American Petroleum Corporation - Chairman
Samedan Oil Corporation
Shell Oil Company
Tidewater Oil Company
Continental Oil Company
Hobbs City Water Board
State Engineer's Office
Hobbs Commission Staff

After collecting additional information regarding water wells and contamination of water wells in the Hobbs Pool area, after giving consideration to existing information and all reports of fresh water contamination, and after obtaining advice and assistance from recognized authorities on ground water and from research organizations and from texts and reports on geology and petroleum engineering, the Committee concluded its study by making numerous findings with respect to the overall problem of fresh water contamination in the Hobbs Pool area.

I. The Physical Characteristics of the Ogallala Formation and the Movement of Water Through This Aquifer.

The Committee finds:

(1) The entire Hobbs Pool area is directly underlain by the Ogallala formation of Tertiary age.

(2) The Ogallala formation, in the Hobbs Pool area, is an effective fresh-water aquifer with a thickness of 175'-200' of which approximately 100'-150' is saturated with water.

(3) The regional dip of the Ogallala formation is approximately 15-20' per mile in a southeasterly direction.

(4) The Ogallala formation consists largely of fine-grained sand in varying stages of cementation and consolidation. The material of the upper 5-40' is often firmly cemented by calcium carbonate to form hard dense caliche which commonly underlies the land surface in the area. The basal portion of the Ogallala is often composed of coarse sand and gravel. Thin discontinuous clay lenses are often found interbedded within the sand of the Ogallala formation. The Ogallala is underlain by Red Beds.

(5) Clay lenses and thin zones of very fine sand which are relatively well-cemented occur within the Ogallala formation. These are not continuous or of great lateral extent. The Ogallala ground-water reservoir, therefore, is unconfined and acts as a unit.

(6) Water levels in the Hobbs Pool area have declined as much as 12' since 1940 due to large withdrawals and regional drought.

(7) Water level measurements made during August, 1957, show that water levels in the Hobbs Pool area stand at from 18-65' below the land surface. In many instances this level is below the base of the caliche.

(8) The pore space in the sand of the Ogallala formation above the water table would normally contain pellicular water and air.

(9) There would be some water saturation in the sand of the Ogallala formation above the water table due to capillary forces, depending upon the physical characteristics of the sand and the thickness of sand above the water table.

(10) Pressure in the sand of the Ogallala formation above the water table would be atmospheric unless affected by outside forces.

(11) The water table in the Ogallala formation has a gradient of 15' per mile in a southeasterly direction. The water is moving at 9 to 12" per day in that direction.

(12) A negative area of influence, called a cone of depression, is developed by wells pumping water from the Ogallala formation.

(13) The vertical and lateral extent of a cone of depression is dependent upon the rate of withdrawal, duration of pumping, and the lithologic characteristics of the aquifer within the cone of depression.

(14) Ground-water mounds, or positive areas of influence, can be created by injecting water into the Ogallala formation by recharge wells.

(15) The positive areas of influence around recharge wells probably would not be large and would exist only in the area of the recharge well.

(16) The introduction of a second or third phase, oil or gas, below the water table in the Ogallala formation would cause a reduction in the relative permeability in that portion of the Ogallala sand occupied by the oil-water-gas mixture.

(17) Where both oil and gas are present below the water table, relative permeability of the sand to oil and gas would be zero if the water saturation varied from about 88% to 100%. The relative permeability of the sand to oil and gas increases as water saturation decreases below about 88%. Therefore, oil and gas in the Ogallala formation would not move until water saturation is decreased to less than about 88% of the total pore space occupied by a mixture of water-oil-gas.

(18) Oil or gas introduced into the Ogallala formation would be free to move provided only that sufficient saturation by oil or gas occurred.

(19) Once a portion of the Ogallala sand is saturated by oil or gas, it would not be possible to reduce this oil or gas saturation below about 10-12% saturation by the reduction of pressure or by moving water through the sand.

(20) Any movement of oil or gas in the Ogallala formation below the water table would result in a minimum of about 12% of the oil or gas remaining trapped in the sand through which the oil or gas moved.

(21) Oil introduced into the Ogallala formation above the water table could result in the sand tending to become oil-wet thereby resulting in residual oil saturation much higher than if introduced below the water table.

(22) Gas produced with oil is soluble to some extent in the water of the Ogallala formation, depending upon the amount of gas in contact with the water and the pressure at the point of contact.

(23) Gas dissolved in the Ogallala water would have no effect upon the movement of the water unless free gas began breaking out of the water below the water table. In such a case a reduction in the relative permeability of the sand to water would result.

(24) Dissolved gas would move with the water in a south-easterly direction at a rate of approximately 9 to 12" per day.

(25) Gravitational forces would tend to move oil or free gas in the Ogallala formation upward toward the water table.

(26) A comparison of the water wells contaminated with oil and their relationship to the structure of the base of the caliche shows that these wells are located in the structural highs while water wells contaminated with gas are located both in structural highs and lows. Refer to Exhibit No. 1 which is a map of the Hobbs Pool area contoured on the base of the caliche.

(27) The structure of the base of the caliche could possibly affect the movement of oil and gas toward structural highs. Refer to Exhibit No. 1.

II. Apparent Contaminated Conditions Which Exist in the Ogallala Formation in the Hobbs Pool Area.

The Committee finds:

(1) A total of 378 water wells were located in the area. This includes temporarily abandoned and producing wells. It is believed that this represents about 80% of the total number of water wells in the Hobbs Pool area. The majority of these wells are plotted on Exhibit No. 1.

(2) Based on tests made by Committee members, 17 water wells are suspected to be contaminated by gas. This contamination is in varying degrees, from gas contamination sufficient enough to burn with a small intermittent flame, to a slight taste. The wells are as follows:

Name	Location		Degree of Contamination
Gibbins	SW SE NE	4-19-38	Slight Taste Gas
Easton	SW SE NE	4-19-38	Slight Taste Gas
Gackle	SE SE NE	4-19-38	Strong Taste Gas
Security Supply	NW NE NE	5-19-38	Slight Taste Gas
Ohio Oil	SE SE SE	32-18-38	Strong Taste Gas
Baker Tool	SW SE SW	32-18-38	Slight Taste Gas
Harwell	NW NE NE	28-18-38	Strong Taste Gas
Dowell	NE NE NE	28-18-38	Will Burn
Humble Oil	SW NE SW	30-18-38	Moderate Taste Gas
Bensing	NE NW NE	30-18-38	Very Slight Taste Gas

Name	Location	Degree of Contamination
Green	NE NE NE 30-18-38	Very Strong Taste Gas
Mertaugh	NW NE NE 30-18-38	Old Well Would Burn
Moon	NW NE NE 30-18-38	Moderate Taste Gas
Moon	SW NE NE 30-18-38	Moderate Taste Gas
Goins	NE SE NE 30-18-38	Strong Taste Gas
Ellison L-2230	SW SE NE 30-18-38	Moderate Taste Gas
Pacific Pump	NW NE NE 5-19-38	Slight Taste Gas

One of the above water wells (Ohio) is reported to have been contaminated with gas since 1930 when the nearest oil wells were more than a mile away,

The greatest degree of gas contamination was found in the Dowell (NE NE NE 28-18-38) water well. This well proved to be contaminated to such an extent that small sporadic flames of gas were observed when a lighted match was held over an opened water faucet.

(3) Of the 378 known water wells, 9 are known to have oil standing in the well bore and 3 are reported to be oil contaminated. The wells known to have oil in the well bore are as follows:

Name		Location	Degree of Contamination
Amerada Pet.		C N/2 29-18-38	19.4 feet
Ellison L-2230	# 1	SW NE NE 30-18-38	6.3 feet
"	# 2	SE NW NE 30-18-38	0.5 feet
"	# 3	SE SW NE 30-18-38	0.5 feet
"	# 4	SE SW NE 30-18-38	0.8 feet
"	# 5	NE SW NE 30-18-38	0.6 feet
"	#11	SE NW NE 30-18-38	Trace Oil
"	#12	SE SW NE 30-18-38	2.4 feet
"	#13	SE SW NE 30-18-38	3.8 feet

In the case of the Ellison wells, the owner reported the presence of oil to the New Mexico Oil Conservation Commission and subsequently Commission personnel confirmed the presence of oil in the degree indicated above.

The Amerada well in which 19.4 feet of oil was found was not being produced when first inspected by Committee members. Subsequently, pumping equipment was installed and the 19.4 feet of oil was recovered. As of this date the well is pumping water and no new oil has entered the well bore. Information reported to the Committee indicates the possibility that the oil entered the well bore from the surface and not from the fresh water aquifer.

The wells reported to be contaminated by oil are located as follows:

Name	Location	Degree of Contamination
Jackson	NE NW NW 20-18-38	Unknown
Phillips	NE NW NW 4-19-38	Unknown
Pacific Pump	NW NE NE 5-19-38	Trace

The Jackson well is reported to have oil in the well bore; however, it is the opinion of this Committee that it probably is lubricating oil from the water well pump.

(4) One well is reported to be contaminated by sewage. It is located as follows:

Name	Location	Degree of Contamination
Phillips #6	SE NE NW 4-19-38	Unknown

(5) Forty-two wells were sampled. These samples were analyzed for chloride and sulfide content. Among these 42 water wells

are all wells that were suspected to be contaminated, the remainder being water wells near these wells. The sulfide determination did not indicate any contamination although some of the wells are known to be gas contaminated. With samples collected and analyzed by different methods, the presence of gas contamination might have been detected. A list of the wells and the results of the analysis are shown on Exhibit No. 2. Exhibit No. 3 shows the analysis of a sample collected from one of the Ellison wells during 1956 by Mr. Charles Reider, then a member of the Commission Staff.

(6) In response to the Committee's request, water analyses on 9 water wells were received from oil operators that operate water wells in the Hobbs Pool area. These analyses are included as Exhibit No. 4.

III. Feasibility of Eliminating or Removing The Apparent Contamination.

The Committee finds that there are no practical nor feasible means, now known, by which the apparent oil and gas contamination can be completely removed from the Ogallala formation for the following reasons:

(1) Evidence available gives no clear indication of the exact extent of the apparent contamination.

(2) Oil and gas contamination can exist at various depths with the same or other depths in the same area showing little or no contamination.

(3) More shallow wells evidence oil or gas contamination than deeper wells, thereby tending to confirm that oil or gas entering the Ogallala will migrate upward toward the water table.

(4) To remove oil or gas from the Ogallala, it would be necessary to flush the contaminated portion of the sand with water, draw the oil or gas into a producing water well, permit the contamination to gradually migrate or disperse, or use a combination of these methods.

(5) The combination of high withdrawal rate water wells in an area of apparent contamination encircled by recharge wells would tend to create an extended area of influence. However, the expected results in moving or flushing oil or gas would not justify the large volume of water necessary to be handled to create such an extended area of positive and negative influence.

(6) In order to decontaminate an area of oil contamination, it would be necessary to essentially remove all of the oil to prevent any further show of contamination. While it is theoretically possible to flush out the oil down to an immobile residual saturation, in practice this would be impossible.

