Case No.

1492

Application, Transcript,
Small Exhibits, Etc.

CASE 1492: Application of Amerada Petroleum Corp. for permission to institute a pilot water flood proj.

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

September 19, 1958

COPY

Mr. H. D. Bushnell
Amerada Petroleum Corp.
P.O. Box 2040
Tulsa 2, Oklahoma

Dear Mr. Bushnell:

We enclose two copies of Order R-1245 issued September 17, 1958, by the Oil Conservation Commission in Case 1492, which was heard on August 13th at Santa Fe.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encls.

Typed Copy Mailed to: Frank Irby, State Engr., SF
Rex Cabiness, Shell, Roswell

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. 1492
Order No. R-1245

APPLICATION OF AMERADA PETROLEUM
CORPORATION FOR AN ORDER AUTHORIZING
A PILOT WATER FLOOD PROJECT IN THE
SAUNDERS POOL, LEA COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on August 13, 1958, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 17th day of September, 1958, the Commission, a quorum being present, having considered the evidence adduced 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, Amerada Petroleum Corporation, proposes to institute a pilot water flood project in the Saunders Pool by the injection of water into the Pennsylvanian formation through its State "SG" Well No. 1, located in the NE/4 SW/4 of Section 10, Township 15 South, Range 33 East, NMPM, Lea County, New Mexico.

(3) That the applicant has failed to prove that the proposed pilot water flood project is necessary or that it would serve any useful purpose.

(4) That the subject application should be denied.

IT IS THEREFORE ORDERED:

That the application of Amerada Petroleum Corporation for permission to institute a pilot water flood project in the Saunders Pool by the injection of water into the Pennsylvanian

formation through its State "SG" Well No. 1, located in the NE/4 SW/4 of Section 10, Township 15 South, Range 33 East, NMPM, Lea County, New Mexico, be and the same is hereby denied.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

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

ir/

No. 22-58

DOCKET: REGULAR HEARING AUGUST 13, 1958

Oil Conservation Commission 9 a.m. Mabry Hall, State Capitol, Santa Fe, NM

ALLOWABLE: (1) Consideration of the oil allowable for September, 1958

(2) Consideration of the allowable production of gas for September, 1958, from six prorated pools in Lea County, New Mexico; also consideration of the allowable production of gas from seven prorated pools in San Juan and Rio Arriba Counties, New Mexico, for September, 1958.

NEW CASES

CASE 1491: Application of Pan American Petroleum Corporation for permission to commingle oil production from two separate leases. Applicant, in the above-styled cause, seeks an order authorizing it to commingle the oil production from two separate leases in the Empire-Abo Pool. One lease comprises the N/2 and SW/4 of Section 11, and the other lease comprises the E/2 of Section 10, all in Township 18 South, Range 27 East, Eddy County, New Mexico. Applicant proposes to separately meter the production from each individual well prior to being run into common storage.

CASE 1492: Application of Amerada Petroleum Corporation for permission to institute a pilot water flood project. Applicant, in the above-styled cause, seeks an order authorizing it to institute a pilot water flood project in the Saunders Pool in an area covering the NE/4 SW/4 and the N/2 of Section 10 and the S/2 S/2 of Section 3, Township 15 South, Range 33 East, Lea County, New Mexico. Applicant proposes to inject water into the Pennsylvanian formation of the Saunders Pool through its State "SG" Well No. 1, located in the NE/4 SW/4 of said Section 10.

CASE 1493: Application of Magnolia Petroleum Company for permission to institute a pilot water flood project and for administrative procedures for the subsequent expansion of said water flood project and for the assignment of a special allowable to said project. Applicant, in the above-styled cause, seeks an order authorizing it to institute a pilot water flood project on its State Bridges Lease in the Vacuum Pool, which comprises all or portions of Sections 3, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, and 27, Township 17 South, Range 34 East, Lea County, New Mexico. Applicant proposes to inject water into the Grayburg-San Andres formation of the Vacuum Pool through six wells located in said Section 14. Applicant further proposes that administrative procedure be established for (1) expanding said pilot water flood project within the limits of said State Bridges Lease without notice and hearing and (2) assigning a project or lease allowable to the extent necessary for the proper operation of said project.

CASE 1489: Southeastern New Mexico nomenclature case calling for an order for the extension of existing pools in Lea, Eddy and Chaves Counties, New Mexico.

(a) Extend the Anderson Ranch-Wolfcamp Pool to include:

TOWNSHIP 16 SOUTH, RANGE 32 EAST, NMPM
Section 2: Lots 1, 2, 7, 8, 9, 10, 15, & 16

(b) Extend the Artesia Pool to include:

TOWNSHIP 17 SOUTH, RANGE 28 EAST, NMPM
Section 34: NE/4

(c) Extend the Bagley-Upper Pennsylvanian Gas Pool to include:

TOWNSHIP 12 SOUTH, RANGE 33 EAST, NMPM
Section 4: NW/4

(d) Extend the Blinebry Oil Pool to include:

TOWNSHIP 22 SOUTH, RANGE 37 EAST, NMPM
Section 36: SE/4

(e) Extend the Bronco-Wolfcamp Pool to include:

TOWNSHIP 12 SOUTH, RANGE 38 EAST, NMPM
Section 35: SW/4

(f) Extend the Caprock-Queen Pool to include:

TOWNSHIP 14 SOUTH, RANGE 31 EAST, NMPM
Section 8: SW/4 SW/4
Section 23: SW/4
Section 26: NW/4

(g) Extend the Cave Pool to include:

TOWNSHIP 17 SOUTH, RANGE 29 EAST, NMPM
Section 4: SE/4

(h) Extend the Empire Abo Pool to include:

TOWNSHIP 18 SOUTH, RANGE 27 EAST, NMPM
Section 10: NE/4
Section 11: NE/4

(i) Extend the Jalmat Pool to include:

TOWNSHIP 23 SOUTH, RANGE 36 EAST, NMPM
Section 20: S/2

(j) Extend the Roberts Pool to include:

