CASE 3212: Application of ARCHIE M. SPEIR for a waterflood project in EDDY COUNTY.

CASE NO.
3212

Application,
Transcripts,
Small Exhibits
ETC.

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

P. O. BOX 2088
SANTA FE

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

March 25, 1965

Mr. A. J. Losee
Losee & Stewart
Attorneys at Law
Post Office Box 239
Artesia, New Mexico

Re: Case No. 3212
Order No. R-2882
Applicant:

ARCHIE M. SPEIR

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC x
Aztec OCC _____
OTHER _____

Case 3212
Heard: 2-24-65
Rec. 3-11-65,

1. Grant Archie M. Spear permission to begin a waterflood on his So. Red Lake-Grayburg Unit.
2. Approve the 18 wells listed on page 2 of his application as injection wells with the proviso that the injection shall not be commenced until
   (a) a cemented liner has been set at the top of the injection zone & tested to 2000# psi, or
   (b) injection accomplished thru tubing and under a packer set at the top of the injection zone,
   (c) or the casing is set thru the injection zone it shall be tested to 2000 psi or injection shall be accomplished as in (b) above.
3. Operate under Rule 701.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 3212
Order No. R-2882

APPLICATION OF ARCHIE M. SPEIR
FOR A WATERFLOOD PROJECT, EDDY
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on February 24, 1965, at Santa Fe, New Mexico, before Examiner Elvis A. Utz.

NOW, on this 25th day of March, 1965, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Archie M. Speir, seeks permission to institute a waterflood project in the Red Lake Pool in the South Red Lake Grayburg Unit Area by the injection of water into the Premier Sand-Grayburg formation through 18 injection wells in Sections 35 and 36, Township 17 South, Range 27 East and in Sections 1 and 2, Township 18 South, Range 27 East, NMPM, Eddy County, New Mexico.

(3) That the wells in the project area are in an advanced state of depletion and should properly be classified as "stripper" wells.

(4) That the proposed waterflood project should result in the recovery of otherwise unrecoverable oil, thereby preventing waste.

(5) That the subject application should be approved and the project should be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:

(1) That the applicant, Archie M. Speir, is hereby authorized to institute a waterflood project in the Red Lake Pool in the South Red Lake Grayburg Unit Area by the injection of water into the Premier Sand-Grayburg formation through the following-described 18 wells:

EDDY COUNTY, NEW MEXICO

WELL	NUMBER	LOCATION
SECTION 35, TOWNSHIP 17 SOUTH, RANGE 27 EAST, NMPM		
Wright Oil Co., Ltd., Harbold	7	SE/4 NE/4
Wright Oil Co., Ltd., Harbold	8	NE/4 NE/4
Wright Oil Co., Ltd., Harbold	15	SE/4 NW/4
Carper Drilling Co., Russell	1	SE/4 SW/4
Carper Drilling Co., Russell	4	SW/4 SE/4
Carper Drilling Co., Magruder	7	NE/4 SE/4
Carper Drilling Co., Magruder	8	NW/4 SE/4
Carper Drilling Co., Magruder	9	NE/4 SW/4
SECTION 36, TOWNSHIP 17 SOUTH, RANGE 27 EAST, NMPM		
J. E. Bedingfield, Delhi	11	NW/4 SW/4
J. E. Bedingfield, State E-379	3	SW/4 SW/4
J. E. Bedingfield, State E-8318	1	SE/4 NW/4
Rutter & Wilbanks, Magruder	2	SW/4 NW/4
SECTION 1, TOWNSHIP 18 SOUTH, RANGE 27 EAST, NMPM		
Wright Oil Co., Ltd., Hill	3	NW/4 NW/4
SECTION 2, TOWNSHIP 18 SOUTH, RANGE 27 EAST, NMPM		
Carper Drilling Co., State A	1	NE/4 NW/4
Carper Drilling Co., Wright State	1	NW/4 NE/4
Atlantic Refining Co., State	1	NE/4 NE/4
Atlantic Refining Co., Turner	1	SE/4 NE/4
Rutter & Wilbanks, Hudson	1	SW/4 NE/4

(2) That the subject waterflood project shall be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

(3) That monthly progress reports of the waterflood project herein authorized shall be submitted to the Commission in accordance with Rules 704 and 1120 of the Commission Rules and Regulations.

(4) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JACK M. CAMPBELL, Chairman

GUYTON B. HAYS, Member

A. L. PORTER, Jr., Member & Secretary

ser/

OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO

April 5, 1965

COPY

Mr. A. J. Losee
Losee & Stewart
Attorneys at Law
Post Office Box 239
Artesia, New Mexico

Dear Sir:

Reference is made to Commission Order No. R-2882, recently entered in Case No. 3212, approving the Archie M. Spear South Red Lake Grayburg Unit Waterflood Project.

Injection into any of the authorized 18 wells shall not be commenced until:

(a) A cemented liner has been set at the top of the injection zone and pressure-tested to 2000 psi; or

(b) A string of tubing has been run and set in a packer immediately above the injection zone;

(c) Where casing is set through the injection zone, it shall be pressure tested to 2000 psi, or injection shall be accomplished as in (b) above.

As to allowable, our calculations indicate that when all of the 18 authorized injection wells have been placed on active injection, the maximum allowable which this project will be eligible to receive under the provisions of Rule 701-E-3 is 1162 barrels per day.

OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO

Mr. A. J. Losee
Losee & Stewart
Post Office Box 239
Artesia, New Mexico

April 5, 1965

COPY

Please report any error in this calculated maximum allowable immediately, both to the Santa Fe office of the commission and the appropriate district proration office.

In order that the allowable assigned to the project may be kept current, and in order that the operator may fully benefit from the allowable provisions of Rule 701, it behooves him to promptly notify both of the aforementioned Commission offices by letter of any change in the status of wells in the project area, i.e., when active injection commences, when additional injection or producing wells are drilled, when additional wells are acquired through purchase or unitization, when wells have received a response to water injection, etc.

Your coorperation in keeping the Commission so informed as to the status of the project and the wells therein will be appreciated.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/ir

cc: Mr. Frank Irby
State Engineer Office
Santa Fe, New Mexico

Oil Conservation Commission office in Hobbs and Artesia

BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF :
ARCHIE M. SPEIR, UNIT OPERATOR, FOR :
A WATERFLOOD PROJECT, SOUTH RED LAKE : No. 3212
POOL, EDDY COUNTY, NEW MEXICO :

APPLICATION

COMES ARCHIE M. SPEIR, by his attorneys, Losee and Stewart, and states:

1. Pursuant to the terms of the South Red Lake Grayburg Unit Agreement and Unit Operating Agreement, the applicant is designated as operator of the Premier Sand of the Grayburg formation underlying the following lands in Eddy County, New Mexico, comprising the project area covered by this application, to-wit:

Township 17 South, Range 27 East, N.M.P.M.

Section 35: E/2, E/2 W/2,

Section 36: SW/4 NE/4, NW/4, W/2 SW/4

Township 17 South, Range 28 East, N.M.P.M.

Section 1: NW/4 NW/4

Section 2: NE/4, NE/4 NW/4

2. There is attached hereto by reference made a part hereof, a plat showing the location of the proposed injection wells and the location of all other wells and lessees adjoining the proposed project area.

3. The applicant proposes to inject water into the producing Premier Sand of the Grayburg Formation in the following wells located within the project area, to-wit:

Wright Oil Co., Ltd. Harbold No. 15 Well, located in the SE/4 NW/4 Section 35,

Wright Oil Co., Ltd, Harbold No. 7 Well, located in the SE/4 NE/4 Section 35,

Rutter & Wilbanks Magruder No. 2 Well, located in the SW/4 NW/4 Section 36,

Carper Drilling Co., Magruder No. 8 Well, located in the NW/4 SE/4 Section 35,

Carper Drilling Co., Magruder No.7 Well, located in the NE/4 SE/4 Section 35,

J. E. Bedingfield, Delhi No. 11 Well, located in the NW/4 SW/4 Section 36,

Wright Oil Co., Ltd., Harbold No. 8 Well, located in the NE/4 NE/4 Section 35,

J. E. Bedingfield, State-E-8318 No. 1 Well, located in the SE/4 NW/4 Section 36,

Carper Drilling Co., Magruder No. 9 Well, located in the NE/4 SW/4 Section 35,

Carper Drilling Co., Russell No. 1 Well, located in the SE/4 SW/4 Section 35,

Carper Drilling Co., Russell No. 4 Well, located in the SW/4 SE/4 Section 35,

J. E. Bedingfield State E-379, No. 3 Well located in the SW/4 SW/4 Section 36,

Carper Drilling Co., State A No. 1 Well, located in the NE/4 NW/4 Section 2,

Carper Drilling Co., Wright State No. 1 Well, located in the NW/4 NE/4 Section 2,

Atlantic Refining Co., State No. 1 Well, located in the NE/4 NE/4 Section 2,

Wright Oil Co., Ltd., Hill No. 3 Well, located in the NW/4 NW/4 Section 2,

Rutter & Wilbanks, Hudson No. 1 Well, located in the SW/4 NE/4 Section 2,

Atlantic Refining Co., Turner No. 1 Well, located in the SE/4 NE/4 Section 2,

4. That all of the wells within the project area have reached the advanced or "stripper" state of depletion

and applicant proposes to inject water into the producing Premier Sand of the Grayburg Formation at the rate of approximately 250 barrels per day under a pressure of approximately 1200 psi to stimulate the production of oil from the producing wells in the project area.

