BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
August 8, 1962

EXAMINER HEARING

IN THE MATTER OF: Application of Aztec Oil & Gas Company for a waterflood project, Lea and Eddy Counties, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a waterflood project in the Robinson Grayburg-San Andres Oil Pool in an area underlying the E/2 SE/4 and SW/4 SE/4, Section 36, Township 16 South, Range 31 East and the SW/4 SE/4, Section 30 and the W/2, W/2 E/2, and SE/4 SE/4 of Section 31, Township 16 South, Range 32 East, Lea and Eddy Counties, New Mexico, with injection of water to be into the Grayburg formation in six injection wells, said project to be governed by the provisions of Rule 701.	Case 2615

BEFORE: Mr. Daniel S. Nutter, Examiner.

TRANSCRIPT OF HEARING

MR. NUTTER: We will call Case 2615.

MR. FLINT: Application of Aztec Oil & Gas Company for a waterflood project, Lea and Eddy Counties, New Mexico.

MR. MORRIS: If the Examiner please, Richard Morris of Seth, Montgomery, Federici and Andrews, appearing on behalf of

the applicant, Aztec Oil and Gas Company. Associated with me in the case is Mr. Kenneth Swanson, attorney for Aztec Oil and Gas Company and a member of the Texas Bar, who will present the case.

MR. SWANSON: I wonder at this time if there would be any other appearances?

MR. NUTTER: We will call for appearances in 2615.

MR. PORTER: Does that include statements?

MR. NUTTER: Yes.

MR. PORTER: H. C. Porter, representing Water Flood Associates, Artesia, New Mexico.

MR. NUTTER: Any other appearances?

MR. IRBY: I may wish to ask some questions. I will know after Mr. Swanson completes his direct examination. I am Frank Irby, State Engineer's Office.

MR. NUTTER: Would you please proceed, Mr. Swanson?

MR. SWANSON: We have one witness to present testimony at this hearing.

(Witness sworn.)

(Whereupon, Applicant's Exhibits Nos. 1, 2 & 3 were marked for identification.)

JIM BURROWS

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

follows:

DIRECT EXAMINATION

BY MR. SWANSON:

Q Would you please state your name for the record?

A Jim Burrows.

Q By whom are you employed, Mr. Burrows?

A Aztec Oil and Gas Company.

Q What capacity?

A As a petroleum engineer in Dallas.

Q Have you previously testified as an expert before this Commission?

A Yes.

MR. SWANSON: Are the witness's qualifications acceptable?

MR. NUTTER: Yes.

Q (By Mr. Swanson) This application involves Aztec's request for a waterflood project in the Robinson Pool. Are you familiar with this pool?

A Yes.

Q And the application? A Yes.

Q Have you made a study of this area including some exhibits that you want to present to the Commission?

A Yes.

Q Would you refer to the first one and explain it, please?

MR. SWANSON: Mr. Porter, would you like a copy of our exhibits?

MR. PORTER: Please.

MR. SWANSON: Mr. Irby, would you like a copy?

MR. IRBY: Please.

A Exhibit No. 1 is a base map which gives the lease ownership and well locations in the vicinity of the Robinson Grayburg-San Andres Oil Pool. The pool boundary which straddles the Lea and Eddy County line is designated by the heavy dashed line. The seventeen-well proposed Aztec Robinson project area located in the northeast portion of the pool is noted by the heavy solid line. The yellow acreage noted in the project area is operated by Aztec Oil and Gas Company, and the light blue acreage is operated by McGrath and Smith. This light blue acreage was included in our application because we have tentative agreement to unitize the area within the project area. This exhibit also indicates the approximate location of a water supply line of the Caprock Water Company from which we believe we can obtain an adequate supply of source water; and inside the project area, the six wells circled and colored in red represent a five-spot or staggered line drive waterflood pattern and are the wells which we request approval to convert for injection of water into the

Grayburg or Premier pay sections as noted on Exhibit 2.

Q Will you refer to Exhibit 2 and explain it, please, Mr. Burrows?

A Exhibit No. 2 is two cross sections. One is northwest to southeast, and one southwest to northeast as traced on the base map in the upper right-hand corner. The intervals colored in red are the Premier zones which we propose to inject water into. This exhibit indicates that these zones are continuous throughout the project area and subject to waterflood.

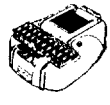
This exhibit also indicates the structure in the area to be a southeast plunging nose, but the dip in all directions of this nose is very slight, in the order of one-half degree; therefore we don't consider the structure to have any bearing on the secondary recovery in this area.

Q Did your study in this regard indicate the presence of any faults or fractures that might impair waterflooding in this area?

A No.

Q Are there presently any other zones open to production in the proposed injection wells than those that are shown on this cross section?

A Yes. In three of the wells there is a lower zone down in the San Andres approximately 150 feet which is open. We



propose to set bridge plug to isolate this zone, as noted in our next exhibit, which is the casing program.

Q You have no plans at this time to attempt to waterflood that lower zone?

A Not initially with the other zone.

Q What is the reason for that decision?

A We consider that there would be too much risk involved in simultaneously flooding the San Andres zone and the Grayburg intervals, in that channeling or deep zones may arise.

Q Would you refer to your next exhibit, please, and explain it?

A Exhibit No. 3 is the casing program which was originally utilized in completing these proposed injection wells as producing wells. We might note that this exhibit is a corrected copy of the Exhibit C which was submitted with our application. The correction is on the first page where we inadvertently listed the State RC No. 4 and its casing program, instead of the State RC No. 3 which is the proposed injection well. We consider these casings and cement that now exists to adequately protect any fresh water sources from damage, and to isolate the zones in which we propose to inject water. As we've noted previously, we intend to set bridge plugs over the lower intervals now open in three of the wells, and we propose to protect the casing by utilizing injection

through tubing and the lower packer.

Q Have you anything else in regards to this exhibit, Mr. Burrows?

A No.

Q Would you refer to your next one and explain it, please?

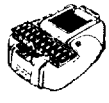
(Whereupon, Applicant's Exhibit No. 4 was marked for identification.)

A Exhibit No. 4 is a data sheet which gives the average reservoir, rock, and fluid properties of this portion of the Robinson Pool, such as the average porosity of 15.6 percent, the average permeability of 10.2 millidarcies, and the average net pay of ten feet. This exhibit also indicates that the area is producing under a solution gas drive type of reservoir mechanism, and that no gas-oil or water-oil contacts have been indicated. I don't consider it necessary to read this entire exhibit unless it's desired. I might note that the data from which these average figures were taken were utilized in the derivation of the performance curve presented in our next exhibit.

Q Would you refer to your next exhibit and explain it, please?

(Whereupon, Applicant's Exhibit No. 5 was marked for identification.)

A The next exhibit contains the predicted performance



curve for the seventeen-well study area. As shown on the cumulative production curve which has the long dashes, we expect to have a cumulative primary recovery of approximately 175,000 barrels as of December of this year, which is the time we anticipate an injection will commence. The daily production curve which has the short dashes indicates that the production from the seventeen-well area is now approximately ninety barrels of oil per day or 5.3 barrels of oil per day per well. Thus we consider the area to be in the stripper stages of primary production.

Continuing to the secondary portion of the curve, the daily production rate curve indicates that we expect a slight degree of response after approximately four months of injection, and at the end of seven months we estimate that the production rate will be top allowable for the unit; then estimate that we'll have top allowable production for approximately two years and production will begin to decline, will decline to an economic limit within about fifteen years following the commencement of the flood. At the end of this period we expect to have recovered an ultimate recovery of 1,115,000 barrels, of which thirty-six percent might eventually have been produced by primary production, and sixty-four percent is due solely to waterflood operations.

Q It's your opinion then that this additional sixty-four percent would not be recovered unless waterflood operations were

instituted?

A That's correct.

Q Then would it not be correct to say that waste would certainly be caused unless this waterflood project was approved and carried out?

A Yes, sir.

Q Will you refer to your next exhibit, please, Mr. Burrows?

(Whereupon, Applicant's Exhibit No. 6 was marked for identification.)

A Our final exhibit is a letter from Caprock Water Company which states that they have injection water available to serve our project and are willing to furnish this water to our plant site.

Q Mr. Burrows, have you any recommendations to make to the Commission with regard to proration schedules and things of that nature?

A We request first that the six wells which we have indicated be authorized for injection into the Premier intervals, and that the project be governed by Rule 701 of the Commission rules and regulations, including the allocation of allowables and the administrative approval for conversion of additional wells.

Q It's contemplated then that it will be necessary at

some later date to convert additional wells to injection purposes?

A Yes.

Q Why do you think this will be required? Would you like to refer to Exhibit No. 1?

A On Exhibit 1, the small circles which haven't been colored is the assumed pattern which will meet the project along the northwest project boundary. Because of the peculiar configuration of the unit boundary along the west side, we have chosen to or propose to inject into a row of wells which will leave two rows of producing wells between the injection wells. After flooding out to the nearest row of producing wells in this corridor area, we believe that additional oil, considerable additional oil will be left in the corridor between the two wells; so in order to recover this oil we propose to convert two additional wells in the southeast row of the two rows.

Q Have you considered other possible injection patterns that could be utilized in this area?

A Yes, we've considered other areas and we've considered that our proposed injection pattern will prevent waste and will result in the protection of correlative rights, and therefore have chosen it.

Q Have you made a study of the possibility of extending into this project area the injection pattern that has developed

in the area to the west, the Square Lake area?

A Yes.

Q And if that pattern of injection were continued into this area, what would be Aztec's primary objection to it?

A The primary objection would be that because in the row of producing wells that would result with the complete row of project wells in this area, we would only have one producing well in this row and a large amount of oil would be pushed to the adjoining acreage to the west, considerably more than would be pushed back by counterflow.

Q Have you made a calculation of the amount of oil that could be involved in this situation?

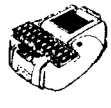
A Yes, my study has indicated that approximately 135,000 barrels of oil will be left in this corridor zone to be recovered by converting additional wells at a later date.

Q If the Square Lake pattern of injection wells were extended into our area, have you made a determination of the approximate number of barrels of oil that would be pushed from the project area to the leases adjoining it on the west that would not be compensated by counter-drainage?

A Yes.

Q What would that figure be?

A Approximately 100,000 barrels.



Q In your opinion, is it possible to recover the oil that would remain in the corridor between the two rows of producing wells by converting additional wells to injection, without causing any waste?

A Yes.

Q If that is done would there be any violation of correlative rights as between the lease and mineral owners to the west and those within the project area?

A No.

MR. SWANSON: This concludes our direct presentation of evidence. At this time we would like to ask for the admission of Aztec Exhibits 1 through 6 into evidence.

MR. NUTTER: Aztec's Exhibits 1 through 6 will be admitted into evidence.

(Whereupon, Applicant's Exhibits Nos. 1 through 6 were admitted in evidence.)

MR. NUTTER: Any questions of Mr. Burrows?

CROSS EXAMINATION

BY MR. FLINT:

Q How old is the casing in the proposed injection wells?

A Approximately three to three and a half years.

Q So that it will not be necessary, in your opinion, to replace any casing?

A No, sir.

Q Are there any fresh water producing formations in the affected wells?

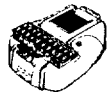
A Not to my knowledge.

Q If there should be any, do you feel that any potential fresh water producing formations would be protected by your casing program?

A Yes, sir.

Q Could you explain in a little more detail the location of adjacent or nearby waterflood projects?

A There has been a project established to the south and east of the project area in Sections 5 and 6 and 7, which is operated by Water Flood Associates, in which there are two injection wells, I believe one in the Southeast Quarter of the Southeast Quarter of Section 6, and one in the Southwest, Southwest Quarter of the Northwest Quarter of Section 5 in Township 17 South, Range 32 East. To the west in the Square Lake pool there are considerable numbers of injection wells already injecting water and I believe orders have been completed to extend this flood by stages by Newmont. In Section 35 Water Flood Associates has had a hearing for injection, and I believe six wells which extend this pattern from the Square Lake Pool to the west. There are other projects approximately four miles to the east and



three miles south. I don't know the locations of all of them.

Q Mr. Burrows, referring to your cross section, Exhibit No. 2, I believe it is, is the pink colored area the porosity that you expect to be flooding in this project?

A That's the gross intervals which contain the porosity. All of it we don't consider pay.