TOWNSHIP 17 SOUTH, RANGE 33 EAST, NMPM
Section 7: SW/4 & W/2 SE/4

(k) Extend the Shugart Pool to include:

TOWNSHIP 18 SOUTH, RANGE 31 EAST, NMPM
Section 36: W/2 NW/4

(l) Extend the Tatum-Wolfcamp Pool to include:

TOWNSHIP 13 SOUTH, RANGE 36 EAST, NMPM
Section 7: NE/4

(m) Extend the Tubb Gas Pool to include:

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 14: NE/4

(n) Extend the South Vacuum-Devonian Pool to include:

TOWNSHIP 18 SOUTH, RANGE 35 EAST, NMPM
Section 27: W/2
Section 34: N/2
Section 35: NW/4

CASE 1490: Northwestern New Mexico nomenclature case calling for an order for the creation of a new pool and the extension of existing pools in Rio Arriba and San Juan Counties, New Mexico.

(a) Create a new oil pool for Gallup production, designated as the Gallegos-Gallup Oil Pool and described as:

TOWNSHIP 26 NORTH, RANGE 11 WEST, NMPM
Section 6: SW/4
Section 7: All
Section 8: S/2 & NW/4
Section 9: SW/4
Section 16: W/2
All of Sections 17 and 18
Section 19: N/2
Section 20: N/2
Section 21: N/2

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM
Section 1: S/2
Section 2: S/2
Section 3: S/2 & NW/4
All of Sections 4 and 5
Section 6: NE/4
Section 8: N/2 & SE/4
All of Sections 9, 10, 11, 12 & 13
Section 14: E/2
Section 24: N/2

TOWNSHIP 27 NORTH, RANGE 12 WEST, NMPM
Section 30: SW/4
Section 31: All
Section 32: S/2
Section 33: SW/4

TOWNSHIP 27 NORTH, RANGE 13 WEST, NMPM
Section 25: S/2
Section 35: NE/4
Section 36: N/2 & SE/4

(b) Extend the Aztec-Pictured Cliffs Pool to include:

TOWNSHIP 30 NORTH, RANGE 12 WEST, NMPM
Section 2: SE/4

(c) Extend the South Blanco-Pictured Cliffs Pool to include:

TOWNSHIP 24 NORTH, RANGE 3 WEST, NMPM
Section 17: SE/4

TOWNSHIP 26 NORTH, RANGE 5 WEST, NMPM
All of Sections 4, 5, & 6
Section 7: N/2 & SE/4
All of Sections 8 & 9
Section 23: SE/4
Section 24: SW/4

TOWNSHIP 26 NORTH, RANGE 6 WEST, NMPM
Section 1: All
Section 2: N/2
Section 12: N/2

TOWNSHIP 27 NORTH, RANGE 5 WEST, NMPM
All of Sections 31 & 32

TOWNSHIP 27 NORTH, RANGE 6 WEST, NMPM
Section 2: S/2
Section 11: E/2
Section 12: W/2
Section 13: NW/4
Section 16: All
Section 17: S/2
All of Sections 35 & 36

TOWNSHIP 27 NORTH, RANGE 7 WEST, NMPM
Section 4: All
Section 5: NE/4

(d) Extend the Tapacito-Pictured Cliffs Pool to include:

TOWNSHIP 25 NORTH, RANGE 3 WEST, NMPM
Section 9: SE/4
Section 16: NE/4

(e) Extend the Blanco Mesaverde Pool to include:

TOWNSHIP 26 NORTH, RANGE 5 WEST, NMPM
Section 8: W/2

TOWNSHIP 26 NORTH, RANGE 7 WEST, NMPM
Section 11: All

TOWNSHIP 27 NORTH, RANGE 8 WEST, NMPM
Section 32: S/2
Section 33: W/2

(f) Extend the Bisti-Lower Gallup Oil Pool to include:

TOWNSHIP 24 NORTH, RANGE 10 WEST, NMPM
Section 3: SW/4
Section 10: NW/4

TOWNSHIP 26 NORTH, RANGE 13 WEST, NMPM
Section 29: N/2 NW/4 & NW/4 NE/4

(g) Extend the Escrito-Gallup Oil Pool to include:

TOWNSHIP 24 NORTH, RANGE 7 WEST, NMPM
Section 15: SW/4 SW/4
Section 22: NW/4

(h) Extend the Horseshoe-Gallup Oil Pool to include:

TOWNSHIP 30 NORTH, RANGE 16 WEST, NMPM
Section 4: NE/4 SW/4

(i) Extend the South Blanco-Tocito Oil Pool to include:

TOWNSHIP 26 NORTH, RANGE 6 WEST, NMPM
Section 11: W/2 SW/4

ir/

MAIN OFFICE OCC

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Case 1492
file

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

S.E. REYNOLDS
STATE ENGINEER

ADDRESS CORRESPONDENCE TO
P. O. BOX 1079
SANTA FE, N. M.

August 21, 1958

Oil Conservation Commission
State Capitol Building
Santa Fe, New Mexico

Attn. Mr. A. L. Porter, Jr.
Secretary-Director

Dear Mr. Porter:

I have just received a letter from R. E. Broschat of Amerada Petroleum Corporation with reference to their proposed water flood under Case No. 1492, a copy of which was sent to you. Enclosed with this letter is a diagrammatic sketch of the casing and cementing program in this well. The surface string is landed at 296 feet and cement circulated to the surface. The base of the Ogallala formation, according to the Amerada electric log, is 295 feet. By elementary mathematics, we deduce that the casing is landed and cemented one foot below the base of the Ogallala which we do not consider sufficient.

We oppose the use of this well for the conductance of salt water to a lower formation, unless the annulus between the surface string and the intermediate string of pipe is completely filled with cement, or as an alternate, a packer be set on the tubing at least 400 feet below the surface, which will seal off all salt water from the casing wall above the packer. This, of course, would necessitate the use of tubing for injection purposes.

