BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

Original

IN THE MATTER OF:

Case No. 1196

TRANSCRIPT OF PROCEEDINGS

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE - SANTE FE
3-6691 2-2211

January 9, 1957

BEFORE THE
OIL CONSERVATION COMMISSION
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IN THE MATTER OF: Application of The Ibex Company for an order authorizing two pilot water flood projects in the Artesia Pool, Eddy County, New Mexico, in exception to Rule 701 of the New Mexico Oil Conservation Commission Statewide Rules and Regulations and further approval of the unorthodox location of a number of its old wells in said pool. Applicant, in the above-styled cause, seeks an order authorizing two separate pilot water flood projects in the Grayburg formation of the Artesia Pool; said projects to be effected by means of water injection through approximately 10 existing wells in Sections 21, 28, and 32, Township 18 South, Range 28 East, Eddy County, New Mexico. Applicant also seeks Commission approval of the unorthodox location of certain of its old wells in the Artesia Pool.	No. 1196

BEFORE:

Mr. Warren W. Mankin, Examiner

TRANSCRIPT OF PROCEEDINGS

MR. MANKIN: And we will continue to the last case on the docket, which is Case No. 1196.

MR. GURLEY: Case No. 1196. Application of The Ibex Company for an order authorizing two pilot water flood projects in the Artesia Pool, Eddy County, New Mexico, in exception to Rule 701 of the New Mexico Oil Conservation Commission Statewide Rules and Regulations and further approval of the unorthodox location of a

number of its old wells in said pool.

(Witness sworn.)

MR. ELLIOTT: I am R. L. Elliott of Breckenridge, Texas. We have one witness, Mr. Vich, who has been sworn.

ROBERT H. VICH

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

DIRECT EXAMINATION

BY: MR. ELLIOTT:

Q Mr. Vich, you are Water Flood Engineer for The Ibex Company in Breckenridge, Texas?

A I am.

Q And you have been qualified as an expert before this Commission?

A Yes, sir.

MR. ELLIOTT: Will you please, Mr. Examiner, if further qualification be had or --

MR. MANKIN: The qualifications are acceptable. Proceed.

Q At this time, we should like to enter as Exhibit No. 1 the field plat of the area that we once entered in the other case before.

(Ibex's Exhibit No. 1 marked for identification.)

Q Mr. Vich, would you discuss this area plat as to well location, proposed water floods, and so forth?

A The plat marked Exhibit No. 1 indicates the proposed pilot positions and the injection wells are indicated, the producing wells, the temporarily abandoned wells and also two of the currently completed or presently completed water wells, and also we would like to point out in Section 22, the location of an abandoned Gulf producing well, which we are in the process of obtaining permits to re-enter. This subject well had an indication of salt water in considerable volume indicated when it was drilled back at an earlier date and we are investigating this as a possible source of future water for the flooding operation in this area.

Q The two proposed floods shown on this area will be referred to as what pool?

A As Pilot Number 2 and Pilot Number 3 of the Artesia Pool. We have previously applied for an application to install pilot flood No. 1, which is in Section 4 of Township 17, Range 28 in the same pool.

Q Do you have any further discussion relative to this field plat at this time?

A No, that is all we have to offer on Exhibit No. 1.

MR. GURLEY: Do you have a list of these wells that you propose to --

A Yes, sir, and I have an exhibit for those.

MR. GURLEY: Fine.

MR. ELLIOTT: At this time, if it please the Examiner, I would like to enter as Exhibit No. 2 a data sheet, which, Mr.

Vich, I will have you look at before we enter it.

(Ibex's Exhibit No. 2 marked for identification)

Q Did you prepare this Data Sheet or have it prepared at your direction?

A I did. And the material shown on the subject Data Sheet covers the reservoir conditions and proposed flooding operation and method, water supply, and anticipated results from the proposed pilot water flood. Also as an attachment to proposed Exhibit No. 2 we have listed the leases currently operated by The Ibex Company in the subject area.

MR. ELLIOTT: I would like to enter this as an exhibit.

Q Mr. Vich, at this time do you have any further discussion as to the production history of this area?

A We were unable to attach production curves or individual production figures for the individual wells in the subject area due to the condition that the previous operators in there report of production on this area, had included production from other leases surrounding the subject wells, and we were unable to ascertain the exact cumulative production or to derive production curves on the area. We have estimated, however, the production, cumulative production from the first Grayberg sand formation, which is the sub-pay interval, to be approximately in excess of four and a half million barrels cumulative.

Q Mr. Vich, is this isopach map one which you drew or had drawn under your direction?

A It was prepared under my supervision.

MR. ELLIOTT: I would like to enter this isopach map as Exhibit No. 3.

(Ibex's Exhibit No. 3 marked for identification)

A. We would like to correct that. That exhibit is a Contour Map on top of the first pay section of the Grayberg formation.

Q Mr. Vich, this is an isopach map. Did you prepare or have prepared under your direction this isopach map of the area?

A This isopach map of the net sand thickness of the first Grayberg pay was prepared under my supervision, yes, sir.

MR. ELLIOTT: I would like to introduce this as Exhibit No. 4.

(Ibex's Exhibit No. 4 marked for identification)

Q Mr. Vich, what is the sand in which you propose to introduce pilot flood known as, and discuss its depth?

A It is the first pay interval or first, known locally as the first sand of the Grayberg formation.

Q Will you discuss your oil completion program for this project at this time?

A The majority of the wells that have been completed in the area do not have an oil producing string. The surface casing on the majority of them is set at approximately eight hundred to nine hundred feet, and the remainder of the hole is open hole.

We propose to go in and run an injection string or an oil string and cement in the top of the producing sand on all of the wells that we will recomplete on the over-all program, the water injection will definitely be isolated to the first sand section of the Grayberg formation.

Q Mr. Vich, what has been done with reference to available water supply for this water flood -- pilot water project?

A We have currently investigated the two possible sources there, the first one being -- or three possible sources -- the first one being fresh water, which is available from shallow sand some sixty feet deep and also from slightly deeper sand at two hundred sixty-five feet. Both of these water supplies are of limited volume and are definitely fresh water. But we have another supply, possible supply at approximately three hundred and fifty feet of depth, which contains approximately nineteen thousand parts per million of salt. And we therefore consider it unfit for domestic consumption, and that is the source of water that we propose or have applied to use -- applied for use in the flooding operation. The other possible source is the Gulf well -- from the old Gulf well in Section 22 which we have previously indicated on Exhibit No. 1 which we are currently investigating and drawing up arrangements for permit to re-enter and test the salt water at approximately forty-four hundred feet.

Q Mr.Vich, is this water supply in one of the recognized water basins of the state?

A No, it is not.

Q You did state, however, there was a water source which you have investigated at approximately three hundred and thirty-five, three hundred and fifty feet, which would be suitable for water injection but not suitable for human consumption or irrigation?

A That is our understanding, yes, sir.

Q I will show you here a laboratory water analysis. Did you have that prepared?

A Yes, sir. This was a sample of the water obtained from the local water wells producing from the three hundred and thirty-five foot depth. This was analyzed by the Chemical Process Company of Breckinridge in their laboratory and is, to our knowledge, correct.

MR. ELLIOTT: At this time I would like to introduce this analysis as Exhibit No. 5.

(Ibex's Exhibit No. 5 marked for identification)

Q Mr. Vich, according to the plats which have been introduced, indicates that most of the wells involved in this pilot flood are in unorthodox locations. Will you discuss with the Examiner when these wells were drilled and any other information you might have that would indicate why the locations are unorthodox?

A The majority of the wells in the area were completed at an early date prior to the pre-spacing and proration unit rules, and with very few exceptions, all of the wells are not over two hundred and fifty feet from the respective production or allowable

unit boundaries, and we would propose that we be permitted to utilize these present locations in an effort to install the pilot programs on twenty acres, ten to twenty acre spacing patterns and in order to obtain faster results and have better control over the flooding operations, and also to keep down the economic cost more or less in line with the risk involved. And so we therefore propose that we be allowed to utilize the present locations which we have indicated on a detailed sheet, the wells to be affected by the respective two pilot floods with --

Q Mr. Vich, has anything been done to determine the exact locations of these unorthodox wells to be used in connection with this water flood?