(7) An area of gas contamination could probably be decontaminated by the use of combined high rate withdrawal and recharge wells. Even so, it would be necessary to remove gas produced with water before injecting the water in the recharge wells. Under these conditions it would be more practical to simply remove the gas from water produced for domestic purposes without a recharge program.

(8) The general and areal movement of water in the Ogallala formation in a southeasterly direction will tend to migrate or disperse the dissolved gas away from an area of apparent contamination.

IV. The Possibility of Contamination of The Hobbs City Water Supply By Migration from the Area of Apparent Contamination.

The Committee finds:

(1) Certain of the City of Hobbs water wells are located in the path of ground-water movement from the contaminated area in NE/4 30-18-38.

(2) Existing oil contamination is expected to be immobilized within the aquifer, especially in the relatively "dry" zone at the top of the aquifer, before it reaches the city wells. Further, as the city wells are completed at or near the base of the aquifer, the possibility of oil contamination has been greatly reduced.

(3) Since gas in solution may travel a great distance, certain city wells may be subject to some gas contamination in the future.

(4) Observation wells should be established and maintained between the contaminated area and the city wells.

The Hobbs City Water Board advised that the City had purchased 6 sections of water rights located 3 or 4 miles to the north and northwest of the Hobbs Pool area. These water rights are considered to be outside of any possible contamination from the Hobbs Pool area.

V. Possible Contamination of the Fresh Water in the Ogallala Formation by Sources Other Than Oil or Gas Wells Such as Sewage, Waste Oil and Acid, Open Storm Sewer Ditches, Gas Plant Waste Water, Refuse, and Oil and Oilfield Brines Held in Earthen Pits.

The Committee finds:

(1) One water well was reported to be contaminated by sewage.

(2) It was found that many service companies operating in the Hobbs Pool area are dumping waste material in earthen pits at random, thus creating a source of possible contamination. The City of Hobbs maintains a supervised pit east of the city wherein such waste can be disposed, for a nominal fee, thus eliminating this source of possible contamination to the Hobbs fresh water supply.

(3) One large storm sewer ditch exists in the southern part of the Hobbs Pool area. The depth of this ditch is such that if it does not actually penetrate the aquifer it is very close to doing so, and is considered a hazard to the underlying fresh water. Although samples of water collected from the ditch by Committee members during August, 1957, did not indicate severe contamination, the open ditch is subject to accidental severe contamination from a number of sources at any time. The analyses of two samples of water collected from the ditch are shown in Exhibit No. 5.

(4) Analyses indicate that water coming directly from the Phillips Gasoline Plant is not a potential source of contamination (196 PPM CL) but that the lake in which it accumulates is high in chlorides (3450 PPM CL). It is possible that oilfield brines are also introduced into this lake. Disposal of such brines by other means may cause the lake to become gradually lower in chlorides. See Exhibit No. 6 for more complete analyses of plant waste water.

(5) No accumulation of refuse was found that could be considered as a source of permanent contamination to the fresh water sands.

(6) It was found that numerous sources of possible contamination exist in the form of pipeline drips, tank battery burn pits, and salt water disposal pits. The latter source is expected to be eliminated in the near future after installation of proposed salt water disposal systems. Holding or disposing of oil in earthen pits is considered a possible source of contamination to the fresh water sands. This possible source of contamination can be controlled by NMOCC under existing rules and regulations.

VI. Possible Need For Rules and Regulations Governing the Drilling, Completion, and Abandonment of Water Wells in the Hobbs Pool Area.

The Committee finds:

(1) There are no rules nor regulations governing the drilling, completion, and abandonment of water wells in the Hobbs Pool area.

(2) There is a definite need for rules and regulations governing water wells to prevent further contamination of water in the Ogallala formation and to minimize the risks of producing contaminants that are now in the aquifer.

(3) Rules and regulations should, in part, govern the location, depth, casing and cementing programs, surface and subsurface completion procedure, inspection, and abandonment of water wells.

(4) There is also a need for rules and regulations governing the drilling and abandonment of any boring or excavation that penetrates the fresh water sands.

VII. Establishment of a Water Well Observation Program To Detect Any New Contamination and to Observe the Movement, if any, of Contamination from the Area Northwest of Hobbs.

The Committee finds:

(1) At least 42 water wells, and probably more, are available for observation purposes in the Hobbs Pool area. Exhibit No. 7 is a tabulation listing these wells according to their location and accessibility to water level measurements and to water sample collection.

(2) As much information as possible should be collected regarding the potential observation wells. Such information should ideally include the driller's log, date drilled, depth, casing program, location of any perforations, and an accurate description of the well location.

(3) An effective network of observation wells can be established by evaluating the potential observation wells with regard to their location within the Hobbs Pool area and to information available regarding their completion.

VIII. The Possibility of, and Methods for, Obtaining Potable Water From the Areas of Apparent Contamination.

The Committee finds:

(1) It should be possible to obtain potable water at almost any location in the Hobbs Pool area provided that proper depth is penetrated, proper methods used to complete the water well, and reasonable caution is used in locating the well with respect to nearby possible sources of contamination.

(2) Since most contamination by oil and gas is evidenced in shallow wells, and since oil and gas will tend to migrate upward toward the water table, it would be advisable to complete water wells as deep as possible in the Ogallala, cement casing to the completion depth, seal around the top of the casing at the surface, and have the casing extend above the natural ground level.

(3) Since some evidence indicates that various depths may be contaminated, casing should be cemented so that shallower intervals can be tested if contamination is found in deeper intervals.

(4) If a water well in the Hobbs Pool area evidences contamination by oil and/or gas, this water can be made potable by removing the oil at the surface by a simple skimming or settling process. Gas can be removed by aeration. If gas contamination is severe, it might be necessary to flow the water over several cascade type trays with a layer of activated charcoal in the bottom of each. This charcoal should not require frequent replacement. If a disagreeable odor or taste of hydrogen sulfide remains a few PPM of chlorine added to the water should remove the odor and taste. Water from gas contaminated wells produced directly into and held in pressure tanks will retain gas in solution to be released when water is withdrawn.

IX. Causes of Oil and Gas Well Casing Deterioration.

The Committee finds:

Oil Conservation Commission records indicate that to this date defective casing has been repaired at 63 Hobbs Pool wells. There are numerous causes of this deterioration of casing in oil and gas wells. Some of these causes are listed as follows:

(1) Corrosive conditions are known to exist in the Hobbs Pool which can cause leaks in any casing string subjected to these conditions.

(2) Severe internal casing corrosion can result from the presence of hydrogen sulfide contained in gas produced with the Hobbs crude oil.

(3) External or internal casing corrosion can result from electrolytic action, action of sulfate reducing bacteria, or galvanic action.

(4) Stress concentrations resulting from even mild corrosion can cause failures of the well casing.

(5) Wear between the tubing and casing in pumping wells as is caused by the movement of tubing during the pumping cycle can cause casing leaks.

(6) Pressure in formations behind the casing can cause collapse of the casing.

(7) Casing will be subjected to continued high pressure from the producing formation throughout the foreseeable future. Hobbs Pool bottom hole pressures averaged 986 psig in 1954 and 941 psig in 1956, indicating very gradual decline. With continued high pressure on the casing and considering the age of the remaining Hobbs Pool wells where casing has not been repaired, the instance of casing leaks may be expected to increase during the 20-30 years remaining life of the pool.

X. Methods of Preventing or Minimizing Oil and Gas Well Casing Deterioration.

The Committee finds that there are numerous means and materials available to the oil industry by which oil and gas well casing deterioration can be minimized or eliminated. Some of these means and materials are listed as follows:

(1) Coatings applied to the interior and/or exterior of casing.

(2) Numerous and various chemicals injected into oil and gas wells to minimize corrosive attack.

(3) Induced electrical current or elimination of electrical current to minimize electrolytic corrosive attack.

(4) Spotting chemically treated mud outside of casing or circulating cement outside of casing to prevent corrosive attack by sulfate reducing bacteria.

(5) Setting packers in the casing in or above the producing formation and filling the annular space above the packer with non-corrosive liquid.

(6) Circulating cement between strings of casing.

(7) Using anchors or guides to prevent tubing-on-casing wear.

XI. Methods of Determining the Existence of Defective Casing.

The Committee finds that there are numerous methods available by which defective casing can be detected. Some are listed as follows:

(1) Internal caliper surveys to gauge the extent, depth and location of corrosive attack on the internal string of casing.

(2) Temperature surveys to locate temperature anomalies which are possible indications of casing leaks.

(3) Hydraulic pressure tests using packers to determine if a leak exists and to locate the leak.

(4) Potential profile surveys to determine the probability of external casing corrosion and thereby the likelihood of casing leaks.

(5) Bradenhead pressure surveys to determine by pressure observations on the several casing strings the possible existence of casing leaks.

(6) Chemical analysis of produced water as an indication of a casing leak through the presence of foreign water.

(7) Lack of normal clearance between tubing and casing as an indication of possible casing collapse or of parted casing.

(8) Any observed abnormal performance of the well with respect to bottom hole pressure, gas-oil ratio, water production, or oil production.

(9) Unusual performance or presence of foreign liquid or gas in shallower oil, gas, or water wells in the vicinity.

(10) Electical logs, permeability surveys, and radioactive tracer surveys to locate leaks or parted casing.

The method or combination of methods best adapted for any particular well will depend upon the conditions which exist at each individual well. The bradenhead pressure survey is least expensive, quicker, and very effective under proper conditions.

XII. Methods of Repairing Oil and Gas Well Casing Found to be Defective.

The Committee finds that there are numerous means by which casing can be effectively repaired. The method to be used will depend upon the conditions which exist at the individual well. Some of these methods are as follows:

(1) Recover the entire casing string found to be defective and run and cement an entirely new casing string.

(2) Run and cement a full string of smaller casing inside the defective casing.

(3) Recover that portion of the casing string found to be defective, replace casing, and re-run casing string using casing bowl overshot or other method to tie back on to and seal with casing left in the hole.

(4) Run and cement a liner covering that portion of the casing found to be defective.

(5) Circulate cement to the surface between casing strings during completion or repair operations.

(6) Squeeze cement through casing leaks and obtain a solid final build up squeeze pressure.

XIII. Programming of Bradenhead Pressure Tests on Oil and Gas Wells In the Hobbs Pool Area.

The Committee finds:

(1) Bradenhead pressure surveys, where the several casing strings are open for pressure measurement, should indicate whether or not a casing leak exists and therefore the possibility of fresh water sand contamination at the well being tested.

(2) Bradenhead pressure surveys conducted annually are too infrequent to provide adequate warning of possible contamination of the fresh water sand.

(3) Bradenhead pressure surveys conducted quarterly should provide more adequate warning of possible contamination of the fresh water sand.

(4) It should be necessary for the NMOCC to witness only one of the quarterly bradenhead pressure surveys each year.

(5) The operators of the individual wells should conduct the other three surveys, recording and saving the test results, and filing a certification with NMOCC that all wells operated by that operator have been tested and whether or not leaks were found.

