BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO
Santa Fe, New Mexico

September 18, 1957

TRANSCRIPT OF HEARING

Case 1309

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
3-6691 5-9546

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO
Santa Fe, New Mexico

September 18, 1957

IN THE MATTER OF:

Application of the Operators Committee of the Maljamar Cooperative Repressuring Agreement for an order expanding the Kewanee Oil Company pilot water flood project and for the approval of an additional pilot water flood project in the Maljamar Cooperative Repressuring Agreement Area, Maljamar Pool, Lea County, New Mexico, and for the promulgation of rules to govern the operation of said projects. Applicant, in the above-styled cause, seeks an order authorizing the expansion of the Kewanee Oil Company pilot water flood project authorized by Order No. R-841, to permit the conversion from a producing oil well to a water injection well of its Pearl "B" No. 21 Well located in the NW/4 SW/4 of Section 25, Township 17 South, Range 32 East, Lea County, New Mexico; and further, for the W/2 SE/4 and the SW/4 of Section 21, E/2 SE/4 of Section 20, W/2 NE/4 and the NW/4 of Section 28, E/2 NE/4 of Section 29, Township 17 South, Range 32 East, Lea County, New Mexico. The applicant proposes to convert gas injection wells IP No. 11 and IP No. 35 in said Section 28 into water injection wells and to convert a presently producing oil well known as the Buffalo Oil Company Baish "A" No. 21 Well in said Section 21 to a water injection well, and to drill six additional water injection wells within the above-described pilot area; and further, to authorize the transfer of the oil allowables assigned to the above-described water input wells, which are now producing oil, to other wells on the same basic leases; and further, for a provision authorizing administrative approval, without notice and hearing, for additions to or deletions from the pilot areas and/or injection wells.

Case 1309

BEFORE:

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

TRANSCRIPT OF HEARING

MR. PORTER: The meeting will come to order. Before we go into Case 1309 I would like to announce that the Oil Allowable for October will be 37 barrels normal unit allowable.

At this time I would like to recognize three guests who have been here all day, but I didn't find it out until noon. Mr. Henderson, the Chairman of the Utah Oil and Gas Conservation Commission, Mr. Tompson, a member of that Commission, and Mr. Fight, Secretary to the Commission.

We will take up next Case 1309.

(Marked Exhibits Nos 1 through 17 of applicant, for identification.)

MR. HINKLE: If the Commission please, Clarence Hinkle of Hervey, Dow and Hinkle of Roswell, representing the Operators Committee for Maljamar Cooperative Repressuring Agreement. If the Commission please, we have two witnesses and seventeen exhibits. If it's all right with the Commission, we will go through the exhibits as rapidly as we can and save as much time as possible and wait until the close of each witness's testimony before offering the exhibits in evidence. Those on the board and on the walls are all the exhibits except one, 11, 12, and 13. We have placed before each member of the

Commission and before the Staff, a copy of the application and attached to the application are the same exhibits as we will offer as one, 11, 12 and 13. As we progress we will furnish to the Commission and the Staff, copies of the exhibits which we have on the board.

MR. PORTER: Mr. Hinkle, may I interrupt here and go off the record?

(Discussion off the record.)

MR. PORTER: Mr. Hinkle, you may proceed.

MR. HINKLE: The first witness is William J. Wright. Will you stand and be sworn?

MR. COOLEY: Will all the witnesses stand and be sworn?

(Witnesses sworn.)

WILLIAM J. WRIGHT

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

DIRECT EXAMINATION

By MR. HINKLE:

Q State your name, please. A William J. Wright.

Q Whom are you employed by?

A Maljamar Cooperative Repressuring Agreement.

Q By the Operators Committee?

A Operators Committee of the Maljamar.

Q Are you a graduate petroleum engineer?

A Yes.

Q What year? A 1928

Q What university? A Lousiana State.

Q Have you previously testified on several occasions before this Commission? A I think twice.

MR. HINKLE: Are the qualifications acceptable to the Commission?

MR. PORTER: Yes, sir.

Q When was the Maljamar Cooperative Agreement entered into?

A In 1941, it was a joint agreement between the six or seven operators in the Maljamar Field.

Q Has it been approved by the Secretary of the Interior?

A Approved by the Secretary of the Interior and approved by the Land Commission.

Q Also by this Commission?

A We came before the Commission in September 1941 and it was approved at that time. We were requesting a pilot pressure maintenance project for the area.

Q It was approved under Order R-485 of the Commission?

A Yes, sir.

MR. PORTER: Pardon me, Mr. Hinkle. I believe that was prior to the institution of the R. for our orders. Priot to that time up through order 850 we didn't have a prefix. Apparently on that date it

should be just --

A 485?

MR. PORTER: It should be 485 rather than R.

MR. HINKLE: We would like the record to show that is 485.

Q Mr. Wright, will you please refer to the exhibit on the board that's marked Maljamar C. R. Exhibit No. 1 and explain to the Commission what it is and what it shows?

A In 1941 when the Cooperative area was formed, it covered an area of that type and extended again in 1946 and again in 1952. So this is the present boundary of the Maljamar Cooperative Repressuring area.

Q When was the little area that juts out to the east included?

A '54, I think.

Q '54. And all the rest of the area was included prior to that time?

A In 1941, and they had a supplement in 1946 which added something over in this part of the area.

Q All of those extensions have been approved?

A Both by the Secretary of the Interior and New Mexico Land Commissioner and the Conservation Commission.

Q Does the Cooperative area include both federal and state lands?

A Yes, we have designated the state land on that and federal land. We've also designated the operators' holdings and their

leases and have also all the producing wells and the present injection wells which are shown. We have also shown the present water pilot which has been conducted by Cornell Oil Company, and the extension we are requesting, and also showing the present pilot that we would like to inaugurate in the Maljamar Pool.

Q The wells which are at the present time being used for gas injection are circled in red, is that right?

A Circled in yellow, an orange probably. The water wells are in red.