5. There are no electric logs in existence on any of the proposed injection or producing wells within the project area but applicant does attach hereto and by reference make a part hereof, the Grayburg section of a log of the Carper-Sively-Empire joint account Magruder No. 13 Empire Abo Well, located in the SE/4 SE/4 of said Section 35.

6. There is attached hereto, and by reference made a part hereof, a schematic diagram of all of the eighteen proposed injection wells. Applicant proposes to inject water through either the casing or tubing,

7. Caprock Water Company will furnish the water for this project from its wells in the Red Lake area or the Caprock area or applicant will secure water from some other commercial source.

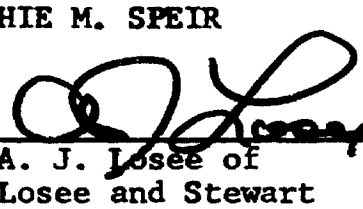
8. That applicant will conduct said waterflood project under the allowable provisions of Rule 701 of the New Mexico Oil Conservation Commission.

9. The approval of this waterflood project will be in the interest of conservation and will prevent waste, and protect correlative rights.

10. That a copy of this application and all exhibits attached hereto have simultaneously been sent to the State Engineer's Office, Attention Mr. Frank Irby, Capitol Building Santa Fe, New Mexico, certified mail, return receipt requested.

WHEREFORE, applicant prays that an order be entered authorizing the institution of the aforesaid waterflood project and for such other relief as may be just in the premises.

ARCHIE M. SPEIR

By 

A. J. Losee of
Losee and Stewart
Attorneys at Law
P.O.Drawer 239
Artesia, New Mexico

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

'65 MAR 3 AM

S. E. REYNOLDS
STATE ENGINEER

March 2, 1965

ADDRESS CORRESPONDENCE TO:
STATE CAPITOL
SANTA FE, N. M.
87501

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
Santa Fe, New Mexico

Dear Mr. Porter:

Since the hearing of February 24, 1965, on the application of Archie M. Speir for a water-flood project in the South Red Lake Pool (Case 3212) I have discussed it with the staff members of this office and some of your engineering staff.

It should be noted in table 1 of Mr. Speir's report (exhibit #2) that most of the wells are old, the youngest being seven years old and the oldest being 39 years old. Exhibit No. 5 (3 sheets) submitted at the hearing (Injection Well Casing Program) shows extremely poor construction of the wells in most cases. These exhibits lead me to conclude that most of the wells are in poor condition, and Mr. Speir's testimony resulted in the same conclusion.

This office offers no objection to the granting of the application provided the casing and cementing program and the equipment used in the injection of water will protect the ground waters which exist to a depth of 927 feet.

Very truly yours,

S. E. Reynolds,
State Engineer

By Frank E. Irby
Frank E. Irby,
Chief
Water Rights Division

FEI/mls
cc: Archie M. Speir
F. H. Hennighausen

LAW OFFICES
LOSEE AND STEWART
CARPER BUILDING - P O DRAWER 239
ARTESIA, NEW MEXICO

A. J. LOSEE
EDWARD B. STEWART

AREA CODE 505
746-3508

February 17, 1965

Case 3212

Certified RRR

New Mexico Oil Conservation Commission
State Land Office
P. O. Box 871
Santa Fe, New Mexico

Gentlemen:

Enclosed herewith you will please find three copies of the Application of Archie M. Speir for a waterflood project in the South Red Lake Pool, Eddy County, New Mexico, together with the exhibits therein referred to. With a carbon copy of this letter we are furnishing Mr. Irby with a copy of this application and all exhibits thereto.

I understand that this case has been set for hearing on February 24, 1965.

Very truly yours,

A. J. Losee

AJL:dh
Enclosure
cc: State Engineers Office
Capitol Building
Santa Fe, New Mexico
Attention: Mr. Frank Irby

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

'65 FEB 24 AM

S. E. REYNOLDS
STATE ENGINEER

February 23, 1965

ADDRESS CORRESPONDENCE TO:
STATE CAPITOL
SANTA FE, N. M.

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
Santa Fe, N. M.

Dear Mr. Porter:

It is noted on the Oil Conservation Commission Docket for February 24, 1965 that Archie M. Spier seeks authority to institute a waterflood project in the Red Lake Pool by injection of water into the Premier Sand-Grayburg formation. This application has been given Case No. 3212 on the Docket. No application from Mr. Spier has been received by this office and I have no information available concerning his plans.

This office objects to the granting of Mr. Spier's application until such time as we have received a copy of the application and all information necessary to reach a decision and have had sufficient time to study the proposal.

I have no address for Archie M. Spier and am unable to forward him a copy of this letter but will enclose an extra copy of this letter in the event you desire to forward it to him.

Yours truly,

S. E. Reynolds
State Engineer

By: Frank E. Irby
Frank E. Irby
Chief
Water Rights Division

FEI/ma

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
February 24, 1965

EXAMINER HEARING

IN THE MATTER OF:

APPLICATION OF ARCHIE M. SPEIR FOR A WATERFLOOD PROJECT, EDDY COUNTY, NEW MEXICO

Case No. 3212

BEFORE:

ELVIS A. UTZ

TRANSCRIPT OF HEARING

MR. UTZ: Case Number 3212.

MR. DURRETT: Application of Archie M. Speir for a water flood project, Eddy County, New Mexico.

MR. LOSEE: Mr. Examiner, A. J. Losee of Artesia, New Mexico, representing the applicant. I have one witness, Mr. Speir.

MR. DURRETT: Let the record show that Mr. Speir was sworn in the previous case, Case Number 3211, and is still under oath.

MR. LOSEE: Before we start cross-examination of the witness, the question has been raised outside of the record that the State Engineer did not receive a copy of the application with the exhibits. I would like for the record to show that, one, my file reflects that a copy was directed to the State Engineer's Office; I have a certified slip made out that the letter was prepared for that delivery; I would testify that my recollection is that I added a pen note to Mr. Frank Irby; and, although not reflected by my file, I have a recollection that a return receipt has been received on it. Now, let me also state that I don't intend to say that the State Engineer's Office received it; if I had the return receipt--I have another file--I might then argue. But we would like to furnish him with such information as is necessary for them to evaluate the project, whether it be at this hearing or after

the hearing, so that they would have an opportunity to review it.

MR. IRBY: Mr. Examiner, I am Frank Irby, State Engineer's Office. Yesterday I reviewed the docket that had been sent out, and noted that I had nothing on Mr. Speir's application, or designated as Case Number 3212, and directed or dictated a letter to the Secretary-Director of the Commission so stating, and also advised the Director that I would object to granting of the application until such time as I had received the application and exhibits and had reasonable time to study them. I do not object to the hearing going on and possibly any objections that I may have to this application can be satisfied here today in this hearing. I did not send a copy of this letter to Mr. Spier because I didn't have an address in my files--I enclosed an extra copy to the Secretary-Director to be forwarded to Mr. Speir in case they did have his address.

MR. UTZ: We'll forward it to him right now. Do you want to hand that back, please? Under those conditions we will proceed with the hearing, and see what develops. You may wish to make a statement at the termination of the testimony, Mr. Irby.

MR. IRBY: Thank you.

A R C H I E M. S P E I R, the witness, having

been duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. LOSEE:

Q Would you state your name, residence and occupation, please.

A I am Archie M. Speir, Artesia, New Mexico. I am a practicing petroleum engineer.

MR. LOSEE: In view of Mr. Speir's statement in the previous case, are his qualifications acceptable, Mr. Examiner?

MR. UTZ: Yes, sir, they are.

MR. LOSEE: Please refer to what has been marked Exhibit 1, and explain what it portrays.

A Exhibit 1 is a plat of the area, and it shows the boundary of the waterflood project area. It also shows the proposed injection pattern, and it reflects also the maximum allowable under Rule 701 that would be granted to this project at this particular time.

Q It shows the location of all wells completed within the formation proposed to be waterflooded, does it not?

A Yes, sir, and only those wells, except for the dry holes in offsetting leases.

Q Have there been waterflood projects in the adjoining area in the same formation?

A Yes, sir, there are three waterflood projects now

in existence that we can use as a guide to what we may do here, and one of them is Curzy & Company waterflood in the Red Lake pool and the other is the Sema Capitan project of the Red Lake area. The first two are offsetting projects to the north of the proposed area. The third is the Gray Ridge Corporation's waterflood project in the north part of the Artesia Pool.

MR. UTZ: Where is that located from this flood?

A Approximately six miles east.

MR. LOSEE: How far is the Kersey Curzy?

A Approximately two miles--more than two miles north, and the Sema Capitan is an east offset to the Curzy project.

Q Are these projects all waterflooding the same Premiere zone you have requested approval to waterflood?

A Yes, sir. There are other floods in the area that are flooding a different zone than the Premiere, that have not been brought to your attention.

Q Have any of these floods responded to water injection?

A Yes, sir, they have all responded to water injection.

Q Have you prepared an engineering report of this proposed project area and submitted it to the interest owners?

A Yes, I have.

Q Has that engineering report been marked Exhibit 2 in this hearing?

A Yes, it has.

Q How many producing wells are there in the proposed project area?

A There are 34 wells that are now within the proposed project area.

Q Have those wells reached an advanced or stripper state of depletion?

A Yes, sir, all of the wells are in the stripper stage.

Q Now, please refer to what has been marked Figure 3 of your engineering report, and explain what that figure reflects--I'm sorry; it's Figure 6.

A Figure 6 is a decline curve of the total unit area, Mr. Examiner. This is a larger area than our proposed project--it includes the three tracts that were omitted in our project area.

