BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
August 19, 1970

EXAMINER HEARING

IN THE MATTER OF:	Cases:
Case 4402: Application of Reserve Oil & Gas Co. for a unit agreement, Lea County, New Mexico	4402
Cases: 4403 & 4404: Application of Reserve Oil & Gas Co. for a waterflood project, Lea County, New Mexico	4403 4404

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

Case Numbers: 4402, 4403, 4404

MR. HATCH: This is the application of Reserve Oil and Gas Company for a unit agreement, Lea County, New Mexico. The applicant seeks approval for the Cooper-Jal Unit Area comprising 2581 acres, more or less, of Federal and fee lands in Township 24 South, Ranges 36 and 37 East, Lea County, New Mexico.

MR. LOSEE: Mr. Examiner, A. J. Losee of Artesia, appearing on behalf of the applicant, Reserve Oil and Gas Company. I have two witnesses in this case and the next two cases, 4403 and 4404.

MR. NUTTER: Are they companion cases?

MR. LOSEE: Yes. They are. Waterflood and we would move to consolidate. Let me mention that our exhibits -- I will have to be careful in connection with the record because they are chronologically numbered only by cases, but they are companion cases.

MR. NUTTER: We will call the next case, 4403.

MR. HATCH: Application of Reserve Oil and Gas Company for a waterflood project, Lea County, New Mexico. Applicant in the above styled cause seeks authority to institute a waterflood project by water injection through 26 wells into the lower Seven-Rivers and Queen Formations underlying its Cooper-Jal Unit Area, Langlie-Mattix Pool, Lea County, New Mexico.

MR. NUTTER: And Case 4404.

MR. MATCH: Case 4404: Application of Reserve Oil and Gas Company for a waterflood project, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a waterflood project by water injection through 23 wells into the Tansill Yates, and Upper and Middle Seven-Rivers formations underlying its Cooper-Jal Unit Area, Jalmat Pool, Lea County, New Mexico.

MR. NUTTER: Cases 4402, 4403 and 4404 will be consolidated for purposes of testimony

JOHN PINGREE

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

DIRECT EXAMINATION

BY MR. LOSEE

Q Would you state your residence and occupation, Mr. Pingree?

A I am Division Land Man for Reserve Oil and Gas Company located in Dallas, Texas.

Q You have not previously testified before this Commission?

A No. I have not.

Q Would you state what colleges you attended and the degrees obtained?

A I graduated from S.M.U. in 1950 with a B.A. in

Industrial Engineering.

Q Would you give a synopsis of your professional experience since your graduation from college?

A Yes, sir. I was employed by Magnolia Oil Company as a Land Man until 1960 when I went with Producing Properties, Incorporated as a manager of the Land Department and later with James A. Lusk Engineering, Dallas, as manager of the Land Department. Joined Reserve Oil and Gas Company in 1963 as Division Land Man.

MR. LOSEE: Mr. Examiner, are Mr. Pingree's qualifications accepted?

MR. NUTTER: Yes. They are.

Q Now, referring to Case 4402, would you explain briefly the purpose of the application?

A This is to secure approval from the New Mexico Oil Conservation Commission for Cooper-Jal Unit agreement for the orderly implementation of a waterflood operation in the Unit Area.

Q Was an Engineering Committee appointed to study this area?

A Yes. An Engineering Committee was appointed and held their initial meeting on May 19, 1967.

Q And has that Committee been working with the operators since that date to form this unit?

A Yes, sir. They have.

Q How many acres are in the Unit Agreement?

A Two thousand five hundred eighty-one acres.

Q Of those acres, what percentage is land owned by the United States?

A Twenty-eight point eighty-six percent or seven hundred forty-four point seventy-nine acres.

Q Are there any lands owned by the State of New Mexico?

A No.

Q What is the remaining percentage which is owned by private individuals?

A Seventy-one point one four percent or one thousand eight hundred thirty-six point twenty-one acres.

Q Has the United States designated this area as logically subject to unit possession?

A Yes. They have, by letter dated January 5, 1970.

Q Did the United States approve the form of Unit Agreement which has been marked as Exhibit 1?

A Yes, sir, also by the January 5, 1970 letter.

Q And the lands proposed to be included within this Unit Area are shown on Exhibit A to the Unit Agreement?