Q Explain to the Commission briefly the object of forming the Maljamar Cooperative Repressuring Agreement.

A Well, the operators definitely felt that it was a dissolved type of gas reservoir and they would drill most of these wells, 99% were drilled with cable tools. We found that the porosity was not too high, somewhere around 12 or 15%, the permeability was extremely low. We think it might average out ten millidarcies, and in a dissolved gas type reservoir we realized that our recovery of the oil in place would be very very low, ranging somewhere from 1 to 15% if we produced the well just on the primary types of production.

Therefore, they organized the Maljamar Cooperative Repressuring Agreement to handle the pressure maintenance part, which constituted gathering of the produced gas and returned it to the reservoir. Of course, the pilot flood in 1941 started with only

thirteen wells and there were only two wells to the section. It proved very very successful, and like lots of pilots, we got into trouble trying to handle sour gas, and wet gas and corrosion ate up more equipment than we could afford. The pilot was so successful in 1946 we began to drill wells for injection purposes only. You will note that these injection wells were drilled on the boundary lines so there would be a minimum of migration from one lease to the other. We found that in the Maljamar type of reservoir that if we could maintain pressure, we could keep our oil at a very nice viscosity value, about one centipose, but if the pressure dropped any great extent, why the centipose value increased very very rapidly.

We did get into difficulty in about 1945. We were trying to produce the Maljamar field on the same basis as the State of New Mexico was allocating the oil, just 40 acre unit, but we found athe productive ability of considerable of our wells couldn't keep up the state allowable. We came and asked our own allocation formula, which you granted to us in 1945 under your Order 595, Case 56. Since that date we have been producing Maljamar Field from roughly a thousand, fifteen hundred barrels, under the state top.

Q What kind of a plant do you operate in connection with your pressure maintenance system?

A We are gathering gas, of course, from the field separators at five or ten pounds of pressure, and we found to get the volumes

of gas necessary in the reservoir, our injection pressure had to be around 1500, so we tried a straight compress or plant which was very successful, so we went to straight gasoline absorption. During the absorption operation we are taking all the casinghead butane and propane and putting a fairly dry gas back into the reservoir. As the field has continued to increase in ratio, why of course, we have continued to increase the size of the plant.

For instance, in our pilot we had a plant that was returning only about two and a half million to the reservoir. The fifteen years it has been in operation, the plant has now increased to where we're running somewhere a little over nine million feet per day to the reservoir and still at 1500 pound reservoir. I think to date we have injected, roughly speaking, twenty million feet of gas. We have succeeded very well in not maintaining our reservoir pressure, but we are keeping the decline from being very severe.

Q You consider that the operation of the maintenance program as a whole has been quite successful?

A I think very successful. We're very well pleased. We have done everything we can to conserve our gas energy. We will disagree to what extent, but all six of the operators are very pleased with that.

Q Can you go on indefinitely with an operation of this kind, injecting gas?

A There is a limitation to how large a plant, and then,

of course, as our ratio, the original ratios in the field around 800, we are now up to 3,000 cubic feet per barrel. We still feel we have another six or seven years that we can produce the field on pressure maintenance. We thought that from pressure maintenance we could go into a gas drive type of operation, but a gas type drive operation wouldn't be very successful in our low permeabilities and very low porosities.

Q Because of the increased volumes of gas as time goes on it will finally reach a point where you reach an economic limit?

A Just as a rule of thumb, it costs you ten cents for every thousand cubic feet of gas that you would compress up to 1500; you can see as the volumes would go up those ten cents would go up to where it would be uneconomical to try and continue over a certain period of years.

Q Is that the reason you are considering the installation of a water flood project?

A We feel we have ten years to continue. We feel there is additional oil left in the reservoir. We wouldn't like to be checked on this, but we feel that with pressure maintenance, we'll recover at least 20 to 25% of the oil in place, which under primary, we couldn't have recovered over 15 in place.

Q Now, refer to Exhibit 2 and explain to the Commission what it is and what it shows.

A Exhibit 2 is a structural map of the Maljamar Field based

on the top of the San Andres, showing how flat this long anticline dropping off very fast into the basin and to the north flattening out, but due to a lack of porosity and permeability, there is no productive definity of any kind up there. Coming over to the east, the well drops about, I would say, something like fifty feet per mile, but to the south maybe two hundred feet per mile.

Q What are your contours drawn on?

A Fifty foot intervals.

Q On the top --

A (Interrupting) Of the San Andres.

Q (Continuing) -- San Andres.

A It also shows location structurally of our recommended pilot and the location structurally of the present pilot.

Q Are all the wells which are now under the pressure maintenance system or project, producing from the Grayburg-San Andres formation?

A Yes. We had to throw the Grayburg and San Andres all in to a common reservoir and produce them as a common reservoir rather than separate.

Q Is that a common source of supply?

A Common source of supply.

Q The structural map indicates that to be the case?

A No, the structure map indicates the structure of the San Andres. We do have others displaying the cross section and this

which shows that we have thrown all four of the producing zones into the common reservoir.

Q Refer to Exhibit 3, the cross section map, and explain it to the Commission, please.

A We noticed in here, which I neglected, that we have cross sections right through the middle of the field north and south, and a cross section through here running east and west. This is the north and south cross section, these red lines.

Q Please refer to Exhibit 3 first. I believe the top one is Exhibit 3, is it not?

A Well, Exhibit 3 then would be the east-west cross section, which shows you a very small drop as you come west. To these pays, more or less roughly speaking, here is the top of the lime; top of the Grayburg, would be somewhere in here, and the top of the San Andres and the casing is set on top of the sixth zone and all those pays are thrown in as a common reservoir and treated as a common reservoir.

Q Have you indicated on the cross section the crest of the structure?

A The crest of the structure would be right in through north of here, right in through here, the high point which would, as it shows here, be right in through there. These two lines here indicate the location of our pilot structurally recommended pilot, requested pilot, and these two show structurally the present pilot

that we conduct.