Q Is there any material difference between the decline curve on the project area and this decline curve as shown on Figure 6?

A No, sir. The present state of production is of the same order that is shown on this decline curve.

Q Is that true in all of the 34 wells?

A Yes, sir, in all wells.

Q I notice that this ends in November of 1963, this decline curve. Have you tabulated the data since November of 1963?

A Yes, sir, I have.

Q Is that reflected by Exhibit 3?

A Yes, it is.

Q In your engineering report did your Figures 7 through 25 contain any information which would reflect on the present production of this?

A Figures 7 through 25 are the individual leases. It is the decline curve of the individual leases within the unit area, identical to the leases as shown in Exhibit 3.

Q In this engineering report did you estimate the amount of oil that could be recovered from secondary recovery or by secondary recovery methods?

A This engineering report reflects estimated secondary recovery in the amount of 1,940,000 barrels.

Q Approximately what was the cumulative primary production on this project area?

A As shown on Exhibit 3, to date--excuse me; to January 1, 1965, the cumulative production is 1,045,545.

Q Are there any electrical logs on any of these thirty-four wells?

A No, there are not.

Q Do you have any logs of any wells drilled in this same area?

A We have a typed log which is an electrical log of a

well drilled to the Ohio formation which was logged back through the unitized formation. It is the Carper-Sivley Enterprise Magruder Federal Number 13 and it is located in the southeast quarter of the southeast quarter of Section 35, Township 17 South, Range 27 East.

Q That log is marked Exhibit 4, is it not, Mr. Speir?

A Yes, it is.

Q On this log have you marked the producing interval you propose to inject water into?

A The common reservoir producing interval, the Premiere zone of the Grayburg formation, is colored in red on this typed log, which is the base of the Grayburg formation.

Q Please refer to what has been marked Exhibit 5, and explain what it reflects.

A Exhibit 5 is a schematic diagram of the casing program that now exists in the proposed eighteen injection wells.

Q That is the present casing program on these wells, is it not?

A Yes, it is.

Q Is any fresh water encountered or present in this area?

A There is evidence of some fresh water throughout the area, that can be encountered--oh, from 300 to 900 feet below the surface. There also is salt water that would be encountered

down to approximately 1200 feet; however, the fresh water is not prevalent in the area; it's sort of haphazard, and the water that is encountered is not of a great quantity. A cable tool drilling a well in the area can carry the water.

Q During what period were these eighteen proposed injection wells drilled?

A There have been three distinct periods of development, so to speak. The first wells were drilled in 1926; the others were drilled in the 1948-1949 era. There may be an isolated case of some wells being drilled later than 1955.

Q How do you propose to protect these water intervals in your injection wells?

A We feel like that to economically protect us, we have designed two types of completions. The preferred type, where allowable, would be tubing set on a packer and the packer set in the shoe joint of the present casing. Second, where necessitated, would be a string of casing run and set immediately above the pay zone and cemented. We have designed these two types through the lack of information on the present wells' condition. That includes the condition of the casing and the condition of any fracture zone or what-not. We cannot at this time ascertain as to which of these two methods of completion we will need on a given well. We are requesting permission to inject down the present casings as they are, until such time

as a sufficient hydrostatic head can be maintained and additional information gathered on the condition of the wells, to determine us to select one of these two types of completion.

Q How long do you think it will take you after you commence injection, to obtain this information?

A Adequate information should be obtained from between three to six months after initial injection.

Q If--strike that. Do you contemplate that all these eighteen injection wells would be completed with the same means, or would one of them be completed with casing and injection through the casing, and one through tubing?

A We contemplate that we will throughout the life of the project use both of these types of completion--that some wells will necessitate for themselves a string of casing set; others, through economics, we would prefer to select running the tubing.

Q What factors will you consider if you determine to run casing into the wells?

A There are three factors--three predominant ones. One is a well that has a fairly lengthy open hole section between the present casing shoe and the producing formation, which would be of such a nature that injecting water across that head would tend to sluice and plug the formation. Another condition would be a fracture zone in the proximity of the

producing interval that must be plugged off. Another one would be the sad state of affairs of the present casing that is now in the well, that will be evaluated through this temporary injection procedure. One of the most common causes we can think of probably will be leaking around the shoe joint, with inadequate cementing of the original casing. Some of the casings will not--no, strike that, please.

Q Is there any evidence of delay in running the strings of casing?

A Yes, there is. Through economics we prefer tubing and packer. Therefore we would like to have this privilege of obtaining the necessary information to our own satisfaction that we are not--or rather I might say that we are injecting into our primary target, and not losing water to a fracture zone or some other place. Therefore, we would not desire to run tubing and packer at this particular time in any well. We would rather wait and find out if we do need casing.

Q Could you obtain a better cement job on any casing run after you had obtained a hydrostatic head?

A Yes, sir, that is the primary reason, among others, that we are asking for this. We feel like if we fill the void space the well will maintain a hydrostatic head and we can more efficiently and more assuredly place a satisfactory cement job on any casing we may run.

Q On those wells in which you would run casing, what grade of casing do you contemplate?

A Through API standards we would select a grade of casing that would adequately protect us and maintain the pressure ratings we will use to inject. It will be new casing--either new or a Grade A used which would be susceptible of like performance of a new casing.

Q Would you, before commencing injection down any of this new casing, propose to test it?

A Yes, sir, it would be tested.

Q To what pressure?

A To 2,000 pounds.

Q If during this initial period of injection you determined that it was economical and would protect the fresh water areas to run tubing, explain what kind of tubing you would run and whether you would use a packer, and where it would be set.

A If we use tubing we would set it on a packer with the packer set in the shoe joint of the present casing. The tubing selected also would be adequate to give us a long life, economical injection string, to adequately protect ourselves as well as any fresh water zones that exist; also so we can efficiently inject into a primary target.

Q At the completion of this three- to six-months period

do you propose to advise the Commission and the State Engineer's Office of the exact method of injection--the permanent method of injection, down each well covered by your application?

A Yes, sir, I would file a casing program on each well --a completion program.

Q Let me refer back to the casing. If you ran casing in the wells, how would you cement them?

A Any additional casing string that would be run-- adequate cement would be used to tie that string of casing back up into the present casing string. This would be a new string that is run on the inside. We would not pull the existing casing--just run new string on inside and cement it back up into the present casing.

Q At what pressure do you propose to inject water into these wells?

A The anticipated maximum injection pressure throughout the life of the flood will be 1200 pounds per square inch.

Q What volume of water do you anticipate being able to inject?

A At this pressure the average well injection rate is 250 barrels per day.

Q What is proposed to be the source of your water for this program?

A We are purchasing water from C Crock Water Company.

Q Do you know from which of their wells they will secure water for this program?

A I am not completely informed as to their exact programs. I am assuming at the present time that this water will be supplied out of their Red Lake water system.

Q Do you know what kind of water that is, out of the Red Lake?

A Through the experience of using this water, it's-- I don't have a complete mineral analysis; I'm not sure it's potable water. It does have the presence of oxygen for some reason; it's a shallow aquifer. It does require treatment because of the fact of this presence of oxygen, to control bacteria and corrosion.

Q Do you propose to treat the water with such treatment as is necessary to control bacteria and corrosion?

A Yes, sir; in sound engineering practice it's mandatory that bacteria and corrosion are controlled.

Q Does your project propose to re-inject water that has been recovered from these wells?

A Yes, all produced water will be re-injected.

Q Is the allowable you are requesting from the Commission the standard allowable set by Rule 701?

A Yes, it is.

Q In your opinion, will this waterflood project

prevent waste and protect correlative rights?

A Yes.

Q Will oil be recovered that cannot otherwise be recovered from these wells?

A Yes, the secondary recovery by water injection will allow recovery of oil that otherwise would not be recovered.

Q What do you estimate would be the life of your project?

A Fourteen years.

Q Were these exhibits prepared by you or under your direction?

A They were prepared by me.

MR. LOSEE: We offer into evidence Exhibits 1 through 5.

MR. UTZ: Without objection, Exhibits 1 through 5 will be entered into the record of this case. Are there any questions of the witness?

CROSS-EXAMINATION

BY MR. IRBY:

Q Yes, sir. Mr. Speir, these remarks you made concerning the method of completion of these wells for injection purposes--is that a part of the application? I mean, is that included in the application or the exhibits?

A The method of completion?

Q Yes, sir. In other words, you stated two methods

you propose to use, and that's something I couldn't find in the material Mr. Losee handed me.

MR. LOSEE: It's in the application.

MR. IRBY: I don't have that.

WITNESS: May I loan you mine? Section 7 or 8, somewhere there.

MR. UTZ: I think we can spare him a copy of the application out of the file.

WITNESS: Section 6.

MR. IRBY: Mr. Losee, maybe you need this back to answer questions? -- Pardon me; Mr. Speir.

WITNESS: No, sir, I have that committed to memory.

Q (MR. IRBY) These two methods you set out--this is a little new to me, and if you would just go through that briefly again, how you intend to do this recasing and use of tubing--I'm not aware of the meaning of this injection to obtain information.