Q Of your six injection wells, are all six of those open in both of these bands of porosity?

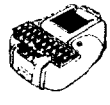
A I believe that two of the injection wells are not open in the upper band at the present time.

Q Is it your intention to perforate that and flood that upper band in those wells?

A This upper band, it's indicated that it's much less permeable than the other zone, and we intend initially to commence injection into only the zones that are now open and to perforate those zones. Later, if we're getting any water in them, in other words, as detected by tracer surveys or something, if we are getting water in there effectively, we'll perforate the upper interval.

Q It would appear on your Cross Section A-A^1 that you have two injection wells, being the fourth one from the left and the fifth from the left. Would those be the two wells?

A I believe that's correct.



Q Which of those wells are on your casing program?

A It would be the Brinson Federal "R" No. 1, that is the fourth one from the left, and the Humble State "A" No. 3, the last well in the casing program exhibit.

Q In other words, the Brinson Federal No. 1 is the third well on the casing program exhibit; is that correct, the one at the bottom of the first page?

A That's correct.

Q It's perforated from 3800 to 3867, which would be entirely in the lower band; is that correct?

A I believe 3800.

Q Is that the top figure?

A It's the top figure there.

Q Is that the number in the top band?

A Yes, I believe so. It's kind of difficult to read, though.

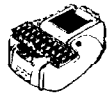
Q If that's 3800 right in the middle of the upper band, then the 3867 would extend into the lower band?

A Yes. The Brinson No. 1 is open in the upper zone.

Q And also in the lower?

A Yes.

Q That would also hold true for the Humble State "A" No. 3, then?



A Yes, sir.

Q Open in both zones? A Yes, sir.

Q There will be a bridge plug set in the State "A" RC No. 3 at 3900 feet which will exclude that lowermost perforation, 3848 to 60; is that correct?

A Which well is that?

Q State "A" RC No. 3. A Yes, sir.

Q The 3848 to 60, is that in the San Andres?

A That's a lower interval, the Lovington Zone of the San Andres, which is in this pool.

Q And you'll set a bridge plug at 3900 feet in the RC No. 1 to exclude the perforation from 3968 to 78; is that correct?

A Yes, sir.

Q And in the State "R" No. 3 a bridge plug will be set at 3900 feet to exclude the perforation 3957 to 71?

A Yes, sir.

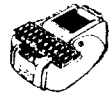
Q What about that Brinson Federal No. 3, Mr. Burrows?

A It already has a bridge plug set at 3970, which has isolated those lower zones.

Q It would have a set of lower perforations also that would still be open then, 3903 to 09, wouldn't it?

A I believe those are in the lower pick interval.

Q Those will be the only perforations in any of these



wells below 3900 feet that will be open, though, won't they?

A Right. That Lovington Zone; that's correct.

Q On your Exhibit No. 1, Mr. Burrows, to the west of your project area, I see five wells or five locations which have the larger circles around them but which are not colored in. What do the larger circles indicate?

A That is an assumed pattern. It would be an extension of the pattern to the west. Two of them, two of the injection wells that haven't been drilled.

Q Have any of those injection wells as yet been authorized by the Commission, do you know?

A I believe in this row, no, sir.

MR. NUTTER: I would like to excuse the witness, subject to recall, and call Mr. Porter to the stand, please.

MR. PORTER: That is Mr. Hal Porter?

MR. NUTTER: Mr. Porter with Water Flood Associates.

(Witness sworn.)

HAL PORTER

called as a witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. NUTTER:

Q Are you Mr. Hal Porter representing Water Flood

Associates, Inc.?

A Yes, sir. However, Mr. Examiner, I do not have legal counsel if that's required. I'm not sure whether it is or not.

Q I don't think it will be. I just want to ask you some questions regarding a flood that Water Flood Associates has been authorized; has Water Flood Associates been authorized a flood west of the proposed flood that's under consideration here today?

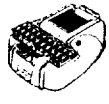
A Yes, sir. Water Flood Associates has been issued an Order No. R-2270 in Case 2580 which authorized six injection wells in Section 35.

Q Would you describe for the record the location of the injection wells which have been authorized by the Commission, Mr. Porter?

A Yes, sir. Am I permitted to enter an exhibit showing those or just pass up a map?

A I think if you'll just enumerate the wells, that will be sufficient, Mr. Porter.

A In Section 35, 16, 31, the well marked on Exhibit 1 of Aztec as No. 2 in the Southwest of the Northwest Quarter. That well number is wrong, that's No. 4 and it's not plugged as shown; that is one of the injection wells. Then the well marked 3-X, which is in the Northeast Quarter of the Southwest Quarter is an authorized injection well; and the well marked No. 5 which is in



the Southwest of the Southeast Quarter is an authorized injection well; as well as the well marked 1-X, which is in the Southwest of the Northeast Quarter, Section 35; two new wells which have not yet been drilled but which are authorized is a new well in the Northeast Quarter of the Northwest Quarter and one in the Southwest of the Southwest Quarter. That acreage marked BTA is being assigned to Water Flood Associates and the agreement has been made. Those are the six injection wells.

Q Has Water Flood Associates actually commenced work on any of these wells to convert them to water injection?

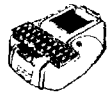
A Yes, sir, we have cleaned out the four present producers, the presently completed wells. We have them cleaned out and we have started our plant and plan to begin injection in September.

Q Have you commenced the drilling of the two undrilled locations?

A No, sir, not yet. We plan, however, to drill the BTA farmout within the next month or so.

Q Do you expect to have those two wells completed and on injection by September first, or will that be just the four wells that have been completed to date?

A The four that have been completed. We don't expect to start injecting into the BTA well until the Newmont pattern is



completed in Section 34 and under the Commission order for the staging of that flood, they are authorized to begin injection in Section 34 on the first day of April of 1963.

Q So your BTA well would go on injection at approximately the same time that Newmont's wells in Section 34 would go on injection?

A Yes, sir.

MR. NUTTER: I believe that's all. Does anyone have any questions they wish to ask Mr. Porter? You may be excused.

(Witness excused.)

JIM BURROWS

recalled as a witness, having been previously duly sworn, testified further as follows:

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Burrows, you stated that it was your opinion that the circled locations which you have not colored in would be an extension of the existing pattern of the flood to the west; was that your statement?

A Right.

Q Which would be an extension of the locations which Mr. Porter has testified have been authorized for injection?

A I believe that's correct, yes, sir.

Q You stated also, Mr. Burrows, that in the corridor of wells between the two rows of injection wells there would be a row of two producing wells; is that it?

A Yes.

Q Can the two rows of producing wells produce all of the oil that's there upon injection in your proposed locations as well as an extension of Water Flood Associates flood along the pattern that you've indicated, without the conversion of additional wells to water injection?

A No, sir.

Q Where would the additional wells be drilled or put on injection there in the corridor?

A One would be the Federal "R" No. 3, which is located in the Northeast Quarter of the Northwest Quarter of Section 31; and the State "RC" No. 2, which is located in the Northeast Quarter of the Southeast Quarter of Section 36.

Q When would those wells be put on injection, after the water from your presently proposed injection wells has passed those wells, after you've had a water break-through?

A Either at that time or possibly before that time.

Q Well, the conversion of those two wells would be an extension of Water Flood Associates' pattern, would it not?

A Yes, it would.

Q Maybe I misunderstood you, you said that you would have to convert two wells to the southeast, or is this what you meant, the wells on the southeast flank of the corridor?

A Southeast flank of the corridor.

MR. NUTTER: I believe that is all. Thank you. Any further questions of Mr. Burrows? He may be excused.

(Witness excused.)

MR. NUTTER: Do you have anything further, Mr. Swanson?

MR. SWANSON: No, sir.

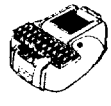
MR. NUTTER: Does anyone have anything to offer in Case 2615?

MR. PORTER: Hal Porter, representing Water Flood Associates, Artesia, New Mexico. I have a statement I would like to read. Water Flood Associates is offset operator to Aztec to the north and within three locations to the west, operating wells in Sections 35 and 25, 16, 31 and Section 30, 16, 32. The original five-spot waterflood pattern was established by Ambassador Oil Company in Square Lake Pool. Newmont later purchased the flood and has expanded the established pattern eastward two miles, including Section 24, which offsets Water Flood production. Sinclair has set the established pattern to the south.

On June 21, 1962 the Commission issued order No. R-2270 in Case 2580, which was a permit to an extension of an established

pattern into Section 35 of the Robinson Pool by Water Flood Associates. This project, if approved, the water injection would begin on September 1st. As part of the exhibits and testimony presented in this case, the plat was presented showing our proposed expansion under the established pattern. As offset operator we want to cooperate with Aztec on a lease line cooperative basis; however, we feel that whereas an operator may have his own particular reasons for preferring one pattern over another, that when a pattern is established in the area, the established pattern should be followed. With all due regard to Aztec, Water Flood Associates feels they must protest the establishment of any pattern which does not adhere to that already established in the pool. We feel that any such deviation would lead to a serious violation of correlative rights, and at some point where the two patterns would eventually meet, result in a waste due to insufficient sweep. Also any precedent so established by permitting different patterns in the same pool could lead to a disorderly rather than an orderly waterflood development of pools and a resultant loss of secondary reserves.

In summation, we would like to call to the Commission's attention that we feel that we have a unique situation here. We were aware that a pattern had been established in the area to the west and would have been happy to continue that pattern if we



felt it could be done with reasonable expectation that the Commission would logically approve it. Of course, first we realize it's necessary that the most efficient pattern be established to recover the oil that's there to be recovered. Our engineers have made a detailed study of this problem and it is their considered opinion that what perhaps could be referred to as a modified approach to the established pattern, or a later concurrence with the established pattern, would efficiently produce the oil that is in the corridor without any waste whatsoever. If our lease line had been other than it was -- it just coincidentally aligns itself in the same parallel direction with the existing injection wells -- we wouldn't have this problem; but should we continue the existing injection pattern into our area, we'd be in a position of having one producing well between the rows of injection wells on each side of our common boundary to other individuals for producing wells. Obviously we would not be allowed an opportunity to recover our share of the oil in that area. We feel that this is not protection of correlative rights.

Mr. Burrows has testified that in his opinion, based on his study, approximately 100,000 barrels of the oil would be pushed from the project area to the area to the west. It is our opinion that this proposal will affect the production of oil without waste and will completely protect correlative rights.

MR. NUTTER: Thank you. Does anyone else have anything they wish to offer in Case 2615? We'll take the case under advisement and call a fifteen minute recess.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 31st day of August, 1962.

Ada Dearnley

Notary Public-Court Reporter

My commission expires:

June 19, 1963.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2615, heard by me on Aug 8, 1962.

....., Examiner
New Mexico Oil Conservation Commission

BEFORE THE
OIL CONSERVATION COMMISSION
Farmington, New Mexico
October 18, 1962

IN THE MATTER OF:

CASE 2615: (De Novo) Application of Waterflood Associates, Inc. for a hearing de novo in Case No. 2615, Order No. R-2304, application of Aztec Oil & Gas Company for a waterflood project, Robinson Pool, Lea County, New Mexico.

BEFORE: Honorable Edwin L. Mechem, Governor
Mr. A. L. "Pete" Porter, Land Commissioner
Mr. E. G. "Johnny" Walker, Secretary-Director

TRANSCRIPT OF HEARING

MR. PORTER: We will take up next Case 2615.

MR. DURRETT: Application of Waterflood Associates, Inc., for a hearing de novo in Case Number 2615, Order R-2304, application of Aztec Oil and Gas Company for a waterflood project, Robinson Pool, Lea County, New Mexico.

MR. SWANSON: Kenneth A. Swanson, representing Aztec Oil and Gas Company. I am a member of the Bar. I am a member of the law firm of

MR. PORTER: Thank you very much. Do we have any other counsel?

MR. LOSEE: A. J. Losee, representing A. J. Losee and Waterflood Associates.

MR. PORTER: Mr. Losee, Waterflood Associates and one

other operation?

MR. LOSEE: It is actually Waterflood Associates Incorporated. It is an association.

MR. PORTER: Thank you, sir. Do we have any other appearances in this case?

MR. LOSEE: Mr. Porter, there is another. I am representing BTA Oil Producers out of Midland.

MR. PORTER: Thank you.