MR. PORTER: Mr. Wright, would you identify what you mean by these two?

A This red line and this red line.

MR. PORTER: I mean for the record.

Q On Exhibit 3.

A The red line on the right-hand side.

MR. COOLEY: Can you someway identify the crest?

A The crest of the structure is shown as the highest point on the west end of the east-west cross section.

Q Could you identify it by the well number?

A The well number would be this well right here which is Copper Simonds 4, would be the highest well structurally.

Q Now, refer to Exhibit 4 and explain to the Commission what it is.

A Exhibit 4 is the north-south cross section showing in the northern end of the field how flat it is. Here is the highest well structurally.

Q What point is that, between what wells?

A The highest wells would be Buffalo Baish G A structurally, and then as you go into the basin you can see how rapidly it falls. These two red lines here between Baish A and Baish 14 and Baish 15 and Baish 25 represents the location structurally on the cross section that we are requesting for the pilot.

Q Now, refer to Exhibit No. 5 on the board and explain to the Commission what that is.

A Exhibit 5 is a very few wells in the Maljamar Field as it was drilled back in '38 and '39 which were cored. This is well No., input well No. 27 which was cored. We, therefore, ran a radioactive log and we also showed the permeabilities and the porosities of the three, four zones encountered, and also a sample log. You can see that the permeabilities of these pays are very very low, and also in porosity are very low in value. The radioactive log which we ran on there is a comparison, so we could compare some of our other radioactive logs in the field as to porosity and permeability. The sample log is a typical log showing the anhydrites and sands and dolomites as they occur in drilling.

Q Have you kept a monthly record reflecting the operations and indicating the reservoir pressure and oil production since the beginning of the pressure maintenance project?

A Yes, we have kept complete records.

Q Refer to Exhibit 6 and explain to the Commission what it shows.

A Exhibit 6 is the one that we refer to as our monthly reservoir operations of the Maljamar area as it was prior to 1954. You will observe that pressure maintenance operations started in 1942, gas volumes were being injected, and when we revised our operation, the plant was done for approximately a year drilling

new input wells and going to four wells to a section instead of two, and since that date we have been in continuous operation injecting gas.

During this period of time you can see how rapidly, but prior to pressure maintenance you can see how rapidly the reservoir pressure of the Maljamar Field was dropping very very fast as pressure maintenance gas injection we began to notice considerable retard in our reservoir pressure. We observed every well in the field every six months trying to use it on an allocation formula as well as keeping records. This pressure over here is quite misleading; in 1954 we stopped observing quite a number of the wells that were down to marginal stage, and therefore the arithmetic average showed an increase which isn't quite correct, but you can see along with that the well had a peak when pressure maintenance started right in 1942 of roughly 145,000 barrels a month. We have been able to practically maintain that withdrawal rate with a small decline through '51, '52, '53 and with the assistance of remedial work on the wells, increase in the plant and enlarging our withdrawal rates into the reservoir after fifteen years of operation, our peak at the end of '56 is the same as the field was back in 1941.

Q Mr. Wright, have you compiled any information to show the decline in production in the Maljamar Pool as compared with other pools in the state?

A Yes, one other thing that I neglected, you can see that the ratio started at 800 and you can see that the ratios are up to around 3,000 cubic feet.

Q Refer to Exhibit 7.

A Exhibit 7, it is hard to take one reservoir and compare it to another. Of course, we all would like to know what would have been the production decline in the Maljamar, primary decline in the Maljamar Field. Trying to get something as a basis to evaluate what our drop in production would have been under primary type of operations, we have taken four or five of the same gas disolved type reservoirs on the Grayburg Jackson trend and hit an average on those which shows those wells to date are producing somewhere around 300 barrels a year. Where in the injection area right now, why we are producing in the neighborhood of a little over, the right line, about ten thousand barrels a year from those wells. We feel as though this might be, we felt as though it might be a little too severe using our average, so you can see the line we have used is a little high what we call. But using that primary against the Maljamar Field on our next exhibit.

Q Is that Exhibit 8? A That is Exhibit 8.

Q Okay.

A This primary of the Maljamar Field would have been produced on a primary. Their recovery to date would have been roughly a little over fifteen million barrels. But under our pressure

maintenance operations, accumulated oil to date is roughly twenty million barrels. This is based on what we refer to as the injection area where the majority of the gas has been returned into an area there that roughly 4,300 acres where 125 wells are being produced. You'll also notice the pressure decline curve of those 125 wells in uniform right on through and doesn't show that increase like we have shown on the field as a whole.

Q Does that show in effect then, that by the pressure maintenance operation you have already recovered approximately five million barrels of oil that you would't have otherwise?

A Just about. That is our interpretation of it.

Q Now, I believe that you mentioned at the beginning of your testimony that the Operators Committee have the allocation planned which they submitted to the Conservation Commission each month. Do you have a typical copy of that.

A We have a typical copy of that. It's quite complicated, that was brought out in 1945, we had to do something and ---

Q Is that Exhibit No. 9 that you referred to?

A Exhibit No. 9. When we found out that our main objection in returning gas was filling void space and some of the wells were losing pressure producing tremendous volumes of gas, it was voiding space in the reservoir tremendously. For instance, a well with say a thousand pound pressure and 800 pound ratio was voiding the

reservoir maybe a barrel, barrel two tenths, barrel three tenths per barrel of stock tank oil. Where some of the wells who had extremely low pressure, five or six hundred pounds, producing at five and six thousand ratios were voiding the reservoir, fifteen or twenty barrels of space per barrel of stock tank oil. So we have been allocating our nomination on what we call our void space factor. We still have the 195 wells that we handled under our last sheet allocation, we still have 135 top allowable wells which we are still applying our formula to. We have 60 wells that are marginal wells that produce under 25 barrels a day. Of these 135 wells are now averaging 29.4 barrels per unit, and it is our understanding that the state, along with the top wells does not exceed the state unit top, why we can continue to ask monthly nominations for the field. We especially brought that up because with our pilot flood we would like to continue nominating our own oil.