A Yes, they are.

Q What formations do you propose to be utilized?

A Tansill, Yates, Seven-Rivers and Queen's formation.

Q Now, what field or fields are included within this

unitized formation?

A Jalmat oil, Jalmat gas, and Langlie-Mattix.

Q What participation formula is adopted under Article 13 of the Unit Agreement?

A This Unit has two phases. Phase 1, which is based on one hundred percent total income for the year 1967 -- this Phase 1 will remain in effect until one million barrels has been produced from the Unit Area after 1, 1, 68. Phase 2 which would commence thereafter is based on one hundred percent of ultimate recovery as determined by the Engineering Committee.

Q Ultimate primary recovery?

A Yes.

Q What are some of the other participating factors that were considered by the Committee in the operation over the past three years?

A Well, total acres, the developed acres, number of oil wells, number of gas wells, total wells, 1967 oil production, 1967 casing head gas production, 1968 dry gas production, cumulative oil, remaining primary, ultimate primary and remaining dry gas.

Q Can you briefly explain why the Committee and the operators disregarded these others and came up with the formula you earlier mentioned?

A They could not reach an agreement as to the participation based on any of the other factors.

Q Who is designated as Unit Operator under the Agreement?

A Reserve Oil and Gas Company.

Q Under the provisions of Article 14 when is a Tract qualified for participation?

A When one hundred percent of the working interest owners, seventy-five percent of the royalty interest owners ratify the Unit.

Q Are all of the tracts within the Unit Area qualified for participation at this time?

A All except Tract No. 27 under which the working interest ownership is in dispute and we have been unable to obtain sufficient working interest on the ratification of the Unit Agreement to qualify this tract.

MR. NUTTER: That appears to be a forty acre tract, is that correct?

WITNESS: Yes, sir

Q And there is no producing well on that tract at this time?

A That is correct.

Q Now, has the United States requested that even though this tract is uncommitted at this time it be included within the Unit Area so that if the ownership problem can be eventually solved, commitment may be obtained?

A Yes, sir. They have.

Q Has Reserve contacted all of the interest owners and given them an opportunity to commit their interest to the Unit Agreement?

A We have contacted all of the royalty interest owners with the exception of three royalty owners under Tract No. 12 and we, Reserve Oil and Gas, nor the pipeline purchaser of the crude from this tract have been able to locate or give an address for these parties.

Q Their failure to ratify it does not prevent commitment of that tract?

A No, sir. They have a small royalty interest on it.

Q Now, please refer to Exhibit 2 in Case 4402 and explain briefly what is shown by this exhibit.

A Exhibit 2 we have set out by tracts the working interest, the overriding royalty interest and the royalty interest and the percentage as set out is a percentage of the working interest. Where it says a hundred, that shows a hundred percent of the working interest override and each tract, each classification under each tract is broken down into the percentage that it bears to the total. You will note where we say tract participation percentage, that is the percentage that their interest bears to the total. The second column which is percent of unit signed shows what part of that percentage has been signed by each owner, working interest, overriding or royalty interest owner.

Q Now, will this schedule show that all tracts except twenty-seven have a hundred percent of the working interest committed in at least seventy-five percent of the royalty interest committed?

A Yes. It does.

Q Under Article 20, 22 of the Agreement, when does it become effective?

A The Unit Agreement will become effective 7:00 A.M. on the first day of the month following three things: One, when we have received ratification of the Unit by eighty-five percent of the working interest owners, sixty-five percent of the royalty interest owners, approval by the New Mexico Oil Conservation Commission and the United States Geogolical Service and the filing of the Unit Agreement for records in Lea County, New Mexico.

Q In your opinion is the plan contained in the Unit Agreement for the development operation of the Cooper-Jal Unit area a proper conservation measure?

A Yes, sir. It is.

Q Will it prevent waste and will it protect the correlative rights within the Unit Area?

A Yes. It does.

MR. LOSEE: I have no further questions at this time of this witness, Mr. Examiner.

The next witness will cover the Engineering and Geogolical portions.

CROSS EXAMINATION

BY MR. NUTTER

Q Mr. Pingree, I didn't understand what percentage of the working interest you said had been committed.

A One hundred percent in all the tracts except Tract 27.