Yours truly,

S. E. Reynolds
State Engineer

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

FEI/ma
cc-Mr. R. E. Broschat
Monument, N. M.
Amerada Petro. Corp.
Box 591, Midland, Texas
F. H. Hennighausen

Case 1492

AMERADA PETROLEUM CORPORATION

P. O. BOX 2040

TULSA 2, OKLA.

ROBERT J. STANTON
GENERAL COUNSEL
JOHN S. MILLER
ASSISTANT GENERAL COUNSEL

LEGAL DEPARTMENT

H. D. BUSHNELL
HAROLD J. FISHER
ROBERT T. JAMES
JAMES C. McWILLIAMS
VIRGIL C. MORELLE
ARDEN E. ROSS
ATTORNEYS

July 11, 1958

Re: Application for Amerada Petroleum Corporation to create pilot water flood unit in Lea County, New Mexico, covering NE/4 of SW/4 and the N/2 of Section 10 and the S/2 of the S/2 of Section 3, Township 15 South, Range 33 East, Lea County, New Mexico.

New Mexico Oil Conservation Commission
107 Mabry Hall
Capitol Building
Santa Fe, New Mexico

Gentlemen:

Enclosed is our Application in original and two copies for authority to create a pilot water flood unit covering certain lands in Lea County, New Mexico.

This Application is to substitute the former Application mailed to you with our cover letter of July 3, 1958, and which we requested that you disregard by our later letter of July 8, 1958.

We request that this matter be set for hearing before the Commission for the regular monthly hearing in August or, before the examiner, if an earlier date can be set.

Very truly yours,

H. D. BUSHNELL

HDB:CE
Enc:3

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF)
AMERADA PETROLEUM CORPORATION FOR)
AUTHORITY TO CREATE A PILOT WATER)
FLOOD UNIT COMPRISED OF THE NE/4 OF)
THE SW/4 AND THE N/2 OF SECTION 10)
AND THE S/2 OF THE S/2 OF SECTION 3)
ALL IN TOWNSHIP 15S, RANGE 33E, LEA)
COUNTY, NEW MEXICO.)

CAUSE NO. 1492

in Saunders Pool
Permo Penn.

APPLICATION

Comes now Amerada Petroleum Corporation and alleges and states the following in this Application:

1. Applicant proposes to create a pilot water flood unit comprised of the NE/4 of the SW/4 and the N/2 of Section 10 and the S/2 of the S/2 of Section 3 all in Township 15 South, Range 33 East, Lea County, New Mexico, for the purpose of maintaining reservoir pressure for secondary recovery of oil and gas from under the lands herein described in accordance with the provisions of Rule 701 of this Commission.

2. The plat attached, marked Exhibit No. 1, shows the proposed intake well of Amerada-State "SG" Well No. 1, as located in the NE/4 of the SW/4 of Section 10, the names of owners of record or operators of leases within one-half mile of the intake well and the location and designation of other wells within the lands herein described.

3. The formation from which the wells within the lands described is producing is the Pennsylvanian Lime, located at an interval of 9600 to 10,000 feet.

4. The log of the intake well, Amerada-State "SG" No. 1, is attached and marked as Exhibit No. 2 and made a part of this Application.

5. The casing of the intake well is as follows:

13-3/8" surface casing set at 296 feet with 250 sacks of cement;
8-5/8" casing set at 4245 feet with 1500 sacks of cement;
5-1/2" casing set at 10,035 feet with 400 sacks of cement.

6. The intake well was drilled to a total depth of 10,069 feet with a drilled out depth of 10,015 feet and perforated at the following intervals:

9874 feet to 9895 feet
9907 feet to 9935 feet
9942 feet to 9950 feet
9970 feet to 9980 feet;

7. Applicant proposes to set a packer on the tubing below the top of the cement located at 8000 feet behind the 5-1/2" casing and to build up pressure on the annulus to 1000 pounds.

8. The source of the water is from the Pennsylvanian and estimated volume to be injected into the intake well is 500 barrels per day.

9. The applicant Amerada Petroleum Corporation, sole owner of the leases covering the lands herein described, will be the operator.

WHEREFORE, Amerada Petroleum Corporation prays that this matter be set for hearing, that notice thereof be given as required by law, and that upon hearing this Commission enter its order granting authority for this applicant to create the pilot water flood unit for the purpose of maintaining reservoir pressure by secondary recovery and to inject water in the intake well in the manner herein proposed.

AMERADA PETROLEUM CORPORATION

BY H. D. Bushnell

H. D. BUSHNELL
ATTORNEY

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 1492

TRANSCRIPT OF HEARING

AUGUST 13, 1958

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE NEW MEXICO
Phone CHapel 3-6691

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
AUGUST 13, 1953

IN THE MATTER OF:

CASE 1492 Application of Amerada Petroleum Corporation for permission to institute a pilot water flood project. Applicant, in the above-styled cause, seeks an order authorizing it to institute a pilot water flood project in the Saunders Pool in an area covering the NE/4 SW/4 and the N/2 of Section 10 and the S/2 S/2 of Section 3, Township 15 South, Range 33 East, Lea County, New Mexico. Applicant proposes to inject water into the Pennsylvanian formation of the Saunders Pool through its State "SG" Well No. 1, located in the NE/4 SW/4 of said Section 10.

BEFORE:

Mr. Edwin L. Mechem
Mr. Murray Morgan
Mr. A. L. Porter

T R A N S C R I P T O F P R O C E E D I N G S

MR. PORTER: The meeting will come to order, please. We will take up Case 1492.

MR. PAYNE: Application of Amerada Petroleum Corporation for permission to institute a pilot water flood project.

MR. BUSHNELL: We have one witness to be sworn in.

(Witness sworn)

R. E. BROSCHAT,

called as a witness, having been first duly sworn on oath, testified

as follows:

DIRECT EXAMINATION

BY MR. BUSHNELL:

Q Will you state your name and the company for which you are employed?

A R. E. Broschat. I am employed by Amerada Petroleum Corporation.

Q In what capacity?

A As district engineer.