Q Do you prepare a monthly statement which reflects the entire operation such as the water produced, the oil produced, the status of each well and whether flowing or pumping?

A Well, it's not quite a monthly statement. I think that is called our Exhibit No. 10. We have been making a study of the reservoir of the field and we worked up the recovery on each individual well, the recovery by each lease, the recovery per acre by each lease, and the total recovery by each company, and also

the recovery per acre by each company. You'll notice some of the leases in the field have recovered over 5,000 barrels per acre, and, of course, some of the poor leases down around a thousand. The field as a whole has recovered a little over 29,000,000 barrels as of July 1st, which gives it a recovery per acre of 3,461 barrels.

The injection area which we showed in here where there is 125 barrels had a recovery of around 4,000, 5,000 barrels per acre.

Q Explain to the Commission briefly the manner in which you propose, or the Operators Committee, propose to inaugurate this new pilot water flood in the cooperative area.

A We picked the heart of the field, the pilot over here on the eastern edge being only from the sixth zone, trying the sixth zone where in the heart of the field right in here we'll try our pilot in all four of the zones. We have two injection wells in there now, that gas injection wells that we'll convert to water injection wells. We have one producer that we'll convert to water injection well and necessary --

Q (Interrupting) What is the number of the producer that you are going to convert to?

A [illegible]. The two injection wells are I.P. 11 and I.P. 35, and we'll have to drill six new wells entirely for injection purposes.

Q Is that the Baish or Buffalo? A Buffalo Baish.

Q Buffalo Baish? A A-21.

Q 21-A. What is the well capable of producing at the present

A I imagine, off hand I wouldn't know. We are, on our present allocation plan, we are allowing it a nomination of 23 barrels. It's capability would be in excess of that.

Q By your application, are you requesting that the allowable of that 23 barrels from that well be reallocated to the other wells on the same lease?

A To the rest of the wells on the Baish lease.

Q Now identify, refer to Exhibit No. 11 and explain to the Commission what that is.

A Exhibit 11 was given to you with the application. It is the sample log of the two I.P. wells. I.P. 11 and I.P. 35 right in the heart of the field. It's a sample log and therefore as most cable tool sample logs are, it's quite misleading when you want a considerable amount of knowledge like we are hoping to obtain for our water. Of course, the six new wells in the field will be cored where we can actually get porosities and permeabilities, and the exact zones encountered and things on that order. It is the best we have to offer to you right now on these two wells.

Q Do you have a log of the well which you propose --

A (Interrupting) The Baish A-21, we have a radioactive log.

Q What exhibit are you now referring to?

A That is Exhibit No. 12. That is the radioactive log of the producing well. It shows the gama ray, neutron ray and also a calibration of the whole. It's very interesting, thinking that you

might notice up at the top of this well, was acidized, it was shot, it was sand fracted, and I don't know what other type of remedial work we haven't tried in the Maljamar Field to get the maximum recovery.

You can also notice the shot factors, the caliper hole where they broke right in the pays of the seventh zone and the ninth zone where it shattered just the pays in through there. We hope by coring our water injection wells and running radioactive logs on the present producing wells, that a considerable amount of additional knowledge will be obtained where we can conduct our water flooding operation.

Q I believe you stated that you proposed to drill six new injection wells in connection with the pilot water flood. Have you formulated any casing program for these wells?

A Yes, of course, we always look back and wish we had completed wells in a certain way, but since the majority of the wells in the Maljamar Field were drilled during the old cable tool days, and we would have loved to have set pipe through the pays and run perforated fract, but since the fracting wasn't in existence at that time, we were afraid to set pipe through these six pays and cement because with the low permeability we felt definitely we would never get back to the pay section with anything at that time.

But now, with fract and so that we can control the water if it's necessary down the line by water flooding and make it go into

whichever zone we desire, we will set pipe entirely through the pay and, of course, gun perforate and fract the various zones, so therefore, we can control our water.

Q That casing program is shown by Exhibit 13?

A 13, which will either run five and a half and four and a half J, 55, which is good for at least 3,000 pounds.

Q Mr. Wright, where do you propose to get the water to carry on this water flood project?

A It's a good question. We have been very disappointed in that we have had three deep wells in the Cooperative area, one to about ten thousand, tested all available pays, we couldn't find oil or water, one to about eleven thousand we have drilled one well to fifteen five hundred to the Devonian which will make some water. We have also gone over into this part of the field.

Q What part are you pointing to?

A The eastern edge of the field at Section 25 and 30 where their pilot have gotten very very poor water well for anything like we would have to have to conduct a pilot. So we have been unable to find any source within distance of the Maljamar Field that we could even start a pilot, much less develop this pilot into water flooding operations. So, we went to the Land Commission and asked for water leases up on the Caprock, which is within ten or twelve miles of the field.

Q Now refer to Exhibit 14, does that show the area that

you have just mentioned?

A That shows the Maljamar Cooperative area and shows the water, the sections which we are applying for water rights.

Q What is the status of your application to appropriate water from this area?

A We have applied to the Land Commission and we have also applied through the State Engineer. I think our application --

Q (Interrupting) Is this in the so-called declared area where the State Engineer declares water to be public waters and subject to appropriation? A That is my understanding.

Q Has any water been developed contiguous to the area shown in yellow on Exhibit 14?

A Yes. There's quite a bit, all the potash mines have quite a bit of water acreage more or less to the west.

Q It is contiguous to the part shown in yellow to the west?

A Yes.

Q Is that where the potash companies obtain their water supply for the use in the mines which are east of Carlsbad?

A Yes.

Q They have a pipeline from that area down to the mining area?

A Yes.

Q Have you been able to get the appropriation from the State Engineer as yet?

A Yes. We have been, I understand it's our application

No. L3927, L3928 and L3929. It is our understanding that the Roswell Engineers saw no objection whatsoever to use this water for water flooding and have made the recommendation to their Santa Fe office.

Q Have the rights been granted as yet?