Q One hundred percent in all the tracts except Tract 27?

A Yes, sir.

Q Then you mentioned that three royalty owners have not been contacted because they haven't been located?

A Under Tract 12.

Q Under Tract 12?

A Yes, sir.

Q What percent of the total royalty owners have committed their interest?

A All the royalty interest owners with the exception of -- I am sorry -- I don't have the figures of the percentage of the total royalty committed, but we have only one lady in Tract 13 -- Mrs. Jessie Cooper -- and she owns a four point zero eight percent of that tract. Then we have the three owners under Tract 12.

Q So you do have a hundred percent of the working interest with that one tract exempt and you have the seventy-five percent royalty interest in every case?

A Except Tract 27.

Q So it is all committed then except Tract 27?

A Yes.

Q And there is no producing well therein?

A That is right.

MR. LOSEE: Let me take a minute to make a statement with respect to Tract 27. As he has testified, the United States, because the approval was given in Washington with the inclusion of this tract, they asked that we submit the unit with Tract 27, realizing at this time that it is not going to be committed. As a result, our application asks to include Tract 27 which, of course, will not be committed. Now, our waterflood application is delete Tract 27. If it is committed and that is taken into the project area, we will have to move to enlarge it.

MR. NUTTER: I see.

Are there any further questions of Mr. Pingree?

He may be excused.

(Witness excused)

Wyndel Thomas, having been first duly sworn, was examined and testified as follows

DIRECT EXAMINATION

BY MR. LOSEE:

Q State your residence and occupation, Mr. Thomas.

A I am Division Petroleum Engineer of the Reserve Oil and Gas Company in Dallas, Texas.

Q You have not previously testified before this Commission and had your qualifications accepted?

A No, sir.

Q Would you state what colleges you have attended?

A Yes.

Q And what degree you obtained?

A I graduated from the University of Texas in 1958 with a Bachelor of Science in Petroleum Engineering. Following my graduation I have held various engineering positions with Honolulu Oil Corporation, American Petrofina Company of Texas, James A. Lusk Engineering and Reserve Oil and Gas.

MR. LOSEE: Are his qualifications acceptable?

MR. NUTTER: Yes. They are.

MR. LOSEE: I have marked an exhibit within the brochure erroneously, Mr. Examiner. They need to be --

MR. NUTTER: You can mark them all on the outside. We will just change them as we go through them.

Q Our first presentation will really be with respect to Case 4404, I think, which is the Jalmat. Explain briefly the purpose of the applicant's request in Case 4404.

A Reserve Oil and Gas Company, as the largest working interest owner in the designated Unit Operator, seeks approval to install a waterflood project in a portion of the Jalmat field, Lea County, New Mexico, in order to inject water into the Yates formation for the purpose of recovering oil reserves

which would otherwise be left in the reservoir.

Q Now, Mr. Thomas, what formations are included in the Unit area within the Jalmat field?

A Within the Unit area we have the Jalmat designation from the top of the Tansill formation, all of the Yates and all that -- the lower two hundred fifty feet of the Seven-Rivers formation.

Q Now, is the acreage covered in the proposed project area shown on your Exhibit 1?

A Yes, sir. Exhibit 1 shows thereon the outline of our proposed project area and you will note that we have also indicated the Federal acreage on the same exhibit. This project is located approximately six miles north of Jal in Lea County, New Mexico and the project area will contain approximately two thousand five hundred forty-one acres. The waterflood project will eventually contain twenty-three injection wells, twenty-two oil producing wells and five dry gas wells. At the end of 1969 nine wells were producing gas from the Yates formation within the proposed project area along with twenty-seven oil wells. Four of the present gas producing wells and three of the shutin gas wells will be later converted to water injection wells. Six of the gas wells will remain as gas producers.

Q Are there currently any other Yates waterflood projects in the area?

A Yes, sir. The Cone Jalmat Yates Unit and the Gulf Jalmat Yates Unit are located approximately twelve miles northwest of the proposed project area. Both projects appear to have responded favorably to the water injection. Injection programs were commenced at about 1961 in the Gulf project and in 1963 in the Cone project.

Q Does this proposed unitization cover only a portion of the pool?

A That is correct.

Q Have you considered border and leaseline injection agreements with offset operators?