A The areas, sub-areas, have been re-surveyed by Mr. Mathis, who is the state registered land surveyor from Artesia and we have in our records these re-surveyed plats and have taken the respective distances of the sub-well locations from those re-surveyed plants and prepared them on an itemized sheet.

Q I will ask you, Mr. Vich, if this represents the itemized sheet which you prepared or had prepared at your direction showing the exact locations of each well involved in this project?

A That is correct, yes, sir.

MR. ELLIOTT: At this time, Mr. Examiner, I wish to enter this as Exhibit No. 6 and ask that you will use this in connection with your plat to determine the exact locations of these unorthodox wells.

(Ibex's Exhibit No. 6 marked for identification)

Q Mr. Vich, from your study of this area relative to the water flood project, is it your opinion that the wells in this area have reached their economic limits and what you propose to do would be an interest to conservation and prevention of waste?

A That is correct. The average production was indicated on Exhibit No. 2 as approximately one and a half barrels per day, present production of oil, and from this rate the wells are definitely approaching the economic limit and will have to be abandoned with a subsequent loss of the otherwise recoverable reserves which we have indicated on Exhibit No. 2.

Q Mr. Vich, I believe I asked you, on most of these exhibits -- we have entered six exhibits here -- I would like to ask you at this time whether or not each was prepared by you or under your direction?

A They were all prepared either by me or underneath my supervision.

MR. ELLIOTT: At this time I should like to make a motion that these exhibits be entered and be made a matter of record in this case.

MR. MANKIN: Is there any objection to entering Exhibits Nos. 1 through 6 in this case? If not, they will be so entered.

MR. ELLIOTT: I believe that's all.

MR. MANKIN: On your Exhibit No. 2 you indicated you anticipated initial injection of three hundred barrels per day per well, of which there is approximately ten injection wells in these

two pilot floods. Would that not be about three thousand barrels per day injection.

A That is correct. Now that was taken as purely an estimated figure. We do not have exact core data on the sub-area but it will be obtained in the process of re-completing these sub-wells and we intend to apply for a new producing well offsetting one of the proposed pilots which we will core and analyze and evaluate, further evaluate the producing sand, which might lower somewhat our anticipated water requirements for the proposed floods.

MR. MANKIN: This proposed new well which you might core, is it not in the vicinity of your pilot flood Number 1, rather than No. 2 and No. 3, or is it in this area?

A It will be in the vicinity of pilot flood Number 2.

MR. MANKIN: Returning again to the water source, do you anticipate at first utilizing the four water source wells in the beginning, or do you anticipate using the old Gulf from the San Andres?

A We will definitely pursue the source of water in the Gulf well as soon as we get the permit to re-enter the well. However, we have applied for prospecting rights through the Commissioner of Public Lands, for prospecting rights for this sub-area. The water shows that we have indications at three hundred and thirty-five feet. Now the volume of water from the presently completed water supply wells that we have indicated on Exhibit No. 1 is not sufficient to carry on the operations. We would drill additional wells to this

three hundred thirty-five foot water-sand interval for it when we obtain the permits from the, through the Commissioner of Public Land.

MR. MANKIN: You indicated that all of these old wells were completed, some at -- with casing at some six hundred feet, and the anticipated setting of new production strings down into the zone that was to be flooded.. That was in the injection well, is that correct?

A That will be both injection and producing wells.

MR. MANKIN: In both types of wells?

A Yes.

MR. MANKIN: So that you can isolate the zones?

A Yes, sir.

MR. MANKIN: Are there other questions of the witness?

MR. IRBY: The number of gallons in your barrels, how many gallons per barrel in this three thousand barrel minimum per day?

A That would be regular 42-gallon barrel.

MR. IRBY: Thanks. That's all.

MR. ELLIOTT: I would like to ask one more question of the witness to clarify this proposed possible source of Gulf Oil. I don't know if it has been brought out clearly or not.

MR. ELLIOTT: Mr. Vich, I would like for you to explain to Mr. Irby and Mr. Mankin just what we know about this thing as to possibility that there may be water and there may not be?

A Well, when the well was drilled, it was never completed

as a producing well back at some early date, but they did have on the log of the well, indicated a hole full of salt water and how much that would be finally, we don't know. It would just have to be determined by re-entering the well and testing or acidizing and testing, which we intend to do. We have obtained the verbal approval from Gulf and the agreements are being drawn up, the legal agreements to gain access to the well.

MR. ELLIOTT: And, actually, the only information we have as to this possible source is that the old log showed the hole full of salt water?

A That is correct, yes, sir.

MR. ELLIOTT: That's all.

MR. MANKIN: Mr. Vich, returning to Exhibit No. 6, which was your well locations, unorthodox locations, are all of the proposed unorthodox locations which you requested on Exhibit No. 6, are these either presently producing wells or wells that will be converted to injection or -- first answer that question. Can you answer that?

A Yes, sir. I believe on Exhibit No. 1, on our designation at the bottom we have stipulated the temporarily abandoned locations, the presently producing locations and the wells proposed for conversion to injection wells.

MR. MANKIN: So none of these wells are abandoned, they are temporarily abandoned producers?

A That's correct.

MR. MANKIN: There is none that would have to be renewed completely? They are not abandoned?

A That's correct. We might possibly find junk or some other material in the hole and which would require the drilling of a new well or the abandonment of a proposed injection well, but that would just have to be as the program progressed.

MR. GURLEY: You don't stipulate on your -- specify on your Exhibit No. 6 which wells are to be used. That is the unorthodox wells -- location of wells that are to be used as water injection wells and the ones that are to produce. In other words, you got to use your Exhibit No. 1 in connection with --

MR. ELLIOTT: When I introduced it, I asked that it be used in connection with Exhibit No. 1 so that you could get it all in your mind in a picture. In other words, that will give you everything except the map, which would have the full footage on each location and if you would like to have that, we could prepare that for you at a later date.

MR. GURLEY: Just a minute.

MR. MANKIN: That's satisfactory. Any other questions of the witness?

MR. UTZ: Mr. Vich, I believe you stated that the water you proposed to use from the three hundred and thirty-five foot level was unfit for human consumption or irrigation purposes?

Q Yes, sir, to our knowledge.

MR. UTZ: I wonder if you would refer to your Exhibit

No. 5, the water analysis report, and indicate for the record what makes this water unfit?

A Well, the sodium parts is indicated at 1653 parts per million and the chloride at 3000 parts per million which chloride content, I believe of anywhere in excess of 200 parts per million is unfit for domestic consumption?

MR. UTZ: And also irrigation?

A Well, not sure about irrigation but in treating books for various water supplies they list a limit of some 200 parts per million of salt as being the maximum allowable.

MR. UTZ: Can you state whether or not the State Engineer's office agrees that this water is unfit for irrigation purposes?

A We have furnished them with copies of water analyses from the previous application for the pilot flood Number 1 that we proposed in Section 4 of this same township and range and we will also, as we complete new water supply wells, definitely furnish them chemical analysis and samples of the water for their records and then for their interpretation and ruling.

MR. UTZ: That's all I have.

MR. MANKIN: Is there any further questions of the witness? If there is no further questions of the witness, the witness may be excused.

(Witness excused)

MR. MANKIN: Is there any statements to be made in this case? If not, we will take the case under advisement and the hearing is adjourned.

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

I, J. A. Trujillo, 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, the 30 day of January, 1957.

J. A. Trujillo
NOTARY PUBLIC - COURT REPORTER

My Commission Expires:

October 5, 1960

BEFORE THE
OIL CONSERVATION COMMISSION
SEPTEMBER 10, 1958

IN THE MATTER OF:

CASE 1196 Application of The Ibex Company for permission to expand a pilot water flood project in the Artesia Pool, Eddy County, New Mexico, and for six unorthodox well locations. Applicant, in the above-styled cause, seeks an order permitting the expansion of its Artesia Pilot Water Flood project No. 2, authorized by Order No. R-966 in the Artesia Pool, Eddy County, New Mexico, to include eight additional water injection wells in Sections 21 and 28 of Township 18 South, Range 28 East, Eddy County, New Mexico. Applicant further seeks an order authorizing six unorthodox well locations in said Sections 21 and 28.