A I think so.

Q What is the character of the land shown in yellow on Exhibit 14, is it state land? A It is state land.

Q Have you obtained from the Commissioner of Public Lands water leases covering that area? A Yes.

Q They have already been issued?

A With twenty-two as I understand it.

Q What is the depth at which you expect to develop water in that area?

A From 250 to 350 feet.

Q And because of the development which has been carried on by the potash companies, do you believe that you would find a source of water supply that will be sufficient to carry on this water flood project?

A We feel that way. We have checked into the area quite a bit and the way those wells are holding up for the potash company and their withdrawals, we feel as though the thickness of the sand body in there would give us an adequate supply.

Q Have Exhibits 1 through 14 been prepared by you or under

your direction?

A Some by me and some under my direction.

Q To the best of your knowledge, they portray the correct facts in each situation? A Yes.

MR. HINKLE: I would like to offer in evidence Exhibits 1 through 14.

MR. PORTER: Without objection the exhibits will be admitted.

Q I believe you have already indicated upon Exhibit 1 the location of the Kewanee pilot plant at the present time. When was that first inaugurated?

A I think they inaugurated the gas injection in '52 and water about '53, I'd say and came into the Cooperative in '54.

MR. HINKLE: I might state to the Commission that Mr. Mills, the other witness, will testify with respect to the operation of that plant and how successful it has been.

Q Now, Mr. Wright, in the event this proposed additional pilot is approved and proved successful in operation, do you intend to expand that operation?

A We hope to. We feel definitely --

Q (Interrupting) Will that be expanded in cooperation with the other pilot plant?

A Yes, we hope both pilots prove successful as we hope to we will all operate from one source and one source of oil.

Q So it will eventually encompass the entire area?

A The entire area.

Q Do you propose to the Commission that any future expansions, if it does prove successful on approval of drilling of additional wells or converting present wells to injection wells, to be approved by the Commission administratively or come back each time and have a hearing on those matters?

A It might be asking too much administratively. We feel we have fifteen years of operation that the operators have conducted every form of conservation, and we would certainly appreciate if the Commission would grant us that, and I'm sure we will continue to do the best we can, the operators will do the best they can to extract the greatest amount of oil from the Maljamar Field under the conservation methods they can.

Q Is it your opinion this will greatly facilitate the handling of the whole project? A It certainly would.

Q It would eliminate the necessity of advertisement and formal hearing with each phase of the expansion program?

A It certainly will.

Q If this water flood is successful, do you anticipate that considerable additional oil will be recovered from the Maljamar Pool?

A Once again we are talking with not too much reservoir data to go by, and more or less under the watching of our present performance, we feel as though we'll, if water flooding is successful

in the Maljamar Field, that we can at least get another 25% or 50, a little over to 50 to 60% of the oil in place will be recovered. We feel as though we are talking somewhere in the neighborhood of forty or fifty million barrels of additional oil.

Q That, I guess, would be in the interest of conservation, would it not?

A I think you can entitle that conservation.

Q Are you asking for any increased allowable in connection with additional pilot water flood?

A No. We feel under our present allocation plan that we can operate the field without any additional nomination.

Q Do you intend to operate under the existing proration rules? A Yes.

Q No change in that? A That's right.

Q Now, has this project, or proposed project, been approved by the United States Geological Survey?

A We made an application and it is my understanding it has been approved.

Q And they're willing to go along on this same project?

A On the project.

MR. HINKLE: I believe that's all from this witness.

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

CROSS EXAMINATION

By MR. NUTTER:

MR. NUTTER: First, Mr. Hinkle, is your other witness going to testify as to the result on the pilot flood?

MR. HINKLE: Yes. He is a representative of the Kewanee and familiar with the entire operation.

Q Just a couple of questions of Mr. Wright. Mr. Wright, have you made any tests of the water that's been obtained by the potash companies up on top of the Caprock there to see if that water would be compatible with the fluids in your reservoir in the Maljamar Pool? A Yes, we have.

Q Are the waters compatible? A They are compatible.

Q Would your application for a system of administrative approval of expansion of this water flood be limited to an expansion within the limits of the Maljamar Cooperative Repressuring Agreement area? A Definitely.

Q Would your application for administrative approval also include administrative approval of transfer of allowables in the event that any oil producing wells were converted into water injection wells?

A Yes, that is my understanding, transfer of allowable to the lease.

Q Yes. That's all.

RE-DIRECT EXAMINATION

By MR. HINKLE:

Q You wouldn't porpose to increase generally or deviate from the statewide allowable by reason of the administrative order?

A Not at all. We'll still produce the field under the regular proration which would be up to or under the unit allowable as set by the state.

MR. HINKLE: That's all we have of Mr. Wright.

MR. PORTER: Mr. Cooley, did you have a question?

RE-CROSS EXAMINATION

By MR. JOHNSON:

Q Did you anticipate increasing the allowable after the flood is fully in effect?

A Mr. Johnson, that would be hard to say, but I don't think that we'll flood the field at that rate of speed. We're talking of perhaps drilling somewhere around 30 to 35 injection wells.

Q There has been quite a bit of discussion about curtailing the flood and so on.

A We realize that, and consequently our development will be fairly slow. Our thoughts are if we can maintain present withdrawal from the field at around 4,800 barrels per day. If we got up to the state top, it would be somewhere around 5,000, 5,067. We feel as though we will not have to exceed the state top.

MR. JOHNSON: That answers my questions.

By MR. PORTER:

Q Mr. Wright, there seems to be a question still in the minds

of some of us as to the proration and the allowable system that be you are asking for. My understanding is that it would a continuation of Order 595 under which the pool is prorated at the present time. There would be no deviation whatever from the provision of that order? A That's right.

By MR. COOLEY:

Q These wells will be treated just as though they were not in the water flood?