Q As petroleum engineer? A As petroleum engineer.

Q Have you testified before the Commission on prior hearings?

A I have testified before an Examiner Hearing, I have never appeared before the Commission.

Q And for that Examiner Hearing, your qualifications were accepted to qualify you as an expert witness, is that right?

A Yes, sir.

MR. BUSHNELL: Are his qualifications acceptable?

MR. PORTER: Yes, sir.

Q I hand you what is marked Amerada's Exhibit No. 1, which is a plat of an area in the Saunders Pool. Would you state what that represents?

A Exhibit No. 1 is a plat of the portion of the Saunders Pool showing our proposed injection well, the Amerada State "SG" No. 1 outlined with a red circle, and our proposed pilot water flood area is also outlined in red. This pilot water flood area consists

of the S/2 S/2 of Section 3, Township 15 South, Range 33 East, the N/2 of Section 10, and the NE/4 of the SW/4 of Section 10, also in Township 15 South, Range 33 East.

Q Now, also shown on the Exhibit copy, but perhaps not shown on the copies of the plats distributed to the Commission and personnel is a half mile circle from the proposed injection well, the "SG" No. 1, which shows that owners of leases within one half mile of this well include two leases owned by Cities Service and one by Humble, is that correct?

A Yes, sir. I believe Shell has a lease too, don't they?

Q Shell, that's right. Now, within the red outline of the lease acreage there designated that is owned by Amerada Petroleum Corporation, is that right?

A That is correct.

Q Now, what is the location or described location of the proposed injection well, Amerada "SG" No. 1?

A The "SG" No. 1 is located in the NE/4 of the SW/4, Section 10, Township 15 South, Range 33 East.

Q When was that well originally drilled?

A This well was completed August 4th, 1952.

Q And that well was completed in the formation known as the Saunders Pool, is that right?

A Yes, sir. The Pennsylvanian formation, Saunders Pool.

Q And it was operated and did produce from the Saunders until what date?

A It was temporarily abandoned on May 17, 1958.

Q Now, also on this Exhibit No. 1 or this plat are shown to the north of the proposed injection well numerous wells, all of which are completed in this Saunders Pool, is that right?

A That is correct.

Q Now, I hand you what is marked Amerada's Exhibit No. 2, which is a contour map covering the area of the Saunders Pool, contoured at an interval of twenty-five feet. What interval is that contour drawn on?

A This contour map is drawn on the top of the a double X, which is a shale marker bed at the top of the Pennsylvanian formation.

Q And does that formation as reflected by these contour lines represent substantially the top of the pay of the Saunders?

A Yes, it does. The top of the productive pay is approximately one hundred twenty-five feet below this a double X marker.

Q Now, the Saunders is a Pennsylvania lime formation, is that correct?

A That is correct.

Q And what does this Exhibit No. 2 show with reference to the location of the Amerada "SG" No. 1 in relation to the other wells in this pool, completed in the Saunders?

A It shows that the "SG" No. 1, which is in Section 10 -- I neglected to circle it in red -- is on the flank of the structure on the south side of the structure on the flank.

Q This "SG" No. 1, to repeat, is located in the NE/4 of the SW/4 of Section 10, 15 South, 33 East, is that correct?

A That's correct.

Q And the axis of the Saunders Pool is running approximately north and south with most of the wells completed located north of the "SG" No. 1, is that right?

A That is correct.

Q Now, by this proposed pilot water flood program, how many barrels of water do you propose to inject in the "SG" No. 1 Well?

A We propose to inject approximately five hundred barrels per day.

Q And the source of that water that you will inject in this well is from where?

A It will be produced water from the Pennsylvanian formation.

Q Now, I hand you what is marked Amerada's Exhibit No. 3, which is an electric -- copy of an electric log of the State "SG" No. 1 Well, and does that show on there the interval of perforations presently in this well?

A Yes. The perforations have been marked on this electric log.

Q And what are those perforations intervals?

A The well has been perforated from 9,874 to 9,895; 9,907 to 9,935; 9,942 to 50; and 9,970 to 9,980.

Q Now, as reflected by this Exhibit, the net pay of the

Saunders in this "SG" No. 1 would be how many feet?

A Approximately sixty-seven feet.

Q What is the casing existing now in this well?

A This well has thirteen and three-eighths inch surface casing set at 296 feet, cemented with 250 sacks, eight and five-eighths inch casing set at 4,245 feet, cemented with 1500 sacks, and five and a half inch casing set at 10,035 feet, cemented with 400 sacks.

Q How do you mechanically propose to inject this 500 barrel -- maximum 500 barrels of water per day into the well?

A We propose to inject it down the five and a half inch casing through the perforations and into the formation.

Q Now, by your application, or by the application filed on behalf of Amerada, it is stated that applicant proposes to inject this well through a tubing set within the well and that they locate, yes, locate a packer behind the tubing, set at approximately 8,000 feet below the surface. I take it from your testimony, then, that the management has had a change of thought on it and is, instead, proposing to inject this water through the casing only, is that right?

A That is correct.

Q Is this method of disposal or injection one standard within the industry? A Yes, it is.

Q Is it a method that, in your opinion, will protect fresh water sand?

A Yes, I believe it will.

Q And will the method of injection and the plan here proposed protect the underground source of oil in the Saunders Pool?

A Yes, I believe it will.

Q As a matter of fact, it is your hope that it will increase eventually the production of oil from the Saunders Pool, is that right?

A Yes.

MR. BUSHNELL: I would like to offer Amerada's Exhibits 1 through 3, if there is no objection, as part of this record. That's all the questions I have.

MR. PORTER: Without objection, Amerada's Exhibits 1 through 3 will be received. Does anyone have a question of the witness? Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q What was your name? A Broschat.

Q Mr. Broschat, what do you expect to accomplish by the injection of water in this well?

A We are hopeful that this pilot injection will prove that it is possible to successfully water flood the Pennsylvanian formation in this field.

Q Are the wells that are shown on your Exhibit No. 2 all Pennsylvanian wells?