BEFORE:

Mr. Daniel S. Nutter

TRANSCRIPT OF PROCEEDINGS

MR. NUTTER: The hearing will come to order, please. First case on the docket this morning will be Case No. 1196.

MR. PAYNE: Application of The Ibex Company for permission to install a pilot water flood project in the Artesia Pool, Eddy County, New Mexico, and for six unorthodox well locations.

MR. NUTTER: Let the record show that this is an application to expand the pilot water flood project rather than install one.

MR. CAMPBELL: Mr. Examiner, I am Jack M. Campbell, Campbell & Russell, Roswell, New Mexico, appearing on behalf of the applicant. I would like to briefly state what the present status and past history of this particular flood is. It's pretty well reflected in the application in this hearing dated -- submitted to the Commission by letter of August 7. The original order approving a pilot water flood project in the area here involved was entered on March 29, 1957 by Order No. R-966. That Order approved what were designated as Artesia Water Flood projects No. 2 and No. 3. This application and the area here involved is only as to Artesia Water Flood project No. 2. On May 26, 1958, the Oil Commission by Order R-966-A authorized capacity production allowable for certain wells in the pilot area, and this application is now filed solely for the purpose of obtaining approval for some unorthodox well locations, wells which were drilled prior to spacing rules by the Commission, and as to injection and producing wells, and for the approval of eight additional injection wells in Artesia Pilot Flood area No.2. We have one witness, Mr. Harrision, to be sworn.

MR. NUTTER: Mr. Campbell, the Order R-966 and 966-A have been entered in this case?

MR. CAMPBELL: Except there has been an emergency Order E-10, I believe it is, which preceded R-966-A.

MR. NUTTER: Thank you.

(Witness sworn)

B. G. HARRISON,

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

DIRECT EXAMINATION

BY MR. CAMPBELL:

Q Will you state your name, please?

A B. G. Harrison.

Q Where do you live, Mr. Harrison?

A Breckenridge, Texas.

Q By whom are you employed and in what capacity?

A I am employed by The Ibex Company and Grayridge Corporation as manager of secondary recovery.

Q Have you previously testified before the New Mexico Oil Conservation Commission or one of it's examiners in your professional capacity?

A Yes sir, I have.

MR. CAMPBELL: Are the witness' qualifications previously made to the Commission acceptable?

MR. NUTTER: Yes, sir, they are.

Q Mr. Harrison, are you acquainted with the pilot water flood project which has been designated as Artesia Pilot Flood project No. 2 in Eddy County, New Mexico? A Yes, sir.

Q Is The Ibex Company the operator of that project?

A Yes, sir.

Q Under Order R-966, the Company was required to file monthly reports with the New Mexico Oil Conservation Commission, regarding

the operation of this project. Have those reports, to your knowledge, been filed with the Commission?

A Yes, sir, they have.

Q Mr. Harrison, I hand you what has been identified as Applicant's Exhibit No. 1 in this case, and ask you to state what that is, please?

A This is an area map showing a portion of the Artesia Field in Eddy County, New Mexico. It shows Sections 20, 21, 29 and 28, Range 28 East, Township 18 South. And indicated on the map are the present producing wells, the present injection wells, the proposed injection wells which are requested by this hearing as an expansion to this pilot flood, and also the wells indicated as unorthodox well locations which have not been approved.

Q How have you designated on that the unorthodox locations which you seek -- for which you seek approval in this application?

A They are indicated by dashes of green above, below and on the side of the well location.

Q Did this situation with regard to unorthodox well locations exist at the time the pilot flood was proposed and the order issued except as to other wells?

A Yes, it did, Mr. Campbell. The wells, in some cases, were abandoned wells, but due to the economics involved, it was more economical to reenter the old holes than it was to drill new wells.

Q Now, how have you designated the proposed additional water injection wells on the plat?

A The additional water injection wells have been colored in red.

Q Now, what do the figures adjacent to some of the producing well locations indicate?

A These indicate the present daily production from these wells according to well tests that were taken from the first eight days of September.

Q Now, is there anything else as to that plat that you wish to present to the Examiner at this time, Mr. Harrison?

A I might point out that on The Ibex Company McNutt State Well No. 3, just -- which is an outside location to the pilot flood, we have had some water production there, very recently. We also have some water production in The Ibex Company Resler-Yates No. 17, which also is a very recent development. These wells have each produced a proportional amount of oil per acre. In other words, they have produced about equal amounts of oil per acre prior to water breakthrough.

Q What normally does the water breakthrough indicate with regard to the necessity for additional water injection wells, Mr. Harrison?

A In the case of McNutt State No. 3, we feel that we should have a backup which would involve injection Wells No. 8 and No. 5 to -- in order to produce more oil per barrel of water produced, thus increasing the economic life of the well.

Q Were all of the wells in this area, and that would be

affected by these water injections, additional wells which had reached a marginal stage at the time the project commenced?

A Yes, all of the wells in the area were producing in the neighborhood of one-half to one barrel per well.

Q Referring to Exhibit No. 1, which is the plat, will you indicate the wells that -- the producing wells that, in your judgment make necessary backup and point out to the Examiner the increase in production in those particular wells as a result of the water flood?

A On the Welch Duke State lease, Well No. 3, now producing forty barrels of oil per day; Well No. 9 producing forty-six barrels of oil per day, and Well No. 8 producing sixteen barrels of oil per day. On the McNutt State lease, Well No. 3 is now producing forty-four barrels of oil per day. It has produced as high as eighty-four barrels per day prior to water breakthrough. McNutt State No. 4 also has had a substantial increase in that it was -- has increased from one barrel of oil per day to eight barrels of oil per day. Resler-Yates State No. 21, presently producing sixty-four barrels of oil per day. These wells have all shown increases from approximately one barrel per day to the present figure.

Q In your opinion, in the interest of the greatest ultimate recovery of oil from this area, is it necessary to commence water injection at the locations requested in this application?

A Yes, sir, it is.

Q Now, with regard to the water injection, I hand you what

has been identified as Ibex' Exhibit No. 2 in this case, and ask you to state what that is?

A This is injection well data for the month of August, 1958, which includes the total injection barrels per month for each of the six injection wells in the pilot flood, the average volumes of injected water, barrels per day, and the average injection pressure along with the cumulative injections, volumes which have been injected into each well.

Q Is that report the same as the report you have been submitting monthly with regard to this project, Mr. Harrison?

A This information is included in the Form C 120, which is filed with the Commission.

Q Now, what is the source of your water in this project, Mr. Harrison?

A We have two sources of water, one a brine water, which is being produced in Section 22, from a depth of between three and four thousand feet, and a fresh water injection, or fresh water producing well which is in Section 28.

Q What is the status of the casing situation in this area, if you know, Mr. Harrison, both in the producing and injection wells?

A When we acquired the properties, the wells, on the most part, had six to nine hundred feet of surface pipe with no oil string. We are recompleting our injection wells with a four and a half inch casing as oil string cemented at the top of the producing

pay at approximately two thousand feet.

Q Do you make tests of the surface casing and the other casing that is in the hole when you go in to complete it either as a water injection or producing well?

A Yes. If the well shows any water in the hole, or if it is a producing well and is showing any water, then we test the casing to see if we have a casing leak.

Q And if there is a casing leak, do you make the necessary adjustments to correct it?

A Yes, we do it.

Q Insofar as the operation of this project to date is concerned, is it your opinion that there is any possibility of contamination of upper fresh water sources by the injection of this brine water into the producing formations?

A No, sir. The brine water naturally is corrosive to a certain extent. We are using corrosive inhibitors to protect our casing string, and in the event any detrimental corrosion appears to be resulting, which we will determine by use of various tests, including corrosion coupons and water analyses, we would at that time run strings of two inch plastic lined tubing, and with a packer -- with a packer set at the base of the oil string, in the oil string.