A Yes. Under our present formulas, as the ratio on the well drops, it entitles them to more oil. Therefore, under water flooding, when water flooding becomes effective, the first thing you observe in a water flood operation is the ratio dropping on the producing well, so therefore we'll automatically give that well a top allowable, which under our formula, is 44 barrels per day. But we can't get too many 44 tops because our 130, 140 formula wells will still have to stay, on the average of those formula wells will still have to stay, will not be able to exceed your state top, which is now 37. We have our average for 135 wells at 28 barrels per day. Under your order we could go up to 37 barrels per day.

Q Then the only deviation from the allowable standpoint will be that the allowable which would have been assigned to the Baish A-21, isn't it? A That's right.

Q Will be produced from one or more of the other producing wells in the pilot area? A On that pilot area.

MR. HINKLE: On that lease. The same lease.

A The same lease. That's also coming up, we have one on 20 lease down here which we are also asking the same thing.

By MR. NUTTER:

Q Also when administrative approval is given for expansion of the pilot flood, that any oil wells converted will have their allowables transferred by administrative approval?

A Yes, by administrative approval.

By MR. UTZ:

Q What is your anticipated rate of injection?

A We feel we will start somewhere around 500 barrels per well per day.

MR. UTZ: That's all I have.

A That might change after we get into it, but that's what we are basing on right now, 500 barrels of oil per day. We'll start our pilot with the nine wells we feel as though we will have to have 5400 barrels per day.

MR. PORTER: Mr. Cooley.

By MR. COOLEY:

Q Mr. Wright, do you feel that you can effectively operate an associating water flood project after it goes out of the pilot stage within the allowable formula established by 595?

A We hope we can. We are not definite, but we will continue our pressure maintenance operation and extend our pilot very

slowly. Just what we are getting into is hard to say.

Q Is it your opinion that the reservoirs in question here would be rate sensitive?

A Right under our present type of operation we found that a well in the Maljamar Field could not be produced continuously over a 24 hour period of time. Every well in the Maljamar Field is on pressure intermittance or time cycle intermittance, the feeding rate has been very very slow. An average well produces thirty minutes four times a day.

Q Will your water flood producers produce under the same system?

A I'm just telling you that, so from that I think our water recovery will be at a fairly slow rate. Our production will not be too excessive. If it becomes too excessive, 500 barrels a day, which we will find out from our pilot, it might require 300. We will produce it at 300 or 800.

Q However, you feel at the present time it will not be rate sensitive?

A That is our present thoughts on that.

MR. PORTER: Any more questions of Mr. Wright?

MR. HINKLE: On the discussion here as to the allowables, I would like to have Mr. Ralph Gray sworn to make a statement.

(Witness sworn.)

RALPH GRAY

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

DIRECT EXAMINATION

By MR. HINKLE:

Q Mr. Gray, do you care to make a statement to the Commission with respect to the injection operation of the water flood project?

A I would like to make a statement in clarification.

Q Just a minute before you proceed, by whom are you employed?

A By the Buffalo Oil Company.

Q Are they one of the operators in the Maljamar Cooperative Repressuring area? A They are.

Q One of the largest operators? A We have a large interest.

Q Are you a member of the Operating Committee?

A Yes.

Q In what capacity?

A Secretary of the Operators Committee.

Q How long have you been with the Buffalo Company?

A Nine and a half years.

Q Are you a petroleum engineer? A Yes.

Q Have you previously testified before the Commission?

A I have.

MR. PORTER: His qualifications are accepted.

A I would like to explain to the Commission that we have

several operators involved in this cooperative project and appreciate Mr. Wright's position here in trying to represent all of the thoughts of the various companies, he's rather handicapped to some extent. I would like to clarify to some extent some of the statements that have been made in regard to the allowables and the allowables that might be expected in the future.

This application, of course, is being made with no recommendation for a change. The intention of our project at this time is to follow the existing allocation plan for the field with no change whatsoever. Now, the operators have not attempted to look into the future and to ascertain what our future allowable situation might be. We have no intention at this time to make any statement in regard to our future allowables under the full scale water flood.

Q By that, you mean that if you in the future should ask for an increased allowable on account of the success of the water flood, you wouldn't expect to do that administratively, but through hearing before the Conservation Commission?

A That's right. In the event there is any change in the allocation desired later under a full scale project, it's our intention at that time to request a separate hearing for that matter.

Q Which would be a formal hearing before the Conservation Commission?

A Yes, sir.

MR. PORTER: Does anyone have a question of Mr. Gray? The witness may be excused.

(Witness excused.)

MR. HINKLE: My next witness is Mr. Mills.

W. H. MILLS

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

DIRECT EXAMINATION

By MR. HINKLE:

Q State your name, please. A W. H. Mills.

Q Where do you live, Mr. Mills? A Odessa, Texas.

Q By whom are you employed? A Kewanee Oil Company.

Q How long have you been with the Kewanee?

A Eight years.

Q Are you a graduate engineer? A Yes, sir.

Q What university?

A University of New Mexico.

Q What year? A '47.

Q Have you previously testified before the New Mexico Oil Conservation Commission? A I have.

MR. HINKLE: Qualifications accepted?

MR. PORTER: Yes, sir.

Q Have you been familiar or observed the operations of the pressure maintenance project in the Maljamar Cooperative Repressuring area? A I have.

Q Over a number of years? A Yes, sir.

Q Does the Kewanee have a number of leases involved in the area?

A Yes, sir.

Q They are one of the largest owners of leases in the area?

A We have a large share of the cooperative area.

Q Did you do the preliminary engineering work or were you associated with it?

A I did the preliminary engineering work on the Pearl pilot water flood.

Q Now, the Pearl pilot water flood is the one shown on Exhibit No. 1 on the east side of the small project in blue?

A That's right. That is the eastern extension area of the cooperative area.

Q Was the inauguration of that pilot water flood approved by the Oil Conservation Commission?

A It was approved by the Oil Conservation Commission.

Q Do you remember when?

A On the 9th day of July, 1956 by Order R-841.

Q Mr. Mills, explain to the Commission briefly how that pilot was inaugurated and how it has progressed.