(6) All producing oil and gas wells, abandoned wells, temporarily abandoned wells, and salt water disposal wells, should be scheduled for the quarterly bradenhead surveys.

(7) There are a number of old oil wells in the Hobbs Pool area with the intermediate casing set on open surface casing with clamps, thereby preventing pressure observation. Such open surface casing is a possible source of fresh water sand contamination since the top of the surface casing is in the bottom of cellars. In order to obtain valuable information during bradenhead pressure surveys and to eliminate one possible source of contamination, the top of the annular space between the clamped intermediate casing and the surface casing should be sealed and vented to the surface.

EXHIBIT NO. 2

ANALYSIS OF 42 SELECTED WATER WELLS IN HOBBS POOL AREA

Analysis was to include only sulfide and chloride content. However no sulfides were identified.

Name and Source	Location		Date Obtained	Chloride mg/l
BLACKBURN, Tap at well	SW SE SW	32-18-38	8-14-57	56
CONTINENTAL, Abd. Hole	NE SW	13-18-37	8-14-57	72
HOBBS ICE CO.	NW SE SW	34-18-38	8-15-57	112
SUN OIL CO., Tap at Kuth's	SW NE NE	5-19-38	8-14-57	96
OHIO OIL CO. NO. 2, Tap by Storage Tank	NW SE SE	32-18-38	8-14-57	48
YATES SHELL STATE, Abd. Well	NW SE SE	23-18-37	8-14-57	80
HOBBS IRON & METAL, Tap	NW SE NW	3-19-38	8-14-57	80
ROBERT OWINGS, Tap	NW NE NE	31-18-38	8-13-57	80
BRIANT, From well	NE SW NE	30-18-38	8-13-57	56
R. D. MOOR, Well	NE NE	30-18-38	8-13-57	72
RYBANT, Tap	NE NE NE	30-18-38	8-13-57	48
HOBBS GAS CO., Tap	NW NE NE	28-18-38	8-13-57	112
C. MYERS, Tap	SE SE NE	4-19-38	8-14-57	48
SIMON, Tap	SE SE SE	32-19-38	8-14-57	64
PHILLIPS NO. 3, Well Tap	NW NE NW	4-19-38	8-14-57	104
PHILLIPS NO. 2, Pump Tap	NW NE NW	4-19-38	8-14-57	88
BROWN WELL SERVICE, Tap	NE NW NE	5-19-18	8-14-57	112
Water from Phillips Gasoline Plant from ditch to W-most pond	NW SE NW	4-19-38	8-12-57	749
PHILLIPS NO. 6, Tap at Well	NW NE NW	4-19-38	8-13-57	327
HUMBLE OIL, Tap at Well	SW NE SE	30-18-38	8-13-57	72
JACKSON, Sample from earth ditch 10 yds. S. of pump	NE NW NW	20-19-38	8-13-57	494
STEELE, Tap sample	SE NE SW	4-19-38	8-12-57	96
CAZEE, Tap	SW NE NE	30-18-38	8-13-57	64
PACIFIC PUMPS, Tap Sample	NW NE NE	5-19-38	8-12-57	64
SECURITY, Tap Sample	NE NW NE	5-19-38	8-12-57	80
H. EASTON, Tap Sample (S.House)	SW SE NE	4-19-38	8-14-57	64
GIBBONS, Tap Sample (N.House)	SW SE NE	4-19-38	8-12-57	40
BAKER TOOL, Tap Sample	SE SE SW	32-18-38	8-12-57	40
OHIO OIL CO., Tap Sample	SE SE SE	32-18-38	8-12-57	128
E. W. BENSING, Tap Sample	NE NW NE	30-18-38	8-13-57	80
ROBERT BENSING, Tap Sample	NE NW NE	30-18-38	8-13-57	80
JESS HARWEIL	NW NE NE	28-18-38	8-13-57	104
DOWELL, INC., Tap Sample	NE NE NE	28-18-38	8-13-57	56
MAYFIELD, Tap Sample	NE SE NE	30-18-38	8-13-57	72
GOINS, Tap Sample	SW NE NE	30-18-38	8-13-57	343
W. E. MOON, Tap Sample	NW NE NE	30-18-38	8-13-57	104
MERTAUGH, Tap at new well	NW NE NE	30-18-38	8-13-57	56
BLAKLEY, Tap	NE SE NE	30-18-38	8-13-57	80
L. DEVERS, Tap Sample	SW SE NE	30-18-38	8-13-57	64
P. L. RIEVE, Tap Sample	SW SE NE	30-18-38	8-13-57	104
COX, Well Sample	NE SE NE	30-18-38	8-13-57	48
*DOWELL, Gas in line and spurting as sample was taken	NE SE NE	30-18-38	8-22-57	80

*Contained sulfide present as ferrous sulfide in trace quantity. No free hydrogen sulfide was found in this sample nor in any of the other samples listed above.

With samples collected and analyzed by different methods, the presence of gas contamination might have been detected.

EXHIBIT NO. 3

ANALYSIS OF SAMPLE
FROM ELLISON WELL
AUGUST, 1956

Air and Water	95.37%
Methane	2.30%
Ethane	0.15%
Propane	0.49%
CO_2	1.49%
Butane (plus)	0.14%
H_2S	0.06%

Analysis made by Permian Basin Pipeline using Mass Spectrometer. Sample collected by Mr. Charles Reider, then a member of the Commission Staff.

EXHIBIT NO. 4

ANALYSIS OF WATER IN PARTS
PER MILLION FROM WATER WELLS
IN HOBBS POOL AREA

NAME	LOCATION		DATE	Na	Ca	Mg	SO_4	Cl	CO_3	HCO_3
Pan American	NE SW NW	33-18-38	9-1950	35	74	18	77	50	0	226
			7-1951	54	57	16	82	53	0	202
			7-1952	32	80	21	82	57	0	232
			8-1957	9	103	21	89	60	12	201
Pan American	SE NE SE	4-19-38	9-1950	51	123	25	56	181	0	256
			7-1951	45	128	29	53	195	0	256
			7-1952	56	137	27	30	227	0	268
			8-1953	32	139	25	72	163	0	262
			6-1956	63	80	12	63	78	0	256
Pan American	NW NE NE	9-19-38	10-1950	67	89	18	109	82	0	262
			7-1951	52	79	21	93	67	0	250
			7-1952	52	86	21	96	71	0	262
			8-1953	31	124	19	114	85	12	238
			8-1955	58	80	17	103	78	0	218
			5-1956	66	86	17	113	71	0	256
Humble Federal Bowers No. 3			7-1957		190	46	22	66		
Sun Oil Co. McKinley No. 1	NE NE	5-19-38	11-1953	56	95	15	80	120	0	205
McKinley No. 2	NE NE	5-19-38	11-1953	47	81	14	98	53	0	227
Gulf Oil Corp. West Grimes			9-1952	36	70	7	48	31	0	229
			7-1953	50	59	7	44	33	0	235
			7-1954	50	62	5	45	32	0	235
			7-1955	46	65	6	45	31	0	238
			7-1956	65	96	19	119	92	0	250
East Grimes			7-1953	78	93	12	130	82	0	244
			7-1954	60	92	12	102	74	0	244
			7-1955	53	94	14	99	74	0	244

EXHIBIT NO. 5

ANALYSIS OF WATER SAMPLES
FROM LARGE STORM SEWER DITCH

The chloride and sulfide content of the two water samples, each designated "open sewer, Hobbs, New Mexico", submitted August 21, 1957, was negligible. Both samples gave a negative Endo Agar Test, indicating they were free of fecal contamination. They contained organic matter, both dissolved and in suspension, and considerable dissolved iron. The sodium, potassium, and calcium content was 12, 4, 24 and 9, 4, 28 parts per million, respectively.

EXHIBIT NO. 6

ANALYSIS OF WASTE WATER

Phillips Gasoline Plant

Sample No. 1 - Waste water direct from plant
Date Collected - 8/6/57

Phenolphthalein end point = 550 ppm
Methyl orange (M-orange) = 620 ppm
Total hardness = 0
Chlorides = 196 ppm
Ph = 11.55
Orthophosphate = 45 ppm
Hydrogen sulfide = 0 ppm

Not considered potable but is soft. Will not scale.

Sample No. 2 - Waste water from large pit behind Phillips Plant
Date Collected - 8/6/57
Algae growth moderate

Phenolphthalein end point = 0 ppm
Methyl orange (M-orange) = 196 ppm
Total hardness = 1700 ppm
Chlorides = 3450 ppm
Ph = 7.55
Orthophosphate = 20 ppm
Hydrogen sulfide = 0 - 1.7 ppm

Not considered potable due to hardness and chlorides.

EXHIBIT NO. 7

WATER WELLS IN THE HOBBS POOL AREA WHICH COULD BE UTILIZED FOR OBSERVATION PURPOSES

Well Location	Accessibility of Well: For Measurement Of Water Level	For Collection of Water Sample: From Tap or Discharge Pipe	For Collection of Water Sample: By Thief or Trip Sampler	Present Use	Remarks
NE SW 13-18-37	x		x	Abandoned	Sampled 8/14/57
NW SW SE 13-18-37	x	x		Stock	Windmill
NW SE SE 23-18-37	x		x	Abandoned	Sampled 8/14/57
SE SE SE 24-18-37		x		Domestic	Windmill
SW NE SE 17-18-38	?	?	?		Not checked
SE SE SW 18	?	?	?		Not checked
SW SW SW 19	x		x	Abandoned	
NE NW NW 20		x		Irrigation	Sampled 8/13/57
SE/4 21	?	?	?		Many wells. Not checked
NW NW 27	?	?	?	Standby	City Well #13
SW SW SE 27	?	?		Municipal	City Well
N/2 28	?	?	?		Many wells. Not checked.
NW SW NE 29	x		x	Abandoned	Contained oil 8/14/57
SW NE SE 29	x		x	Abandoned	N° most of two wells

Well Location	Accessibility of Well: For Measurement Of Water Level	For Collection of Water Sample: From Tap or Discharge Pipe	For Collection of Water Sample: By Thief or Trip Sampler	Present Use	Remarks
SW NE NW 30	x	x		Domestic	
NE/4 30	x	x	x	Domestic, Irrig.	Many Wells, Contaminated area.
NE NE SW 30	x		x	Abandoned	
SW NE SW 30-18-38	x		x	Abandoned	
SE SE SW 30	x	x		Domestic	Windmill
SW NE SE 30	?	x		Domestic	Three wells present. Sample from contaminated well.
NE NE SW 31	x		x		
SE SW SE 31	x	?			Not checked
NE NE NE 32	x		x	Abandoned	
NE SW NE 32	x		x	Abandoned	Plugged with timber
NE NE NE 32	x		x	Abandoned	Plugged with bull plug
S/2 32	?		?		Many wells. Not checked.
NE/4 33	?	?			Many wells. Not checked.
SW SE SW 33	x			Domestic	

	Accessibility of Well				
		For Collection of Water Sample			
Well Location	For Measurement Of Water Level	From Tap or Discharge Pipe	By Thief or Trip Sampler	Present Use	Remarks
NE SW SW 34	X		x	Domestic	
SW SW SW 34	x		x	Abandoned	
NW SE SW 34		x			
N/2 34	?	?			Many wells. Not checked
S/2 3-19-38	?	?			Many wells. Not checked
N/2 4	?	?			Many wells. Not checked
SW SW SW 4-19-38	x		x	Abandoned	
SE NE SE 4	?	x		Domestic	Sampled 8/12/57
N/2 5	X	X			Many wells. Not checked
NE NE SE 6	x		x	Abandoned	Timber plug
SW NE NE 6	?	x		Stock	Windmill
NE/4 9-19-38	?	?			4 wells here. None checked.
SW NE SE 10	?	x		Domestic	Windmill
SE SW SE 10	x		x	Abandoned	

ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
HOBBS, NEW MEXICO

WATER ANALYSIS

Well Ownership: WESTERN MUSIC (George New) Well No. ______

Land Status: State ____ Federal ____ Fee ____

Well Location: Unit Letter ____, Section ____, T____S, R____E

Hobbs Pool Area (1313 South Grimes, Hobbs, NM (Box 580)

Type Well: domestic water well Depth ______ feet.