A Let me add this, Mr. Irby--that the reason we're short of information is, there are very few people presently on the wells that drilled the wells, and through the years adequate well file records have not been passed on, and also some of these wells were drilled in a period of casing shortage and we're not just assuming that we have good casings; we really are proceeding on the premise that all of the wells

will need more than a normal amount of repair. Now, there was a dual purpose in asking for this temporary injection procedure, and primarily, through sound economics, it does follow good engineering practice that if a well can be circulated with water or with some type of fluid, you can obtain a fairly decent cement job. If you cannot obtain that circulation your risks are high in obtaining good cement, and that is the primary thing--to cement the casing in place. Therefore we want to fill the voids with our injection. We are going to do this anyway, so we start with injection and fill it so we can circulate it. This will be several thousand barrels of water, to fill the present void, and then we can circulate. Also, as we find out and we know more about our present casing, we wouldn't want to run any more if the open hole area is shorted or sluicing or thieving, and I am talking primarily of thieving into the barren zone or non-productive or fracture area below our water zone. Also I know of practices that took place in 1948 and 1949--it's doubtful that the shoe joint itself or the present cement around the present casing won't leak, and we must set new casing. Therefore we couldn't set the tubing on a packer in this shoe joint because it would leak around the shoe. But it's preferable--we would like to set tubing on a packer, it's more economical, we prefer that, and if it must be replaced, if corrosion got out of control or we

sprung a leak it's fairly easy to replace tubing--it doesn't necessitate a close watch. And also if we pick up corrosion in our produced water, which some places we do--it's non-compatible with the makeup water--it will accellerate corrosion, we can plastic-coat this tubing string and that will give us adequate protection.

Q As I understand, you had two methods by which you propose to complete the wells after this test project is completed in three to six months--one of these was that in some instances you would run new casing and cement back up into the old casing; and I'm assuming the new casing would come all the way to the surface?

A Yes, sir.

Q And the other would be to in some cases--you would inject down the casing, is this right; or where you put in your new casing?

A Yes, sir.

Q And in the other case you would be where you would use tubing and packer. Is this a case where you find the hole casing and the setting in good condition, and you put this down at the bottom--you don't intend to run new casing and tubing both?

A That's right. If the well condition is such, and the present casing is adequate and there is no shoe leak, we

would run the tubing and set the packer close to the bottom of the casing.

Q Basically, the way I have stated my understanding is the way you propose to complete them?

A Yes, sir, that is correct.

Q I'm going to have to have some consultation with my staff, Mr. Speir, before I know clearly what is going to happen on this test, and I would like to have a few days, if it isn't a serious inconvenience to you, to go over this material with my staff, and then either contact you for additional information or make my conclusions known to the Commission. Now, you haven't talked about how emergent your problem may be, whether you have to get to work tomorrow or ten days from now, and what I'm really saying is that--well, I'm asking if it would be a serious inconvenience for me to have a few days to go over this with the men in my department before I give a final answer to the Commission.

A Mr. Irby, I want to be sure you're completely satisfied on this. As you know, the normal oil field practice is to hurry up; everybody's behind. I might say this is a typical case; we're trying to pursue it double-time, but I would be most happy for you to take whatever time you need to convince yourself, and I would make myself available to you for any additional information. I would like--we're running at dead-

lines all the time.

MR. IRBY: In view of your statement, I'll try to straighten things out at my office, and find my copy of this application, and I'll get on it immediately if I have to do it at night, and contact you, if necessary, and get my conclusions to the Examiner at the earliest possible date.

MR. UTZ: Mr. Irby, is there anything else you need, assuming you cannot find your copies--anything else you need that we can furnish you out of the files at this time?

MR. IRBY: I assume this set of exhibits is the one to be turned in to the Committee?

MR. LOSEE: No, that's yours.

MR. IRBY: Then I do have a copy of the application from your file. I don't know of anything else I need.

MR. UTZ: Mr. Speir, you spoke of circulating water on this test. What do you mean by that?

A I meant circulation as would be established after running new casing, just prior to the cementing job.

Q Oh, I see. You weren't thinking of injecting on this trial test long enough to run water through the formation and circulate through a producing well?

A Oh no, sir. The circulation is down and out through the well bore.

Q By using this temporary test, how will you determine

whether or not the casing is leaking around the shoe?

A General experience in the area, Mr. Examiner, is that after a given number of barrels are injected into these formations in southeastern Eddy County, they will require pressure to inject. There can be some calculation actually as to the void space that is there by using cumulative oil recovery from this particular well as one indication, plus its associated dissolved gas, will give an indication of about how many barrels need to be injected. The percent of that will offer a resistance that will require pressure, and if you have not established this surface pressure within this normal volume that's being injected, that's going to warrant some investigation where the water is going, rather than to the primary target. Some of these would--excuse me just a minute; I saw Mr. Irby mark down a telephone number, and may I give you a new number--it's 7462404.

MR. IRBY: Thank you.

WITNESS: Water or waterflood--I'm sure everybody in the waterflood business would testify to this--is expensive; you just can't afford to lose it. Therefore it in itself will prompt some expenditures to find out where it may be going. There are several normal procedures you must follow to ascertain that loss that you have determined from the fact that you're not getting adequate surface pressure. Of course the normal tracer surface or spinner surface--

MR. UTZ: The only quick way you could find out would be to set a formation packer and pressure up?

A You could do that immediately, but my thoughts on that is that you would--that's a hazardous operation; you wouldn't do it only as a last resort. You wouldn't want to fill up on the back side of that formation packer and then try to pull it...it's risky business, and the pressure in the back side--it may or may not hold, and actually maybe the packer is leaking--that is, if you have a complete void below it.

Q Is it your intent to test the casing before the test period injection?

A The present casing?

Q Yes.

A I had not wished to--no.

Q In other words, your proposal is to hook up to the wells in the present condition as shown on Exhibit 5, and start injecting?

A Yes, sir, and let the period of injection serve as a test to the casing condition.

Q What period is it you're asking for?

A We have estimated the period to be from three to six months, that this normal surface pressure would be maintained.

Q How many thousand barrels of water do you expect you would inject in that length of time?

A Well, let's run through a little calculations. Let's figure it on just one well.

Q The total, or one well?

A Well, let's use one well. If we find it's going to average 250 barrels per day, we might say this experimental period will be 400 barrels per day injection rate. At 180 days at number 72, if we have all the zeros on it--

Q 72,000 barrels per well? If the casing isn't in good shape is there a possibility that injecting that much water would have already done substantial damage if it goes in the wrong place, into a fresh water zone or oil producing zone? It could lose a lot of water if it went in the wrong zone.

A We feel we will get this evidence before this volume of water is injected. I know the damage that you refer to. I believe credit would be exercised against us as a unit, more so than any other place. I have grave doubts that we could create any damage, so to speak, any place except just a loss of ineffective water. Now, we are cognizant of the fact that we are in a water basin. We respect the State Engineer and his jurisdiction over the shallow water, and we don't want to operate in a manner that will damage this fresh water. We realize very greatly the value of fresh water to the State of New Mexico, and we as part of it don't want to hinder that in any way.

Q Is there a number of these wells with the casing set substantially higher in the pay zone that you showed in red on some exhibit here--Exhibit 4? In other words, as I understand, Exhibit 4 is the area in which you want to inject water?

A Yes, sir.

Q Is there a number of these wells completed with open hole and casing set substantially higher in that zone?

A There are a number of the wells that are set in the neighborhood of 300 feet above that zone. I don't believe there are any set higher than that, or I would say more than 300 feet above that. There are some of these wells that have casing set through the zone now, and it would be the second or maybe the third string of casing that is now set and perforated through to our primary target. Quickly glancing through this, I see a few wells that are set in this 300-foot range above the zone. Some are set immediately above the zone, but we have doubts as to the condition of the casing, and this is why we are saying we must investigate this casing condition, must not assume that it is adequate and that we can inject as it is. We want more information and we're asking that you grant permission that we obtain the information in this manner.

Q On each well, can you determine the top of the zone in which you intend to inject--the depth?

A I think that we failed to submit or draw attention to one figure in the engineering report. It would be Figure

2, which is the structure map on top of the main pay zone.

Q That figure by each well is the top of your injection zone?

A Yes, sir, it is. Now, this figure is not accepted as geologically correct; it is only the figure that was taken from the reports as filed with the Commission or with the U.S. G.S. in the case of the Federal wells.

Q Do you have any other information that is more correct?

A This is the best we had. Now, some wells did offer more accurate information as to that particular well, but we felt like if we used real spotty information in the area as representative of the area total, we would get a distorted picture. We feel that this gives us a good picture of the area, even though we are not truly correct as to the true top; but it is accurate enough.

Q Are these contours based on subsea?

A Yes, sir, they are.

Q Then in order to determine the relation between these tops and the casing, we would have to have the elevation of the well?

A Yes, sir. Exhibit 3--5; excuse me, is this schematic diagram of casing programs, giving the top in surface depth measurement of the pay zone.

Q I see--oh yes. We can determine from your Exhibit 5 how high the casing is set above the pay zone?

A Yes.

Q Now, on your Exhibit 3 you have listed production over a certain period of time, in addition to Figure 6 in your Exhibit 2. As I interpret these figures, these are on a lease basis?

A Yes, they are.

Q Can you state or do you have any information to show us as to what the range of daily production is in all wells included in Exhibit 3? In other words, what is the low and what is the high for daily production?

A I don't have that figure with me; however, the low is zero. Some of the wells are temporarily abandoned, waiting for the project to be kicked off. The maximum I believe would be--I just don't know, I haven't taken great stock in each individual well's production but it has been--I look at the lease average; they're going into a common tank battery and this is an old depleted area and I know the average of any lease is quite low. I could pull a figure out of my hat, but it might be misleading, and I would hesitate to do so.

Q Could you give us an idea or furnish information as to what you think the well average is, along the number of the wells listed on this lease, and you can just write that figure

on the exhibit and send it back to us, or hand it to us before you leave town...if you know how many wells are on the lease.

A I can give you a lease well average now. I know the number of wells on each of these leases.