A Prior to the expansion of the cooperative area, the area referred to as the eastern extension area known as our Pearl lease was not included in the MCRA area.

Q Was this pilot inaugurated prior to that inclusion in the MCRA area?

A Yes, it was. Kewanee desired to initiate a pilot water flood on the lease to determine whether or not it was feasibly economical to water flood that portion of the reservoir. In accordance with that line of thinking we started a pilot flood utilizing our, its our Kewanee Pearl No. 26 that flood has progressed through the years to the current time and we feel that the flood has been an economic success.

Q How many injection wells have been involved up to the present time?

A Present time just one injection well.

Q When was that pilot first inaugurated?

A We started it in 1954 merely to determine whether or not we could pump water into the ground, and then it was shut down for a period of time and started again in September of '55.

Q Where have you been obtaining your water for injection?

A We obtain water from our Pearl No. 12 XWS, which is located in the southeast quarter of the southeast quarter of Section 25, Township 17 South, Range 32 East.

Q That well is shown on Exhibit No. 1?

A That's right.

Q What has been your rate of injection since March, 1955?

A Since March, 1955, we have been maintaining an approximate rate of 350 barrels of water per day.

Q At what pressure?

A The pressure has gradually increased until now it is approximately 2900 pounds per square inch.

Q Mr. Mills, refer to Exhibit 15 and explain to the Commission what it is, what it shows.

A Exhibit 15 shown here is a plot of the average injection pressure for Pearl pilot water flood, the average rate of water injected into Pearl No. 26, the cumulative water injected into the reservoir surrounding Pearl 26, and the average down time for the pumping equipment that we utilized in the flood.

Q That is from the time the pilot was first inaugurated up to the present time? A That's right.

Q Now, refer to Exhibit 16 and explain to the Commission what it is.

A Exhibit 16 is a plot of the average gas-oil ratio, average oil production, average water production of the six wells surrounding Pearl input No. 26, which is the pilot water injection well. It shows the gas-oil ratio has been declining here within the last two years, the oil rate curve shows it declined until we had an increase in production, approximately in May of 1956, about the same time the water from these six wells showed a substantial increase.

We feel now that we definitely are producing water flood oil, from not all of these six wells, but from some of these wells offsetting the Pearl Input No. 26.

Q Do you consider generally that this pilot water flood so far has been successful?

A We consider the pilot water flood a success, yes, sir.

Q Have you any way of estimating the additional amount of oil that might have been produced on account of this pilot?

A As of the first of September, 1957, we estimate the cumulative oil produced as a result of water injection now amounts to 15,075 barrels. The cumulative water flood production as of the same date, 3,851 barrels.

Q So there has been a considerable increase in the amount of oil produced on account of the pilot water flood?

A Yes, sir.

Q Now, explain to the Commission your proposed expansion of this pilot.

A We propose to expand the pilot, if the Commission please, to take in additional area to the west of the current pilot area.

Q You are referring now to Exhibit 1?

A That's right. And using our Pearl No. 21 as a water input well, initiate an operation similar to the one that we have now in operation on our Pearl No. 26.

Q In other words, your well 21-B would be converted to water injection well? A Yes, sir.

Q What is that well capable of producing at the present time?

A That well is capable of producing approximately 15 barrels

of oil per day.

Q By this application, are you requesting that the 15 barrels be allocated to the same lease?

A Yes, sir, we are requesting that the 15 barrel allowable that is assigned to the well now be allocated to other wells on the same lease.

Q Are you asking for any increased allowable in any way?

A No, sir.

Q Do you have a log of Well 21-B? A Yes, sir.

Q Is that Exhibit No. 17? A That's right.

Q You might explain to the Commission anything that you think might be pertinent concerning that log.

A Merely for the benefit of the Commission, this well was completed initially August 28, 1948. It has been on production since that time, the well was originally completed at 4,190 feet, seven inch pipe was set at 3,920 feet, cemented with 200 sacks of cement. The well was initially shot with nitroglycerin in the intervals 4,004, 4,050, 4,104, 4,190. Initial production of the well was 64.8 barrels of oil. The gas-oil ratio of 758 cubic feet per barrel.

Q Mr. Mills, were Exhibits 15, 16 prepared by you?

A Yes.

Q And 17 is a true and correct copy of the log of that well?

A Yes, sir.

MR. HINKLE: I would like to offer Exhibits 15, 16 and 17 in evidence.

MR. PORTER: Without objection they will be admitted.

Q Mr. Mills, you have referred to converting Well 21-B to an injection well. Is this at an unorthodox location or is it at a regular location? By that I mean in the center of a 40 or of 40?

A It is an unorthodox location. It is what is referred to commonly as a five-spot well.

Q Are there any other wells in your proposed expansion?

A Yes, sir.

Q That are unorthodox? A Pardon me.

Q That are unorthodox locations? A Yes, sir, there are.

Q What are those wells?

A Those wells are including Pearl 21, Pearl 23, Pearl 26, Input No. 42, No. 44, No. 45.

Q Have those unorthodox locations all been heretofore approved by the Conservation Commission? A Yes, sir, they have.

Q Under what order, do you remember?

A Under Order No. 770 dated May 25, 1948.

Q Do you anticipate that if this expansion of the pilot is successful that other expansions will be necessary and that you will cooperate with the Operators Committee of the Maljamar Cooperative Repressuring Agreement in the event that they desire to eventually expand the initial pilot plant that they are inaugurating?

A Yes, sir.

Q Is it your intention that with these two pilot projects that eventually you will encompass the entire Maljamar Cooperative Repressure area?

A That is the ultimate plan.

Q Is it your opinion, as an engineer, by carrying on this water flood project you will recover a considerable amount of additional oil?

A Yes, sir.

MR. HINKLE: I believe that's all we have.

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

CROSS EXAMINATION

By MR. NUTTER:

Q Do you plan to keep No. 42 and No. 45 on the Pearl leases as injection wells?