MR. SWANSON: This de novo hearing has as its subject here Aztec's section, owned by Aztec and McGrath and in the matter of the Robinson-Grayburg Pool in Eddy and Lea Counties. The matter after notice and publication, was heard by an examiner over two months ago. At any rate elements appear in opposition to the application. The parties appeared before the examiners, gave testimony and entered a statement setting out the reasons for opposition. After a favorable recommendation by the examiner and after the Commission had considered all the evidence any persons interested enough in the area to state his position had offered, an order approving the application without qualification was entered by the Commission. Subsequently, another party, owning acreage offsetting the produced unit boundary to the west, adjoined with the original owning party; and, as is our statutory right, moved to de novo hearing before the Commission. I think it is safe to assume that the adverse parties anticipate introducing additional evidence

to that that was given before the examiner. Otherwise, it would appear a pointless waste of time to impose upon the Commission and to cause Aztec economic loss, if the same evidence were presented to and considered by the Commission. Unfortunately, Aztec has no additional evidence to introduce. The facts are the same. The identical engineering principles apply. The equities have not changed. So, we feel that our evidence will probably be repetitious to that that we gave originally.

Our evidence will be presented in two parts. First, we will deal with all patterns other than those related to the proposed injection pattern. This was the only basis of opposition offered by the opposing parties or in their motion for the de novo hearing. On that point, we will try to denote our evidence; but , in that point in our testimony, we will show that due to the course of a peculiar alignment of our western lease boundary, it would be impossible to protect correlative rights by continuing in our area the injection pattern that is already in the area in the west. We have a solution to this problem, which basically involves delaying conformance with the existing patterns, until it conforms with the operations. We feel correlative rights have been preserved. However, it has been presented to the Commission in full, considered by the Examiner, and the Commission entered its original order, so in view of it being repetitious, if an apology is in order, we would like to offer it now, and with that in mind, we will do it again. We have one witness who will presently testify to the Commission.

Perhaps he could be sworn at this time?

MR. PORTER: Will you call your witness, Mr. Swanson?

(Witness sworn.)

MR. SWANSON: Mr. Burrows.

We have large exhibits. If we could, we would like them to be displayed?

MR. PORTER: I think we can get those up there, if we have some scotch tape. You may proceed, Mr. Swanson.

(Whereupon, Applicant's Exhibits Nos. 1 through 8 marked for identification.)

JAMES BURROWS, called as a witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. SWANSON:

Q Will you state your name for the record?

A Jim Burrows.

Q By whom, and in what capacity are you employed, Mr. Burrows?

A I am employed by Aztec Oil and Gas Company as a Petroleum Engineer in Dallas, Texas.

Q Have you previously testified before this Commission?

A Yes, I have.

Q Have you made a study of the project area involved in that application?

A Yes.

Q Have you prepared a series of exhibits to present to the Commission in support of this application?

A Yes, sir, I have.

Q Were these exhibits prepared by you, or under your direct supervision?

A Yes, they were.

Q Would you refer to the first one, and explain it, please, Mr. Burrows? Is this a copy of Exhibit No. 1 on the board behind the Commission?

A Yes, sir, it is. Exhibit No. 1 is a base map showing the lease ownership and well locations in the vicinity of the Robinson-Grayburg and San Andres Oil Pool in Lea and Eddy Counties, New Mexico. The heavy das lines represent the pool boundary which straddles the county line between these two counties. The area enclosed by the heavy solid line, in the northeast portion of this pool, is the 17-well proposed Aztec Robinson Project Area. This exhibit also indicates the location of a water supply line belonging to Caprock Water Company from which we intend to procure an adequate supply of injection water in the project area. The 6 wells circled and colored in red are the 6 wells in which we request approval to convert for the injection of water into the lower Grayburg or Premium pay intervals, as shown on our next exhibit.

Q Would you refer to your second exhibit, and explain it, please?

A Exhibit No. 2 is two cross sections, one northwest to

southeast, and one southwest to northeast as traced on the base map in the upper right hand corner. The intervals colored in red on this exhibit are the intervals into which we propose to inject water. This exhibit indicates that these intervals are continuous throughout the pool and subject to water flooding. This exhibit also indicates structure in this portion of the pool to be that of a southeast dip. We are plugging those. The dip of this nose is very slight in every direction, however, and is in the order of 1/2 of 1 degree. Therefore, we do not consider the structure to have any bearing on the water flooding.

Q Did your study in this regard indicate the presence of any faults or fractures that impair water flooding in this area?

A No, it didn't/

Q Are there presently any zones open to production in any of the wells proposed as injection wells, other than the closed zones indicated to this cross section?

A Yes, O-3 of the proposed injection well, there is a lower interval, approximately 150 feet below the lower zone shown in red on this exhibit, which is open at this time. We propose to isolate this off by setting a bridge plug above it and to inject only into the two intervals shown in red.

Q You have no present plan to attempt to waterflood the lower zone?

A No.

Q What is the reason for that decision?

A We considered the risk of simultaneously flooding this lower zone with the zones which we have proposed to be too great, due to the possibility of channeling and the possibility of encountering these zones.

Q Have you anything further to go over with respect to this exhibit?

A No.

Q Would you refer to your next one, and explain it?

A Exhibit No. 3 is the original casing programs which were utilized in the completion of these wells as producing wells. We propose to utilize these same programs with no changes. As our injection well casing programs, we might note that this exhibit is a corrected copy of exhibit C, which was originally introduced with our application. The correction is on the first well, on the first page where it states R. C. #4 was previously listed with the casing program instead of the stated R. C. #3, which is to be the proposed injection well. We consider that this casing program will adequately protect any fresh water zones which may exist in that it will isolate zones into which we propose to inject water. This exhibit also indicates that we plan to set bridge plugs at approximately 3900 feet in the wells which we previously indicated had the low zone open to isolate this zone.

Q Is this all in regard to this exhibit, Mr. Burrows?

A Yes.

Q Would you refer to your next exhibit, and explain it?

A Exhibit No. 4 is a data sheet which gives the reservoir rock and flood properties of the pay zone. These properties are given such as the average porosity of 15.6%, the average permeability of 10.2 and the average net pay of 10 feet. This exhibit also indicates that the reservoir is producing under a solution gas drive mechanism and that no gas, oil or water oil found. I don't feel it is necessary to read this whole exhibit unless it is desired. We would note, however, that the data from which these averages were taken was utilized in the preparation of our performance curve, which is our next exhibit.

Q Would you refer to your next exhibit, please, and explain it?

A Exhibit No. 5 gives the predicted performance curve of the 17-well project area. The cumulative production curve is shown by the heavy dashed line. This curve indicates that as of December of this year, we will have recovered a cumulative production of approximately 175,000 barrels of oil. The curve shown with the short dashes is the Gary production curve. This curve indicates at the present time that the daily production is about 90 barrels a day from the 17 wells, or approximately 5.3 barrels of oil per day per well. We therefore consider the area to be in stripper stages of production.

Continuing to the secondary portion of the curve, we expect a slight degree of response from our water injection, after

approximately four months. At the end of seven months, we anticipate that the unit production will have reached capacity allowable and will continue at capacity allowable rate for approximately two years, and then will begin to decline and will decline to an economic limit approximately 15 years after the commencement of the flood.

At the end of this time, we expect to have recovered an ultimate recovery of 1,115,000 barrels of oil, of which 36% may have eventually been produced by primary production, and the remaining 64% is due solely to our water injection plans.

Q Is it your opinion, then, that this additional 64% recovery would not be realized unless waterflood operations were instituted in this area?

A That is correct.

Q It would be correct, then, to say that that would certainly be caused, if this area was subjected the waterflood operations?

A That is correct.

Q Have you anything further in relation to this exhibit, Mr. Burrows?

A No, sir.

Q Would you refer to your 6th exhibit and explain it, please?

A Exhibit No. 6 is a copy of a letter from Caprock Water Company which states that they have an available supply of injection

water for our proposed waterflood; and, that they are willing to furnish it to our plant site.

Q Mr. Burrows, at this time do you have any recommendations at all to make to the Commission with respect to allowables with related matters?

A Yes, I would recommend first that the six wells as shown on Exhibit No. 1 be authorized for conversion to be utilized as injection wells for the purpose of injecting into the lower Grayburg or Premier pay sections as shown. We would further request that the project be governed under the provisions of Rule 701 of the Commission's Rules and Regulations, including those provisions for the allocation of allowables and the provision for administrative approval for a conversion of additional injection wells.

Q You contemplate, then, that it will be necessary at some later date, that it will be necessary to convert additional wells to injection?

A Yes.

Q Why do you think this will be required?

A Referring to Exhibit No. 1 again, the wells in locations to the west of our project area, the five wells which have been circled but haven't been colored, it is assumed that these wells will be utilized at some future date by Waterflood Associates, Incorporated, adjacent to the project boundary along the northwest flank. The basis of this assumption is that Waterflood Associates

has indicated that they control the acreage to the west of the project area and that their tentative plans are to drill the three undrilled locations as shown, and to convert the five wells circled for injection. When we were first studying this area as a waterflood project, we approached Waterflood Associates concerning unitization of the Aztec acreage with the acreage to the west, and they indicated that they preferred not to unitize. This fact presented a very unequitable drainage situation due to the peculiar configuration, due to the common boundary to the west of our project. If we immediately began injection into the next row of wells which would extend our tentative pattern to the east, we would be in the position of having one producing well between the rows of injection wells, whereas the operators to the west would have four and possibly five producing wells between the rows of injection wells. We estimate that under this condition, we would push a net amount of approximately 100,000 barrels of oil off of our lease on the west, to the west of the project area which we consider a serious impairment of our correlative rights. I believe that Exhibit No. 7 will further clarify this properly.

MR. SWANSON: If the Commission please, we thought we might display this one on the board, as well.

MR. PORTER: All right.

Q (By Mr. Swanson) Would you explain Exhibit 7, please, Mr. Burrows?

A Exhibit No. 7 is a general illustration of the effects of boundary configurations on the protection of correlative rights. Figure No. 1 indicates the normal situation where the angle between the project boundary and the rows of producing wells is approximately 45 degrees. It is apparent that under this pattern, the operators on each side of this common boundary line will have an equal number of producing wells with which to recover their fair share of the oil. It is obvious that correlative rights are protected as shown by the red and blue areas which represent the oil which will be swapped by counter-drainage of the project.

Q Would it be a correct simplification of this exhibit to state that various colored reds would be swept across the line and various sweeps of blue would be produced to the area to the right?

A That is correct.

Q In this situation, correlative rights would be exactly preserved.

A Figure No. 2 indicates a unique situation where the trend of the common boundary line between projects is parallel to the rows of injection wells. It is obvious that if the row of wells nearest the common boundary in the project were to be utilized as injection wells, approximately one-half of the oil, in the proper relation of the units in this row, would be swept off the project area to producing wells in project A, if the injections in both of these wells were initiated at the same time or if project B started injection first.

Q Mr. Burrows, if this diagram represented wells drilled on 40 acre spacing patterns, how many acres of oil would be swept from what you have labelled project area B to the left of the common line?

A Since there would be 40 acre prorationing, which is 160 acres, one-half of this would be swept to the west, which would be approximately 40 acres.

Q This would be the equivalent of how many wells?

A Two wells.

Q The oil that should have been produced by two wells to the project would actually be produced by the adjoining project to the west?

A That is correct. In our Aztec-Robinson project, we were faced with the problem which was similar in principle to that problem presented in figure 2 of this exhibit. We have studied the area to determine the system which would protect us from this loss of 100,000 barrels of stock tank oil, which represents a large percent of our reserves of this project. We believe that we have the answer which will both protect correlative rights and prevent waste. Referring to Exhibit No. 1 again, we propose initially to inject into a row of wells which will leave two rows of producing wells between the rows of injection wells, along the common boundary. We then propose to conform to the pattern desired by the operators to the west at the later date, by the conversion of two additional wells in the corridor area.

It is true that if we do not convert two additional wells in the corridor, we believe that an area of approximately 72 acres or a quantity of all of approximately 121,000 barrels of oil would be left unswept between these two rows of producing wells if the flood were completed under these circumstances. We would also grant that if we waited until the rest of the project area were completely flooded out to convert these wells, that a small portion of the 72-acre area might remain unswept due to the condition of continuing plant operations after the other area has been completely flooded out. We therefore propose to convert these two additional wells at a time prior to the time that the rest of the area will be flooded out.