Q Well, that would be partially satisfactory. I think you understand what I'm after--I'd like to know what the capacity is of the larger wells on this lease, in order for us to make a determination whether this is an area to be waterflooded or whether it's still in primary.

A Well, let me add this...

Q If it's on the order of nine or ten barrels, that's one consideration; if it's forty to fifty for some wells and there's quite a few of that type of wells, that would be another thing.

A Let me do this--I'll gladly send you any additional information, but on the tabular form if you take the month of December, 1962, we can readily pick out the daily production rate of this particular month. Number 1, that's twelve barrels per month or one-half barrel per day. The C&H Oil Malco Federal Number 1 well, that's 78 barrels a month or 2½ barrels per day. The Cockburn MS Barrientos Federal is two wells; that's one barrel per day. The Magruder Federal is 251 barrels for the month, or 80 barrels a day--eight barrels per day, rather; and there's seven wells on this lease so that's about a barrel

per day. That's a lease average, and I know there are some shut-in and some producing as high as four or five barrels per day on this particular lease. The maximum of that lease probably would be four or five for its best well that's completed in several zones. The next one is Russel Federal lease which has four wells and 27 barrels per month, or about ¼ barrel per day, and the State A lease is--I believe that's two wells, and the Wright State of course is shut-in in the Grayburg formation. Wright Oil Company's option of the Bedingfield lease or State D-8318 lease is 38 barrels for one month; that would be 1.2 barrels per day. The State E-1059 lease has two wells, 37 barrels or about ½ barrel per day. The State E-379 is one well, which is about 3/4 barrel per day. The Delhi II is one well; 90 barrels a month, which would be three per day. The Delaware Number 12 is shut-in. The John H. Trigg Harbolt--this is--the Wright Oil Company has purchased the John H. Trigg, as listed on Exhibit 5, in his Harbolt Federal lease--124 barrels for the month, and this has six wells on it. I believe that would be about 3/4 barrel a day. The Hill Federal lease is shut-in. The Atlantic Refining Company State lease is shut-in. The Atlantic Refining Company Turner State lease, 48 barrels per month; that would be a barrel and a half per day. Rutter & Wilbanks Magruder Estate, 59 barrels per month; there's two wells; that would be one barrel

per day. The Rutter & Wilbanks Hudson State lease, 7 barrels per month; it has one well...¼ of a barrel. Hume Yates, et al Dooley State lease, 84 barrels a month; it's a four-well lease; that would be 3/4 barrel per day.

MR. UTZ: I think that information will be satisfactory, as long as we know the number of wells on the lease so we can get an idea. How do you first intend to put the wells on injection?

A I think I had made some mention of that in the report to the operators, and we still plan to develop in this same fashion. If you will refer to Table 3, this is a development schedule. They are listed in years, through five years, and under each year there is a notation of well conversion that refers to the number of wells that will be converted in that particular year.

Q Six the first year, and second and third--in other words, for three years you'll have eighteen wells?

A Now, what this report covers is the total unit area in which we are still including the three tracts that were omitted in the project, in this application, and we would modify this to the extent of the wells that would fall under this category and the wells that were outside and not joining with us, and it would be reduced by that proportion, as this report covers a total of 23 wells to be converted.

Q In other words, the temporary injection program would last over a period of three years?

A No, sir--yes, sir, so to say. We would like this temporary injection period to be applicable to every old well converted to injection, for its own three- to six-month period.

MR. UTZ: Are there any other questions of the witness? ... The witness may be excused. Are there any other statements to be made in this case? The case will be taken under advisement. The hearing is adjourned until one-thirty.

* * *

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ELIZABETH K. HALE, Notary Public and Court Reporter, do hereby certify that proceedings in Case Number 3212 were taken by me in shorthand and transcribed by me; that such transcription is a true and accurate record of proceedings to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF, my hand and seal of office this 19th day of March, 1965.

Notary Public

My commission expires

May 23, 1968.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3212, heard by me on March 19, 1965.

Examiner
New Mexico Oil Conservation Commission

ARCHIE M. Speir Engineer PETROLEUM
N. M. 3733

P. O. DRAWER 40 • PHONE 746-3759

ARTESIA NEW MEXICO

February 12, 1964

The Operators
South Part Red Lake Pool
Eddy County, New Mexico

Gentlemen:

This study was made to determine the merits of a waterflood operation in the South Part Red Lake Pool.

A waterflood project can be successful by a unitized operation of all the operators in the proposed area. Lease line cooperative type agreement will have inequities that will make them undesirable.

The opportunity to present this study to you in this joint meeting is appreciated.

Yours very truly,

Archie M. Speir

Archie M. Speir

AMS/jsp

LIST OF TABLES

LIST OF FIGURES

CONCLUSIONS

1 The pool is a depleted gas drive reservoir, all leases are near the economic limit.

2 The Premier Zone has a favorable waterflood history in other Pools of the vicinity.

3 The proposed area is the total reservoir and will offer the maximum efficiency.

4 Early water break-through can be tolerated for a successful operation.

5 Development spaced over a five year period offers the greatest advantages.

6 Investments, net balance, will be $137,030.00 on a 75% working interest basis; exclusive of water contractual costs and unitization expenses.

7 Cumulative Production Factor is the most equitable participation parameter for unitization.

8 Net income for a 75% working interest lease basis will be $1,999,780.00 in 14 years of operation.

RECOMMENDATIONS

1 A unit agreement for the area should be formed using API standard forms.

2 A waterflood project should be initiated and developed over a five year period.

3 Participation factors should be based solely on cumulative production.

DISCUSSION

GENERAL This report is a study of the ecomonics of a waterflood project. The horizontal limits of the study are confined to the Premier Zone of the Grayburg Formation. The aerial limits are defined as the South Part of the Red Lake Pool.

The North Part of the Red Lake Pool has two waterflood projects. One operated by Kersey & Co., initiated in 1957 and one operated by Cima Capitan, Corp., initiated in 1963. There is an indicated seperation between the North Part and South Part of the Pool.

The first well drilled in the area was the Carper-Sivley No. 1 Russell Federal; drilled by the Empire Gas & Fuel Co. and completed on July 1, 1926. Drilling continued by Empire until November 1927 with the completion of eight producing wells. A second stage of development began in 1947 with the completion of the Barney Cockburn No. 5 Barrientos Federal on March 30 and continued into the late 50s. A total of 42 wells have produced from the subject zone in the proposed area.

GEOLOGY The structure map of the top of the pay zone employs the depth to

the top of the pay as reported to the Oil Conservation Commission by the operators. This correlation point, no doubt, is not consistent through out the reservoir but is sufficiently uniform to show a reservoir continuity of the main pay zone. Figure 3 indicates three areas of maximum sand development, coinciding with the areas of greater initial potential. This map does not prove discontinuity of the sand members of the pay zone within the reservoir. It does indicate a change in the sand characteristics, such as the thickness, porosity and permeability.

Geological information on the area is very limited. Using that which is available as representive of the total area would be misleading and would distort the perspective.

A study of the production histories and the above maps give sufficient evidence for a successful waterflood operation. This is verified by other waterfloods in the Permian Basin.

PRODUCTION HISTORY The Unit Area consists of nineteen leases owned by nine operators. Forty wells are now producing from the Premier, two have been plugged and abandoned. A sufficient number of dry holes have been drilled to define the periphery of the proposed Unit Area.

As of November 1, 1963 the cumulative oil production was 1,026,620 barrels from the forty two wells. All leases have

declined to or near the economic limit.

Average cumulative production per well is 24,434 barrels. On an acreage basis this amounts to 855 barrels. The average per well recovery ranges from a low of 6352 to a high of 53,706 barrels; the average acreage recovery has a low of 158 to a high of 1430 barrels per acre.

Oil production data for the proposed area is comparable to the other Pools in Eddy County that have produced primarily from the Premier Zone. Water production is negligible. Gas production has not been regarded as the records are brief and inconsistent.

WATER INJECTION

Rates of water injection calculations are based on the production rates, estimated net thichness of pay zone, and compared to projects in the surrounding area, Figure 5 is based on the above injection rate and primary oil production rates. Figure 4 is a hypothetical curve.

A major portion of the wells were completed with production casing set below the Artesian Water Zone at 1300 to 1500 feet; some being set as high as 900 feet; and the pay zone shot with TNT. All of the proposed injection wells of the pilot area are completed in this manner.

A workover to convert a producer, so completed, to an

injection well will require running a string of injection casing and cementing immediately above the upper most productive zone. An alternative would be to run a liner to case the 300 feet to 500 feet of open hole and inject down tubing set on a packer. Water Injection Plant design is for a maximum capacity of 5000 barrels per day at 1500 pounds per square inch pressure. Pilot operation will require the construction of a plant of one-half the maximum capacity. When expansion exceeds the original capacity then the remaining part will be constructed.

There is adaquate flexibility in design to allow for necessary changes that operational experience may indicate.

Secondary production is calculated to be 1,940,070 barrels. Assigning 20,000 barrels of primary production to each of the nine development wells (discussed later) gives a total primary production of 1,200,220 barrels, Ratio of recoveries is then 1.61;1. Total recovery of 2,960,290 barrels is 2472 barrels per acre. Table IV shows the rate of return.

DEVELOPMENT

Initial response is estimated to occur in twelve months. Hence, expenditures that are necessary at that time appear in the second year in table 3. If the response occurs in less than twelve months then that expense would be in the first year.

First year operational and maintanence expense is designed to

properly maintain only the wells in the pilot area (18). Conversion costs of $4,000.00 per injection well should be sufficient for a well planned program exercising proper economics.