A Yes, sir, they are all Pennsylvanian wells.

Q And this contour map on Exhibit No. 2 is contoured on top of the Pennsylvanian?

A It is contoured on top of the A Double X which we consider the top of the Pennsylvanian.

Q Is this well your State "SG" No. 1 completed in a relatively low point on the Pennsylvanian structure?

A Yes. As you can tell by Exhibit No. 2, it is on the flange of the structure, and it is completed low in relation to the other wells.

Q What is the current rate of production from this well?

A The well is presently temporarily abandoned. It is no longer economic.

Q Does it produce water, or was it producing water?

A It was producing water.

Q What is the status of the Cities Service "AG" Well No. 1 in the southeast of the southeast of Section 9?

A It is my understanding that this well has either be temporarily abandoned, or it will be in the near future.

Q Does it produce water? A Yes.

Q What is the reservoir producing mechanism in this pool?

A I believe it is primarily a solution gas drive reservoir, although we do have water at the bottom of the oil section, and we may be getting some help from that.

Q Do all wells in the pool produce water, or only those on the lower part of the structure?

A I would say only the wells on the lower part of the structure produce water at the present time.

Q Does your State "SC" No. 3 directly north of this proposed injection well produce water?

A Let me check. Yes, it is producing water at the present time.

Q Do you think there is any possibility that injection of water into your "SG" No. 1 will result in premature flooding out of the other wells in this area rather than stimulating the flow of oil from the wells?

A That is a possibility. However, I wouldn't think it very likely.

Q Do you believe that there is a natural water drive that comes up the structure in this pool and adds to the solution gas drive mechanism?

A I have no engineering evidence to state that there is. However, it's a possibility since the field is producing water.

Q But at any rate, you would add an artificial water drive?

A Yes.

Q Mr. Broschat, you gave the number of sacks that each one of these casing strings has been cemented with. Will you give us the top of the cement on each casing?

A Yes. I am sorry I didn't give that. The surface casing, which was set at 296 feet cement was circulated on the eight and five-eighths inch casing. It was set at 4245; top of cement is at 777 feet. And on the five and a half inch casing set at 1,035 feet, top of the cement is at 8,000 feet.

Q Now, this perforated interval from 9,874 to 9,980 through which you propose to inject water, is that the same interval that this well produced? A Yes, sir.

Q Was the well producing one hundred percent water when it was abandoned?

A The last production test I have listed here, it was making approximately seventy percent water, but the total fluid was very small.

Q Was it on the pump?

A It was on gas lift.

MR. HUTTER: I believe that's all. Thank you.

QUESTIONS BY MR. UTZ:

Q Mr. Broschat, in referring to your Exhibit -- electric log, what Exhibit was it?

A That would be No. 3.

Q No. 3. Can you tell me where the water-oil contact is?

A No, I am afraid I can't. However, the drill stem tests that were taken when the well was completed would indicate that it was originally around 10,000 feet.

Q Would you say that it is now above 9,873?

A Apparently it has come up from the original --

Q What kind of water is this that you intend to inject, salt water?

A Yes, it is salt water.

Q How much salt water is produced in this area?

A Total water production in the Saunders Field at the present time is about 2,000 barrels per day.

Q Two thousand barrels per day?

A Yes, sir.

Q Do you intend to inject five hundred barrels a day?

A Yes. We also have a salt water disposal system in operation in this Field which is handling the remainder of water --

MR. BUSHNELL: Will you state the well that is now being used as a disposal well and give us its location?

A We are using the State "SC" No. 5.

MR. BUSHNELL: That's located in the SW/4 of the SW/4 of Section 4, is that correct?

A That is correct.

Q (By Mr. Utz) Are you presently injecting salt water in that well now? A Yes, sir.

MR. NUTTER: Has the injection of water into the No. 5 Well enhanced the oil production in that area?

A It is too early to tell. We've only been injecting for about two months, and we don't have any evidence one way or the other as yet.

Q (By Mr. Utz) What is the interval of that well that you are injecting into?

A We are injecting into the Pennsylvanian, in that well also.

Q That is below the water-oil contact?

A Yes, sir.

Q Would not that well be also an injection well for the pilot water flood as well as the one that you are --

A Well, it could be considered as an injection well. However, in our original application, we called it a salt water disposal well.

Q Why don't you call this one a salt water disposal too?

MR. BUSHNELL: Mr. Utz, I doubt if Mr. Broschat could answer that question, and maybe I can't either. The best explanation I can make is that apparently when the No. 5 Well application came up, it was the means of disposing the water as such, whereas apparently, the management desires to use this "SG" No. 1 as a secondary recovery, and that would be the only explanation I could make for stating one is a disposal and the other is an injection for secondary recovery.

MR. UTZ: Well, is the No. 5 Well taking two thousand barrels a day? A Yes.

Q So there is no need for a salt water disposal well to dispose of all the water?

A Well, it would help to have an additional well. Water production in the field may increase, and we may experience difficulties with this well taking all the water.

MR. UTZ: That's all I have.

MR. BUSHNELL: I have one more question.

REDIRECT EXAMINATION

BY MR. BUSHNELL:

Q Mr. Broschat, with reference to this question about the amount of water and also with reference to the water in the disposal well of State's "SC" No. 5, do you anticipate that there will be an increase of water that would require the additional means of disposal of this water by this injection process?

A Yes, we anticipate that water production will increase, and we'll need additional disposal facilities.

MR. BUSHNELL: That's all I have.

RECROSS EXAMINATION

BY MR. COOLEY:

Q Mr. Broschat, what was the production of the "SG" No. 1 Well at the time of abandonment? Oil production, I mean.

A Oil production. You mean monthly oil production?

Q Per day, if you have it, please.

A Somewhere around three barrels per day. We were just producing it intermittently on gas lift.

Q Was it the high quantity of water production that made it continue to produce the well?

A I would say it was more the low oil production.

Q There are a lot of wells producing there, but the lifting costs make it unfeasible to continue at that level?