Q Mr. Burrows, would you identify the two additional wells which will be converted for injection?

A One would be the well labeled 3-R in the Northwest Quarter of the Northwest Quarter of Section 31. The other would be the well labeled 2-RC in the Northwest Quarter of the Southeast Quarter of Section 36. I believe that Exhibit 8 will further illustrate this. Exhibit No. 8 contains three figures which give approximate flood fronts in the corridor area under various conditions.

Q May I interrupt you just a minute, Mr. Burrows? You have not displayed the common lease line on this exhibit, have you?

A That is correct.

Q These lines that are drawn are lines along the sides and bottoms of the applicable sections?

A That is correct.

Q Would you refresh my memory as to how the common lease line does lie in this area?

A It lies parallel to the rows of injection wells and this corridor area shown in figure 1, approximately one-half of it would be on each side of the common boundary line.

Q Thank you, proceed please.

A This figure 1 indicates the floodfront at the time at which we propose to convert the two additional wells. It is noted that at this time the unswept area will be approximately 235 acres, as shown in green, between the two floodfronts. This was chosen as the time for conversion of additional wells because it is approximately the latest time at which the wells can be converted to allow a balance of injectivity after this point, which will allow the ultimate floodfront to meet at producing wells and thereby afford an efficient sweep of the corridor area. This is also the time at which an appreciable amount of water will begin to be produced from the two wells which we propose to convert for injection.

Q Mr. Burrows, the wells circled in red are indicative of which wells?

A They are the wells in the Aztec project area.

Q They will be initially approved,if we receive a favorable order on this application, for injection purposes?

A That is correct.

Q And the wells circled in yellow are which wells?

A They are assumed wells which may be utilized at a future date by the operators to the west.

Q That color code is used through these three figures, is it not?

A Yes, sir, it is. Continuing to figure 2 of this Exhibit, it indicates the same floodfront as figure 1 and between these flood-fronts we have constructed a dashed line which represents the approximate ultimate flood-front of the five wells to the west at flood-out conditions independent of the Aztec flood to the east; for example, in the construction of this, we have assumed that the operators to the west will efficiently flood their own acreage. To give an example of this: If the well in the Northwest Quarter of the Southwest Quarter of Section 36, that is the second well from the bottom, colored in yellow; if this well efficiently floods the area between it and the well labeled No. 2 to the west, it will also flood a similar area between it and the well labeled 4-RC to the southeast. The remainder of this flood-front was constructed in a similar manner. In other words, if the operators to the west were to efficiently flood their own acreage, they would produce an ultimate flood-front of approximately as shown by the dashed line in the corridor area to the east.

Q Mr. Burrows, in efficiently flooding their own acreage, have you assumed that they would comply with the existing pattern to the west?

A Yes.

Q How many acres are in the area colored yellow? I beg your pardon, acreage colored blue?

A In reaching this position, the flood-front to the west has swept an area of approximately 96 acres. From the time at which we propose to convert additional wells, that area is completely flooded out. It is noted that injecting in the wells, into the five wells to the west, the water pumped into the wells will go both to the northwest and to the southeast, towards the corridor area. We therefore estimate that this 96-acre area will be swept by one-half of the water pumped into these wells, which is equivalent to 2-1/2 net injection wells. In order to flood the entire corridor during the same period of time as the floods to the west, as diversely in the area shown in blue, Aztec must flood the acreage shown in green. This area is approximately 139 acres. We do not consider one-half of the four-well row of injection wells to the southeast will be enough to flood this during this period of time. We therefore propose to convert two additional wells in the corridor area of the approximate flood-front, which will result in four net wells injected into the corridor area. Simple comparison indicates that these four wells can flood an area of 154 acres, while the five wells to the west, or 2-1/2 net wells, flood the 96-acre area. Since we can flood 154 acres, we believe that we have excess injectivity equivalent to flood approximately 150 acres, and that we will meet the flood-front to the west

slightly before it can reach the position shown in figure 2, or approximately as shown in figure 3. Figure No. 3, the blue area represents the area which we believe will be efficiently swept under our plan, and that for all practical purposes the corridor area will be swept out. We believe that this plan will prevent waste in the best degree possible.

Q Mr. Burrows, is it your testimony that should Aztec by furnishing injectivity sufficient to flood 154 acres during the period that it is necessary to efficiently flood the area offsetting our proposed acreage to the west, that in fact, the corridor area will be swept of oil and efficiently flooded at that time; that is, at the time of the flood-out in the area to the west?

A Yes, sir.

Q I noticed two small green areas shown on figure 3. What is the significance of those areas?

A These small areas represent areas where we believe that a small amount of unrecoverable oil may be left.

Q Under Aztec's proposed pattern, would these areas be swept?

A No.

Q In your opinion, would an appreciable amount of oil be left in these areas?

A No, these areas are outside of the outer row of producing wells in the pool; and we believe that the pay quality is much poorer than it is in the interior of the pools. This is also indicated by a dry hole, which is approximately 330 feet south of

of the south section line of Section 36. I believe this is shown on Figure 1. This indicates that the pay quality in this area is poor and we believe a negligible amount would be left in this area.

Q Is it likely that the same situation would exist; that is, that a proposed flood pattern would not effectively sweep edge areas and that in the edge area throughout the Robinson-Grayburg pools there might be some unrecovered oil?

A Yes, sir.

Q Is it likely that in those areas which are unswept, there would be no significant amount of pay oil, because of the pay oil in those areas being very poor?

A That is correct. To return to the correlative rights aspect, I turn briefly to Exhibit No. 7. We note that in Figure No. 1, for correlative rights to be protected, each operator in projects "A" and "B" will each have an equal number of producing wells along the common boundary. To return again to the Exhibit No. 1, under our plan, initially, the operators on each side of the common boundary line will have an equal number of producing wells. The operators to the west would have six producing wells along the common boundary and the Aztec project would have six producing wells along the common boundary, and the Aztec project would have six producing wells along the common boundary at the time of conversion of two additional wells. The loss of wells due to the conversion of these wells and the flooding out of other wells would result in each operator having three wells in the corridor area

with which to produce their fair share of the oil that remains. In opposition to this, the operators to the west have proposed a plan whereby they will have four and possibly five producing wells in the row of wells between the two rows.

Q I beg your pardon for the interruption. I believe you're testifying under Aztec's proposals that Aztec would have six wells initially on each side of the boundary line, and after conversion they would each have three wells, which would protect the correlative rights; and I believe you were testifying that the other operators had made another proposal?

A Under the proposal of the offset operators to the west, we would be in the position of having only one well between the two rows of injection wells, whereas the operators to the west would have four, and possibly five.

So in conclusion, we believe that our plan with this provision, with later conformance by the operators to the west, we eventually will sweep the corridor area, and also the remainder of our project area; and the balance of the oil is to be pushed along the common boundary line and thereby protect correlative rights, and prevent waste.

We would also note that if no flood were initiated to the west, our plan would allow an efficient sweep of our project area; or if the project wells shown to the west, we believe, would have an efficient sweep of our areas. Our plan would also allow us to initiate a flood at the earliest possible date, since we now

have a complete agreement with McGrath and Smith in the needed area, a tentative approval by the USGS; and we are ready to start our flood and increase our economic picture in this pool.

Q Mr. Burrows, are you generally familiar with the efforts made by Aztec and the offset operators to the west to work out some arrangements that would work out this unusual western lease boundary?

A Yes.

Q Would you briefly review what those efforts have been?

A I believe that the operators to the west have proposed that the location for the well shown in the Northwest Quarter of the Southeast Quarter of Section 36 be unitized with ours.

Q That the well on the 40 acre tract on which well No. 3 is located be included in Aztec's unit area?

A Yes, sir, I believe that is what their proposal was.

Q Haveyou made a study as to whether or not this would preserve correlative rights?

A Yes.

Q What was your conclusion?

A I concluded that under this situation that the project area, including this 40-acre tract, will be pushing approximately 33,000,000 barrels of oil to the wells to the west.

Q Even if this would equalize correlative rights, would there be any other objections you would have to such a proposal?

A Yes, the undrilled injection well shown in the Northwest Quarter of the Southwest Quarter of Section 36, of course, hasn't

been drilled; and we don't know that it ever will be drilled.

Q Do you know who properly owns the location on which that undrilled well would have to be located?

A Yes, I believe two days ago the operator to the west indicated that this was actually owned and controlled by Humble Oil and Refining Company.

Q In your opinion might it be difficult to make a trade with Humble, whereby you would not drill a producing well on the tract contributed by them to you?

A Yes, it might be difficult and certainly time consuming.

Q Have you had thought as to the time that it would take to settle our differences in this area?

A I believe it would be in the order of three months.

Q Then it would probably result in additional delay then if we had tried some other approach than what has been proposed today?

A Yes, I believe it would.

Q Do you have anything futher?

A No.

MR. SWANSON: That concludes our examination.

MR. PORTER: Mr. Swanson, your aspect of time was very good. Do you intend to offer your exhibits?

MR. SWANSON: Yes, sir.

MR. PORTER: Without objection, the Exhibits will be admitted into the record.

(Whereupon, Applicant's Exhibits Nos. 1 through 8 admitted in evidence.)

MR. PORTER: Does anyone have a question of Mr. Burrows?

MR. LOSEE: Yes, sir.

CROSS EXAMINATION

BY MR. LOSEE:

Q Mr. Burrows, I believe you have testified that your wells in this project area have at times produced 157 barrels of oil, is that correct?

A Yes.

Q Now, are you counting the three wells that are not owned by Aztec, but are within your unit boundary, within the 157 calculation?

A Yes, that is as of December 1st of this year.

Q I believe your estimate of the amount of oil that would be recovered from your project area when you have completed your secondary recovery operation was 1,115,000 barrels, is that correct?

A That is correct.

Q The ration of the amount of oil to be recovered to what has already been recovered, is then 6 to 1 is that not right, approximately 6 to 1?

A That would be approximately correct.

Q Do you know of any waterflood project in the state of New Mexico that has recovered six times the amount of oil, after the institution of the waterflood project, by a ration of 6 to 1?

A I can't think of one, however, I might state that this area has as shown by some of the other wells, as Exhibit D, a very long primary producing life under a very low rate of production.

Q Do you know of any project areas in New Mexico that have even produced three times the amount after secondary operations were started, compared to what they produced up to that time?

A I don't know of many of them that have been completely flooded out so that I could check.

Q Isn't it true, though, that actually your calculations of 6 to 1 recovery up to this point is a most optimistic outlook?

A No, sir. I believe it is a reasonable engineering estimate.

Q But none of the project areas in New Mexico have recovered half of that esimate, ratio-wise?

A I don't know that.

Q Earlier in your testimony, you mentioned that you had discussed with BTA, the Waterflood Associates, the possibility of unitizing their acreage, which you understood they control to the west of your west lease line, is that right?

A Yes.

Q Actually your map shows that your offset operators starting from north to south is Waterflood Associates, F. L. Benson, BTA, and Dob Oil Producers. Of those five people, did you contact any parties other than Waterflood Associates?

A No, because they initially indicated that they controlled

this acreage under plans to purchase acreage, or other plans, that they indicated that they did control the acreage to the west.

Q When Waterflood indicated that they were not necessarily willing to unitize, did you discuss with them a possibility of a leaseline agreement, whereby the producing wells could be balanced along your west leaseline?

A Not in great length.

Q When did you first talk to Waterflood Associates?

A I can't remember the exact date. It's been, I suppose, approximately four months ago.

Q If I may use what I think is your Exhibit No. 5, noted as figure 2 up here --

MR. SWANSON: If you will, I'm sorry, that is No. 7.

MR. LOSEE: Yes, figure 2 of No. 7.

Q (By Mr. Losee:) You have indicated that this is somewhat similar to the west leaseline of your project area, and that the water lying west of these four injection wells would be swept across the line?

A Yes, I believe this area to the west would be swept to the producing wells to the west.

Q You have drawn this figure 2 -- is this your 40-acre jagged line -- so that it bends on every acre up to the northeast, have you not?

A That is correct.