Q You had not considered, to date, that that has been required in any of the wells?

A No, we have had very good reports on our corrosion rates.

Q Now, Mr. Harrison, I hand you what has been identified as Ibex' Exhibit No. 3. Will you please state what that is?

A Exhibit No. 3 is a group of curves which have been drawn on the individual producing wells showing the rates of oil and water production, barrels per day since the beginning of the pilot flood.

Q Do these include the wells you referred to as having shown some water breakthrough?

A Yes, they do.

Q Do you want to make particular reference to those curves for the purpose of explaining the necessity for the additional injection wells?

A I would like to refer to McNutt State No. 3. I might explain the scale which is used. The scale, the upper figure of one ten and 100 apply until the well has reached the producing rate of over 100 barrels per day, and then it reverts back to the scale of ten one hundred, one thousand. This well has had a peak rate of eighty-two barrels of oil per day, and is presently producing twenty-one barrels of water per day, which has decreased the oil production. This is considered to be water breakthrough, not a premature water breakthrough in that this well has produced some 607,000 barrels of oil prior to this water, and also it correlates very well with the data we have on Resler-Yates State No. 17, which is the center producing in the southeast five spot. We might refer to the curve on Resler-Yates No. 17. Here we had a peak rate of over 123 barrels of oil per day, and as we had water breakthrough into

the well our oil production has decreased now to some 96 barrels per day.

Q Do you consider that water breakthrough to be a situation as to that well, or is that what you might have reason to have expected?

A Due to permeability variations, this is something we would expect in most water flood projects; after water breakthrough approximately sixty percent of the water flood oil is produced.

Q Do you have anything further with regard to the production curve shown on Exhibit No. 3 of the various wells?

A I might refer in general to all the curves to indicate that the production in each case was one barrel per day or less, and that it has increased considerably on all the wells. McNutt State No. 4 has shown a very recent increase. It had increased to four barrels per day and had leveled off there for a period of some two and a half months, and now has increased to eight barrels of oil per day, and we assume that it will continue to increase.

Q Now, I hand you what has been identified as Ibex' Exhibit No. 4 in this case, and ask you to state what that is?

A These are performance curves for the entire water flood pilot flood project. As indicated, we have oil production barrels per month which has increased from a figure of 300 barrels per month at the initiation of the flood to its present 15,200 barrels per month. We have injected a volume of some 482,000 barrels of water. I might refer to the two curves of average injection volume,

and average injection pressure. Here it will be noted that during the last month we have had a slight decrease in injection pressure with an increase in the average injection volume. And this is believed to be caused by leaching of gyp from the formation. The presence of this gyp and the fact that it can be leached was indicated in core study, where relative permeabilities were increased by flushing the core with water.

Q Anything further with regard to Exhibit No. 4?

A I believe that's all, Mr. Campbell.

Q Once again, let me ask you this question. Based upon your experience in the operation of this pilot water flood area, is it your opinion that the additional water injection wells sought by this application are necessary in order to assure the greatest ultimate recovery of oil from this area by use of secondary recovery methods?

A Yes, sir.

MR. CAMPBELL: I believe that's all now.

MR. NUTTER: Does anyone have any questions of Mr. Harrison?

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Harrison, the first thing I would like to clear up is, there appears to be a discrepancy between your application and Exhibit No. 1. Is the SE/4 of Section 21 in this unit, or this pilot water floor No. 2?

A Would you repeat that, please?

Q The SE/4 of Section 21 in this pilot water flood project?

A Yes, it is.

Q Well now, as I read your application, it doesn't appear that it is.

MR. CAMPBELL: Which application are you referring to, Mr. Payne?

MR. PAYNE: Your application in this case.

MR. CAMPBELL: Off the record.

(Discussion off the record.)

MR. CAMPBELL: If I may get back on the record. May the applicant request that the Exhibit attached to the application in this matter be corrected to conform to Exhibit No. 1 in the case, in that the NE/4 of Section 21 should be shown as a Lackawana, Lackawana lease rather than Resler-Yates.

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

MR. PAYNE: No.

MR. NUTTER: Does anyone have any questions of the witness?

QUESTIONS BY MR. IRBY:

Q I am Frank Irby, State Engineers' Office. On the source of your water, you stated the brine was in Section 22, and fresh water in 28. What is the Township and Range?

A Those are Range 28 East, Township 18 South.

Q On the cementing in the casing program, I understand you had surface casing in these wells from six to eight hundred feet. Is the cement circulated on that string to the surface?

A No, sir, this is -- I say no, let me amend that and say that in some cases we are not sure because of the records that we have, that is the original pipe that was run in these wells on the original completion back during the period 1924 to 1929.

Q Now, you are running an oil string inside there now, is that correct?

A Yes, that is true.

Q And where did you say you were landing that casing?

A We are landing it approximately two thousand feet, or just above the pay section of the first Grayburg.

Q And how much cement are you putting in that? How far are you bringing it up?

A Well, we are putting in approximately three hundred sacks per well.

Q And will that fill the annulus to the surface, or how far up?

A The approximate volume would, yes, but we haven't run cement tops. We are not certain as to the top of the cement in most instances.

Q What type of formation is the surface string landed in, if you can tell me?

A I am not real certain, but I believe it's in a red bed

or in a shale formation.

Q Now, as to the amounts of water, what percentage and what amount of the water being injected is fresh water?

A At the present time we are injecting approximately 1500 barrels per day of which about 900 barrels is brine water and 600 barrels fresh water.

MR. IRBY: That's all I have. Thank you.

MR. NUTTER: Any further questions? Mr. McCombs?

MR. McCOMBS: I have a few questions.

MR. NUTTER: Go ahead.

QUESTIONS BY MR. McCOMBS:

Q I am J. B. McCombs. What is your maximum production, your estimate of the maximum daily production on this project, Mr. Harrison?

A It will depend on our rate of development, but it should not exceed some twenty and twenty-five thousand barrels per month.

Q When is your peak supposed to be reached in this?

A We don't have a projected curve that I could refer to and give you an estimated time on that.

Q Do you have an estimate life on this twenty or twenty-five thousand barrels? I mean, how long would that appear, would that live?

A Probably a very short period in that you can see we reach a peak year on our producing wells. This pilot flood was initiated in September of 1957, and some of the wells have already reached peak production and are making some water, and after water break-

through, your oil production continues to decline.

MR. McCOMBS: That's all I have.

MR. NUTTER: Any further questions?

A May I make a statement? Did I say twenty-five thousand barrels per day or per month?

MR. McCOMBS: Per month.

A All right.

MR. NUTTER: Any further questions?

QUESTIONS BY MR. NUTTER:

Q Mr. Harrison, I note that your injection wells, McNutt State No. 2 and McNutt State No. 7 are the two wells indicated on Exhibit No. 2, which have had the most cumulative water injected into them, -- A Yes, sir.

Q -- is that correct? Also the McNutt State No. 3 well was the one that you referred to as having experienced a breakthrough of water. Do you attach any significance to the fact that this No. 3 well is offsetting the wells which have had the most water injected into them?

A The injection wells have individual characteristics and at our normal injection pressures, these wells are able to receive more water than other wells in the pilot, and this could be due to a permeability variation in the area and the injection rates overall for all the injection wells are fairly uniform, considering the nature of the sand. In most all water flood projects there will be some variation as to the amounts of water any parti-

cular injection well will take.

Q So, do I interpret your answer correctly to say that there is not necessarily any significance attached to this fact?

A There could be some significance, but it would not be anything that would be out of the ordinary. We have water breakthrough into Well No. 17, a center producer in the lower five spot, and here we have some of the lower and average injection rates so that it probably will be somewhat of a characteristic of the area.

Q Is the peak production for the No. 17 Well this 96 barrels that you indicate on this Exhibit?

A No. It had gone to something over 96 barrels, if you will refer to the individual curve.

Q It produced somewhat in excess of a hundred barrels prior to water breakthrough?

A Yes, that's right.