Well Use: ______

Sample Number: ______ Date Taken: 2-5-81

Taken By: Otto W. Wink

Specific Conductance: ______ m/℧

Total dissolved Solids: ______ PPM.

Chlorides: 255.6 PPM.

Sulfates: ______ PPM.

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

Sulfides: ☐ None ☐ Low ☐ Medium ☐ High

______ : ______

Date Analyzed: 2-6-81 By: [signature]
Oil Conservation Division

REMARKS:

25 ml 142 x 1.8 = 255.6

S. Hobbs Unit Area

Martin Water Laboratories, Inc.

WATER CONSULTANTS SINCE 1953

Martin Water Laboratories, Inc.

P. O. BOX 1468
MONAHANS, TEXAS 79756
PHONE 943-3234 OR 563-1040

709 W. INDIANA
MIDLAND, TEXAS 79701
PHONE 683-4521

RESULT OF WATER ANALYSES

LABORATORY NO. 880280

TO: Mr. S. J. Okerson
P.O. Box 68, Hobbs, New Mexico

SAMPLE RECEIVED 8-26-80

RESULTS REPORTED 8-28-80

COMPANY Amoco Production Company LEASE South Hobbs Unit

FIELD OR POOL South Hobbs

SECTION ___ BLOCK ___ SURVEY ___ COUNTY Lea STATE New Mexico

SOURCE OF SAMPLE AND DATE TAKEN:

NO. 1 Raw water - taken from Hobbs Sub-District Office water well.

NO. 2 Raw water - taken from Mr. C. D. Cline's water well. } both located across 500'

NO. 3 Raw water - taken from Mr. C. V. Myers' water well. } South of South Hobbs Unit #34

NO. 4 and Byers "B" Well #35

REMARKS:

CHEMICAL AND PHYSICAL PROPERTIES	NO. 1	NO. 2	NO. 3	NO. 4
Specific Gravity at 60° F.	1.0013	1.0012	1.0010	
pH When Sampled				
pH When Received	7.37	7.20	7.39	
Bicarbonate as HCO_3	254	351	298	
Supersaturation as $CaCO_3$				
Undersaturation as $CaCO_3$				
Total Hardness as $CaCO_3$	252	320	330	
Calcium as Ca	76	110	112	
Magnesium as Mg	15	11	12	
Sodium and/or Potassium	29	39	33	
Sulfate as SO_4	50	30	63	
Chloride as Cl	40	61	65	
Iron as Fe	*8.7	0.11	0.11	
Barium as Ba				
Turbidity, Electric				
Color as Pt				
Total Solids, Calculated	464	602	583	
Temperature °F.				
Carbon Dioxide, Calculated				
Dissolved Oxygen, Winkler				
Hydrogen Sulfide	0.0	0.0	0.0	
Resistivity, ohms/m at 77° F.	19.00	15.00	15.00	
Suspended Oil				
Filtrable Solids as mg/l				
Volume Filtered, ml				

Results Reported As Milligrams Per Liter

Additional Determinations And Remarks * Sample submitted in metal container.

The undersigned certifies the above to be true and correct to the best of his knowledge and belief.

Form No. 3

By ______

Waylan C. Martin, M. A.

BOX 1468
, TEXAS 79756
.34 OR 563-1040

Martin Water Laboratories, Inc.

WATER CONSULTANTS SINCE 1953

BACTERIAL AND CHEMICAL ANALYSES

709 W. INDIANA
MIDLAND, TEXAS 79701
PHONE 683-4521

August 28, 1980

Mr. S. J. Okerson
Amoco Production Company
P. O. Box 68
Hobbs, NM 88240

Subject: Recommendations relative to analysis #880280 (8-28-80) - South Hobbs Unit.

Dear Mr. Okerson:

The determinations performed above reveal no evidence of any contamination of any of these water wells. The mild changes in the different levels of salts and the total salts are considered common to the Ogallala aquifer from well to well. Therefore, we would conclude with confidence that only normal fluctuations are occurring between these waters, clearly indicating no contamination that would influence any of the salts or characteristics in these waters.

Yours very truly,

Waylan C. Martin

WCM/md

1957

EXHIBIT NO. 2

ANALYSIS OF 42 SELECTED WATER WELLS IN HOBBS POOL AREA

Analysis was to include only sulfide and chloride content. However no sulfides were identified.

Name and Source	Location		Date Obtained	Chloride mg/l
BLACKBURN, Tap at well	SW SE SW	32-18-38	8-14-57	56
CONTINENTAL, Abd. Hole	NE SW	13-18-37	8-14-57	72
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SUN OIL CO., Tap at Kuth's	SW NE NE	5-19-38	8-14-57	96
OHIO OIL CO. NO. 2, Tap by Storage Tank	NW SE SE	32-18-38	8-14-57	48
YATES SHELL STATE, Abd. Well	NW SE SE	23-18-37	8-14-57	80
HOBBS IRON & METAL, Tap	NW SE NW	3-19-38	8-14-57	80
ROBERT OWINGS, Tap	NW NE NE	31-18-38	8-13-57	80
BRIANT, From well	NE SW NE	30-18-38	8-13-57	56
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C. MYERS, Tap	SE SE NE	4-19-38	8-14-57	48
SIMON, Tap	SE SE SE	32-19-38	8-14-57	64
PHILLIPS NO. 3, Well Tap	NW NE NW	4-19-38	8-14-57	104
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PACIFIC PUMPS, Tap Sample	NW NE NE	5-19-38	8-12-57	64
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P. L. RIEVE, Tap Sample	SW SE NE	30-18-38	8-13-57	104
COX, Well Sample	NE SE NE	30-18-38	8-13-57	48
*DOWELL, Gas in line and spurting as sample was taken	NE SE NE	30-18-38	8-22-57	80

*Contained sulfide present as ferrous sulfide in trace quantity. No free hydrogen sulfide was found in this sample nor in any of the other samples listed above.

With samples collected and analyzed by different methods, the presence of gas contamination might have been detected.

Hobbs Pool Area

Domestic Water wells sampled in Sec 20, T18S, R38E on 3-6-84

#1 -- Gearhart -- 25 ml (3.8 x 142 = 539.6 ppm Chlorides)

#2 -- Brakes & Wheels - 25 ml (3.7 x 142 = 525.4 ppm chlorides)

** #3 -- GMA Inc. - 25 ml (3.9 x 142 - 553.8 ppm chlorides)

#4 -- Western - 25 ml (3.4 x 142 = 482.8 ppm chlorides)

** has water softener (317 West County Road)

32-1 (Rev. 3/54) REFERENCE

SHELL OIL COMPANY

DATE AUGUST 27, 1957

TO HOBBS DIVISION - PRODUCTION MANAGER

FROM G. H. LAIR - PRODUCTION LABORATORY - MIDLAND AREA

SUBJECT WATER ANALYSIS

The following tabulation shows the results of the testing done on fresh water samples from the Hobbs area for the New Mexico Oil and Gas Conservation Commission:

Sample No.	Well and Source		Date Obtained	Chloride mg/1
1	Blackburn, Tap at Well	18.38.32.343	8-14-57	56
2	Continental, Abd. hole	18.37.13.320	8-14-57	72
3	Hobbs Ice Co.	18.38.34.341	8-15-57	112
4	Sun Oil Co., Tap at Kuth's	19.38.5.223	8-14-57	96
5	Ohio Oil Co. No. 2, Tap by Storage Tank	18.38.32.441	8-14-57	48
6	Yates-Shell State, Abd. well	18.37.23.441	8-14-57	80
7	Hobbs Iron & Metal, Tap	19.38. 3.131	8-14-57	80
8	Robert Owings, Tap	18.38.30.2212	8-13-57	80
9	Briant, from well	18.38.30.223	8-13-57	56
10	R. D. Moor, well	18.38.30.220	8-13-57	72
11	Rybant, Tap	18.38.30.2224	8-13-57	48
12	Hobbs Gas Co., Tap	18.38.28.221	8-13-57	112
13	C. Myers, Tap	19.38. 4.244	8-14-57	48
14	Simon, Tap at well	19.38.32.444	8-14-57	64
15	Phillips No. 3, Well tap	19.38. 4.121	8-14-57	104
16	Phillips No. 2, Pump tap	19.38. 4.121	8-14-57	88
17	Brown Well Service, Tap	19.18. 5.212	8-14-57	112
18	Water from Phillips Gasoline Plant from ditch to W-most pond	19.38. 4.141	8-12-57	<749
19	Phillips No. 6, Tap on well	19.38. 4.122	8-13-57	327
20	Humble Oil, Tap at well	18.38.30.423	8-13-57	72
21	Jackson, Sample from earth ditch 10 yds S. of pump	19.38.20.112	8-13-57	494
22	Steele, Tap sample	19.38. 4.424	8-12-57	96
23	Cazee, Tap	18.38.30.223	8-13-57	64
24	Pacific Pumps, Tap sample	19.38. 5.221	8-12-57	64
25	Security, Tap sample	19.38. 5.212	8-12-57	80
26	H. Easton, Tap sample	19.38. 4.243 (S. House)	8-14-57	64
27	Gibbons, Tap sample	19.38. 4.243 (N. House)	8-12-57	40
28	Baker Tool, Tap sample	18.38.32.344	8-12-57	40
29	Ohio Oil Co., Tap sample	18.38.32.444	8-12-57	128
30	E. W. Bensimg, Tap sample	18.38.30.2122	8-13-57	80

Sample No.	Well and Source		Date Obtained	Chloride mg/1
31	Robert Bensing, Tap sample	18.38.30.2122	8-13-57	80
32	Jess Harwell	18.38.28.221	8-13-57	104
33	Dowell, Inc., Tap sample	18.38.28.222	8-13-57	56
34	Mayfield, Tap sample	18.38.30.242	8-13-57	72
35	Goins, Tap sample	18.38.30.223	8-13-57	343
36	W. E. Moon, Tap sample	18.38.30.221	8-13-57	104
37	Mertaugh, Tap at new well	18.38.30.221	8-13-57	56
38	Blakley, Tap	18.38.30.242	8-13-57	80
39	L. Devers, Tap sample	18.38.30.2434	8-13-57	64
40	P. L. Rieve, Tap sample	18.38.30.2434	8-13-57	104
41	Cox, Well sample	18.38.30.2424	8-13-57	48
42	Dowell. Gas in line and spurting as sample was taken	18.38.30.2424	8-22-57	80

Sample No. 42 contained Sulfide present as Ferrous Sulfide in trace quantity. No free Hydrogen Sulfide was present.