Q If we were to draw this on 160 acres, so that your line

extended up here, and up here, and extended across here (indicating) so that actually we take that one 40-acre tract that you have colored as being in project "A", then what would be the effect of the boundary line along there in your figure 2, if it then came up to this point, and across here, (indicating) rather than being jagged on 40-acre subdivisions, it were jagged on 160's, what would be the effect on correlative rights?

A Then Project "B" would have two producing wells in the row of wells between the injection wells; and Project "A" would have three producing wells.

Q Well, your Project "A" would have how many producing wells?

A Project "A" would have three producing wells.

Q This well (indicating) and this well (indicating) and this well (indicating)?

A That is correct.

Q And Project "B" would have what number?

A Two producing wells.

Q This well (indicating) and this well (indicating). What would be the effect on correlative rights, if that kind of a west line configuration were adopted in your project area?

A I estimate off hand that Project "B" would push oil to the west in the ratio of 3 to 2. In other words, there would be some oil pushed to the west that wouldn't be compensated by counter-drainage.

Q What if Project "B" had a well right here (indicating) producing well right here? What would be the effect? Wouldn't the correlative rights actually, Mr. Burrows, be protected and each side of the line would have a chance to recover their rightful share of the oil?

A No, I believe if there was a well there, the area between it and the injection well and Project "B" would sweep to it; but I can't see that there would be any additional oil pushed from Project "A" to Project "B".

Q Not by virtue of this injection well here?

A A small corner might be pushed.

Q Under this re-drafting of your project, isn't it true that the correlative rights would be substantially protected with the addition of this one well up here?

A With that well up here, -- there, you say?

Q Yes, sir. With this as a producer?

A Your question, that will be a producer?

Q Yes.

A I'd have to study a little more to say for sure that they would be.

Q Well, can you say that they would not be protected?

A No, because I'd have to study the significance further.

Q Well, now, referring back to your Exhibit No. 1, and if the BTA Well No. 3 was contributed to your unit, would that then not conflict exactly to what I have drafted on your Exhibit 2 on

figure 7, so that your west line would be developed on 160 acres and so that the correlative rights of each party would be protected on each side of the line?

A No, I don't believe they would be protected. I believe under this situation, the project to the east would have two producing wells in that area, where the area to the west would have three or possibly four producing wells in that area.

Q Would you describe which would be the three or possibly four producing wells, from your exhibit?

A The producing wells of the operator to the west would be Well No. 1 located in the Southeast Quarter of the Southwest Quarter of Section 36 under this situation. The operator to the west would then have the Well No. 3 and in the Northwest Quarter of the Southeast Quarter of Section 36 --

Q Excuse me, Mr. Burrows, I must have mis-stated my question. I said if BTA were to contribute that well to your unit and square off that corner in 160's?

A I don't believe I understand the question.

Q If BTA Well No. 3, located in the Northwest Quarter of the Southeast Quarter contributed to your unit, so that on Exhibit 1 you would have within your unit the entire Southeast Quarter, is it not true that under that situation, the correlative rights of the parties on each side of that line would be protected?

MR. SWANSON: If the Commission please, Mr. Burrows has testified to that already. It has been gone into and I believe he

has testified in his opinion that the number of producing wells and correlative rights would not be balanced. I fail to see any purpose in having him testify to that again.

MR. LOSEE: If the Commission please, I attempted, by use of his Exhibit 7, figure 2, which happens to be diagonal 40 acre tracts, which is not the picture. Then, the witness at that time answered what would have happened to correlative rights, based on that. I then reviewed his other maps so that the two are actually identical, as adapted by the examiner, and I think he should be able to answer the question.

MR. PORTER: Will the witness proceed to answer the question please, if you can answer?

MR. SWANSON: I wonder if the witness could be refreshed as to what the question is?

Q (By Mr. Losee) If Well No. 3 located in the Northwest Quarter of the Southeast Quarter, were contributed to your unit, is it not true that the correlative rights on each side of that lease line, divided, then, in diagonal 160 acre tracts, would be adequately protected?

A No, sir, I don't believe it would. I believe that there would still be a difference in the number of wells to produce from the corridor area.

Q Isn't it true that there are actually three wells on each side of the line, one of which would have been drilled to the west side, in Waterflood Associates No. 3 in Section 30, an undrilled

location owned by Brinson in Section 36, and BTA Oil Producers Well No. 1 on the west side of the line, whereas on the east side of the line, that will be all these wells to balance No. 3?

A If we converted that additional row of wells, there would be a five-well row of producing wells, counting the undrilled locations and possibly including the abandoned well which might be placed on production. Under this situation that you stated, where the 40 acre tract and the Northwest Quarter of the Southeast Quarter of Section 36 was contributed to the unit project area, the operators to the west would still have three and possibly four wells in the corridor area, whereas the project to the east would have two producing wells between the rows of producing wells.

Q Well, I have got to have you name the four producing wells that would be west of the line, please, sir?

A The producing wells that would be to the west of the line would be the Well No. 1, in the Southeast Quarter of the Southwest Quarter of Section 36, and the undrilled location shown in the Southeast Quarter of the Northeast Quarter of Section 36, and the well labeled No. 3 in the Southeast Quarter of the Southwest Quarter of Section 30, and the developed Well No. 1 in the Southwest Quarter of the Southwest Quarter of Section 30.

Q This undrilled location doesn't have any well on it now does it, this Brinson 40 acres?

A That is correct.

Q Do you know if that Well No. 1 in its abandoned condition

is able to produce any oil?

A I don't know whether it is or not. I am sure it could be made to produce even if it took drill-out plugs, whatever condition it's in.

Q Then, what well would you have inside your project line?

A Then we would have the Well No. 3 in the Northwest Quarter of the Southeast Quarter of Section 36, which under your stipulation would be in the project in the east and be the well labeled 2-R in the Northwest Quarter of the Northwest Quarter of Section 31.

Q Also, in my hypothetical situation, up there, in your Exhibit 1, I said your one well would be a producer rather than an injector?

A Well, then, I'd still have to study that further because the sweep wouldn't be quite as efficient.

Q Well, to arrive at that calculation of the number of wells, the people on the west side of the line would have to drill one new well and recomplete the one well that is abandoned, would they not?

A Yes, sir.

Q Would there be anything to keep you all from drilling a couple of new wells, within your boundary line?

A What is the question?

Q Is there anything to keep Aztec from drilling a couple of wells within their lease line, inside their project area?

A We already have wells on all of our production units.

Q Well, isn't this No. 1 this abandoned hole an appropriate

unit for an injection well?

A Yes, I believe it is.

Q You have the offset operators doing that, I thought possibly you all might have two wells on one proration unit, would that be possible?

A I don't know whether that is illegal or not.

Q Earlier in your testimony you said that if Aztec, without any leaseline consideration or joinder of this BTA 40, if Aztec were to put the injection wells on at the protestant's request, about 100,000 barrels of oil would pass to the operators to the west that you were not compensated for it by counter-drainage. Would you explain how you arrived at that calculation of 100,000 barrels of oil, briefly?

A It was done by a geometric estimate of the areas, which would be --

MR. PORTER: Would you speak a little louder?

A Which would be flushed across the common boundary line.

Q Did you attribute so many barrels to each 40 acre subdivision on that leaseline, or half of the 40 acre lease on the subdivision in arriving at that calculation?

A I believe I utilized, since these wells are not all placed right in the middle of 40 acre tracts, I considered the differences in spacing.

Q Did you attribute so many barrels surrounding each of your wells, such as for example your 4-RC well?

A Yes, in my estimate I studied all individual areas.

Q How many barrels of oil would be pushed off of your project area from that 4-RC area location?

A I don't have the exact figures available.

Q Do you have any approximate figures?

A I haven't checked the spacing exactly; but it would represent approximately 20 acres of oil.

Q How many barrels of oil was that, in your calculation, approximately, you don't need to get your computer out, if you can tell us approximately how many barrels?

A It will be approximately 20 acres and 1657 barrels per acre.

Q About 33,000 barrels on that 20 acre tract?

A Approximately that.

Q Would be pushed off your lease line if you adopted protestant's proposed pattern?

A Under your protestant's proposed pattern, it would probably be approximately 10 acres or 17,000.

Q All right. That's 17 of the 100,000 barrels. Where is the other acreage?

A In 2-RC.

Q Do you have a like 17,000?

A It might be approximately that, I would still have to check the spacing to see.

QThat is 34 out of 100,000 barrels. Where is the rest of the oil that you are going to push off your lease line?

A We would -- under Waterflood's Associates proposed pattern, is that --

Q Under the established pattern in this field, yes, which is waterflood's proposed pattern -- in the well labeled 1-R, in the Southwest Quarter of the Northwest Quarter of Section 31, how much would you push off from that?

A If the spacing were in the middle of the 40 acres, approximately that amount, I have given a total figure; working up these figures, it wouldn't be accurate.

Q Well, all I'm trying to find out, Mr. Burrows, is you have made an esti ate that there is 100,000 barrels that is going to be pushed off to our lease line if you adopt the pattern that has already been adopted in the field. I am trying to ascertain where that 100,000 barrels is. At this point, you have testified to 34,000 being pushed over on our lease line. I realize your figures are approximate?

A We stated the 4-RC would push some oil off. The 2-RC would push some oil off.

Q That is each would be 17,000? This is without BTA's 40 acre contribution to your well?

A Then, each one of those would be 33,000, instead of 17,000.

Q So that that is 66 of the 100,000 barrels?

A Yes.

Q Now, let me ask you, if BTA's oil were contributed to your unit, would they not go in your Well No. 3?

A If that well were converted to the west, this would make up quite a bit of the difference, yes, sir.

Q Actually all of that 66,000 barrels?

A No, I don't believe -- well, it would be approximately, if it weren't for the odd spacing of some of the wells.

Q Well, that is 66,000. We haven't accounted for the other 33,000. Where is that, sir?

A Well, then, the well labeled 1-R in the Southwest Quarter of the Northwest Quarter of Section 31 would push some oil to the west.

Q Wouldn't that be counter-balanced by the Brinson Well No. 2 pushing oil off its lease line and into your well 2-R?

A It might be, approximately.

Q Well, now, it would be as close as we can determine at this time, would it not?

A Close as I can determine here, yes.

Q Do you know where the other 33,000 is sir?

A Of course, we would still have two injection wells, the 3-R in the Northeast Quarter of the Northwest Quarter of Section 31, pushing oil off, and the Well 1-A in the Southwest Quarter of the Southeast Quarter of Section 30 would be pushing oil off.

Q The Well 1-A, if that were a producer, would that be

pushing any off?

A No, it wouldn't be pushing any off if it were a producer, it would cut down our efficiency.

Q Now, isn't the oil you refer to losing, on your 3-R Well would not that be counter-balanced by the oil pushed off the Waterflood lease by Well No. 2?

A We might under this, balance it all, however, we wouldn't sweep the area as efficiently.

Q Actually, then, Mr. Burrows, if the BTA 40 were contributed to your unit area, this 100,000 calculation would be reduced substantially, and would be almost nil?

A If the BTA well were added to our unit?

Q Yes.

A I believe that would still, would be approximately 33,000 barrels of oil off our unit, not compensated for by counter-drainage.

Q Now, you have referred to that figure of 33,000; but when we went through your break-down of 100,000, you attributed 66,000 barrels going to the BTA Well No. 3 is that not right?

A 66,000 to the BTA Well No. 3?

Q Yes, sir.

A That is approximately 33,000 to the Well No. 3.

Q I think we will leave this line of questioning. Your proposed injection well pattern, Mr. Burrows, it is not a true 5-spot pattern, is it?

A Yes, it is a 5-spot pattern. It is just started on a different line of rows.

BY MR. PORTER: A different line of what?

A Started on a different line of rows, which would skip an additional row to the east of it. It would be a 5-spot.

Q (By Mr. Losee) How many completely enclosed 5-spot patterns do you have within your project area?

A We would have one completely enclosed initially.

Q Then, when you talk about this double corridor, would that create any true 5-spot patters, double corridor of producing wells?

A I didn't understand the question?

Q I am sorry, I will have to refer to this exhibit. Do you know the number?

MR. SWANSON: That is No. 8, it would be on the right, I am sorry they are not marked by number.

Q (By Mr. Losee) Your figures 1 and 2 show what I call a double corridor, with injection wells on each side, that is not a true 5-spot pattern, is it?

A Not in that area.