Q Do you think that the increase in productivity that the McNutt State No. 4 Well has experienced is indicative that it definitely has received the effects of the water flood?

A Yes, sir. Let's refer to the individual curve on that particular well. The well originally was producing one barrel or less per day, and after some cleanout operations, the well increased to two barrels per day, then slowly to four barrels per day, and has recently increased to eight barrels per day, which definitely is a response to the water flood in that other wells in the area are maintaining their one barrel or something of that

nature, barrel per day of oil production.

Q How do you account for the productivity of this well holding to two and a half barrels for four months?

A Well, that probably was just a normal thing that would happen, a well that is being flooded from only one side. It would be difficult to say exactly why that well did that. The fact that the other wells around injection Well No. 2 picked up considerably in production, probably the water has been traveling in the direction of this increased production.

Q How about Well No. 46? Do you believe it's received a response from the water flood? That would be Resler-Yates State No. 46, I believe.

A Yes, it has received some increase. As you'll note, it had no water production prior to water injection, and it also has recently shown a one barrel increase.

Q Do you think that this well will ever show a marked response to the water flood, or is this water breakthrough that has been encountered going to slow down its production?

A It would be difficult to say at this time. It is the first well that we have had to show water production at this early stage, so it would be impossible to say at this time what the performance of that particular well will be. However, in other water floods I have noted that in cases of early water breakthrough that the breakthrough was not necessarily of a serious nature, and that a large amount of oil was produced without producing excessive

amounts of water.

Q Now, on your Exhibit No. 3, Page 1, I notice that the Welch Duke State No. 3 has reached what appears to be a plateau at approximately forty barrels per day, --

A Yes, sir.

Q -- and has held that for almost a month. Do you expect that this well has reached its peek?

A It is possible with the injection that we now have that it would peak at this rate. However,with well tests spaced closer together, actually there is only about twenty days or something of that nature between the test in August and the September test, and it could be that this well would go ahead and increase, but it would be certain to increase and increase more rapidly if it were backed up by other water injection wells.

Q You are taking actual water production tests on these wells once a month?

A Once a month, or more often, yes.

Q Is it expected that a well will reduce its productivity after having reached its peak, but prior to the time of any water breakthrough?

A No. Normally, the well will reach a certain peak dependent upon injection rates and maintain that peak for a short time prior to the water breakthrough.

Q But it won't decrease until the water breakthrough, as a rule?

A Normally, it will not.

Q What is the cause, then, for the Welch Duke State to show this decrease in its production for the last two months? No water has broken through in it, has it?

A What State?

Q Welch Duke State No. 6.

A Well, these variations in test actually is only a volume of some fifteen to twenty barrels involved there.

Q Per day?

A Yes. This could be the effects of pumping equipment or could be the effects of the testing apparatus. I asked the field men about this, and they maintain that the well is producing at its normal rate there. We did have one test that there was some doubt about, which would be the high test, in that we were employing a new testing apparatus, and it is a pre-water knockout type of tester and possibly that test could be a little bit high to actually what the well was producing at that time.

Q Now, Mr. Harrison, you presently have six wells on injection, is that correct?

A Yes, sir.

Q And you are injecting approximately 1500 barrels a day total?

A Yes, sir.

Q Your request here is for an additional eight injection wells?

A Yes, sir.

Q How many barrels additional oil -- additional water do

you expect to be injected when all these eight wells are on injection?

A We would anticipate 150 to 200 barrels per day rate per well. We noted earlier in some of the injection wells that upon initial injection they had a breakdown pressure below our present plant pressure, and that after several months, approximately six months of injection, that new breakdown tests were run on the wells and breakdown pressure had increased to a thousand and fifty pounds due to the cushioning effects of the water that had already been injected and the oil which had been built up, and we feel that probably we would have lower injection rates than the present average rates due to this condition.

Q In response to a question by Mr. Irby, you indicated that about three barrels of brine to two barrels of fresh water are being used. Do you anticipate that this same ratio will hold when you put the additional wells on injection?

A No, we plan to increase the fresh water. We have drilled another fresh water well and have an additional supply of fresh water.

Q Will all of this 1200 to 1600 barrels additional water come from this new fresh water well?

A No, sir. We will still have some capacity in the brine water well. The new water well will supply some 700 barrels per day, and we plan to develop additional fresh water supply.

A Now, in response to Mr. McCombs' question, did you state

that you expect the ultimate recovery from this project to be in the neighborhood of 25,000 barrels per month?

A A peak, not an ultimate. An ultimate peak.

Q An ultimate peak, that's what I meant.

A Yes.

Q That would be after you have the entire area on flood as indicated by the ultimate pattern that you have shown with red marks on this Exhibit?

A Yes, sir.

Q How long do you think it will be before you have this entire area under flood?

A It, of course, will depend on our rate of development, which is going to be controlled by our increases in production, and it looks like it probably would be at least two years before we would have full development.

MR. NUTTER: Does anyone have any questions of Mr. Harrison?

REDIRECT EXAMINATION

BY MR. CAMPBELL:

Q Over a period of two years, I would assume that some of the wells in this initial area, for example, will have reached their peak in decline and be producing a substantial amount of water, isn't that correct?

A Yes, sir. As a matter of fact, the two center wells in the five spot are probably at or near a peak at this time.

Q But you are taking that into consideration in your estimate that the highest ultimate peak, in your opinion, if it is developed over a period of two years, would be the approximate 25,000 barrels per day, is that correct?

A Yes, sir.

MR. NUTTER: Any further questions?

RECROSS EXAMINATION

BY MR. FISCHER:

Q Mr. Harrison, is that Section 28 on this big map here, it is the Welch State, Welch Duke State, those subdivisions there, small subdivisions are forty acres, aren't they?

A Yes, sir.

Q It looks like if you follow your five spot pattern here, you would have to put an injection well in Unit G.

A Of Section 28.

Q Of Section 28. I see. You've got some proposed injection wells other places, but there is not one in there?

A It is possible that we would have to drill an injection well there. We are planning to drill first the corner well between our Resler-Yates State and Western Yates State lease and core this well and determine the economics of development in this area. It is possible that economics will dictate that we should drill another injection well there, but at the present time we propose this pattern. We would have two producing wells surrounded by five injection wells, and the fact that we probably will be using more

fresh water and that the formation is showing a tendency to leach out and actually give us higher injection rates -- well, let's say, the same pressure; we feel that we may be able to go to larger spacing than the original economic evaluation of fifteen acre spacing.

MR. FISCHER: Thank you.

QUESTIONS BY MR. NUTTER:

Q The logical pattern to follow here in Section 28 would be to put Resler-Yates State No. 14 on injection, would it not?

A Yes, sir, that is right. However, we do not own these wells, we own the rights to the first Grayburg but the people who own the wells felt that they could not give up the production which they have there now to plug these wells. They are completed deeper than the first Grayburg. And the D. E. Well Service group has indicated that they would prefer line injection wells to having -- where they would share on a fifty-fifty basis rather than having to convert some of their wells to injection wells and doing some additional inside drilling. They feel like with line injection wells they will be able to evaluate their area and determine the economics of inside drilling.

Q Mr. Harrison, you stated that you felt that the McNutt State No. 4 had experienced a substantial response to the water flood. Do you think that that response has been substantial enough so that Well No. 8 -- Well No. 6 directly north and Well No. 22 directly east must all be put on water injection?

A The justification for Well No. -- McNutt State No. 8 and Resler-Yates State No. 22 would be as backups to McNutt State No. 3 and Resler-Yates State No. 21, and to keep the pattern in balance we felt that Well No. 6 should be included in this hearing since we do have a response in No. 4.

Q What will happen if Well No. 6 is not put on injection?

A If it is not put on injection?

Q Yes.

A We would expect something in the same order to happen as has happened in the McNutt State No. 3. In other words, we would expect some water breakthrough whereby we would have to handle more barrels of water per barrel of oil produced, thus decreasing --

Q Didn't you state the No. 3 and No. 17 had equivalent amounts of oil produced prior to the time of breakthrough?