A That's correct. These wells are almost 10,000 feet deep, and lifting costs are quite high.

Q Mr. Broschat, is the salt water disposal system to which you have previously referred in your testimony one hundred percent

effective at the present time? In other words, is it disposing of all salt water produced in the field?

A I believe there are two leases that are not connected at the present time. However, we are making arrangements to connect them. We have experienced mechanical difficulties from time to time at our injection station, necessitating putting a little water into a disposal. However, when everything is working, we are able to dispose of all the water.

Q Do you feel that the water production at the present time is just about the capacity of the existing system, or is it capable of handling substantial quantities of additional salt water?

MR. BUSHNELL: Are you referring to --

MR. COOLEY: To the "SD" No. 5.

A I believe that's about all the water the "SC" 5 will take.

Q (By Mr. Cooley) Is that "SC" or "SD?"

A That's "SC."

Q Do you feel that the injection of salt water into your "SC" No. 1 Well will alleviate this situation some?

A Yes, I think so.

Q Will it take some of the pressure off of the "SC" No. 5?

A Yes.

Q By the way, do you happen to know the Order No. that granted authority to utilize the "SC" No. 5 as an injection well, or disposal well, rather?

MR. BUSHNELL: Yes, I have that. It is Order No. R-951,

Case No. 1193. And the date of that hearing was January 9, 1957.

Q Then, at least one of the contributing incentives to utilizing the "SG" No. 1 Well as an injection well, whatever you call it, is to arrive at a more satisfactory means of disposing of produced salt water in the Saunders Pool, is it not?

A That is correct.

Q Under these circumstances, would Amerada have any objection to the Commission authorizing a salt water disposing well rather than an injection well?

MR. BUSHNELL: Well, again, I don't know if Mr. Broschat could answer that question, but since this is a pilot water flood program, I think they would have that objection, Jack.

Q Well then, let's pursue that. Mr. Broschat, what type of pilot program would you call it, is it a line drive, is it four spot, or five spot pattern? What pattern is it, or is there a pattern, in fact?

A Well, with just one well, I would say we have no pattern.

Q What could it develop into? There must be some type of pattern that Amerada has in mind that they intend to institute on a secondary recovery project in this area.

A I would imagine that we would -- if this pilot flood is successful, that we would go to a peripheral type flood, injecting water along the flanks around the field.

Q Could you expend and project your thoughts along that line and point out what wells on Exhibit No. 2, I believe it is, that

might be injection wells in such pattern?

A I am afraid at the present time I wouldn't be in a position to say which wells we might --

Q Well, I understand that Mr. Broschat, but assuming that you were instructed to design a peripheral type flood for this pool, what wells would appear to be the most satisfactory for such a plan?

MR. BUSHNELL: Mr. Cooley, may I rephrase that question?

MR. COOLEY: If the witness doesn't understand, I guess you can rephrase it.

MR. BUSHNELL: What I wish you would ask him is if he has knowledge of such a plan.

MR. COOLEY: I am trying to get at the possibility of what could possibly develop, not what necessarily will develop.

Q (By Mr. Cooley) Would you try to answer the question? If you can't, why then --

A I can't answer that at the present time. If you would like to have an answer later, after we have been able to study it more thoroughly, I am sure Amerada would be happy to --

Q Mr. Broschat, what can this develop into then, starting with this type of situation?

A Well, assuming our pilot flood was completely successful, we could take additional wells around the periphery of the field.

Q How do you propose to determine success or failure of your proposed pilot flood project, utilizing one injection well? Where

are you going to determine this effect, if any?

A By studying production of the adjacent producing wells.

Q That is particularly what I am asking you. Where are these wells that are going to experience any result, if any?

A These wells are the ones shown on Exhibit 1 in our pilot water flood area; would be the "SC" 2 and 3, and "SE" No. 1 in the NW/4 of Section 10, and "SF" No. 1 in the NE/4 of Section 10, and the "SD" No. 2 in the S/2 of the S/2 of Section 3.

Q Do you think you are being a little over optimistic to expect any results from a well more than half a mile away?

A It may be in this case.

Q Do you know from your experience of any successful operations at such distances?

A Yes, I am sure there are.

Q Could you enumerate some of them, please?

A I don't recall any particular instances. I believe the Saprock unit in Texas has widely spaced injection wells.

Q More than a half a mile?

A I believe so. I am not sure.

Q At what stage of completion are the four wells in a line on Exhibit No. 1, that being the "AC" No. 1, the Amerada "SC" No. 1 and 2 and the Amerada "SF," I believe it is No. 1?

A "SE" No. 1, "SF" No. 1 are both marginal wells as is the "SC" No. 3, "SC" No. 2 is still a top allowable well.

Q Could you give us the latest tests on these wells, please,

those four wells, water and oil both?

A These are not the latest tests. However, they are the latest ones I have with me.

Q And the date of the tests, please.

A These tests were taken in April of 1958. The "SC" No. 2 producing on gas lift produced 146 barrels of oil and 79 barrels of water.

Q Over whar period of time?

A Twenty-four hours. "SC" No. 3 on gas lift produced 110 barrels of oil, 44 barrels of water in twenty-four hours. "SE" No. 1 producing on gas lift produced 28 barrels of oil and 15 barrels of water in twenty-four hours. The "SF" No. 1 on gas lift produced 22 barrels of oil and 2 barrels of water.

MR. COOLEY: That's all I have.

QUESTIONS BY MR. NUTTER:

Q Was a test taken on the "SG" No. 1 in April?

A Yes, that's the latest test we have in April.

Q What was the result of that test, please?

A In the test I have shown here in April, the well produced 6 barrels of oil and 59 barrels of water in twenty-four hours. That contradicts a test I gave previously, which I believe was a later test than this. Now, this well was not produced every day. It was produced about one day out of four toward the end.

Q Is there any particular reason why the "SG" No. 1 would produce more water than the "SF" No. 1, and the well seems to be

structurally a little bit higher than the "SF" No. 1?

A I don't know of any particular reason right now. There may be.