G. H. Lair

G. H. Lair

GHL:HB

PETROLEUM AND ITS PRODUCTS

GULF OIL CORPORATION

P. O. Box 2167
Hobbs, New Mexico

FORT WORTH
PRODUCTION DIVISION

HOBBS OCC
1957 AUG 27 AM 8 22

August 21, 1957

Mr. R. F. Montgomery
Oil Conservation Commission
P. O. Box 2045
Hobbs, New Mexico

Dear Mr. Montgomery:

In reply to your letter of July 31, 1957 requesting information regarding water wells in the Hobbs area, we offer the following:

Gulf has two water wells in this area that are not plugged and abandoned. They are the W. D. Grimes (NCT-A) Water Well No. 3 and the W. D. Grimes (NCT-B) Water Well No. 1. The Grimes (NCT-A) Water Well No. 3 is located approximately 2570' from the south line and 1210' from the west line of Section 32-18S-38E. It is 60' deep, equipped with a 4" Pomona pump and the amount or depth of 7" casing is not known. The W. D. Grimes (NCT-B) Water Well No. 1 is located approximately 450' from the north line and 1670' from the east line of Section 33-18S-38E. It is 95' deep, equipped with a 4" Pomona pump and the amount or depth of 8-1/2" casing is not known.

Copies of water analyses are attached. You will note that the W. D. Grimes (NCT-B) Water Well No. 1 is also labeled "East Grimes Camp Water Supply" and the W. D. Grimes (NCT-A) Water Well No. 3 is labeled "West Grimes Camp Water Supply". Prior to the dates of these water analyses the company made annual bacteriological analyses or Presumptive Coliform Tests. Our records indicate that these tests date back to February, 1952 for the W. D. Grimes (NCT-A) Water Well No. 3 and to January, 1951 for the W. D. Grimes (NCT-B) Water Well No. 1, all results being negative. We have no record of any tests or analyses prior to January, 1951.

Yours very truly,

C F Taylor

C. F. TAYLOR
Area Superintendent
of Production

WRN:cm
Att'd.

W.A. No. [illegible]

GULF OIL CORPORATION
FORT WORTH DISTRICT - RESERVOIR ENGINEERING
LABORATORY

WATER ANALYSIS

Company GULF OIL CORPORATION Well No. WATER SUPPLY Farm EAST GRIMES CAMP

Location LEA COUNTY, NEW MEXICO - EAST GRIMES LEASE (ZONE 5)

Depth of Sample — Depth of Well — Formation —

Date of Sample 7-31-53 Date Well Completed —

Primary Salinity, % 37.52

Secondary Salinity, % 18.08

Primary Alkalinity, % 0.00

Secondary Alkalinity, % 44.40

Specific Gravity 1.0007

pH 8.01

Radical	P.P.M.	Reaction Coefficient	Reaction Value	% Reaction Value
Na	78	0.0435	3.38	18.76
Ca	93	0.0499	4.64	25.75
Mg	12	0.0822	0.99	5.49
Al-Fe	0		0.00	0.00
Si	0		0.00	0.00
OH	0	0.0588	0.00	0.00
CO_3	0	0.0333	0.00	0.00
HCO_3	244	0.0164	4.00	22.20
SO_4	130	0.0208	2.70	14.98
Cl	82	0.0282	2.31	12.82
H_2S	0		0.00	0.00
Total	639		18.02	100.00

Hypothetical Recombination	P.P.M.
$Ca(HCO_3)_2$	324
$CaSO_4$	44
$MgSO_4$	59
Na_2SO_4	76
NaCl	135

REMARKS:

Annual chemical analysis of Camp Water Supply.

W.A. No. 2517

GULF OIL CORPORATION
FORT WORTH DISTRICT - RESERVOIR ENGINEERING
LABORATORY

WATER ANALYSIS

Company GULF OIL CORPORATION Well No. WATER SUPPLY Farm EAST GRIMES CAMP

Location LEA COUNTY, NEW MEXICO - EAST GRIMES LEASE (ZONE 8)

Depth of Sample - Depth of Well - Formation -

Date of Sample 7-22-54 Date Well Completed -

Primary Salinity, % 32.04

Secondary Salinity, % 19.24

Primary Alkalinity, % 0.00

Secondary Alkalinity, % 48.72

Specific Gravity 1.0002

pH 7.98

Radical	P.P.M.	Reaction Coefficient	Reaction Value	% Reaction Value
Na	60	0.0435	2.63	16.02
Ca	92	0.0499	4.59	27.95
Mg	12	0.0822	0.99	6.03
Al-Fe	0		0.00	0.00
Si	0		0.00	0.00
OH	0	0.0588	0.00	0.00
CO_3	0	0.0333	0.00	0.00
HCO_3	244	0.0164	4.00	24.36
SO_4	102	0.0208	2.12	12.91
Cl	74	0.0282	2.09	12.73
H_2S	0		0.00	0.00
Total	584		16.42	100.00

Hypothetical Recombination	P.P.M.
$Ca(HCO_3)_2$	324
$CaSO_4$	40
$MgSO_4$	59
Na_2SO_4	38
NaCl	122

REMARKS:

Annual chemical analysis of Camp Water Supply.

W.A. No. 2853

GULF OIL CORPORATION
FORT WORTH DIVISION - RESERVOIR ENGINEERING
LABORATORY

WATER ANALYSIS

Company GULF OIL CORPORATION Well No. WATER SUPPLY Lease EAST GRIMES CAMP

Location LEA COUNTY, NEW MEXICO - EAST GRIMES LEASE (ZONE 8)

Depth of Sample WATER WELL Depth of Well - Formation -

Date of Sample 7-6-55 Date Well Completed -

Pay Interval ____________

Primary Salinity, % 28.34

Secondary Salinity, % 22.58

Primary Alkalinity, % 0.00

Secondary Alkalinity, % 49.08

Specific Gravity 0.9997

pH 7.54

Resistivity at ______ ° C = ______ ohmmeters.

Radical	P.P.M.	Reaction Coefficient	Reaction Value	% Reaction Value
Na	53	0.0435	2.31	14.17
Ca	94	0.0499	4.69	28.77
Mg	14	0.0822	1.15	7.06
Al-Fe	0		0.00	0.00
Si	0		0.00	0.00
OH	0	0.0588	0.00	0.00
CO_3	0	0.0333	0.00	0.00
HCO_3	244	0.0164	4.00	24.54
SO_4	99	0.0208	2.06	12.64
Cl	74	0.0282	2.09	12.82
H_2S	0		0.00	0.00
Total	578		16.30	100.00

Hypothetical Recombination	P.P.M.
$Ca(HCO_3)_2$	324
$CaSO_4$	47
$MgSO_4$	69
Na_2SO_4	16
NaCl	122

R E M A R K S:

Annual chemical analysis of Camp Water Supply.

THE INDEPENDENT LABORATORY
DIVISION OF U. J. BRAMMER & SONS

WATER ANALYSIS

PHONE FE 7-7952
P. O. BOX 1231
ODESSA, TEXAS

Charge Humble Oil & Refining Co.
Test No. 57-11-356
Date of Run 7-22-57
Date Received 7-19-57

A Sample of Water from Water Well - Fresh Water Zone

Secured from Federal - Bowers No. 3

At Hobbs, New Mexico Secured by J. Wolf

Purpose Time Date 7-19-57

Sampling Conditions: Sample taken from well at pump discharge. H_2S analysis was run at wellsite immediately on catching sample. Sample showed no sign of oil

CONSTITUENTS REPORTED AS PARTS PER MILLION UNLESS OTHERWISE SPECIFIED

Constituent	Value	Constituent	Value
P Alkalinity - - $CaCO_3$	0.00	Dissolved Oxygen - - O_2	
Total Alkalinity - - $CaCO_3$	212.0	Free Carbon Dioxide - - CO_2	9.0
Chlodide - - Cl	66.0	Hydrogen Sulfide - - H_2S	0.341
Calcium - - Ca	190.0	Chromate - - CrO_4	
Magnesium - - Mg	46.0	Manganese - - Mn	
Sulfate - - SO_4	22.0	Sodium - - Na	
Total Hardness - - $CaCO_3$	236.0	Carbonate - - CO_3	
Silica - - SiO_2	1.50	Bicarbonate - - HCO_3	
Alumina - - Al_2O_3		Total Dissolved Solids	348.2
Phosphate - - PO_4		pH 7.65 @ oF	
Total Iron (Water)	0.040	Specific Conductance - - Micromhos	633.0
Total Iron (Oil)		Specific Gravity @ oF	

COUPON DATA

Coupon No.	Initial Wt. Grams	Test Period	Terminal Wt. Grams	Wt. Loss Grams

Average Corrosion Rate MPY: Coupon No.

Average Corrosion Rate MPY: Coupon No.

Description of Corrosion Note: There are hydrocarbon gases present in minute quantities in this well water.

Copies To: 6-Mr. B. K. Bevill
Box 2347
Hobbs, N. Mex.

1-Mr. H. L. Hensley
Box 1600
Midland, Tex

1-File

Analyzed By: J. Wolf

S. M. GLADNEY
MANAGER
T. F. HILL
ASSISTANT MANAGER

SUN OIL COMPANY

HOBBS OFFICE OCC

SOUTHWEST DIVISION

1957 AUG 2

RIO GRANDE NATIONAL BUILDING
~~DALLAS, TEXAS~~

A. S. RHEA
SUPT. OPERATING DEPT

P. O. Box 2792
Odessa, Texas
August 21, 1957

Mr. R. F. Montgomery
New Mexico Oil Conservation Commission
P. O. Box 2045
Hobbs, New Mexico

Dear Sir:

In response to your letter dated July 31, 1957, we submit the following information concerning the fresh water wells that we have in the Hobbs area.

We have two water wells in the Hobbs Pool area, which are located on our H. D. McKinley Lease in the NE $\frac{1}{4}$, NE $\frac{1}{4}$ of section 5, Township 19-S, Range 38-E, N.M.P.M. Both of these wells are approximately 62 feet deep and are cased with approximately 50 feet of 7 inch casing. These wells were drilled in 1930.

Listed below is information taken from analyses made on water from these wells on November 30, 1953.

Constituent	Well #1	Well #2
Sodium (By Diff)	56	47
Calcium	95	81
Magnesium	15	14
Sulfate	80	98
Chloride	120	53
Carbonate	0	0
Bicarbonate	205	227
Silica	45	48
TOTALS	616	568

Yours very truly,

SUN OIL COMPANY

O. D. Albright

O. D. Albright

VBC

Pan Amer.