Q But, generally speaking, is it not true that a 5-spot pattern with four injection wells pushing each producer is more efficient, and will recover more oil, than a pattern consisting of three or less injection wells?

A If it is possible to convert? Would you repeat that

again, sir?

Q Generally speaking, is it not true that a 5-spot pattern with four injection wells pushing on one producing well, is the most efficient and will produce more oil than a pattern consisting of three or less injection wells?

A Yes.

Q Wouldn't that also be applicable to this Robinson-Pool, I think the statement you made is a general statement about 5-spot locations, would that not be true as to this Robinson-Pool?

A In any particular 5-spot.

Q Well, then, Mr. Burrows, without regard to the ownership of the leases in this Robinson-Pool, is it not true that an incorporation of the existing Newmont pattern developed on 5-spot locations will result in a greater recovery of oil than if the pattern is changed?

A No, in my opinion, not appreciably any more or any different than the plan that we have.

MR. LOSEE: I believe that is all.

MR. PORTER: Does anyone have any questions of this witness?

MR. SWANSON: Yes, sir.

REDIRECT EXAMINATION

BY MR. SWANSON:

Q Mr. Burrows, the intimation has been made that your estimate of secondary recovery is quite high. We are comparing the

primary production which you have presented; with the primary source, isn't it a primary source that gives force to produce the oil that is available to the bore hole?

A Yes, I believe.

Q Secondary recovery in your estimate was all oil after some force other than that originally present in this field was used to recover the oil?

A Secondary recovery on my --

Q Secondary recovery in your estimate as opposed to the primary recovery?

A 64% of the total, by secondary recovery; and 36% by primary.

Q And that secondary portion would be all oil recovery after injection was commenced?

A That, plus some primary would be in that percent, some additional primary would be in that percent also.

Q If secondary procedures were not commenced in that, would it not be possible to recover additional oil than what has been recovered today?

A Yes.

Q What is the rough average life in this project area? How long are they?

A They were completed at many different times. Some, I believe, were completed as early as 1930.

Q I was referring in this question to Aztec's project?

A Aztec's were approximately three years old.

Q You were referring to some wells that have been completed at a much earlier date, approximately when were they completed?

A I believe in the early 30's.

Q These wells are in the Robinson-Grayburg Pool?

A Yes.

Q Have you any idea as to what their primary recovery has been?

A Some have a primary recovery, I believe, of more than 17 hundred thousand barrels, which was produced at a very low rate through the whole life of it.

Q Is it possible, in your opinion, that the long productive life of these wells have utilized reservoirs that might otherwise have been utilized in Aztec's project area?

A Yes, sir, that is possible.

Q Mr. Burrows, have you made as accurate an engineering study as you are capable of making, with respect to the amount of oil that would be moved from the Aztec project area to the leases to the west?

A Yes, I have.

Q Was it more detailed than estimating by the areas, and the acres involved, than applying the rough acre foot oil that is in place there?

A Yes.

Q And what was the conclusion as to the effect on correlative rights, if our opponent's plan was adopted in this area?

A That we would push approximately 130,000 barrels of oil off our lease, to the wells to the west.

Q And if our area did include the 40 acre tract that has been mentioned, what will be the effect on correlative rights?

A That still approximately 33,000 barrels of oil might be pushed to the west.

Q Regardless of whether your engineering estimates are accurate, whether it is 10,000 or 1,000,000 barrels recovered in this corridor area, because of the number of producing wells in this area, due to the Aztec wells and the wells to the west, what proportion of it would be recovered by each area, if their proposal is adopted?

A It would be produced approximately in relation to the number of wells that were in the area to produce it.

Q And if we conformed to Mr. Losee's original proposal, that we put 5 wells along it, we would have how many producing wells in the corridor?

A We would then have two.

Q I beg your pardon, wasn't it in your testimony that Aztec would have one, whereas the areas to the west would have four? I am assuming that we are not trading 40 acre tracts in any manner?

A Then we would have one producing well to their four or

possibly five.

Q So that we would produce whatever oil was available in ration to 4 or 5 as opposed to one for us. One other point, at first I thought his proposal in redrqwing the lease land situation from Exhibit 7, was that Aztec drill an additional well north of our 1-A. If you will refer to your Exhibit 1, you will notice that there is a tract there with Aztec's name on it, just off of our 40 acre wells?

A Yes.

Q Would you show what that exhibit shows, with relation to that well?

A A dry hole approximately 330 feet north of the half section line.

Q So, it might be conjecture whether it is possible to drill a producing well at the suggested location?

A Yes.

Q Perhaps his suggestion was that our Well 1-A not be converted to injection purposes, but that it be left as a producer in that situation. Would there be conformance to the existing pattern to the west?

A Not full.

Q Would this have any effect on the oil that you might expect to recover under that situation, under the well immediately north of the Number 3-R?

A Yes, no oil will be swept between those two wells.

Q So even if that proposal might balance correlative rights along our common line, the only way it could be balanced would be by preventing us from producing oil within our area?

A Yes.

MR. SWANSON: I have no further questions.

MR. PORTER: Anyone else have a question?

MR. LOSEE: I have one, one question.

RECROSS EXAMINATION

BY MR. LOSEE:

Q What practical experience have you had in the waterflood industry, Mr. Burrows?

A Well, I worked with waterflood off and on approximately four years with Aztec.

Q How many floods does Aztec operate?

A They are, they have approximately, I don't know exactly, in the order of 10 that we have an interest in, that are in various stages of study.

Q How many do you operate, does Aztec operate out of that 10 that they have an interest in?

A Well, we are not operating any that are actually pumping water at this time.

MR. LOSEE: Thank you.

MR. PORTER: Any other questions?

The witness may be excused.

(Witness excused.)

MR. PORTER: Does anyone have any statements to make? We will take a very short recess.

(Whereupon a 5 minute recess was taken at 3:05 P.M.)

(The hearing was called to order by Mr. Porter at 3:15 P.M.)

MR. PORTER: The hearing will come to order, please. Mr. Losee?

MR. LOSEE: Mr. Porter, a two sentence statement. The application of Aztec as to the location of the injection wells conflicts with the pattern that has already been established in this Robinson-Square Lake Field to the west which has been under operation from three to four years. This application for a de novo hearing is based upon the firm belief of substantially all of the operators of the producing properties in the Robinson Pool that if the Aztec application and pattern is approved, that waste of secondary oil will occur not only in their areas of the Robinson Pool but in the Aztec area, and particularly so where the two conflicting patterns meet. I have two witnesses, Mr. Jennings and Mr. Sayers.

MR. PORTER: We will have them both sworn.

(Witnesses sworn.)

WALTER D. JENNINGS, called as a witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. LOSEE:

Q Would you state your name, residence, and occupation?

A Walter D. Jennings, Midland, Texas, currently employed by

the BTA Oil Producers in the capacity of Reservoir Engineer.

Q You have not previously been qualified as an expert?

A I have not.

Q Where have you gone to school?

A University of Oklahoma.

Q You obtained a degree?

A I graduated with a BS Degree from the University of Oklahoma.

Q When did you graduate?

A 1953.

Q Since the date of your graduation, what positions have you held and by whom have you been employed?

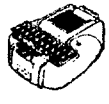
A I was employed by Pan American Petroleum Company in 1955 as an Engineer, field capacity, and continued in that capacity until July of 1957, at which time I was moved to the Midland District Office and worked in the Reservoir Section for them and through 1960; at that time I went to work for BTA.

Q Since your graduation, have you attended any schools or seminars?

A I attended Pan American's logging school and their six-week reservoir course at the general office in Tulsa.

Q Have you had any practical experience with waterflood operations?

A As field experience, as far as laying pipe and watching the water go in the ground, I have relatively none. As far as the



duties of reservoir engineer and evaluation of their performance is concerned, I'd say essentially half my time with the office of Pan American at Midland was spent in that capacity; and, since that time, I have been working for BTA.

MR. LOSEE: Mr. Porter, are the witnesses' qualifications accepted?

MR. PORTER: Yes, sir, they are.

Q (By Mr. Losee) Mr. Jennings, are you familiar with the Robinson Pool area?

A I am.

Q Have you an opportunity to study this reservoir and it's pay characteristics?

A Yes, I have.

(Whereupon, Protestant's Exhibits 1 through marked for identification.)

Q Please refer to what has been marked Protestant's Exhibit 1 and explain it. If the Commission will pardon the witness?

A Exhibit 1 is a map of the Grayburg, Square Lake, and Robinson area, showing the currently operating waterfloods in blud. The blue wells shown in this area are currently injecting water. Those in the red area have been permitted by this Commission for injection. The white circled areas are what I consider a logical extension of this existing pattern over into the Aztec patter which is here (indicating). In about 1958, Ambassador initiated waterflooding in this six well area (indicating) as a pilot flood. It

was subsequently turned over or purchased by Newmont and they continued the waterflood operations and have expanded it into this area or over into this area (indicating); and Waterflood Associates have obtained this area and are injecting water into this area (indicating). The twelve flood areas have been shown on a larger scale in these other exhibits.

Q By the logical extension of this pattern, do you mean a logical five-spot extension?

A Yes, I do.

Q Please refer to your Exhibit 2 and explain what it portrays.

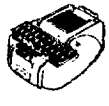
A Exhibit 2 is an idealized five-spot pattern which was formerly adopted by the Applicant for its waterflood. The blues are the injection wells. The blue area is that which would be flooded out with water, and the yellow where the oil will remain. I have divided this into three stages of water flooding. In the initial stage or Stage 1, radial extension of the water from this injection well, any of the six, goes out radially until such time -- and how far this radial extension goes is a function of the rock properties and the relative saturation in the rock and so it is very difficult to say how much radial extension you will have. At any rate, the next experience will be water break-through at producing wells. That is shown in the dark blue and we will call that stage 2. At that time, more or less an erosion effect of oil will take place, as this continues to produce a relatively high

water rate. This area in there (indicating) is flooding. At such time as the ratio of production will go, it is uneconomical to produce the remaining oil. If you stayed with it long enough, you would get all that oil; but, as a matter of practicality, people don't stay with that long enough, because it is not economical.

I might point out that in this five-spot, you can see in the absence of back-up surrounding in five-spot wells, if this is expanded in this direction, this area, this direction, the oil tends to squirt out, where it is not backed up and again, it is an opinion from experience only that a pilot waterflood is only a gauge as to whether waterflooding will work, for this reason, that it squirts out up the opening and around the sides.

Q If one or both of the injection wells, or producing wells, were missing from that five-spot pattern, does it radically effect the recovery that is anticipated?

A Well any departure from the idealized five-spot will result in waste. If this injection well here (indicating) were left off, out of the pattern, there would be a considerable amount of oil left in this area. How much, I couldn't say, but this well, this producing well, here (indicating) would be watered out from this well. Again, it is having to back up a well over here (indicating) so that at some time, this well must be taking over injection, because this well is watered out (indicating). The same with this one (indicating). At that time, there will be some oil left out there.



QPlease refer to what has been marked as Protestant's Exhibit No. 3 and explain what it portrays?

A Exhibit No. 3 is essentially the same as that red area blown up, showing the extension of the existing pattern in the field. The red wells are producing, the blue wells are currently injecting water in the wells of Aztec, or of that property that has been permitted; and this is Aztec's lease line here (indicating) and , we have shown in previous testimony the inclusion of this 40 acre tract, the area pictured in yellow, are those operators which are either represented in this hearing as being opposed to this application, or have testimony to be entered by letter of their objection.

Q Under Aztec's proposed pattern, how many true idealized five-spot locations will they have?

A As you can see, if this was enclosed, they would have one idealized five-spot, with one three-way, one three-way here, (indicating) and a three-way there (indicating) and a two-way out there (indicating).

Q Now, if their proposed injection wells were made to conform with the existing pattern to the west, how many enclosed five-spot locations would they then have?

A We would have one, two, three fully enclosed five-spot and one two way five-spot and one two-way and one remote.

Q Please refer to what has been marked as Exhibit 4 and explain what it portrays?