Complete area development for twenty acre spacing, with modifications in the outer aerial limits, will reguire the drilling of nine wells. Four scheduled to be injection wells and five to be producing wells. The first development well will be drilled in the third year, and all completed by the end of the fourth year. Necessity of such drilling to be substantiated by operational experience of the Unit.

Full pool development will contain forty nine wells; twenty seven injection and twenty two production. A reentry of a plugged and abandoned well is treated the some economically as a well that is to be drilled anew.

COSTS Development costs are itemized in table 3. They total $446,000.00, to be spent over a five year period.

Development and operational costs of the first year, and one-half of the development costs of the second year will be new investment money. This will vary depending on an operators working interest percent. The remaining costs of the project will be defraied by the project income.

Operation and maintanence	Per well per month	$80.00
Pumping, supervision & G.O.E.	Per well Per month	75.00
Supply water, chemical treatment and plant operation	Per barrel injected	2½¢

ECONOMICS

Project life will be fourteen years under present economics. Certain economical procedures may be adopted in the later stages of operation so as to extend the life.

Net income on a 87½% working interest basis will be $2,629,755.00 in 15 years. Using the seventy five percent working interest base the net income will be $1,999,780.00 in 14 years

Stage development, as outlined in table 3 offers two important advantages, One, the initial investment is smaller; two, a tax advantage by the higher expenditures occuring at the time of the higher income.

UNITIZATION

Table 5 presents the four common considerations in determining each lease's participation percentage in a unit. It is strongly recommended that only cumulative production be considered for determining the participation. This recommendation is based on the following points:

The pool is well developed and is in the last stages of depletion by primary production.

Acreage factor has little meaning in a depleted reservoir. A most equitable factor is the acre-feet of productive reservoir. It also offers the most conflicts, and is near imposible to acquire for this area.

Present production rates will not be representative as they are more dependent on the resent workovers and maitanence procedures. Expenditures for such work is reflected in the cumulative production. Also; production histories show that any workover or well stimulation will yield a rapid return and decline steeply to near the original production rate. Such would be the case for the wells that are presently non-productive. A flush production rate could be obtainted for a short period; the rate and additional recovery would be dependent on the treatment.

Disregarding the well factor is most difficult to belelve as being true equities. In depleted pools each well has returned the original investment to the limit of its ability. Per well recoveries are pratically independent of spacing. Closer spaced wells give a higher recovery on a per acre basis. Therefore, the leases with the lesser number of wells per acre have the greater amount of reserves remaining, but these same leases are the ones requiring the additional drilling. The fully developed leases share of the cost in the additional drilling is compensated for by their greater

share of the other leases reserves obtained by the higher participation factor received by the cumulative production percentage. Also, their own closer well spacing that gave a higher primary recovery will result in a lower secondary recovery.

The United States Department of Interior will not approve a unitization agreement where a cost factor, such as the number of wells, involves the royalty participation factor. If cost factors are used then two sets of participation factors must be used. One set for the royalty owners and one set for the working interest owner.

Table 1

WELL COMPLETION DATA

South Part Red Lake Pool

OPERATOR Lease & Well No.	Date Completed	Elev. Feet	Producing Interval	Initial Potential	Production Casing Size-Depth	Stimulation Treatment Type-Size
BURNHAM OIL CO.						
State B E-870						
1	3-29-48	3643	1690-1744	F- 75		TNT 160
C & H OIL CO.						
Malco Federal LC 067849						
1	6- 1-54	3543	1544-1565	F- 40	5½- 1545	
CARPER-SIVLEY JOINT ACCT.						
Magruder-Federal						
7	6- 5-47	3635	1630-1695	F- 50	7- 1350	TNT 220
8	7- 8-47	3636	1590-1660	F-100	7- 1335	TNT 190
9	3-22-48	3620	1555-1610	F- 75	7- 1320	TNT 180
10	5-11-48	3652	1743-1795	F-100	7- 1545	TNT 200
11	5-23-49	3616	1675-1735	F- 40	7- 1496	TNT 260
12	5- 1-58	3632	2140	P- 30	5½- 2348	
Russell-Federal						
1	7- 1-26	3615	1590-1609	F- 50	10- 1217	TNT 70
2	8-16-27	3610	1610-1660	F-100	8¼- 949	
3	9- 3-27		1595-1623		8 - 947	
4	11-23-27	3621	1604-1624		8¼- 948	
State A						
1	11- 8-26	3603	1602-1622	F- 45	8¼- 849	TNT 40
3	8-13-27	3604	1605-1618	P- 30	6 5/8-1588	TNT 40
Wright-State						
1	8- 1-27	3591	1620-1630	P- 25	8¼- 949	TNT 40
3	5-28-48	3586	1650-1685	P- 58	7- 1480	TNT 100
COCKBURN, MAGGIE SUETTA						
Barrientos-Federal						
5	3-30-47	3618	1590-1660	F-150	7- 1318	TNT 140
6	6-10-47	3580	1600-1642	F-132	7- 1325	
HUDSON, WILLIAM M.						
State						
1	11-18-41	3620		F- 50		
DD	11-25-47		1708	P- 50		
Turner-State						
1	8-31-48	3590	1697-1710	F- 43		

Table 1
(continued)

OPERATOR Lease & Well No.	Date Completed	Elev. Feet	Producing Interval	Initial Potential	Production Casing Size-Depth	Stimulation Treatment Type-Size
RUTTER & WILBANKS						
Hudson-State						
1	5-13-48	3572	1672-1697	F- 25	7- 1445	TNT 200
Magruder-State						
2	9-15-47	3582	1617-1632	F- 46	7- 1382	TNT 80
3	10-17-47	3579	1631-1658	F- 89	7- 1414	
4	4- 9-49	3580	1631-1643	P- 45	7- 1400	TNT 160
TRIGG, JOHN H. CO.						
Harbola-Federal						
7	7-12-47	3594	1606-1629	F-240	7- 1317	TNT 60
8	8-14-47	3555	1585-1635	F- 46	7- 1295	TNT 180
10	8-31-47	3609	1568-1618	F-150	7- 1296	TNT 160
11	11-13-47	3582	1590-1620	F- 40	7- 1290	TNT 120
14	1- 1-55	3614	1595-1621	P- 22	5½- 1598	SOF 20000
15	10-12-55	3598	1560-1565	P- 17	5½- 1585	SOF 10000
Hill-Federal						
3	3-27-48	3662	1770-1820	P- 75	7- 1510	TNT 200
YATES, III et al						
Dooley-State						
1	1-15-48	3603	1690-1704	F-210	7- 1427	TNT 80
2	2-25-48	3651	1708-1730	F-200	7- 1500	TNT 70
3	4-15-48	3615	1730-1770	F- 70	7- 1440	TNT 100
4	2-13-49	3620	1714-1742	P- 60		TNT 140
BEDINGFIELD, J. E.						
State B-8018						
1	10-24-47	3597	1641-1672	F-130	7- 1485	TNT 100
4	1-26-49	3602	1653-1706	F- 65	7- 1407	TNT 200
State B-1058						
2	12-26-47	3629	1680-1717	F-140	7- 1500	TNT 100
5	6-25-48	3640	1728	F- 45	7- 1498	
State B-878						
3	3- 4-48	3619	1710-1752	F-172	7- 1444	TNT 120
Delhi-State						
11	12- 1-47	3589	1651	F- 67	7- 1420	
DD		3589	2036-2212	P- 17	5½- 2276	SOF 108760
Delhi-State						
12	12-30-47	3630	1668	F-168	7- 1420	

F-Flowing-BPD
TNT-Nitro Shot-Quarts

P-Pumping-BPD
SOF-Sand Oil Fracture-Gallons

TABLE II

Investment Requirements and Unit Costs

Water Injection Plant			$40,000.00
Injection Well Conversion		23	92,000.00
Meter Runs & Wellhead Equipment			9,000.00
Water Distribution Lines			24,500.00
Lease Modernization			27,000.00
Producing Well Workover & Equipment Exchange			66,000.00
Drilling Program:	Injection Wells	4	68,000.00
	Producing Wells	5	100,000.00
Contingent			20,000.00
	TOTAL		$446,000.00

Operation & Maintanence	Per well per month	$80.00
Pumping, Supervision & G.C.E.	Per well per month	75.00
Supply Water, Chemical Treatment & Plant Maintanence	per 1000 barrels	25.00

TABLE III

Development Schedule

FIRST YEAR			
	Plant, Pilot Stage	$20,000.00	
	Well Conversion 6	24,000.00	
	Distribution Lines, Injection	8,000.00	
	Meter Runs & Wellhead Equipment	3,000.00	$ 55,000.00
SECOND YEAR			
	Plant, Expansion	20,000.00	
	Well Conversion 6	24,000.00	
	Distribution Lines, Injection	9,000.00	
	Meter Runs & Wellhead Equipment	3,000.00	
	Lease Modernization	16,000.00	
	Producing Well Workover & Equipment Exchange	16,500.00	88,500.00
THIRD YEAR			
	Well Conversion 6	24,000.00	
	Distribution Lines	7,500.00	
	Meter Runs & Wellhead Equipment	3,000.00	
	Lease Modernization	11,000.00	
	Producing Well Workover & Equipment Exchange	16,500.00	
	Drilling Program:		
	Injection Wells 1	17,000.00	
	Producing Wells 2	40,000.00	118,500.00
FOURTH YEAR			
	Well Conversion 5	20,000.00	
	Producing Well Workover & Equipment Exchange	16,500.00	
	Drilling Program:		
	Injection Wells 3	51,000.00	
	Producing Wells 3	60,000.00	147,500.00
FIFTH YEAR			
	Producing Well Workover & Equipment Exchange	16,500.00	
	Contingent	20,000.00	36,500.00
	TOTAL		$446,000.00