A Equivalent amounts of oil per acre. In other words, basing No. -- McNutt State No. 3 on approximately ten acres and the No. 17 on the seventeen-acre pattern.

Q Well now, No. 3 has injection from one side by the No. 2 and No. 7 Wells; No. 17 has injection from four sides. How can you attribute the water breakthrough in that case to lack of back-up on the No. 3 Well?

A I do not contribute it to lack of backup.

Q You stated that if you did not have No. 6 on injection, you would expect the same thing to happen to No. 4 as happened to No. 3, which would indicate you would not have any backup there?

A Yes, I am saying this, Mr. Nutter, that we would be required to produce more barrels of water per barrel of oil produced. In other words, it increases the lifting cost and cuts down on the economics. It actually involves more expenditure for the same amount of production.

Q Is this what has happened to No. 3, you are going to have to lift more barrels of water for each barrel of oil?

A Yes. In other words, we have 21 barrels of water there now, and it presumably would increase rather than decrease, and we will have to produce the 21 plus barrels of water each day regardless of the amount of oil we are getting there. Let me put it this way, that for instance, in the case of No. 17 we are producing 96 barrels of oil and have produced over a hundred barrels of oil per day, and the ratio there now is 96 barrels of oil to 11 barrels of water, whereas the ratio in No. 3 is 44 barrels of oil to 21 barrels of water. I cannot state that backup would have prevented this water breakthrough, but it seems reasonable due to the performance of the two center producers in the other five spots that we would have produced more oil per barrel or water, or would be producing more barrels of oil per barrel of water at this time.

Q The test on No. 17 that showed 96 barrels of oil and 11 barrels of water, was that the first test that you had that showed water on that well?

A Yes, it was. We knew that we had some water there, but it only developed in the latter part of the -- August, after, we had

a test there in the early part of August, and there was no water production, and the latter part of August the water was noted at the well head and in the tanks, and this was the first test for the actual amount of water that we were producing.

Q For how long a time has it been noticed that water was in this well?

A For approximately two and a half to two years.

Q How about the No. 3 Well, how long has water been produced in it?

A That is very recent also; about the same period of time.

Q About the same period of time?

A Yes. They both occurred at about the same time and reported to us about the same time. These are the first actual tests that we had.

Q The primary difference between the two wells is that you had a greater increase in the amount of water produced on the No. 3, and also a greater decrease on the oil produced than you have experienced in the No. 3?

A Yes, and we feel, too, Mr. Nutter, that we are going to have a gyp or calcium sulphate problem in producing wells since we do have that condition in the formations, and generally following a water breakthrough, if this condition is going to exist, it will develop and we plan to pull the No. 3 Well and check it for gyp deposition. If this occurs, then the production from the well, both oil and water, will decline due to sand phase plugging by the

calcium sulphate and remedial work will be necessary, probably frac jobs which also increase the cost of the overall project, so that water breakthrough or early water production could be detrimental in more than one way.

MR. NUTTER: Thank you, Mr. Harrison. Any questions?

QUESTIONS BY MR. UTZ:

Q Mr. Harrison, are you recirculating the water produced in this project at the present time?

A Yes, sir, we plan to. We have had no water, we are not putting the produced water back into the system at the present time, but we have had an analysis made of the water and feel like we will be able to reinject it. But, as I say, this water breakthrough has occurred within the last two and a half weeks, and we are in the process now of evaluating the situation and determining what type of treating system we will have to have there to reinject this water, but we do plan to do that.

Q How much water are you producing now from the whole project?

A Well, the entire project would be an approximate total of the water figures we have there, which would be some 34 barrels per day.

Q Mr. Harrison, I believe you stated that your ultimate -- your peak production would be 25,000 barrels a month from this project. Do you anticipate any difficulty in marketing this amount of oil?

A Not at the present time.

Q Who is your purchaser in this area?

A I believe that Malco is the purchaser.

Q Have you had any discussions with them about the purchasing of this oil when it reaches that amount?

A There has been some discussion with Malco. I do not know to what extent, but our people have been in contact with them.

Q You don't know one way or the other whether or not you will have any difficulty when you reach this volume of production?

A I couldn't state definitely that we would or would not. We presume that we won't.

Q Mr. Harrison, regarding the non-standard locations, are any of those locations producing at the present time?

A Yes. The No. 2 on the Welch Duke State is completed as a producer.

Q None of the others are producing? A No.

Q Are any of your proposed injection wells producing?

A No, sir, they are not. They are prepared for water injection.

Q None of these non-standard locations has ever been approved by the Commission prior to this application?

A None of the ones in this particular application.

MR. CAMPBELL: May I state something there? I doubt whether he knows, and I don't know. I gather from the transcript in the prior case where they obtained approval for unorthodox loca-

tion out of an abundance of caution and due to the age of these wells and so forth, it was assumed that none of them had orders issued. I think that is correct. It is possible that there might be an order on some of the later ones. If there is, I think they felt that it would do no harm to obtain an order here, in any event.

MR. NUTTER: These wells were drilled in accordance with the Rules and Regulations at the time?

MR. CAMPBELL: Absolutely.

MR. NUTTER: 19 what?

MR. CAMPBELL: 24.

Q (By Mr. Utz) These are all old wells?

A Yes, sir. They are all old wells that have been re-entered. We felt like we could re-enter these wells and recomplete them cheaper than we could complete a new well. In any event, we would have to re-enter the old wells and see that they were adequately plugged.

Q Had you reached the --

A We had some work that had been done by a surveyor and plain table that located the wells.

Q Are you reasonably sure that the locations shown here are correct now?

A Yes, sir.

Q How long have you produced the Welch Duke State No. 2?

A I am not real certain about that one. I couldn't state how long or how recent the recompletion has been on it.

MR. UTZ: That's all I have.

MR. McCOMBS: I would like to make a statement on this. As far as the market of oil, we do not want to object to the issuance of this expansion, but would like to warn that there is a limit to the amount of crude that we can run in a refinery. At the present time we are going in storage about five hundred barrels a day. We have sold some oil in the past two months, but we don't have any sold for this month or the future. We would like to mention also we are buying from three other water flood projects, and if they were to expand as fast, which some of them are going pretty good, this could get pretty serious on this oil. There are several other projects that have been applied for and some issued that are in our area. This water flood oil has increased by five hundred barrels in the last five months as this project has indicated. We feel that the market and the purchaser should be considered on issuing these projects.

MR. CAMPBELL: May I make an observation on that point since it has been brought up? Of course, I think everyone is aware of, by virtue of prior hearings, that this question of sale of this oil is a pertinent question. I think, however, it would be proper to observe that if the recovery of this additional oil in New Mexico is to await expansion of refinery facilities and purchasing facilities, it will be a long wait before it is obtained. Of course, whether a producer is going to be able to sell his oil is a problem not confined to secondary recovery projects. It is a business risk

which the producer, the people who make these investments and spend the money have to take. And I don't believe that the question of whether this particular purchaser and this particular refinery are going to be able to buy the oil that may or may not be produced, depending on the success of these projects should be the primary factors in determining whether the project should be started or expanded. I have the feeling myself that if these secondary recovery projects work out as they apparently are going to work out in New Mexico, that we will find a market for the oil. If we don't find a market for the oil, the person that made the investment is the one that is going to lose, and the investments have to be made, and if everybody in New Mexico awaited for the drilling of additional or new wells until they were certain that they were going to sell the oil, we wouldn't have as many wells as we have now in New Mexico on primary production.

MR. NUTTER: Does anyone have any questions of Mr. Harrison?

MR. STAMETS: I have just a couple.

QUESTIONS BY MR. STAMETS:

Q Mr. Harrison, do you have any idea of the original capacity of the No. 46 Wells in the southwest, southeast Section of 21?

A Of the original capacity?

Q Producing capacity?

A Producing capacity on primary production?

Q Yes, sir.

A No, sir, I don't. Our records and the records that were kept don't enable us to break that production down to define what one particular well will make or has made.

Q The water that is being produced there now is connate water?