A Again, this is a graph of that red area showing the permitted producing and injection wells and in attempting this, nothing was done geometrically. There was drawn a circle and then shown the break-through that, if Aztec's pattern were continued in this direction, and this pattern continued in this direction (indicating), unless there were two wells of water injection, probably the most amount of recovery would be received from this area (indicating) and consequently, the least amount from the west. First, it would be in my opinion an uneconomical venture to put these wells back to back without production from here (indicating). Secondly, in all oil floods with this rarity, in order to protect correlative rights in this area -- we will single out different properties. They have operated four wells in this area, one here (indicating), one here (indicating), one here (indicating) and one up here (indicating). Five, I beg your pardon. Of these, four would be water injection wells. In order to protect correlative rights, these must continue in order to recover their oil out of this area. In summation, I think this would recover the most amount of oil out of this area, if it would be economically justified.

Q Now, Mr. Jennings, is one method of taking care of the two conflicting patterns, as they meet?

A Yes, sir, it is.

Q That is not necessarily the place they meet?

A Somewhere between Aztec, it doesn't necessarily have to

occur here, back over here (indicating) depending on who expanded and which way; but, some way they have to come together in this area.

Q Does your Exhibit 5 describe another way in which those two conflicting patterns would meet?

A Exhibit 5 in my opinion would be an economical way to flood this area. Aztec has shown this corridor. I have it almost exactly the same; but, again, under the waterflood, these areas are flooded over here, (indicating). This one is flooded about here, (indicating). At the time these wells are flooded out, these will be shut down, (indicating). These injecting here will flood out these wells to the back of them, (indicating) that will not be recovered.

Q Mr. Jennings, I believe you have stated that would be the most economical, our plan on Exhibit 4. Why doyou think the operators would not use that plan to meet the two conflicting patterns?

A Well, again, I stated economics, and I believe the operators that are in this field and operate in this field will realize that it is not any economic boon to mankind and I don't believe that it could have been supported economically.

Q Again, will you refer back to your Exhibit 3 and would you state the importance of the contribution by BTA to this 40 acre tract, your Well No. 3 to the unit area?

A Well, we have drawn their lease line on a staggered 160

instead of the standard 40 acres. In my opinion, if this well were included in this area, correlative rights would be protected along this lease line. We have offered this tract and in, as I say, in support, this tract, this tract right here (indicating) was owned by BTA and was contributed to this waterflood unit in this area. I only use that as an example that we are willing to make some sort of a reasonable equitable arrangement in this area, with this well.

Q Now, BTA has offered to contribute that well to the unit?

A Yes.

Q You stated in your opinion that would protect correlative rights along that line. Would you briefly explain your statement?

A The oil pushed from this well will go to that well (indicating). This one will push it to that, (indicating). This one will push it that way (indicating). This will push it over that way (indicating). It is just a staggered line, whereas a previous exhibit showed a straight line and, unfortunately, they are not developed on perfect north-south lines, and the patterns are not also.

Q Actually, with that contribution, each 160 acres, each offsetting the line would have two producers and two injection wells?

A That is correct. This 160 acres would have two producing wells and two injection wells. This one would have two injection wells and two producing wells.

Q Still referring to that Exhibit No. 3, how many producing

wells do you find in that area?

A Total wells, 17 on that pattern. There would be 8 injection wells and 8 producing wells and a remote.

Q Now, how many injection wells would there be?

A There would be eight injection wells.

Q Under their proposed plan, how many injection wells will they have?

A They will have six injection wells and one, two, three, four, five, six, seven, eight, nine, ten producing wells.

Q Is that going to be the unbalanced injection to producing wells under their proposed plan, is that going to have any effect on the other operators to the west when the pattern meets?

A Well, of course, the ideal situation for everyone is to have two producing wells for two injection wells or each to have one injection and one producing. Any time you depart from that scheme, somebody is going to have to give up or get an extra producing well or injection well, and that is where it compensates adjoining parties.

Q After studying this pattern and their explanation, have you reached an opinion as to whether or not waste would or not occur in the Aztec project area under this proposed pattern of injection wells?

A Well, it is my opinion that if they were to conform to the pattern, that they will recover more oil only because they have several more enclosed five-spots than they have in the pattern

which they have selected. In any oil field, however, it is liable to work out the other way, or it is liable to work out that they were less one way or the other.

Q Under their proposed pattern, do you think waste would occur in their pattern?

A I think more waste could occur in one enclosed five-spot than with three enclosed five-spots.

Q Now, in reference to the area line to the west, with their existing floods and their proposed floods, have you reached an opinion as to whether waste would occur in relation to the change of this waterflood pattern?

A Well, if the existing pattern is adhered to, I think waste will not occur.

Q You think waste will occur if it isn't?

A Yes, I do.

Q Do you have anything else to say about these exhibits?

A I do not.

Q Were these exhibits prepared by you?

A Yes.

MR. LOSEE: We move that Exhibits 1, 2 and 3 be admitted.

MR. PORTER: Without objection, we will admit Exhibits 1, 2 and 3.

(Whereupon Exhibits Nos. 1, 2, and 3 admitted in evidence.)

MR. PORTER: Mr. Swanson, do you have a question?

MR. SWANSON: Yes, I have a question.

CROSS EXAMINATION

BY MR. SWANSON:

Q Mr. Jennings, would you from your study assume that by the time the areas on each side of our common boundary were flooded out, there would be left a corridor of oil which would not be economically recoverable?

A Yes.

Q Was that assumption that there would be no means of recovering the oil that was in the corridor, while the wells on each side were recovering the oil that was coming to them?

A Yes, this is assuming that this pattern would be followed and at the time that the production from the pilot would cease.

Q Then, this strictly illustrates an example that if no effort is made throughout other project areas?

A That is correct.

Q Leaving aside for a moment the 40 acre tract in question that you have said would be acceptable to your company to contribute to our unit, if some adjustment was not made, wouldn't it be a fact that should one continue to establish such an injection pattern in our area, there would be a gross inequity of correlative right along that boundar --

A That is correct.

Q -- of considerable magnitude, one side of the line would have quite a few more wells to produce the oil than the other side,

is that correct?

A That is correct.

Q Now, refer to your proposed 40 acre tract once more, and illustrate to me the wells that would be available for production purposes on each side of the line?

A Assuming inclusion of this tract?

Q Yes, sir.

A There would be a producing well, one, two, three.

Q Now, would you illustrate the wells available to the Aztec side of the line?

A Those were the Aztec wells.

Q I beg your pardon, my first question was what would be the wells available to the operators to the west for production purposes?

A There would be one, two, three.

Q Now, will you illustrate the available wells to the Aztec unit?in that same situation.

A One, two, and if you'd like to, three.

Q Well, would you like to?

A The number of producing wells is not the yardstick for determination of correlative rights.

Q You disagree with the Exhibit of what happens when your lease line is a line in a parallel direction with the injection row?

A The ideal case is straight up and down, this is correct.

Q What happens if you incline the common boundary to a 45

degree angle, straight up and down?

A Well, conversely what happened on the other side, except it is --

Q I'm sorry.

A State the question again.

Q If you should align your injection wells parallel with your boundary line, what would be the effect, would correlative rights be preserved as portrayed in your exhibit, if they align vertically up and down?

A Is that for figure 2?

Q Yes.

A Well, I think it was adequately covered, but if you have any questions --

Q If we do consider the last well that you pointed out, that I consider with much hesitation, would it be conceivable to receive any oil by offset injection wells?

A This would be an injection well, on the proposed pattern that would be the extension.

Q Well, that would be an injection well on our side?

A It would be, if you choose to make it an injection well.

Q Do you have an offsetting injection well on your side of the line to push the oil to it?

A That would be the well (indicating).

Q So that it is unfair to say that it's as close to the

boundary?

A Well, it's as close as this well.

Q Well, I think we probably should confine our discussion to the common boundary, that is the problem we have.

MR. SWANSON: I think there is nothing further, Mr. Porter.

MR. PORTER: Does anyone else have a question? Mr. Losee, do you have a question?

MR. LOSEE: Yes.

REDIRECT EXAMINATION

BY MR. LOSEE:

Q Mr. Jennings, you stated that the number of injection wells on the lease line was not necessarily the yardstick to determine correlative rights. Would you elaborate on that statement?

A Well, we have heard much today on the number of producing wells and the number of injection wells. I don't see why it isn't self-explanatory, that if you have two producing and two injection wells, that this is not balanced, assuming backup in every direction. There is an edge of the field last, and so inequities are going to occur. I have tried to say that, but along these common boundaries, Aztec has the option to drill these wells, if they wish to; and, then, there is a perfect 160 that way. If it turns out that the flood stops here, one is going to have one more than the other has.

MR. LOSEE: I think that is all.

MR. PORTER: Does anybody else have any questions of the witness? The witness may be excused.

(Witness excused.)

MR. PORTER: Call your next witness, please.

JACK SAYERS, called as a witness, having first been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. LOSEE:

Q Will you state your name, residence and occupation?

A My name is Jack Sayers, I live in Artesia, New Mexico, I am a Petroleum Engineer with Waterflood Associates.

Q You have not previously testified before this Commission?

A No, I haven't.

Q Where did you obtain your public education?

A At Cushing High School, Cushing, Oklahoma.

Q Did you graduate?

A Yes, sir.

Q What college have you attended and what degrees have you received?

A I attended Tulsa University, and obtained a BS degree in Engineering.

Q What year?

A '59.

Q Since graduation by whom have you been employed?

A Forrest Oil Corporation and Waterflood Associates.

Q In what capacities?

A I was a logging engineer trainee for Schlumberger. I was a tool pusher for Sears Well Service. I was employed as a Petroleum Engineer for Honolulu and for Waterflood Associates.

Q What experience have you had in Waterflood?

A Well, when I was with Honolulu, they started waterflood in the company field in 1959, and I started working in June of 1960 and I became Engineer up until the time we sold out.

Q How many wells in that project?

A 48 wells.

Q Since your graduation from school, were you in any special training schools?

A I attended an advanced reservoir engineering course at Texas A and M, that is an advanced course.

MR. LOSEE: Mr. Porter, are the witness's credentials satisfactory?

MR. PORTER: Yes, they are.

Q (By Mr. Losee) Mr. Sayers, does Waterflood Associates have any wells in the Robinson-Grayburg Pool area?

A Yes, they do.

Q Approximately how many?

A Approximately 17.

Q Have you made a study of the reservoir characteristics of this pool?

A Yes, sir, I have.

Q Based on this study, have you reached an opinion as to whether or not waste will occur where conflicting patterns of injection wells meet, such as are proposed here by Aztec?

A Yes, sir, in my mind waste certainly will occur if the established pattern is not followed.

Q Have you also reached any opinion with respect to whether or not the precedent in approving conflicting patterns would hinder further negotiations for lease line agreements?

A Yes, sir, I have. I think if these proposed injection wells were approved, then a precedent would certainly be set and it would be detrimental not only in this field but in many other fields in New Mexico.

Q This 160 acre tract that offsets Aztec's area, described as the Northwest Quarter of Section 36 as shown on the map, Exhibit 3 to be owned by Brinson and Woodall, has your company made negotiations to purchase this tract?

A Yes, sir, we have.

Q Have you concluded those negotiations?

A No, sir.

Q Do you know why?

A Well, it was because of the irregular or the proposed injection wells of Aztec, which did not conform to the established pattern in the field.

MR. LOSEE: I have no further questions.

MR. SWANSON: Yes.

CROSS EXAMINATION

BY MR. SWANSON:

Q Mr. Sayers, in your opinion, should Aztec's proposal be approved, would any area produce more oil than that which might be produced under the existing pattern?

A Yes, sir, I believe it would. In excess?

Q Yes.

A No, not in excess.

Q Should the suggestions put forth by you and Mr. Jennings today be approved by the Commission or agreed to by Aztec, that is, leaving out the 40 acre tract, should we conform with the existing pattern, would any oil from Aztec be produced by leases to the west by counter-drainage?

A Well, there possibly would. I haven't made enough of a study of the two patterns.

MR. SWANSON: That's all.

MR. PORTER: Does anyone else have a question?

The witness may be excused.

(Witness excused)

MR. LOSEE: At this time, I have some letters, which I would like to quickly read into the record.

"Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Gentlemen:

This is in regard to the application of Aztec Oil and Gas Company for a water flood, Case No. 2615.

As an operator in the Robinson Field in Eddy County, New Mexico, we hereby object to the authorized pattern for injection wells, Order No. R-2304, because the pattern does not conform to that established by Newmont Oil Company, Waterflood Associates, and Sinclair Oil & Gas Company in their operated and proposed flood areas.