A At the present time, Mr. Nutter, Pearl 42, 45 and 46 are gas input wells. We plan to continue injecting gas into those three wells.

MR. PORTER: Mr. Cooley, did you have a question?

MR. COOLEY: Yes, please.

By MR. COOLEY:

Q Mr. Mills, I think you testified that the allowable presently being assigned under the formula to the Pearl B Well No. 21 is 15 barrels per day?

A That's right.

Q It is your proposal that the figure remain constant through the life of this flood as a transfer figure?

A For that particular well.

Q Yes. Will there be a monthly calculation to be assigned to this non-producing well?

A I think that in our original application we are proposing to transfer the allowable of any producing well that has been established as of the first date of the month for that particular well, so in this case Pearl 21 has an allowable of 15 barrels per day. We propose to transfer that 15 barrels to other wells on the lease, and I presume that will be the case from here on out.

Q Maybe, Mr. Wright can help straighten me out on this.

MR. COOLEY: Will there be a monthly assignment of maybe 15, maybe some other figure, to this well, or will it always remain 15? If so, how do you determine it?

MR. WRIGHT: I think it will remain 15 until we feel that this 15 additional barrels will be harmful to the other wells in the lease.

MR. COOLEY: Harmful, do you say?

MR. WRIGHT: Harmful. In other words, you can take the 15 and 16 wells and assign it 15 barrels and not hurt the withdrawal from the large lease. You get into a lease with three or four wells and assign 15 barrels to other leases, it becomes detrimental under the pressure maintenance.

MR. COOLEY: Under your pressure formula, there would be no way to calculate a formula for the well without production figures?

MR. WRIGHT: It is quite complicated. Just like he was talking about the five-spot, there are two wells to the 40. Those two wells to the 40 can end up over 44 barrels top. Therefore, we assign that well 15 barrels. The other well in that 40 is taking the other 44 barrels. We therefore figure it out under our formula, it might end up 65 barrels, and therefore, proportioned down to where they end up with the 44 barrels.

A I think to definitely answer your question, Mr. Cooley, I think that the allowable as is established as of the first day of the month for any well, we propose to transfer the allowable on, will be transferred in that amount from there on out because --

Q (Interrupting) As of the first day of which month?

A The month that the allowable is transferred. In other words, the well has an allowable established 15 barrels right now as of the first of September.

Q Say we write the order tomorrow proving it is.---

A We want the authority to transfer from that well to other wells on the lease.

Q The effect of the order will be to fix the 15 barrels for every open well, will it not? A That's right.

MR. HINKLE: At least it could never exceed that amount.

A That's right.

MR. COOLEY: Is that also true, Mr. Wright, of the Baish 21-A?

MR. WRIGHT: That is another large lease, 16 well lease, so I don't think it would be harmful.

MR. COOLEY: It would be workable to fix that, to fix that, what was the estimate at, 25?

MR. WRIGHT: 25.

MR. COOLEY: It would be fixed at the day --

MR. WRIGHT: (Interrupting) It is converted into a water well.

MR. COOLEY: Until the day it is converted and remains so forever?

MR. WRIGHT: Yes.

Q Will the transfer be only to such wells inside the pilot area as outlined?

A Let me explain to you in the pilot area in the different parts of the field there are several different operators in that area. It will have to be transferred to his lease and not the entire pilot area. On the Pearl lease we control the entire Pearl lease.

Q The ownership is not common --

A (Interrupting) Not in the proposed pilot area in the center of the field. It is not common.

Q But on the Pearl it is? A Yes.

Q Would it be satisfactory to transfer to one of the six

wells included in the pilot area?

A We would want the authority.

Q To any one or all of them? A That's right.

Q But limited to the six wells? It couldn't be transferred to the 17-B out here to the south?

A My original statement, I said transfer to the lease. The lease, the Pearl lease encompasses the entire Section 25 and the west half of Section 30.

Q Do you think that the pilot water flood is affecting the 17-B? This is, transfer is being requested as a result of the pilot water flood project? A Yes.

Q It seems to me it should be transferred to the well that you reasonably anticipate will be affected by the pilot water flood.

A I_n all probability it would be the case.

Q It would be satisfactory to transfer to the six wells inside the pilot area?

A Well, I would rather not, I don't think that's the intent of the original application. I think the intent of the original application was the authority to transfer the allowable to other wells on the same basic lease.

Q Are you prepared to testify that any other well outside the pilot area will be affected by the pilot flood?

A Not at the present time. I might point out to clarify this particular situation, Mr. Cooley, it so happens that the

Pearl 21 Well is in the same 40 acre unit as our, as what is known as our Pearl No. 9 Well, so that well would automatically would have to have its allowable transferred over to the No. 9 Well, which is on the same basic 40 acre unit.

Q You didn't clarify a thing.

A I was merely trying to bring it out to you in this particular case those two wells are on the same 40 acre unit.

Q Same 40 acre unit, and as a unit, it is entitled to so much allowable? A That's right.

MR. HINKLE: You would be transferring the 15 barrels to the other well on the other well on that 40 acres.

Q If the 9-B can produce the 15 barrels, fine, but if it doesn't, you would want to transfer it to some other well?

A That's right.

MR. COOLEY: That's all.

MR. PORTER: Any further questions of the witness? Mr. Utz.

By MR. UTZ:

Q Mr. Mills, referring to your Exhibit No. 1, and particularly to your Pearl 26-B, what is the location of that well?

A Pearl No. 26 is located 2615 feet from the south line and 25 feet from the west line of Section 30, Township --

Q (Interrupting) It is to the northwest of the southwest of Section 30? A Yes.

MR. UTZ: That's all.

MR. PORTER: Any further questions? The witness may be excused.

(Witness excused.)

MR. PORTER: Does anyone have anything further to say in this case? We'll take the case under advisement and we will take up next Case 1310.

C E R T I F I C A T E

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 7th day of October, 1957.

Ada Dearnley
Notary Public-Court Reporter

My commission expires:

June 19, 1959.