A We have considered them. We have not entered into any since we only have one area that this will cover later on in the project. You will note most of the oil producing portions of the reservoir is within the proposed project area. The southwest area of the injection project will be evaluated as the proposal progresses to determine the feasibility of leaseline agreements.

Q Will you briefly tell us about the reservoir of the Yates, of the Jalmat Pool?

A All right, sir. If you will refer to Exhibit 2 of the brochure, this is a typical well log and comes from a well within the Unit area. We believe this log shows the characteristics of the Yates formation which is found at an average depth of about three thousand feet. The Yates

formation may be described as fine to medium crystalline dolomites and dolomitic limestones interbedded with fine to medium grained sands with the zones of porosity occurring irregularly as intercrystalline and fine vugular in the carbonates and as intergranular in the sand bodies. Regionally the Unit Area is located on the western edge of the central basin platform of the Permian basin but locally it is on a structurally low area or syncline and if you would refer to the Exhibit 3, perhaps this will be readily apparent. The regional dip in the area is west-southwest toward the Delaware basin but it is abruptly interrupted by a structurally high trend produced by the Cooper-Jal reef located to the west of the Unit Area. The northwest-southeast trending syncline produced by this reversal of dip extends beyond the Unit Area in both directions and is abnormally low locally to actually form a closed low in which most of the Unit is located. As we have indicated on Exhibit 3, the Yates formation is progressively higher structurally in all directions such that the oil accumulation in the Yates formation is virtually surrounded by wells producing dry gas from the Yates formation.

Now, if you will turn for a minute back to Exhibit 1, we have noted on this exhibit the status of the wells outside of the proposed Unit boundary and you will note that most of the wells located west of the Unit boundary have been plugged and

abandoned are recompleted as Jalmat gas wells. The annual report of the New Mexico Oil and Gas Engineering Committee lists most of these wells as having produced from the Jalmat oilfield. However, the oil recovery from these wells is far in excess of that produced by wells within the Unit Area.

Now I call your attention to the C. D. Woolworth Well No. 14 located in Section 26 -- that would be Unit L. It is classified as a Jalmat oilfield completion but during the year 1969 this well produced four thousand six hundred twenty-nine barrels of oil and one hundred seventy-three thousand seven hundred fifty-nine barrels of water. Based on this analysis we do not consider this to be the same producing horizon that we are dealing with in our unitized area. The average porosity of the Yates formation pay zone is estimated to be nine point eight percent and the permeability is estimated to be eleven point eight millidarcies. These averages were obtained from three hundred twenty-one samples which were available from the Yates formation within the Unit Area.

Q Was there sufficient reservoir data available to construct a net isopach map?

A In the Engineering Committee we reviewed all of the available data and available logs and the consensus of opinion was that there were not sufficient qualitative data available to construct such a map. Furthermore, we concluded that a gross pay aspect map would be of no value.

Q What can you say about the primary operations in the area of this project?

A The first oil production from the Jalmat zone occurred in 1947. By 1954 all drilling of the unit area had been completed with the greatest drilling activity occurring in 1950 when nineteen wells were completed. Several wells which once produced from the Langlie-Mattix Pool have been plugged back to the Jalmat Pool and also we have seven wells within the project area with cumulative oil production ranging from twenty six thousand to one hundred twenty-nine thousand barrels of Yates oil which have been reclassified as Jalmat gas pool wells. Now, a listing of these wells -- we have the Maggie Dunn Number 1, Maggie Dunn No. 2, Maggie Dunn No. 3, Jack Federal Number 4, A. J. Falby Number 3, C. C. Fristos "B" Number 1, Van Zant Number 4. Now, I will discuss these wells in greater detail when we move on to our next exhibit. The Unit also contains six dry gas wells which have not produced any Yates oil. The cumulative oil production from the Jalmat Zone on January 1, 1970 was three million nine-hundred twenty-seven thousand barrels. At that date the estimated remaining primary reserves were one hundred thirty-three thousand barrels. The daily average oil production per well for the twenty-seven wells which were producing oil during December of 1969 was three point six barrels of oil per day. At this stage all wells have reached an advanced

stripper stage of depletion. The oil is being produced by solution gas drive and the reservoir at this time is estimated to be ninety-six point eight percent depleted as to its primary reserves. The estimated ultimate primary recovery from the Unit Area is four million barrels. The dry gas production from the Unit Area during the year 1969 was four hundred seventy-eight thousand F.C.M. from nine wells.