If the pattern initiated by Aztec is adjoined to that pattern already established, we believe correlative rights will be almost impossible to protect and waste will occur where the two flood patterns coincide.

Yours very truly,

DOB OIL PROPERTIES, INC.

s/ A. F. Giebel
A. F. Giebel"

"New Mexico Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr. Secretary

Dear Sir:

Western Development Company of Delaware, as an overriding royalty owner in three wells in the Square Lake Pool, concurs with Waterflood Associates, Incorporated, in their position on pattern flooding within the subject area. Deviation from the established five-spot pattern would result in an inefficient water flood sweep and secondary recovery would be substantially decreased, resulting in waste. We feel the present established pattern should be continued throughout the pool area in the interests of conservation and the protection of correlative rights.

Very truly yours,

WESTERN DEVELOPMENT COMPANY
of Delaware

s/ R. J. Davenport
R. J. Davenport
Production Superintendent"

"Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Gentlemen:

As an operator and royalty owner in the Robinson Pool, Eddy County, New Mexico, I find I am extremely interested in the application of Aztec Oil & Gas Company for a waterflood project Case No. 2615.

The well pattern approved by the examiner hearing in Order No. R-2304 is in direct conflict with the orderly pattern heretofore adopted by other operators in the Robinson Pool as well as the Square Lake Pool. I am confident when these two injection patterns meet both the operator and royalty interest owner will suffer. Therefore I object to Order No. R-2304.

Yours truly

s/ H. L. Brinson

H. L. Brinson"

"N. M. Oil Conservation Commission
Box 871
Santa Fe, New Mexico

Gentlemen:

The Kennedy Oil Company thoughts concerning the changing of an established waterflood injection pattern, within a given area, is that the change is not in the interest of conservation, and that waste will occur.

This waste of recoverable oil, where off patterns meet, will cause reduced secondary recoveries, and effect economics in the contact area.

Very truly yours,

KENNEDY OIL COMPANY

s/ Robert B. Kennedy

Robert B. Kennedy
Vice President"

"Mr. Hal C. Porter
Waterflood Associates
301 Booker Building
Artesia, New Mexico

Dear Mr. Porter:

Regarding the de novo hearing of October 18, 1962 to protest Aztec Oil & Gas Company's proposed change in injection pattern in the Robinson Pool, Newmont Oil Company supports your protest to this change.

If the proposed change is effected, it appers that there is a significant question as to whether correlative rights are being adequately protected. There is also a good possibility that waste will occur.

In our opinion, continuation of the established pattern would make cooperation among the many operator's in the area easier to reach and thereby would most efficiently flood this reservoir, and insure protection of correlative rights. We therefore concur tha the established pattern should be maintained throughout this area.

Yours very truly,

NEWMONT OIL COMPANY

s/ Herman J. Ledbetter

Herman J. Ledbetter
Superintendent"

I move that these five letters be made a part of the record in this case.

MR. PORTER: Any objection to the Counsel's motion? The letters will be admitted to the record.

MR. LOSEE: That is the Protestant's case.

MR. PORTER: Does anyone else have any statements to present at this time?

MR. SWANSON: Yes, sir. I will try to simplify what has

become rather complex. We are faced primarily with the problem caused by an unusual lease boundary. Normally this doesn't happen; but, here, we have it. We recognized it from the beginning and attempted fo find a solution for it. Our first step was to investigate the feasibilities with our neighbors of forming a unit. Perhaps we weren't as diligent as we should have been. We were told there was no interest in the formation of such a unit, to this unit acreage owned by McGrath and Smith in the southeast portion. So we necessarily had to resort to some other technique which would, without creating waste, protect correlative rights. I think it has been obvious that without some sort of adjustment, it would be materially out of balance. Witnesses for the opponent said that this would be the case. We have introduced evidence which clearly shows that there would be no waste involved. This would be done by converting additional wells to injection at an early enough date that the corridor would be flooded out at the same time that the acreage to the west of it would be flooded out. I don't see that this is going to cause much waste if it is completed. Now, it is based on an assumption. We have agreed that this would not be a solution.

The letters which have been introduced in testimony, unfortunately the people weren't here to see and perhaps understand what plan we have to solve this problem. We would be the first to state that certainly a problem is posed by this situation and does call for some solution. We feel that this is a feasible solution. It

has not been attached on any basis to show any violation of correlative rights; and, we therefore ask the Commission to approve it.

MR. PORTER: Mr. Losee?

MR. LOSEE: The Commission has been called upon to approve a change in injection well patterns already existing in a pool. We realize that there exists in other states a variety of injection well patterns under waterflood programs, probably caused by the diverse spacing regulations and rules of those states. However, we realize and are proud of the fact that spacing regulations and decisions in this state follow a regular pattern and generally result in recovery of greater volume of oil, with the least amount of expense to the operator. We feel that this Commission should follow this primary practice in the secondary recovery field.

It seems obvious in this case that the offset operators of the Aztec project area, that the applicant in this case would have only six initial injection wells out of a total of 16 and will not bear its fair share of the burden of recovering the secondary oil. The testimony of the protestant we think conclusively shows that a continuation of the existing pattern in the Robinson Pool will recover the greatest volume of secondary oil. I believe the applicant's witnesses agreed with that statement. In addition, we think the testimony of the protestant's witnesses is to that effect particularly where the two conflicting flood patterns meet. Now,

the applicant proposed to justify this waste of oil. Obviously, this is not something the applicant or the protestant created but it happens throughout New Mexico and the waterflooding industry. Before the Commission should disregard this evidence of waste and approve this opposing well pattern, it seems logical to require the applicant to show what reasonable efforts have been made in its project area for communitizing or pooling some of the tracts in this case. One of the protestants, BTA, has offered to place a 40 acre producing tract within this area, so that the greatest recovery of secondary oil would be accomplished, so that the least waste will occur and correlative rights will be protected. At the date of this hearing and application, reasonable efforts were being made to so establish regular lease line boundaries agreements with the people on the west. In this case, the protestant, joined by those people who have written letters to the Commission, are all of the operators immediately adjoining this project area to the west. They are people that are going to bear the burden of this in equal distribution of injection and producing wells. They have all indicated their willingness to cooperate in these line agreements. I would be the first to agree that if the proof in this case shows any disadvantage to the applicant, they would be justified in refusing to negotiate, and that the Commission would be justified in ignoring the protestant's case. However, in the absence of such testimony, I do not see how the Commission, in the interests of conservation, can ignore the evidence of waste and issue its order

causing waste, and correlative rights to be impaired. We respectfully request that the Commission accept our proposal upon the condition that the injection well pattern conforms to that already existing.

MR. PORTER: Anyone else have any statement to make? The Commission will take the case under advisement.

CERTIFICATE

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, STEPHEN McCRYSTAL, 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 under my personal supervision, and that the same is a true and correct record to the best of my knowledge, skill and ability.

Stephen McCrystal

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
AZTEC EXHIBIT No. 5
CASE 2615

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
EXHIBIT No.

PRODUCTION RATE - BOPD

0 100 200 300 400 500 600 700 800 900 1000 1100

19 59 MAR. JUNE SEPT. DEC.
19 60 MAR. JUNE SEPT. DEC.
19 61 MAR. JUNE SEPT. DEC.
19 62 MAR. JUNE SEPT. DEC.
19 63 MAR. JUNE SEPT. DEC.
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19 76 MAR. JUNE SEPT. DEC.
19 77 MAR. JUNE SEPT. DEC.
19 78 MAR. JUNE SEPT. DEC.

PRIMARY RECOVERY

SECONDARY RECOVERY

START INJECTION

TOP ALLOWABLE PRODUCTION (17 WELLS)

DAILY PRODUCTION (11 PRODUCING WELLS)

CUMULATIVE PRODUCTION

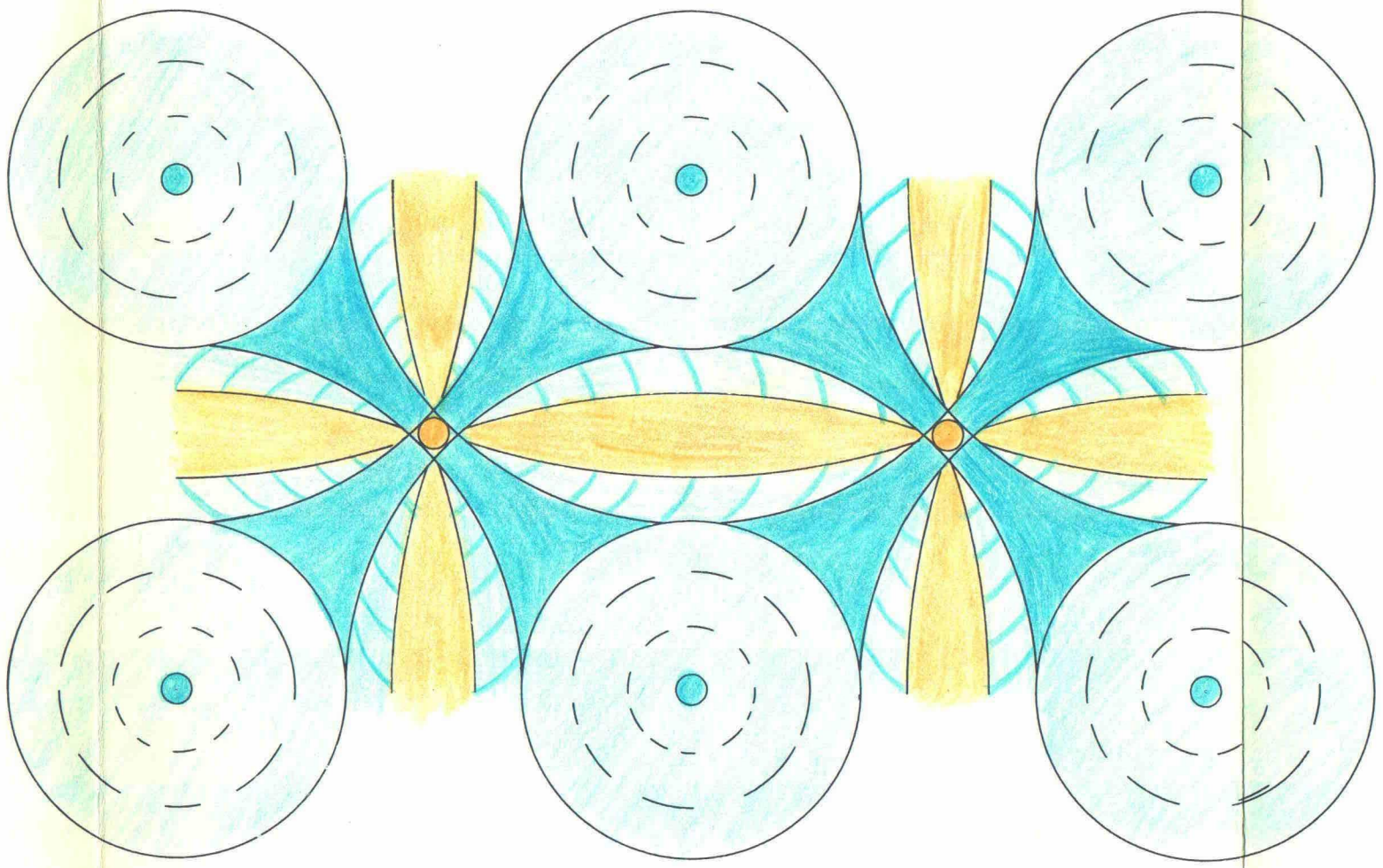
1,115,000 bbls.

ROBINSON POOL
LEA AND EDDY COUNTIES, NEW MEXICO
PREDICTED PERFORMANCE CURVES
680 ACRE STUDY AREA
6-19-62 JFB
(FIGURE 1)

0 200,000 400,000 600,000 800,000 1000,000 1200,000 1400,000 1600,000

CUMULATIVE PRODUCTION - Bbls

IDEALIZED DOUBLE FIVE SPOT WATERFLOOD PATTERN



KEY

- PRODUCING WELL
- INJECTION WELL
- OIL SATURATED AREA
- WATERFLOODED AREA

AREAL FLOODOUT

- STAGE I
- STAGE II
- STAGE III

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
BTH EXHIBIT No. 2
CASE 2615

FIGURE NO. 2