A It could be connate water. We don't have an analysis of it, and it would be doubtful if an analysis would determine whether it is connate water or flood water.

Q It doesn't seem like a particularly high rate of oil for water produced there, does it?

A No. It has had only a slight increase, and the water has increased in proportion to the oil.

Q Would you say that that was an effect of the water flood and the way it is going, or the oil in place?

A It probably -- if this is a water breakthrough, it would be a characteristic of the formation in that particular area.

Q If it were determined that this is water breakthrough, do you think that injection wells should be put into service in the near future? I believe you show one here to the west on the section line between the quarters there?

A Yes, we anticipate drilling that well in the near future and coring it to determine something of the sand quality and characteristics in that particular area, and expansion in that area will be determined somewhat by the data we obtain there. As you'll note to the east, the development has been spares, and as to whether or not it is economical, it is still a question.

MR. STAMETS: That's all the questions I have.

A Mr. Examiner, may I ask the gentleman from Malco a question? I would like to know if the refiners are thinking in terms of making any type of expansion to take care of additional volumes of oil.

MR. McCOMBS: No, not at this time. It is the marketing of the finished product.

A The marketing of the finished product is what is controlling your thinking right now.

MR. McCOMBS: Yes.

A I see.

MR. NUTTER: Does anyone have any questions of Mr. Harrison?

MR. IRBY: I would like to ask one more question.

MR. NUTTER: Go ahead.

QUESTIONS BY MR. IRBY:

Q What disposition is being made of the water that is being produced?

A At the present time it is being brought into a surface pit. We plan to bring it into a system of tanks or of line pits as soon as we can get our plant worked out so that we will be able to set up a procedure for handling this water in a manner that would make it fit injection water.

MR. IRBY: Thank you.

MR. NUTTER: Are there any further questions of Mr. Harri-

son? If not, he may be excused.

(Witness excused).

MR. CAMPBELL: I would like the record to show I offered Ibex' Exhibits 1 through 4 in evidence.

MR. NUTTER: Is there objection to the introduction of Ibex' Exhibits 1 through 4 in Case 1196? If not, they will be received.

We would like to have Mr. McCombs take the witness stand if anybody has any questions they wish to ask him. If there are no questions of Mr. McCombs, he won't be called then.

Does anyone have anything further they wish to offer in this case? If there is nothing further, we will take Case 1196 under adivsement and take up Case 1498.

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

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

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

_____
Notary Public

My Commission Expires:
October 5, 1960.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 1196

TRANSCRIPT OF HEARING

June 25, 1959

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

I N D E X

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
June 24, 1959

IN THE MATTER OF: Application of Graridge Corporation for an order amending Order No. R-966. Applicant, in the above-styled cause, seeks an order amending Order No. R-966 to establish administrative procedures for development of its Artesia Water Flood Projects No. 2 and 3, Artesia Pool, Eddy County, New Mexico, and for approval of unorthodox locations for 27 wells in Said projects, for authority to convert six wells in said projects to water injection, for capacity allowables for five wells in the projects.	CASE NO. 1196

BEFORE:

ELVIS A. UTZ, Examiner.

TRANSCRIPT OF PROCEEDINGS

MR. UTZ: Case 1196.

MR. PAYNE: Case 1196. Application of Graridge Corporation for an order amending Order No. R-966.

MR. CAMPBELL: Jack M. Campbell, Roswell, appearing on behalf of the applicant. We have one witness to be sworn, Mr. Harrison.

MR. PAYNE: Let the record show it's the same witness who has testified in the previous case and was sworn at that time.

B. G. HARRISON

a witness, having been previously sworn on oath, testified as follows:

DIRECT EXAMINATION

BY MR. CAMPBELL:

Q Will you state your name, please?

A B. G. Harrison.

Q Where do you live?

A Breckenridge, Texas.

Q And by whom are you employed and in what capacity?

A By Graridge Corporation as Manager of Secondary Recovery.

Q Have you testified previously before this Commission or its examiners?

A Yes, I have.

Q In your professional capacity?

A Yes, sir.

Q Are the witness' qualifications acceptable?

MR. UTZ: Yes, sir.

Q (By Mr. Campbell) Mr. Harrison, are you acquainted with the application of Graridge Corporation in the Case No. 1196?

A Yes, sir, I am.

Q I refer you, Mr. Harrison, to what has been identified as Exhibit No. 1 in this hearing, and ask you to state what that is

and to describe the markings on it briefly.

A This is a plat of a portion of the Artesia field in Eddy County, New Mexico, in which are outlined Graridge Corporation's Artesia Pilots Flood 2 and 3.

Q Now, have you identified the two projects?

A Pilot Flood 2 has been outlined in yellow on the map, and Pilot Flood 3 has been outlined in blue.

Q Have the Pilot projects, Artesia Flood No. 2 and No. 3 previously been approved by the Commission?

A Yes, they have.

Q Does Exhibit No. 1 outline the proposed ultimate development of these two pilot projects?

A Yes, it does. Here we have shown, in the wells with concentric circles and being colored red indicate the present injection wells in both Pilot Flood 2 and Pilot Flood 3. These wells are connected by a solid red line. The other wells -- I note one mistake on this map; possibly it is the same on the other maps. Ventura State No. 305.

Q Where is that?

A In Section 28 in the northeast of the northeast Ventura State No. 305 has been colored red. This well is not oil injection. It has just been drilled.

Q Is it colored red on the original exhibit?

A All of the other wells colored in red on the exhibit

are water injection.

Q No. 305 is not then on the water injection?

A No, it is not.

Q Now, are you asking the Commission at this time to set up administrative procedures such as have been used in other water flood projects for the conversion of wells to water injection wells.

A Yes, we are. We feel like this will expedite getting the wells on injection following an increase of production by an offsetting producing well.

Q Now, I refer you to what has been identified as Applicant's Exhibit No. 2, and ask you to state what that is.

A This is a series of curves depicting the overall Pilot Flood 2 project, indicating the oil production in barrels per month. The accumulative oil production, the accumulative water injection, the daily water injection, and the average injection pressure.

Q Do you have any particular comments in connection with your overall picture on your Artesia Pilot Flood No. 2?

A It might be pointed out that the accumulative production thus far from the pilot flood has been some 230,000 barrels, and that as we are expanding our project it is continuing to increase in production.

Q Anything else?

A We feel like the flood is responding very well.

As you can see our accumulative water injection at this time is about a million two hundred thousand barrels as compared to our two hundred thirty thousand barrels of recovery.

Q Now, referring you to Applicant's Exhibit No. 3 in this case. Will you state what that is, please?

A This is the same information that we have just presented on Artesia Pilot Flood No. 3 depicting mostly oil production, the water injection, injection pressure and the accumulative water injection. This flood responded initially to the water injection program, but since that time has become very ineffective. The area seems to present considerably more problems than we have in Pilot Flood 2. At the present time we plan to go into the area and drill Well No. 348, and core this well and try to obtain some additional information. Well No. MRY No. 7 in Pilot Flood 3, this being an injection well, has been examined by means of a tracer survey and it was determined that 70 or a larger per cent of the water is going into a limestone stringer which immediately underlies the pay section. And our present plans are to attempt to plug this well back and to shut off this thief zone. We feel like that with additional information and some tracer surveys on the other injection wells that we will be able to have better control of this flood and make a success of it.

Q Now, Mr. Harrison, in your application you have requested the present authority to complete or convert existing

wells to water injection wells. Will you state to the Examiner how those are identified on Exhibit No. 1?

A These are not identified except by well number. 3 wells on the Welch Duke State, Wells No. 19, 20 and 21.

Q Are those newly drilled wells?

A Yes, these are all newly completed wells. These are being in the northwest quarter of Section 28.

Q And on your Welch State lease, which wells do you propose to convert to water injection wells at this time?

A Well No. 14.

Q That's the lease immediately east of the Welch Duke State lease, are they not?

A Yes.

Q Do you intend to convert your Welch State 318 and 304 to water injection?

A Yes, that's correct.

Q And on the Ventura State lease, where is that situated?