TABLE II

ANALYSIS OF WATER FROM WATER WELLS ON PAN AMERICAN LEASES IN HOBBS FIELD

Location of Water Well 1/4, 1/4, 1/4, S-T-R	Date Mo.-Year	Na PPM	Ca PPM	Mg PPM	SO4 PPM	CL PPM	CO3 PPM	HCO3 PPM
NE, SW, NW, 33-18S-38E	9 - 1950	35	74	18	77	50	0	226
	7 - 1951	54	57	16	82	53	0	202
	7 - 1952	32	80	21	82	57	0	232
	8 - 1957	9	103	21	89	60	12	201
S[illegible], NE, SE, 4-19S-38E	9 - 1950	51	123	25	56	181	0	256
	7 - 1951	45	128	29	53	195	0	256
	7 - 1952	56	137	27	30	227	0	268
	8 - 1953	32	139	25	72	163	0	262
	6 - 1956	63	80	12	63	78	0	256
NW, NE, NE, 9-19S-38E	10 - 1950	67	89	18	109	82	0	262
	7 - 1951	52	79	21	93	67	0	250
	7 - 1952	52	86	21	96	71	0	262
	8 - 1953	31	124	19	114	85	12	238
	8 - 1955	58	80	17	103	78	0	218
	5 - 1956	66	86	17	113	71	0	256

W.A. No. 2061

GULF OIL CORPORATION
FORT WORTH DISTRICT - RESERVOIR ENGINEERING
LABORATORY

WATER ANALYSIS

Company GULF OIL CORPORATION Well No. WATER SUPPLY Farm WEST GRIMES LEASE

Location LEA COUNTY, NEW MEXICO - WEST GRIMES LEASE (ZONE 5)

Depth of Sample KITCHEN TAP Depth of Well — Formation —

Date of Sample 9-19-52 Date Well Completed —

Radical	P.P.M.	Reaction Coefficient	Reaction Value	% Reaction Value
Na	36	0.0436	1.56	13.85
Ca	70	0.0499	3.49	31.00
Mg	7	0.0822	0.58	5.15
Al-Fe	0		0.00	0.00
Si	0		0.00	0.00
OH	0	0.0588	0.00	0.00
CO_3	0	0.0333	0.00	0.00
HCO_3	229	0.0164	3.76	33.39
SO_4	48	0.0208	1.00	8.88
Cl	31	0.0282	0.87	7.73
H_2S	0		0.00	0.00
Total	421		11.26	100.00

Primary Salinity, % 27.70

Secondary Salinity, % 5.52

Primary Alkalinity, % 0.00

Secondary Alkalinity, % 66.78

Specific Gravity 0.9998

pH 7.29

Hypothetical Recombination	P.P.M.
$Ca(HCO_3)_2$	283
$Mg(HCO_3)_2$	20
$MgSO_4$	19
Na_2SO_4	49
NaCl	51

R E M A R K S:

Annual chemical analysis of Camp Water Supply.

W.A. No. [illegible]

GULF OIL CORPORATION
FORT WORTH DISTRICT - RESERVOIR ENGINEERING
LABORATORY

WATER ANALYSIS

Company GULF OIL CORPORATION Well No. WATER SUPPLY Farm WEST GRIMES CAMP

Location LEA COUNTY, NEW MEXICO - WEST GRIMES LEASE (ZONE 5)

Depth of Sample — Depth of Well — Formation —

Date of Sample 7-31-53 Date Well Completed —

Primary Salinity, % 32.46

Secondary Salinity, % 0.00

Primary Alkalinity, % 5.78

Secondary Alkalinity, % 61.76

Specific Gravity 1.0002

pH 8.11

Radical	P.P.M.	Reaction Coefficient	Reaction Value	% Reaction Value
Na	50	0.0435	2.18	19.12
Ca	59	0.0499	2.94	25.79
Mg	7	0.0822	0.58	5.09
Al-Fe	0		0.00	0.00
Si	0		0.00	0.00
OH	0	0.0588	0.00	0.00
CO_3	0	0.0333	0.00	0.00
HCO_3	235	0.0164	3.85	33.77
SO_4	44	0.0208	0.92	8.07
Cl	33	0.0282	0.93	8.16
H_2S	0		0.00	0.00
Total	428		11.40	100.00

Hypothetical Recombination	P.P.M.
$Ca(HCO_3)_2$	238
$Mg(HCO_3)_2$	42
$NaHCO_3$	28
Na_2SO_4	65
NaCl	54

REMARKS:

Annual chemical analysis of Camp Water Supply.

W.A. No. 2618

GULF OIL CORPORATION
FORT WORTH DISTRICT - RESERVOIR ENGINEERING
LABORATORY

WATER ANALYSIS

Company GULF OIL CORPORATION Well No. WATER SUPPLY Farm WEST GRYMES CAMP

Location LEA COUNTY, NEW MEXICO - WEST GRIMES LEASE (ZONE 8)

Depth of Sample - Depth of Well - Formation -

Date of Sample 7-22-54 Date Well Completed -

Primary Salinity, % 32.34

Secondary Salinity, % 0.00

Primary Alkalinity, % 6.16

Secondary Alkalinity, % 61.50

Specific Gravity 0.9998

pH 7.47

Radical	P.P.M.	Reaction Coefficient	Reaction Value	% Reaction Value
Na	50	0.0435	2.19	19.25
Ca	62	0.0499	3.09	27.15
Mg	5	0.0822	0.41	3.60
Al-Fe	0		0.00	0.00
Si	0		0.00	0.00
OH	0	0.0588	0.00	0.00
CO_3	0	0.0333	0.00	0.00
HCO_3	235	0.0164	3.85	33.83
SO_4	45	0.0208	0.94	8.26
Cl	32	0.0282	0.90	7.91
H_2S	0		0.00	0.00
Total	429		11.38	100.00

Hypothetical Recombination	P.P.M.
$Ca(HCO_3)_2$	250
$Mg(HCO_3)_2$	30
$NaHCO_3$	29
Na_2SO_4	67
NaCl	53

REMARKS:

Annual chemical analysis of Camp Water Supply

W.A. No. 2852

GULF OIL CORPORATION
FORT WORTH DIVISION - RESERVOIR ENGINEERING
LABORATORY

WATER ANALYSIS

Company GULF OIL CORPORATION Well No. WATER SUPPLY Lease WEST GRIMES CAMP

Location LEA COUNTY, NEW MEXICO - WEST GRIMES LEASE (ZONE E)

Depth of Sample WATER WELL Depth of Well - Formation -

Date of Sample 7-8-55 Date Well Completed -

Pay Interval ______

Primary Salinity, % 31.70

Secondary Salinity, % 0.00

Primary Alkalinity, % 2.98

Secondary Alkalinity, % 65.32

Specific Gravity 1.0004

pH 7.42

Resistivity at ____ ° C =

______ ohmmeters.

Radical	P.P.M.	Reaction Coefficient	Reaction Value	% Reaction Value
Na	46	0.0435	1.98	17.34
Ca	65	0.0499	3.24	28.37
Mg	6	0.0822	0.49	4.29
Al-Fe	0		0.00	0.00
Si	0		0.00	0.00
OH	0	0.0588	0.00	0.00
CO_3	0	0.0333	0.00	0.00
HCO_3	238	0.0164	3.90	34.15
SO_4	45	0.0208	0.94	8.23
Cl	31	0.0282	0.87	7.62
H_2S	0		0.00	0.00
Total	431		11.42	100.00

Hypothetical Recombination	P.P.M.
$Ca(HCO_3)_2$	263
$Mg(HCO_3)_2$	36
$NaHCO_3$	14
Na_2SO_4	67
NaCl	51

REMARKS:

Annual chemical analysis of Camp Water Supply.

W.A. No. 3277

GULF OIL CORPORATION
FORT WORTH DIVISION - RESERVOIR ENGINEERING
LABORATORY

WATER ANALYSIS

Company GULF OIL CORPORATION Well No. 1-WW Lease W. D. GRIMES (NCT-B)

Location LEA COUNTY, NEW MEXICO - SEC. 33 - 18S - 38E - MONUMENT POOL - MONUMENT AREA

Depth of Sample OFFICE WATER TAP Depth of Well 95' Formation -

Date of Sample 7-2-56 Date Well Completed 5-30

Pay Interval -

Primary Salinity, % 30.76

Secondary Salinity, % 24.52

Primary Alkalinity, % 0.00

Secondary Alkalinity, % 44.72

Specific Gravity 0.9993

pH 6.65

Resistivity at - °C = - ohmmeters.

Radical	P.P.M.	Reaction Coefficient	Reaction Value	% Reaction Value
Na	65	0.0435	2.82	15.38
Ca	96	0.0499	4.79	26.12
Mg	19	0.0822	1.56	8.50
Al-Fe	0		0.00	0.00
Si	0		0.00	0.00
OH	0	0.0588	0.00	0.00
CO_3	0	0.0333	0.00	0.00
HCO_3	250	0.0164	4.10	22.36
SO_4	119	0.0208	2.48	13.52
Cl	92	0.0282	2.59	14.12
H_2S	0		0.00	0.00
Total	641		18.34	100.00

Hypothetical Recombination	P.P.M.
$Ca(HCO_3)_2$	332
$CaSO_4$	47
$MgSO_4$	93
Na_2SO_4	16
NaCl	151

REMARKS:

Annual chemical analysis of Camp Water Supply.

Hobbs Pool Area

Domestic Water wells sampled in Sec 20, T18S, R38E on 3-6-84

#1 -- Gearhart -- 25 ml (3.8 x 142 = 539.6 ppm Chlorides)

#2 -- Brakes & Wheels - 25 ml (3.7 x 142 = 525.4 ppm chlorides)

** #3 -- GMA Inc. - 25 ml (3.9 x 142 - 553.8 ppm chlorides)

#4 -- Western - 25 ml (3.4 x 142 = 482.8 ppm chlorides)

** has water softener (317 West County Road)

HOBBS OFFICE OCC

Roswell, New Mexico
August 5, 1957 AM 10 : 13

MEMORANDUM

TO: A. L. Porter, Jr., Director, Oil Conservation Commission

FROM: Committee Studying Fresh Water Contamination in the Hobbs Pool Area.

SUBJECT: Progress Report.

This Committee was appointed and its assignment made at the general meeting called by the Oil Conservation Commission on July 9, 1957. At that time a progress report was requested within 30 days. This is that progress report.

The Committee met for the first time in Hobbs, New Mexico, on July 19, 1957, and subsequently on July 25, 1957, and August 1, 1957. All of the organizations and companies appointed to the Committee had representatives present at each meeting.

It is the consensus of the Committee that their assignment as a whole is approximately 50% completed and that their work will be completed with a final report prepared by the first week of September, 1957.

The principal items discussed during the three committee meetings were as follows:

1. The physical characteristics of the Ogallala formation and the movement of water through this aquifer. Introduction on the subject was furnished by Messrs. E. G. Minton and Zane Spiegel.