Q What is your opinion?

A I don't know. I would have to study further.

Q Would the No. 3 "SC" Well be capable of producing more than 110 barrels of oil and 44 barrels of water, if the gas lift were increased.-- A You mean --

Q -- or is that the total capacity that the well has produced?

A I would say it is the total capacity of the well.

Q Do you anticipate that the injection of water in the No. 1 "SG" Well will cause the water production in the No. 3 Well to go down and the oil production to remain the same or go up, or what will be the result of an efficient water flood by the "SG" No. 1 Well on the No. 3? What do you anticipate will happen to the No. 3 Well?

A I would anticipate increased oil production.

Q How about the water, what would it be?

A I don't know. It might stay the same or it might decrease if an oil bank were swept toward it.

Q There is some natural water being produced at the present time, however? A Yes.

Q If you increase the gas lift in that No. 3 Well, would you be able to produce more than 110 barrels of oil or not, or if you

put a Cole pump or some other type of pump on the well, would you produce more fluid?

A It's possible that we could install a more efficient means of producing this well. However, this Pennsylvanian formation is a low permeability formation. Most of these wells don't make a tremendous amount of fluid.

Q Is the permeability low in the "SG" No. 1 Well?

A I don't have any core analysis, but I'm sure it is.

Q But it is not enough to inject water?

A I think the formation will take 500 barrels per day.

MR. NUTTER: Thank you.

QUESTIONS BY MR. STAMETS:

Q Mr. Broschat, how do you account for the wide variance in producing rates among wells on adjoining 40's such as the State "SC" No. 2 in Section 10, and the State "SE" No. 1 in Section 10?

A I'd say probably due to different stages of depletion; perhaps a localized change in conditions in porosity and permeability. This Pennsylvanian can be erratic.

Q Doesn't this seem to be a condition pretty common throughout the southern end of this field?

A What condition are you referring to?

Q The fact that you can find one presently producing 100 barrels and then on the next 40 it may be less than 100, maybe 40 barrels?

A Yes, it is quite common in the Saunders Field.

Q It would seem to indicate it is more likely a reservoir condition?

A That's a possibility.

Q What makes you feel that this is the proper time to start a pilot water flood in this field?

A Well, I believe this is a good time to start it. Reservoir pressure is declining, and if we start a pilot injection project now, we'll be that much farther along.

Q It seems so -- that water flood is usually associated with stripper field, and this is far from a stripper field, isn't it?

A There are a lot of marginal wells in this field.

Q However, there are also a lot of wells capable of producing more than their allowable. Wouldn't the pressure maintenance possibly be a better project?

A It could be thought of as pressure maintenance.

Q Is there any other reason besides the decline in production in this field for starting a pilot water flood at this time?

A Well, I personally feel that's a good reason. We would like to evaluate the possibility of water flooding this field at the present time.

Q Could you give us a rough estimate of how long it might possibly be before this water flood extends into, say, Section 3, 15 South, 33 East, assuming it is successful?

A No, I am afraid I couldn't at the present time.

Q The reason I was asking is because just a brief glance at

my sketch map here shows about 6 wells capable of producing over a hundred barrels a day. About four of those are capable of producing their allowable or greater. Assuming this pilot flood is successful, what do you suppose will be done at that time, if the pilot proves successful? Do you think the company will go ahead with plans to flood the entire pool?

A That would be a decision of management, and I am afraid I can't answer that at the present time.

Q Would it be engineeringly sound to allow that pilot to just sit there with no more injection?

A Are you assuming that the pilot area is flooded out?

Q You can assume that you have had a sufficient effect in the well immediately north of the injection well to prove that this pilot flood has been successful.

A Well then, I think we would investigate the possibility of expanding our flood.

MR. STAMETS: That's all I have.

QUESTIONS BY MR. FISCHER:

Q Mr. Broschat, how long have you been injecting water in that "SC" No. 5?

A Approximately two months.

Q Two months? A Yes, sir.

Q Do you happen to know the cumulative amount of water injected in that well?

A No, I don't have that information with me.

Q Do you know what the daily might be right now?

A Right now, we are injecting approximately 2,000 barrels per day.

Q And you have been injecting for two months?

A Yes, sir.

Q And this State "SI" No. 1, is that Amerada's well over in the SE/4 of the SW/4 of Section 4?

A Yes, it is an Amerada well.

Q And the No. 4 "SK" is an Amerada well, I see, and the Amerada "SC" No. 4 located in the NW/4 of the NE/4 of Section 9, that's an Amerada well. What are the producing mechanisms of those wells? Are they pumping, flowing, gas lifting?

A "SI" No. 1 is on pump at the present time.

Q Is that a long stroke pump?

A It's a conventional beam type pumping unit. The "SD" No. 4 is on gas lift. What other wells were you --

Q The "SC" No. 4 in Section 9.

A "SC" No. 4 is on gas lift.

Q Have you noticed any increase in production since you -- in those three wells that you just mentioned since injecting water into this "SC" No. 5?

A No, we haven't.

Q Have you noticed any increase of water in any of these wells?

A No.

MR. FISCHER: Thank you.

QUESTIONS BY MR. MORGAN:

Q I would like to know what percentage of the recoverable oil in place has been recovered to date in this pool.

A I'm sorry, I don't have the reservoir analysis of that type with me.

MR. PORTER: You couldn't give us an estimate?

A It would be just a guess. I prefer not to.

Q (By Mr. Morgan) Don't you think it is important to know how much you are going to recover, how much you can expect to recover, I mean?

A This pilot project is primarily to determine the feasibility of a water flood. We haven't investigated how much oil we can recover. We are interested now in determining if the Pennsylvanian can be successfully flooded.

Q And you want to find out at the same time whether the drive will be radial or directional or just where the water flood would create the oil, is that part of the experiment?

A Yes, we are interested in seeing --

Q You have no data that would tell you just where that oil would be driven to, is that right?

A That's right.

Q Or in what quantities? A Yes, sir.