A The Ventura State lease is a lease we have recently acquired. We took over operations on this lease on May 1. This lease is the northeast quarter of the northeast quarter of Section 28. Well No. 305 has been drilled but has not been completed.

Q Are all of the wells in which you request to inject water except Welch State 14 new wells?

A Yes, they are.

Q Why do you feel it is necessary to inject water in these 6 wells?

A All of these wells directly offset producing wells which have experienced an increase in production from the water flood projects.

Q You feel it's necessary in order to obtain the greatest ultimate recovery of oil to back up the production from these wells which have been stimulated by water injection?

A Yes, we do.

Q Mr. Harrison, you have also requested in your application the approval of some 27 unorthodox well locations in these 2 project areas. Have you identified the locations of these wells?

A Yes. These wells have been identified in both Pilot Flood 2 and Pilot Flood 3, but being underlined in purple.

Q Are some of these wells wells that were already in existence?

A Yes, they are.

Q But they are wells which were drilled on unorthodox locations originally, is that correct?

A Yes, sir, that is true. Some of these represent new wells also. Where a new well is represented by an unorthodox location, the location was made unorthodox in order to be able to place it in a central location within a fire spot pattern. And

the only reason it is necessary to have unorthodox locations here is because of the unorthodox locations which surround the well.

Q Now, have you any amendments to the application with regard to the identity of unorthodox wells, Mr. Harrison?

A Yes. In our original application to the Commission we had included Resler-Yates State No. 28, being 640 feet from the north line and 200 feet from the east line of Section 32. We would like to omit this well and substitute Resler-Yates State No. 12 which is 330 feet from the south line and 200 feet from the east line of Section 29, being over on the very east edge of Pilot Flood 3. And also we would like to substitute for Lackawana State No. 7, which is 1540 from the north line and 1020 from the east line of Section 21, being in the southeast of the northeast of Section 21. And for this well we would like to substitute McNutt State No. 1-A, this well being 252 feet from the south line and 343 feet from the west line of Section 21.

Q Is that 352 feet from the south line or 252 from the south line?

A 252. This is a location which was required due to the impossibility of re-entering McNutt State No. 1. No. 1 had been approved as an unorthodox location having been an old hole.

Q The number of wells for which you seek unorthodox well location authority remains the same as was advertised, 27 wells, does it not?

A Yes, sir, that is correct.

MR. CAMPBELL: I would like to ask leave to amend the application in these two respects, Mr. Examiner, by deleting two of the wells and substituting in lieu thereof the wells that Mr. Harrison has referred to.

MR. UTZ: Are there any objections to the change in application as stated by counsel? If not they weill be so amended.

Q (By Mr. Campbell) Now, Mr. Harrison, in this application you have also requested capacity allowable for 5 wells. Where are these wells situated?

A I would like to refer to the plat. We have on the plat some triangles that have been colored in blue. These are .2, the wells which we are asking capacity allowable. These being McNutt State No. 9 and 10 in Section 21 and Lackawana State No. 2-A, Resler-Yates State No. 23. All of these being in Section 21 in the south half. Also Welch Duke State No. 2, being in Section 28 in the southeast quarter of the northwest quarter.

Q Now, Mr. Harrison, I note that each of these wells has a relatively low rate of oil production indicated on Exhibit No. 1. What is the reason for your seeking capacity allowables for these wells at this time?

A These wells have not responded to the flood thus far. In Welch Duke State No. 2 we have 24 barrels of water production there. This, however, we feel is due to a casing leak following

some water analysis which have been made. We feel that we are able to project the approximate time at which these wells will respond to the flood based on similar situations that have occurred in the flood thus far.

Q Mr. Harrison, I refer you to what has been identified as Applicant's Exhibits No. 4 and No. 5. Will you in explaining this to the Examiner refer to these Exhibits?

A Both of these exhibits depict the accumulative water injection which had been calculated to have been injected into the yellow triangles which are shown on the plat. At the time that these wells, Welch State No. 11 and Resler-Yates State No. 35 responded to the flood. Welch Duke State No. 11 can be noted responded -- these water injection figures are in barrels per acre, which is the equivalent of the amount of water that has been injected into the amount of acres shown in the yellow triangles. And it is for Welch Duke State No. 11 as a summation of the water that was injected into Welch Duke State No. 16 and No. 4 as calculated in barrels per acre. Here we show that Welch Duke State No. 11 responded during the month of March, 1959, at which time there had been some 3,800 barrels of water per acre injected into this triangular area. Referring to the curve now on Resler-Yates State No. 53, this well being one of the original wells outside the original pilot flood, we show that this well responded when there was some 5800 barrels per acre having been injected.

We feel that the difference represented here was due to the time required to get Welch Duke State No. 4 and 16 on injection, and that the area around Welch Duke State No. 3 had been pressured up thus gave back up and required less water injection.

Q Have you attempted then to anticipate, based on the volume of water injected in approximately the same area, when the wells included in your application will be likely to respond substantially to the water flood?

A Yes, sir, that is correct.

Q And you believe based upon that that it is necessary to obtain authority for capacity allowables at this time in order to avoid the necessity of emergency orders at a future date?

A Yes, sir, we do. We have based on this type of calculation we have determined that using an average figure between No. 11 and No. 53 in the form of time that McNutt State No. 9 should respond very soon in that it was calculated to. The response date should be about the 6 and 20. McNutt State No. 10 was calculated should have responded along in the first part of the month. Lackawana State A-2 likewise should have responded, but has not. We feel in this case in particular that some remedial work is needed here. We have just recently taken over operation on this lease also, and have not had sufficient time to get into this well and find out what your trouble could be.

Q Do you believe that based on your experience you are

able to calculate with a reasonable degree of certainty when these wells will respond to water flood?

A Yes, sir. Of course, the difference in the type of formations we have, where the formation is homogeneous, we would be able to calculate to a higher degree of accuracy the date at which these wells should respond. But using the best information we have available we have calculated when these responses should come. Here again as in other floods we feel that when these responses come that they will be rather rapid and that we will exceed the unit allowable and require emergency hearings to prevent shut down or over production. And it is with this in mind that we attempt to present this information and calculate the date at which these wells should respond, thinking also from the engineering standpoint that if they do not respond then we have trouble in the area.

Q Were Exhibits 1 through 5 prepared by you or under your supervision?

A Yes, they were, Mr. Campbell.

Q I would like to offer Exhibits 1 through 5 in evidence.

MR. UTZ: Without objection Exhibits 1 through 5 will be admitted into evidence.

A I would like to refer to Exhibit 1 again and point out that with the exception of the unorthodox locations which we

have requested on new wells, all other locations have been set out as standard locations being on regular 10 acre spacing, 330 from the 40 acre unit lines.

MR. CAMPBELL: That is all I have at this time.

MR. UTZ: Are there any questions of the witness?

MR. PAYNE: Yes, sir.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Harrison, your application in this case requested approval of the overall projects as will be presented by the applicant. Now, is that adding anything in addition to the unorthodox locations, the capacity allowables, on the conversion of these 6 wells to water injection and the establishment of administrative procedures?

A The idea in setting out the overall project was to inform the Commission as to the extent of the project, the anticipated development program. Of course, the right of development will be in connection with the control of the Commission as it has been previously set out in allowing us to expand our projects and place new wells or additional wells on injection following offset responses. Here we have set out what we consider to be the maximum development which could occur within this project.

Q Any order that you want entered in this case would

actually set out more specifically the particular points which you request approval for, would it not?

A Yes, sir. It would set out the projected injection well and producing well locations and would allow us to expand the project under the supervision of the Commission by administrative letter rather than by hearing.

Q I see. Thank you.

MR. UTZ: Any other questions of the witness? If not the witness may be excused.

(Witness excused.)

MR. UTZ: Are there any other statements to be made in this case? If there are none the case will be taken under advisement. We will take a ten minute recess.

(Short recess.)

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

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

Witness my hand and seal this the day of July, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico

Notary Public

My Commission Expires:
May 5, 1963

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1196, heard by me on June 24, 1959.

Examiner
New Mexico Oil Conservation Commission