Q Would you please refer to Exhibit 4 and outline your plans for recovery of additional oil by waterflooding?

A Exhibit 4 denotes the waterflood pattern for the Jalmat Zone. It is planned to have eventually twenty-three injection wells and twenty-two producers. As I mentioned earlier, there were several wells which had produced oil that were later converted to statutory oil wells. On Exhibit 4 I have indicated these wells with a blue circle surrounded by an orange triangle. The wells which produce only dry gas are indicated only by an orange triangle. In our negotiations and in the Engineering Committee we concluded that to effect the maximum oil recovery from this particular producing interval it would be necessary for us to include these leases containing the wells which had produced oil previously. It was the opinion that there would be residual oil left. It would not be recovered otherwise.

Now, you will also note on this exhibit that we have some dashed lines going to several of these gas wells that are

indicated to be future injectors. The timing of the conversion of these wells to injection service will be dependent upon the volume of production from the gas wells and the performance of the surrounding pattern. We do not plan to commence injection into all of the gas wells immediately but we would prefer to see how our project advances and performs as to each individual pattern. We plan to inject approximately three hundred fifty barrels of water per day into each injection well. The injection pressure is estimated to be twelve hundred P.S.I. at the well head. However, we have designed our injection plant and the system for a maximum operating pressure of eighteen hundred forty-five P.S.I., so that we will have additional pressure available if it is required.

Q Please refer to what has been marked as Exhibits 5 and 6, being the diagrammatic sketches of typical completions and explain what is shown by these.

A Yes, sir. Exhibit No. 5 and 6 are diagrammatic sketches of a typically singly completed injection well and typically completed dual well. All of the injection wells within the project area will be completed as illustrated in these exhibits. Referring to Exhibit 5, which is the singly completed injection well, we will inject down 2-3/8" internally coated tubing below a tension type packer which will be set approximately fifty feet above the casing shoe or perforations, depending upon whether the well is an open hole completion or

a perforated completion.

In Exhibit 6, the dually completed injection well, we will inject down 2-3/8" internally coated tubing. A permanent packer will separate the Jalmat Zone from the deeper Langlie-Mattix Zone and a tandem tension packer will be set approximately fifty feet above the Jalmat perforation.

Control of the water injected into each zone will be by means of two down hole regulators as illustrated in the sketch. The casing tubing anulus will contain inhibited fresh water.

In conjunction with our injection wells we have Exhibit 7 which is a tabulation of the casing tubing and packer setting for all of the injection wells. The minimum amount of cement coverage above the injection interval is approximately 170'.

Q And most of them are actually greater than 170'?

A That is correct.

Q Will there be positive protection against the pollution of the fresh water aquifer.

A Yes, sir. All aquifers from the surface down to total depth of completed interval will be protected by the existing casing strings and by maintaining their condition -- also periodic checks of the pressure on the tubing casing annulus will immediately give us an indication of any problem that might develop.

Q You mentioned dual injection wells. Will you explain these further?

A The twenty-three proposed injection wells -- we will have five dual injectors. These are the Petroleum Corporation of Texas Maggie Dunn No. 2; Cities Service Jack "A" Federal No. 1 --

MR. NUTTER: We better take those slowly so we can get those. Maybe you can just give the locations as well. Are they listed in the application?

WITNESS: We have noted in the remarks on Exhibit 7 the dual injectors and we can give you the locations.

MR. NUTTER: O.K. They are identified on the application anyway, so you don't have to take it so slow.

WITNESS: All right, sir. The Continental Oil Jack Federal No. 1; Humble No. 4 and Amerada Falby No. 3. Through each of these wells water will be injected into both the Jalmat and Langlie-Mattix Zone. These dual wells will be completed as previously discussed. The fresh water acquifers will be protected in these wells in the same manner as in the singly completed injection wells.

Q What will be the source of your injection water?

A The injection water will be purchased from Skelley Oil Company. In addition to the water purchased, all water produced with the oil will be reinjected. The volume of produced water will not be significant initially.