QUESTIONS BY MR. COOLEY:

Q Mr. Broschat, if this injection project succeeds, referring to your best estimate or is as successful as you are hopeful it will be,

some of the wells offsetting to the north would be increased above top allowable for the pool, is that right?

A If our pilot project is successful, that certainly could be the case, yes, sir.

Q Have you made any primary compilations by how much it might exceed the allowable? A No.

MR. COOLEY: No further questions.

MR. PORTER: Anyone else have a question?

MR. IRBY: Frank Irby, State Engineers' Office.

QUESTIONS BY MR. IRBY:

Q Mr. Broschat, I want to go back to this casing in this well. First, how old is that casing?

A The well was completed in 1952.

Q 1952. Now, you stated that your surface casing is fifteen and three-eighths, set at 296, and cement was circulated to the surface? A Yes, sir.

Q And then your second string is what?

A Eight and five-eighths inch.

Q And it's set at 4,245 -- A Yes.

Q -- and cemented to what depth?

A Seven hundred and seventy-seven feet.

Q Seven seven seven. Then, you have there roughly five hundred feet between your first and second string, which has no outside protection, is that right?

A That's right.

Q Do you know what the condition of that casing is?

A No.

Q Do you know what grade of casing was placed, that eight and five-eighths?

A I don't have that information with me.

Q Now, what was that other string, five and a fraction?

A Five and a half.

Q Five and a half. And it is set at what level?

A Ten thousand thirty-five.

Q And it is cemented to what level?

A Eight thousand.

Q Eight thousand? A Yes, sir.

Q Then, you have quite a gap between there. Now, this second string of casing, the eight and five-eighths, what formation is it in? At 4,245?

A 4,245. It would be set into the San Andres..

Q And the surface casing set at 296, what formation is that in?

A I don't know. We don't pick tops that high.

Q You don't know whether it is in Ogallala or the Chalk Bluff or what it is in? A No.

Q If this water flood project is approved, do you anticipate that there is an adequate supply of salt water being produced from the Pennsylvanian formation to continue this to its ultimate conclusion?

A Are you referring to a pilot?

Q No, I mean ultimate conclusion of your water flood.

A For the entire field?

Q Yes. In other words, would you have to obtain water from other sources?

A For a full scale flood, I would imagine we would.

Q Now, back to this method of injection. As I understand it, you intend to just dump it into the open hole; your present plans...

A Inject down the casing, you mean?

Q Yes. A Yes, sir.

Q By gravity?

A Yes, we hope it will take it on gravity. We may have to apply pressure to put it away.

Q Do you think that the condition of the casing between 296 feet below the surface and 777 feet below the surface will withstand the pressure without any possibility whatever of getting out and contaminating any fresh waters that might be in that zone?

A Yes, sir. Our five and a half inch casing -- I should have brought out -- is run to the surface, so we will be injecting down this five and a half.

Q Is there cement in the annulus between the five and a half and the eight and five-eighths?

A No, there is no cement there.

Q But there is an open annulus between the two?

A Yes, sir.

Q If both of these strings of casing in that zone should corrode and start leaking, what means of detecting that leak do you have?

A I believe the possibility of both strings leaking there is quite remote. If we are injecting under pressure, I am sure we could tell by our pressures if that was the case. Another way would be to open up the annulus between the two and see if we had any pressure or a vacuum there.

Q Where is this Saunders Pool with respect to the town of Eunice?

A The Saunders Pool is in the northwestern part of Lea County.

Q Where is it with respect to Tatum then?

A It is approximately twenty miles west and ten miles south of Tatum.

Q Are you aware that there is potable water in the Santa Rosa formation in certain localities? A Yes, sir.

Q Is it your opinion that the waters in both the Santa Rosa and the Ogallala will be adequately protected by this casing program? A Yes, sir.

MR. COOLEY: That's all.

MR. PORTER: Any further questions?

QUESTIONS BY MR. FISCHER:

Q Mr. Breschat, I don't remember if you have been asked or if you stated -- you said there was a solution gas drive reservoir,

is that correct?

A I don't recall making that statement. I believe I stated that the solution gas drive is probably the main producing mechanism. However, we might have water influxion also.

Q Water drive? A We may have.

MR. FISCHER: Thank you.

MR. BUSHNELL: I don't have any further questions. I would like to submit a statement.

MR. PORTER: Anyone else have any questions? The witness may be excused.

(Witness excused)

MR. PORTER: Did you offer your Exhibits?

MR. BUSHNELL: Yes, sir.

I would like just to remind the Commission that this application is,being a proposal for a pilot water flood program, is made in hopes that it will be successful and also to obtain additional data and information as a means for some future program for secondary recovery. That's all I have.

MR. PORTER: Anyone else have a statement? Mr. Irby.

MR. IRBY: The State Engineer objects to injecting of salt water not adequately protected, particularly in the Ogallala formation. The evidence does not show that the surface string goes through the Ogallala into the Chalk Bluff formation. I think that is a necessity insofar as the protection of fresh waters are concerned. I feel that Amerada can determine whether or not that

casing is set in the Chalk Bluff, and if it is, then the State Engineer has no objection.

MR. BUSHNELL: May I ask there, that if we can satisfy the State Engineer that the method of this completion will adequately protect the Ogallala or any other fresh water sand that is concerned, if he will be willing to withdraw his objection.

MR. IRBY: Yes.

MR. PORTER: Anyone else have a question?

MR. CABANISS: I am Rex Cabaniss with Shell Oil Company. Shell operates ten wells on the Saunders Pool as indicated on applicant's Exhibit, the acreage offsetting the pilot flood. We wish to go on record as being in favor of the application and respectfully request its approval.

MR. PORTER: Anyone else have a statement? If there are no further statements, we will take the case under advisement and recess until one o'clock. At that time we will take up Case 1493.

C E R T I F I C A T E

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, J. A. TRUJILLO, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript by me and/or under my personal supervision, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal, this, the 25th day of August, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

J. A. Trujillo
Notary Public

My Commission Expires:

October 5, 1960.