TABLE IV

Economic Analysis of a Waterflood Project

Year	Production Gross barrels	Total Costs dollars	Income - 87½% W.I. Gross* dollars	Income - 87½% W.I. Net dollars	Income — 75% W.I. Gross dollars	Income — 75% W.I. Net dollars
1	12,820	119,230	29,700	-89,530	25,500	-93,730
2	63,500	169,500	147,300	-22,200	126,200	-43,300
3	265,500	231,280	615,600	384,320	527,700	296,420
4	421,500	280,640	977,300	696,660	837,700	557,060
5	375,000	171,240	869,500	698,260	745,300	574,060
6	234,000	108,640	542,700	434,060	465,100	356,460
7	123,500	105,140	286,500	181,360	245,500	140,360
8	94,400	102,540	218,900	116,360	187,600	85,260
9	78,750	100,100	182,600	82,500	156,500	56,400
10	65,150	98,310	151,000	52,690	129,500	31,190
11	54,200	79,450	125,600	46,150	107,700	28,250
12	45,350	78,200	105,200	27,000	90,100	11,900
13	39,800	74,925	92,200	17,275	79,100	4,175
14	35,300	74,925	81,900	6,975	70,200	-4,725
15	31,200	74,925	72,600	-2,325	-0-	-0-
	1,940,070		$4,498,600		$3,793,700**	
		$1,868,845		$2,629,755		$1,999,780

* Income of $2.65 per barrel after taxes

** Total Costs for 14 years are $1,793,920

Total will not balance as the Income is to the nearest $100.00

No allowance has been made for salvage at the end of the flood.

TABLE V

OPERATOR Lease	Acreage No.	 Factor	Wells No.	 Factor	Cumulative Production Bbls.	 Factor	Present Production 10 Mo.	 Factor
BURNHAM OIL CO.								
State B	40	3.333	1	2.500	20,012	1.950	112	0.902
C & H OIL CO.								
Malco-Federal	40	3.333	1	2.500	14,870	1.450	1208	9.734
CARPER-SIVLEY JOINT ACCOUNT								
Magruder-Federal	160	13.333	6	15.00	87,122	8.490	3298	26.575
Russell-Federal	80	6.667	4	10.00	96,213	9.375	231	1.861
State A	40	3.333	2	5.00	57,351	5.589	71	0.572
Wright-State	40	3.333	2	5.00	44,013	4.289	21	0.169
COCKBURN, MAGGIE SUETTA								
Barrientos-Federal	80	6.667	2	5.00	95,820	9.337	1339	10.790
HUDSON, WILLIAM M.								
State	40	3.333	1	2.50	21,448	2.090	52	0.419
Turner-State	40	3.333	1	2.50	21,004	2.047	120	0.967
RUTTER & WILBANKS								
Magruder-State	80	6.667	2	5.00	88,402	8.614	101	0.814
Hudson-State	40	3.333	1	2.50	6,325	0.616	816	6.575
TRIGG, JOHN H., CO.								
Harbold-Federal	160	13.333	6	15.00	153,280	14.936	1491	12.015
Hill-Federal	40	3.333	0	0.0	23,865	2.328	-0-	0.0
YATES, M. III, et. al.								
Dooley-State	120	10.000	4	10.00	87,008	8.478	958	7.720
BEDINGFIELD, J. E.								
State B-8318	40	3.333	2	5.00	36,441	3,550	460	3.707
State E-1059	40	3.333	2	5.00	54,803	5.340	491	3.956
State E-379	40	3.333	1	2.50	43,721	4.260	389	3.135
Delhi-State 11	40	3.333	1	2.50	53,703	5.233	1252	10.089
Delhi-State 12	40	3.333	1	2.50	21,815	2.126	-0-	0.0
AREA TOTAL	1200		40		1,026,220		12,410	

Table V-1

FACTORS APPLICABLE FOR PARTICIPATION IN A UNIT

OPERATOR	Cumulative Production Factor %	Acreage Factor %	Cumulative &, Acreage 50/50 Ratio Factor %	Cumulative & Acreage 75/25 Ratio Factor %
BURNHAM OIL CO.				
State B	1.95007	3.33333	2.64170	2.29589
C & H OIL CO.				
Malco-Federal	1.44901	3.33333	2.39117	1.92009
CARPER-SIVLEY JOINT ACCOUNT				
Magruder-Federal	8.48961	13.33333	10.91148	9.70054
Russell-Federal	9.37549	6.66667	8.02108	8.69828
State A	5.58857	3.33333	4.46095	5.02476
Wright-State	4.28885	3.33333	3.81109	4.04997
Company Total	27.74252	26.66667	27.20460	27.47355
COCKBURN, MAGGIE SUETTA				
Barrientos-Federal	9.33719	6.66667	8.00193	8.66956
HUDSON, WILLIAM M.				
State	2.09000	3.33333	2.71167	2.40083
Turner-State	2.04674	3.33333	2.69004	2.36839
Company Total	4.13674	6.66666	5.40171	4.76922
RUTTER & WILBANKS				
Magruder-State	8.61434	6.66667	7.64051	8.12742
Hudson-State	0.61634	3.33336	1.97484	1.29559
Company Total	9.23067	10.00000	9.61535	9.42301
TRIGG, JOHN H., CO.				
Harbold-Federal	14.93638	13.33334	14.13486	14.53562
Hill-Federal	2.22808	3.33333	2.78070	2.50439
Company Total	17.16446	16.66667	16.91556	17.04001
YATES, M., III, et al				
Dooley-State	8.47850	10.00000	9.23925	8.85888
BEDINGFIELD, J. E.				
State B-8318	3.55100	3.33333	3.44216	3.49658
State E-1059	5.34028	3.33333	4.33680	4.83854
State E-379	4.26040	3.33333	3.79686	4.02863
Delhi-State 11	5.23339	3.33333	4.28336	4.75838
Delhi-State 12	2.12577	3.33333	2.72955	2.42766
Company Total	20.51084	16.66665	18.58873	19.54979
AREA TOTAL	100.00000	99.99996	100.00003	100.00000

(3)

SOUTH RED LAKE GRAYBURG UNIT
Eddy County, New Mexico

Supplement OIL PRODUCTION HISTORIES to Report of February 12, 1964

YEAR Month	BURNHAM OIL CO. State B	C & H OIL CO. Malco Federal	COCKBURN, M. S. Barrientos Federal	CARPER DRILLING CO., INC. Magruder Federal	CARPER DRILLING CO., INC. Russell Federal	And T. J. SIVLEY State A	SIVLEY Wright State
1963							
Nov	4	115	91	299	34	28	4
Dec	23	30	56	335	32	33	-
Cumulative to 1/1/64	20,012	15,015	95,967	87,756	96,279	57,412	44,017
1964							
Jan	-	54	62	142	32	22	-
Feb	10	93	223	311	27	19	-
Mar	8	156	137	316	39	15	-
Apr	11	130	86	282	28	16	-
May	31	65	105	217	30	18	-
June	13	56	108	246	35	24	-
July	—	107	131	237	33	12	-
Aug	1	114	116	218	32	4	-
Sept	6	103	128	274	15	15	-
Oct	6	80	92	268	41	17	-
Nov	9	68	135	262	28	23	-
Dec	12	78	60	251	27	22	-
Total	107	1,104	1,383	3,024	363	207	-
Cumulative to 1/1/65	20,119	18,119	97,350	90,780	96,642	57,619	44,017

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 3
CASE NO. 3212

OIL PRODUCTION HISTORIES
(con't)

WRIGHT OIL CO., LIMITED

YEAR Month	Formerly J. E. BEDINGFIELD State B-8313	State E-1059	State E-379	Delhi 11	Delhi 12	Formerly JOHN H. TRIGG Harbold Federal	Hill Federal
1963							
Nov	66	65	9	129	-	149	-
Dec	51	50	14	124	-	176	-
Cumulative to 1/1/64	36,558	54,918	43,744	53,959	21,815	158,290	22,865
1964							
Jan	40	43	9	122	-	149	-
Feb	44	43	20	111	-	98	-
Mar	47	46	19	115	-	92	-
Apr	61	60	20	98	-	73	-
May	48	48	17	83	-	85	-
June	47	49	19	82	-	116	-
July	54	54	23	94	-	109	-
Aug	45	47	28	83	-	57	-
Sept	45	47	16	83	-	23	-
Oct	35	37	19	83	-	93	-
Nov	37	36	34	93	-	77	-
Dec.	38	37	24	90	-	124	-
Total	541	547	248	1,137	-	1,096	-
Cumulative to 1/1/65	37,099	55,465	43,992	55,096	21,815	159,386	22,865

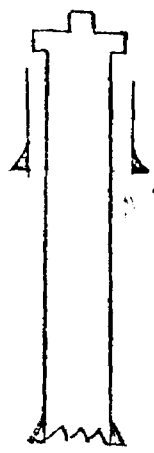
OIL PRODUCTIONS HISTORIES
(con't)