2. The exhibits prepared by Mr. J. W. Runyan and presented at the general meeting held on July 9, 1957.

3. Apparent contaminated conditions which exist in the Ogallala formation northwest of the City of Hobbs.

4. Feasibility of eliminating or removing the apparent contamination.

5. The possibility of contamination of the Hobbs City water supply by migration from the area of apparent contamination.

6. Possible contamination of the fresh water by sources other than oil or gas wells such as sewage, waste oil and acid, open storm sewer ditches, gas plant waste water, refuse, and oil held in earthen pits.

7. Possible need for rules and regulations governing the drilling, completion and abandonment of water wells in the Hobbs pool area.

8. Establishment of an observation water well program to detect any new contamination and observe the movement, if any, from the area to the northwest of the City of Hobbs.

9. Possibility of, and methods for, obtaining potable water from the areas of apparent contamination.

10. Methods of determining the existence of defective casing in oil and gas wells.

11. Programing of bradenhead pressure tests on oil and gas wells in the Hobbs Pool area.

12. Method of repairing oil well casing found to be defective.

During the course of the above discussion, the need for subcommittees was indicated and three were appointed at the meeting on July 25.

1. Subcommittee to locate and gather data on all water wells in the Hobbs Pool area.

    Oil Conservation Commission - Chairman
    Continental Oil Company
    State Engineer's Office
    Shell Oil Company

This subcommittee made a progress report on August 1, indicating that their assignment was approximately 35% completed and expected to complete their assignment within three weeks.

2. Subcommittee to study water well completion and abandonment practices in the Hobbs Pool area.

Tidewater Oil Company - Chairman
City Water Board
State Engineer's Office
Samedan Oil Corporation

This subcommittee made a progress report on August 1, indicating that their assignment was completed.

3. Subcommittee to study possibilities of fresh water contamination through the disposal of waste products.

Samedan Oil Corporation - Chairman
Pan American Petroleum Corporation
City Water Board

This subcommittee made a progress report on August 1, indicating that their assignment was 75% completed and should complete their assignment within one week.

For the Committee

J. W. Brown
Acting Chairman

Copies to: Official Members and Alternates been successively continued to March 14, 1957, September 18, 1957, March 13, 1958, and June 18, 1958, on all of which dates progress reports were submitted by the Chairmen of the ten committees.

When it was decided at the June hearing to continue the case to September 17, 1958, the Commission announced that an order of continuance would be entered. Accordingly Order R-1224 was entered on July 28, and copies were mailed to the 90 operators in the ten most critical areas on July 29th. Return receipts were requested and all operators have now acknowledged receipt of the order.

Order R-1224 requires that all operators in the ten most critical areas file a written report by September 10 or be represented by some one at this hearing to give an oral report. The written reports have been carefully recorded, and in order that all operators who are represented here today may be given credit for reporting, we are asking that each pool chairman be very careful to list all operators whom he represents.

In order that this case may be disposed of in the most orderly and expeditious manner possible, the Commission will receive testimony, reports and statements in the following order:

A. TEN MOST CRITICAL AREAS

(1) Testimony by State Engineer regarding ten most critical areas.

(2) Testimony by interested operators regarding ten most critical areas.

(3) Rebuttal testimony by State Engineer if necessary. None

(4) Presentation of progress reports by operators on ten most critical areas.

(5) Statements and recommendations regarding ten most critical areas.

B. THIRTEEN SECOND MOST CRITICAL AREAS

(1) Testimony by interested operators concerning any or all of the thirteen areas listed as the second most critical in Commission Memorandum 22-56.

(2) Testimony by State Engineer regarding these same thirteen areas.

September 17, 1958

ig

C O P Y

July 26, 1957

Mr. A. L. Porter, Jr., Director
Oil Conservation Commission
Box 871
Santa Fe, New Mexico

Dear Mr. Porter:

The first meeting of the committee that you appointed to study the fresh water pollution problem in the Hobbs area was held on July 19, 1957. A list of the committee members is enclosed for your information.

At this meeting Mr. E. G. Minton, Lea County Hydrologist, gave a brief talk on the general geology and hydrology of the area. Mr. Minton stated that from past studies the water moves at about 7 to 9 inches a day, however due to the Cone of Depression (covering about the area of the City Limits of Hobbs) it probably was moving at two to three times this rate. This Cone of Depression is some 25 feet deep and 5 to 6 miles in diameter causing the water to flow towards the center of Hobbs. When asked for suggestions from committee members he put forth the idea of dewatering the contaminated area and reinjecting the treated water. The difficulty of this type of project would be that water wells in the area would go dry. He made an estimate that if the entire saturated section was opened one well could probably produce 800 to 1,000 gals/min. Mr. Minton also stated that water wells had no casing or plug and abandonment requirements.

After Mr. Minton's talk, Mr. Jack Brown, Chairman, proposed methods of conducting the meetings and the following items were decided upon:

1. Conduct informally
2. Members notify alternates
3. Minimum of minutes
4. Quorum to be 5 members
5. Rule of majority
6. No action of member binding on his organization
7. No charges to committee
8. Only members and alternates attend meetings unless others invited

Mr. Zane Spiegel gave a long talk on the general hydrology of the Hobbs area. Mr. Jack Brown stated that subcommittees would be formed to study specific phases of the problem and the next meeting was called for 9:00 A.M. July 25th at the Hobbs OCC Office.

At the second meeting of this committee, July 25th, numerous items were discussed which took most of the day.

It was the concensus of the members that the area of contamination was small in extent, possibly 2 to 5 acres, and that if as much as 300,000 barrels had entered the fresh water aquifer that due to the fact that the oil would ride on top of the water it would be filtered out within one mile. This is not a final answer but to determine in some manner what we were looking at, 300,000 barrels was assumed to be in the aquifer. Due to the dry water sands in the upper portions of the aquifer within one mile distance it would filter out if it was riding on top of the water.

However the committee is going ahead with its studies. The OCC Hobbs Office has been requested to furnish the committee with information on all remedial work completed and other pertinent information.

A subcommittee was formed, Tidewater Chairman, to investigate the feasibility of the committee recommending the manner in which future water wells should be completed. The following organizations were appointed to this subcommittee:

City Water Board
Samedan Oil Co.
State Engineer

A second subcommittee was formed, Hobbs OCC Chairman, to determine the location of all water wells in the Hobbs Pool area, and determine all physical characteristics of such wells as to pipe, depth and purity of water. The following organizations were appointed to the subcommittee:

Shell Oil Co.
Continental Oil Co.
State Engineer

A third subcommittee was appointed, Samedan Chairman, to investigate contamination of the fresh water aquifer from causes other than oil wells. The following organizations were appointed to this subcommittee:

Pan American Pet. Corp.
City Water Board

The afternoon session was largely taken up by discussing methods of preventing future contamination.

Casing programs and methods the OCC used in checking for leaks was discussed.

Following considerable discussion of preventing future contamination, the committee may recommend the following:

1. That surface pipe set on clamps should be corrected, and that a small diameter pipe be used to vent all surface bradenheads to the atmosphere at all times or install a sensitive gauge.

2. That quarterly tests by operators be submitted to the OCC with the certification that no leaks were found or if leaks were found a program for correction. One such test each year to be witnessed by the OCC.

3. That packers be installed on all flowing wells and the annular space be filled with sweet oil.

The committee meeting was adjourned until 9:00 A.M. August 1, 1957.

Yours very truly,

OIL CONSERVATION COMMISSION

R. F. Montgomery
Proration Manager

RFM/mc
cc-E. J. Fischer, Engineer
OCC, Hobbs
encl.

Only to Ten proco —

Gentlemen:

I am appearing before you to make a statement of position and resolutions in the matter of New Mexico Oil Conservation Comission Order #R-1224

We recognize that it is the duty of the New Mexico Oil Conservation Commission to cooperate with the State Engineer Office in matters of joint interest and we are mindful that a very serious problem of obtaining and protecting fresh water confronts us all. If any one doubts this let me remind us all that our future fresh water needs for domestic, industrial and recreational needs will in part be directly related to future population.

Combining all factors, domestic water requirements for the United States by 1980 are estimated at 880,952,380 bbls. per day. This compares with 268,571,427 bbls. per day for 1955.

Fresh water demand by 1980 for industrial use is expected to be about 400% of the 1955 demand, even on the basis of more conservative use than at present. The 1980 estimate is for 9,285,714,280 bbls. per day.

Total water demand by 1980 excluding use for hydroelectric power, navigation, and recreation is placed at 14,217,142,859 bbls. per day. It is highly improbable that the average precipitation over North America will be increased in any significant way in time to relieve the impending shortage. Certainly in much of our state even with an increase in precipitation there is no way to greatly supplement our growing need for water since in most arid areas the moisture would be taken up by the dry surface sands only to eventually evaporate. Thus we must live within our water income. How?

There are the obvious courses: reduce consumption, end waste, develop more fully the use of avaliable supply, or provide means to convert to benificial uses vast and virtually untapped supplies of sea and brackish water, and in our case in the main, conversion of, off color underground water since the vast majority of our state is arid land.

There is little doubt that in the future the present producing companies will turn in some areas to drilling exclusively for water sources for market as we now do for oil and gas.

These startling facts although they deal with the future do have a very direct bearing on the present Commission Order #R-1224 which is before us today.

In particular we refer to paragraph (2) of the findings which states:

> "That it is the policy of the Commission, in cooperation with the State Engineer, to eliminate the practice of surface disposal of large volumes of oil field brines which may contaminate the fresh water bearing horizons in Lea County, New Mexico.

Also we refer to paragraph (2) of the order which states:

> "That all operators in the above-named areas shall report to the Commission at the Regular Hearing on September 17, 1958, on the progress made thus far and the estimated completion date of a 100-percent disposal system. Operators who are members of a

cooperative group may report through the committee chairman, who shall be prepared to name all operators who are members of such a group. All operators who are not members of a cooperative group shall furnish a written progress report to the Commission prior to September 17, 1958, to report the progress made thus far and the estimated completion date of a 100-percent disposal system for each well which they operate in the above named areas."

At the outset let me assure you that we will not permit fresh water to become contaminated from any source as a result of our own actions.

We do feel however that certain considerations should be made in determining just exactly what must be done in disposing of waters that are produced coincidentally with oil and gas.

We do not have any quarell whatsoever with the duties or perogatives of the State Engineer. As outlined in the booklet entitled "Functions and Activities of the State Engineer Office." by C. B. Thompson, Chief, Technical Division and F. E. Iaby, Chief, Water Rights Division, dated Santa Fe, New Mexico, November, 1957.

Reference is made to #'s 5 & 6 of the purpose of the agency, i.e.,

#5 To conduct hydrographic surveys.

#6 To coordinate the work of various Federal Agencies as regards water resource programs.

It is in these two provisions that we request help from the State Engineer Office.

First of all I wish to point out that the only testimony on record in this case concerning the need for fresh water protection and disposal of produced waters in Lea County has been only a comparison of "they do it someplace else and Lea County is like someplace else."

How about getting specific and actually making a study of Lea County and the problem in Lea County. At least then we would have something with a New Mexico name tag on it in the record. To intelligently solve the problem it will be necessary to get down to at least section lines.

We feel that in order to better understand the problem of water polution and how we can effectively protect fresh waters from our own acts we must know more about the exact locations of the water sands; that is to aerial extent as well as vertical limits, also the source of supply for these fresh water beds and the movement of the water within the confines of the beds.

In line with this thinking we respectfully request the New Mexico Oil Conservation Commission help the oil and gas operators within the state to secure, with the aid of the State Engineer Office as complete information as is possible from a comprehensive hydrographic survey of all areas where oil and/or gas and other well effulents are produced. We fully realize that this would be a project of considerable magnitude and would require complete cooperation on the part of the oil and gas operators. And also it would be incumbent upon the operators to take whatever steps that would be necessary to discharge their part of the resulting responsibilities.

Such a study should not be confined however to only those areas where we are now producing. We are constantly searching for new areas of oil and gas production so that we may continue, as in the past and present, to add to the growing economic resources of the state.

Such information over the entire state would be of considerable economic value to those of us who must from time to time haul water over distances of many miles in order to be able to prospect for oil and gas. In connection with this prospecting I want to point out that the conditions of the mud used in drilling can mean the difference between success and failure in many instances and further it is more economical and feasible to build the proper drilling fluid from a fresh water base.

With particular reference to that portions of paragraph (2) of the order that states "100-percent disposal system for each well." I respectfully point back to a statement made by Mr. Reynolds at the May 16, 1956 hearing of case #1053 in which he stated in answer to the following question: "Is it your recommendation that water be disposed of by injection wells, or just the wells producing the excessive amounts of salt water?" "I would like to answer that a little fully. I think some further investigation is warranted, investigation toward this end. That is, to determine where the brine disposal pits might not overlie fresh water and therefore might not endanger fresh water."

Agreeing that there will be places where the disposal pit or pits do not overlie shallow fresh water beds. I submit that the provision of paragraph (2) of order #1224 should not apply to all wells.

We submit that without such a study as I have discussed no one would have sufficient information upon which to base an order which would regulate the protection of fresh water and the disposal of waters that are produced from oil and/or gas wells.

It has long been the practice of oil and gas operators to run casing in wells, to among other things protect known fresh water supplies. In line with this policy on the part of the operators we strongly urge the adoption of Rules and Regulations Governing the Drilling and Completion, and Abandonment of water wells within the state that would effectively protect the water sands. Such regulations quite concievably would include the following:

1. Casing would be set at a depth to at least the top of the water sand.
2. Such casing would be cemented with sufficient volume of cement to protect the fresh water sand from contamination from any source. In most instances this would mean circulating cement.

Also in line with such hydrographic surveys the studies should be further extended to include the practical as well as theoretical porribilities of contaminating fresh water sands from well effulents, however they may be disposed of. These studies should be pertinent only to those water bearing sands that are of sufficient magnitude that they would bear a reasonable economic and useful value to the people of the state.

Further this study should include the actual physical and chemical composition of waters that are produced coincidentally with oil and gas, and a determination should be made as to the feasibility of utilizing these waters for economic and useful purposes. All produced water from oil and gas wells do not carry high concentration of salt. Further the lifting cost of getting the water to the surface where it is avaliable to do with as may be decided upon is already behind us.

That brings me to #6 as previously refered to. In particular I want to refer to a statement made at the May 16, 1956 hearing that should be clarified in our thinking of brine waters i.e., In answer to a question "is it your opinion that salt is filtered out or removed in any way in this path which it takes from the pits to the aquifer?" Mr. Spiegel answered in part "No, it is impossible to remove the sodium chloride and almost any other constituent in the brines in any way."

I now refer to the United States Senate Joint Resolution #135 a measure that was sponsered by Senator Clinton P. Anderson and was signed by the President on September 2, 1958.

In brief this resolution establishes a saline water conversion program to demonstrate the economics and feasibility of various processes in converting large quantities of "off-color" water into potable and useful liquid.

The resolution calls for the establishment of five demonstration plants of different types for the conversion of sea water and the treatment of brackish water. One of these plants may be located in the Southwest.

It is quite possible that a plant could be located in S. E. New Mexico and we urge that the State Engineer Office take full advantage of the possible use that such a plant would afford us in areas where oil field brine is produced.

I further wish to point out the economics of many operations could not afford the expense of returning produced waters below the surface. All operators have geared their operations to meet the presently known requirements. To force a premature cessation of operations without first determining that actual damage will or has occured to fresh water sands, if they are in place, from the disposal of produced fluids into surface pits, would not protect correlative rights and would constitute a gross negligence and waste of a valuable resource.

I wish to point out that the petroleum industry is already doing something about the treatment of salt and brackish waters for their own use. Let us look particularly at the offshore regions.

The drilling contractors have for some time employed two types of units to convert sea water into potable water, i.e. (1) vapor compression, and (2) flash evaporation.

It's no secret, however, that several new methods - including use of nuclear power for separating salt from water are actively under experimentation.

The approaches are numerous - freezing salt water; using solar energy; using solvents and chemical precipitation; electro-osmosis, and electro-filtration among others.

The Fluor Corp., of Whittier Calif., is studying the combination of a nuclear reactor with distillation of saline water, under a contract from the office of Saline Water.

One of the more unusual processes under research is termed "electro-dialysis." Unlike distillation, which removes water from salt, electro-dialysis removes salt from water.

Another possibility is the use of chemicals to separate the salt from water. Texas A. & M. College is engaged in such a project, using hexa-decanol. This chemical apparently combines with the purer part of the water, and the salty brine separates to another level. A possibility even in off-color underground reservoirs prior to production.

Although I have not discussed the recharge possibilities of our fresh water sands I wish to point out that such a study has been undertaken in Lea County and that we should not overlook this facet of the problem before us.

We submit that there is need for specific studies and time in which to solve this very important problem. Also the problem is not the same in all parts of the state. Further that there are some areas that could not be contaminated because there simply are no fresh water sands in place.

We men of the petroleum industry may have oil in our blood, but we can no more survive without fresh water to drink than the man with manure on his boots or the soil under his fingernails. We are most anxious that a just and satisfactory conclusion be reached in order that the best interest of the state may be served.

GACKLE OIL COMPANY

Paul S. Johnston
Superintendent of Production

||| 7448-B

Mr. R. Houston
Bronco, Texas

16 16 14
16 6 7
16 11
48
16

Re: Fresh Water Contamination

Dear Mr. Houston

Your letter to Mr. A. L. Porter

Ck 61 wells
6 contaminated
58 leaks
9 more leaks

Hobbs Area Water Contamination
Mtg called to Order by Jack Brown
@ 1:30 PM July 19, 1957 @ Hobbs
OCC office

E.G. Minton

NW to SE the general movement
15'/mile slope of WT when in Balance
7 to 9" a day movement
Cones of Depression formed by water wells
Changing direction of movement.
From
A Cone of depression exists throu out
the City limits it is about 25' deep
5 to 6 miles east + west therefore movement
in Hobbs area is increased to 2 or 3 times
the 7 to 9"/day - factors affecting; transmissability
time, slope, (friction loss)
Area of movement towards center of Hobbs
Movement of 7 to 9" figured several years ago

Suggestion; De water the local area
possibly reinject
45.9
20
25.00
Difficulty: Water wells will go dry
Might help is area sorrounding was recharged.
est 800 to 1,000 gals/min could be from
full section
Sp Cap. 15 gals/ft

Formulae

Yates — 8 grams Hydrocarbon, only place could have come from an old pit that was used for crank case oil

No csg requirements on water wells, no requirements for P+A water wells

a. Members notify alternates
b. Conduct informally
c. Minimum minutes
d. Quorum 8 organizations — 5 constitute a Q. Rule of Majority Conv
e. No action of member binding to C.
f. No charges to Committee.
g. Only Members + alternates attend meetings
h. Rex Cabiness - Shell
Bill Owens - Shell
Dick Sammon Continental
E.V. Boynton Continental
Lloyd Calhon - Water Board
Bill Abbott - " "
Shackleford Tidewater
Bob Miller "
Bob Soyhe Samedan
E. J. Fischer OCC
John Runyon "
Eric Englbrecht "
R.F. Montgomery "
Bob Borton State Engineer
Dane Spraigal "
George Hirschfeld O+G Eng Com.

Speigel gave a long talk on the general Hydrodynamics of the Ogalalla formation in the Hobbs Area.

gals / min X .7 = BOPD

450 gals/min poor water well

7,000,000 gals / day
3 gals / min average small domestic well

Water seimed off
140 100' 40
Subcommittee will be appointed
Next meeting 9:00 AM Thursday 25th
OCC Office

2nd Mtg Thursday 9:00 A.M.

Question: can we get oil out
some think small areas contaminated

Make tabulation of all leaks and depths of leaks

10 A
~~10~~
~~100 AcFt × 50% = 50 AcFt~~

~~300,000 bbls - wove~~
~~.25~~

~~Assume that~~
1. We don't know exact area of contamination however small (about 10 A)

2. Motion made ~~and~~ seconded & carried that all producing water wells in the Hobbs Pool Area ~~location~~ be determined with all physical characteristics determined ~~and~~ water analysis be made along with determining if any fluid other than water is present in any producing well.

OCC
Shell
Cont.
State Eng.

26 sections

OCC Chairman Survey
Shell - Survey
Cont. - Survey
State Engineer - Survey

3. Shackleford Chairman Subcommittee to investigate the possibility of ~~recommending~~ ~~that~~ the manner in which future water wells should be completed

City Water Board
Sawdon
State Eng.

Afternoon

Mtg considered methods of preventing future contamination —

Csg program + Pres tests described

1, Surface pipe on clamps ~~should~~ be Connected with vent line to surface + vented. All surface pipe vented to surface OK sensitive gauge

2. Quarterly tests by operators submitted to Commission + certification that no leaks were found. One test a year witnessed by OCC

3, Packers installed on flowing wells + Annular space filled with sweet oil.

Sonedan Chairman SubCommittee to investigate contamination of FW aquifer other than oil wells.

Pan Am, City Water Board.

adjorn. 3:00 PM

9 AM Tuesday Aug. 10

Shell 17, 18, 13, 23, 24, 19, 20, 21, 27
Cont 28, 29, 30, 25, 36, 31, 32, 33, 34

OCC 3, 4, 5, 6, 8, 9, 10, 15

August 1 Mtg
Minimum Requirements
1. Set csg 25' below top W.T.
2. 5 sxs cement around csg shoe
3. Construct well in such a manner that no surface contamination could occur
4. That the State Engineer should supervise completion + P+A of water wells in Hobbs area.

Report accepted –

Committee 2
Disposing waste for service Co's provided by city east of Town
Filling station – keep oil for reprocessing
Gasoline Plant – waste no serious – some chemicals added – + acid used on cooling towers – Water not bad – no sample. Mtg 9:00 Aug 7, 57

4th Mtg

Ck OTH Observation wells

1. Water Table
2. Sample of Fluids
   a.) check for oil + Gas
   b.) check for Cl.

Check contaminated wells and all wells in immediate area. If time available check open wells.

No oil to be stored in earthen Pits
Jetting of water wells with gas
Amerada?

Next Mtg August 22 9:00AM