YEAR Month	ATLANTIC REFINING CO. (Formerly William Hudson) State	Turner State	RUTTER & WILBANKS Magruder State	Hudson State	M. YATES, III, et al Dooley State	POOL TOTAL
1963						
Nov	-	21	49	6	97	1,166
Dec	-	-	83	5	91	1,103
Cumulative to 1/1/64	21,448	21,025	89,340	5,654	87,196	1,033,297
1964						
Jan	-	33	114	7	113	842
Feb	-	29	97	55	95	1,265
Mar	-	29	89	16	99	1,223
Apr	-	41	85	15	91	1,095
May	-	53	74	16	93	983
June	-	19	67	19	33	933
July	-	32	77	15	85	1,063
Aug	-	31	74	16	91	957
Sept	-	34	57	3	76	925
Oct	-	58	66	15	96	1,006
Nov	-	34	62	6	83	986
Dec	-	48	59	7	84	970
Total	-	441	921	190	1,039	12,248
Cumulative to 1/1/65	21,448	21,466	90,261	5,844	88,235	1,045,545

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 5
CASE NO. 3212

SOUTH RED LAKE GRAYBURG UNIT
Injection Well Casing Program
PILOT AREA

WRIGHT OIL CO., LTD.
Harbold No. 15

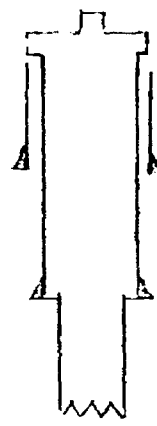


Pulled
7" Casing
set @ 989'
Top Cement Surface
Pay Zone Perforated
w/ 40 holes
1560 to 1565

5½" Casing
set @ 1585'
516 saxs cement

T.D.
1585'

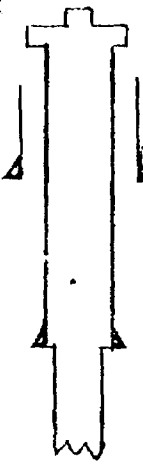
WRIGHT OIL CO., LTD.
Harbold No. 7



Pulled
8" Casing
set @ 933'
Top Cement 706'
7" Casing
set @ 1317'
50 saxs cement
Open Hole
1317 to 1629'
Pay Zone
1606 to 1629

T.D.
1650'

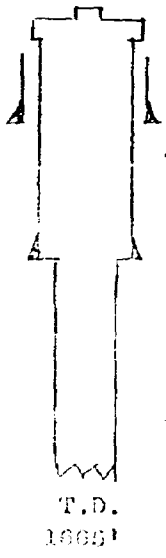
RUTTER & WILBANKS
Magruder No. 2



Pulled
8" Casing
set @ 943'
Top Cement 771'
7" Casing
set @ 1382'
50 saxs cement
Open Hole
1382 to 1634'
Pay Zone
1617 to 1632'

T.D.
1634'

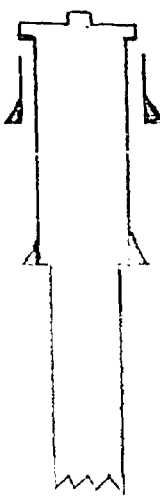
CARPER DRILLING CO.
Magruder No. 8



Pulled
8" Casing
set @ 833'
Top Cement 724'
7" Casing
set @ 1335'
50 saxs cement
Open Hole
1335 to 1665'
Pay Zone
1590 to 1660'

T.D.
1665'

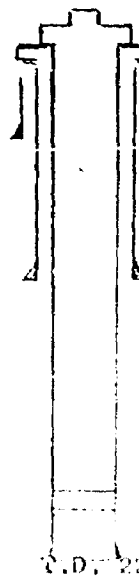
CARPER DRILLING CO.
Magruder No. 7



Pulled
8¼" Casing
set @ 818'
Top Cement
7" Casing
set @ 1350'
50 saxs cement
Open Hole
1350 to 1705'
Pay Zone
1630 to 1695'

T.D.
1705'

J. E. BEDINGFIELD
Delhi No. 11

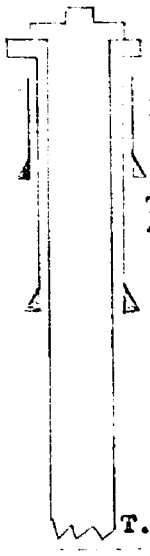


Pulled
8" Casing
set @ 963'
7" casing
set @ 1420'
20 saxs cement
Top Cement 1600'
5½" Casing
set @ 2278'
175 saxs cement
Pay Zone
1631 to 1670'
Cast Iron Bridge Plug
set @ 2000'

T.D. 2278'

SOUTH RED LAKE GRAYBURG UNIT
Injection Well Casing Program
EXPANDED AREA

WRIGHT OIL CO., LTD
Harbold No. 8

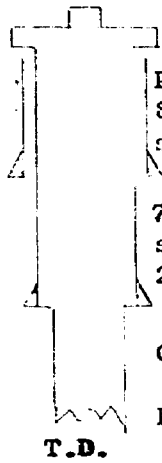


Pulled
8" Casing
set @ 900'
Top Cement 409'
7" Casing
set @ 1295'
50 saxs cement

4½" Casing
set @ 2365'
162 saxs cement
Pay Zone 1585 to 1635'

T.D. 2375'

J. E. BEDINGFIELD
State E-8318 No.1



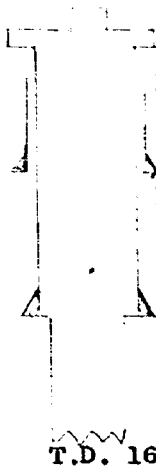
Pulled
8¼" casing
set @ 942'
Top Cement Surface
7" Casing
set @ 1290'
200 saxs cement

Open Hole 1290 to 1696'

Pay Zone 1647 to 1672'

T.D.
1696'

CARPER DRILLING CO.
Magruder No. 9

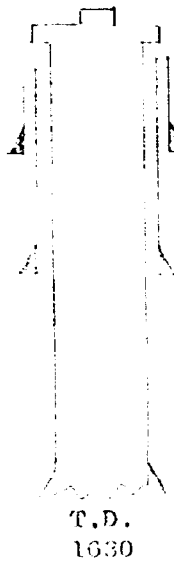


Pulled
8¼"Casing
set @ 924'
Top Cement 709'
7" Casing
set @ 1320'
50 saxs cement

Open Hole
1320 to 1610'
Pay Zone 1555 to 1610'

T.D. 1694'
PBD. 1610'

CARPER DRILLING CO.
Russell No. 1



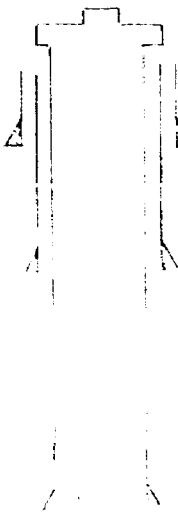
12½" Casing
set @ 713'

10" Casing
set @ 1217'

Top Cement N.A.
Saxs Cement N.A.
6 5/8 " Casing
set @ 1630'
Pay Zone
1590 to 1609'

T.D.
1630

CARPER DRILLING CO.
Russell No. 4



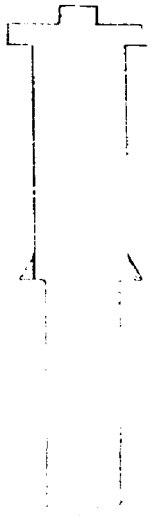
10" Casing
set @ 453'

8¼" Casing
set @ 948'
Top Cement N.A.
Saxs Cement N.A.
6 5/8" Casing
set @ 1574'

Pay Zone
1604 to 1624'

T.D.
162

J. E. BEDINGFIELD
State E-379 No. 3



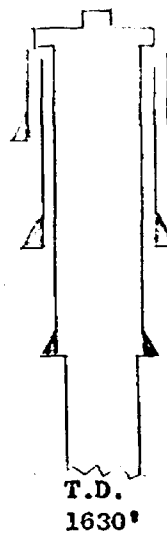
Top Cement 633'
7" Casing
set @ 1244'
50 saxs cement

Pay Zone
1710 to 1752'

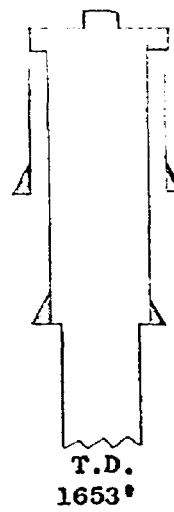
T.D.
1772'

SOUTH RED LAKE GRAYBURG UNIT
Injection Well Casing Program
EXPANDED AREA

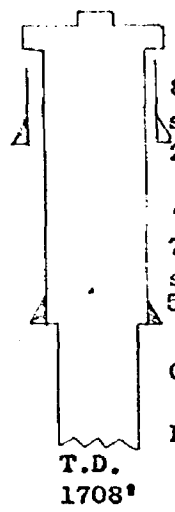
CARPER DRILLING CO.
State A No. 1



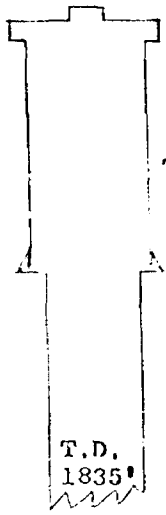
CARPER DRILLING CO.
Wright State No. 1



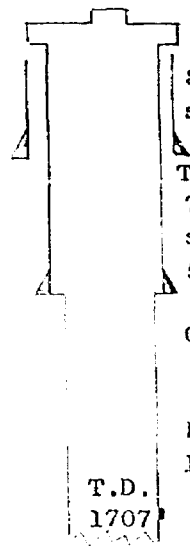
ATLANTIC REF. CO.
State No. 1



WRIGHT OIL CO., LTD.
Hill No. 3



RUTTER & WILBANKS.
Hudson No. 1



ATLANTIC REF. CO.
Turner No. 1