Q Do you know the quality of the water that you will purchase from Skelley?

A It is classified as saline and non-potable.

Q Will you treat the water prior to injection?

A No, sir. Our injection system and tubing will be coated to prevent corrosion. However, in the future, if tests indicate filtration or chemical treatment is desirable, we will take the appropriate action.

Q How much additional oil do you think will be recovered from the project area due to this proposed water injection program?

A We estimate three million barrels of additional oil will be recovered by this waterflood project. This estimate is based on the waterflood recovery being seventy-five percent of the estimated ultimate primary recovery. Recovery of this additional oil will increase the productive life of the wells in the Unit Area.

Q Do you believe this proposed water injection project is in the best interest of conservation and prevention of waste?

A Yes, sir. Under primary operations only a small percentage of the oil in place will be recovered and we feel that the proposed water injection project will recover approximately an additional fifteen percent of the oil in place and at the same time increase the productive life of the wells in the proposed units. We have estimated that twelve years will be required to complete the reservoir

under waterflood operations. Without the waterflood project, most of the wells would be abandoned in the near future as most of the wells are at or near the economic limit.

MR. LOSEE: Mr. Examiner, would you like for me to proceed then to the other project?

MR. NUTTER: Just go right on.

Q Now, the application in Case No. 4403 is for approval of a waterflood project in what zones or field?

A This approval is requested for the installation of a waterflood project in a portion of the Langley-Mattix field located in Lea County, New Mexico in order to inject water into the lower two hundred fifty feet of the Seven-Rivers formation and the entire Queen formation for the purpose of recovering oil reserves which would otherwise be left in the reservoir.

Q Now, your Exhibit No. 1 then in Case No. 4403 reflects the outline of the project area?

A Yes, sir. This exhibit shows thereon the outline of our project area and, once again, it is located approximately six miles north of Jal-New Mexico. This project area will contain two thousand five hundred forty-one acres. At the end of 1969 thirty wells were producing from the Langley-Mattix zone. However, many of the Langley-Mattix zone wells have been plugged back to the Jalmat zone, temporarily abandoned or shut in. The project will eventually include

approximately fifty-one wells of which twenty-six will be injectors.

Q Are there any other Langley-Mattix zone waterflood projects in this area?

A Yes. There are several other projects in operation in this pool. The Amerada operated Woolworth unit is located two miles to the east. The Continental Oil operated Langley Jack unit is located approximately one and one-half miles to the east. In addition, several other projects are in operation in the general area as well as several other projects in planning stages.

Q Now, again, it appears that this is the only unitization or waterflood project in a portion of the pool.

A That is correct.

Q Have you entered into any leaseline or border agreements surrounding the project area?

A On the extreme northern boundary of the unit we planned planned to cooperate with the proposed Myers, Langley-Mattix unit when it is formed. Also, if possible, we plan cooperative injection with Continental on their Jack "B" Seventeen lease which is on the northeast area. On the west boundary of the unit, if you will refer to Exhibit 1, most of the wells adjacent to the unit boundary have been plugged and abandoned or they have since been recompleted as Jalmat Gas wells.

I would call your attention, however, to one well, the C. D. Woolworth No. 7 located in Section 23. It is presently classified as a Langley-Mattix complex. However, during 1969 this well produced five thousand six hundred eighty-six barrels of oil and one hundred ten thousand three hundred forty-three barrels of water. The production history indicates that this well is not in common with the Langley-Mattix zone proposed for water injection. In this project along the southern and eastern boundaries of the unit there are no wells completed in the Langley-Mattix zone.

Q Are any of the nearby Langley-Mattix waterflood projects responding favorably?

A Yes. Most of the waterflood projects in the Langley-Mattix zone have responded favorably to the water injection program. The Langley-Mattix unit has increased in oil production from about four thousand barrels per month at the start of the flood to approximately fifty thousand barrels per month at the present time. This project has been expanded at least twice and in all probability has not reached its peak at this time.

Q Will you tell us something further about the Langley-Mattix reservoir consisting of the lower two hundred fifty feet of the Seven-Rivers and the entire Queen formation.

A Referring to Exhibit 2, we have a typical well log. We have the proposed area and we have indicated on this log

the top of the proposed unitized interval and the bottom of the proposed interval of which we believe this log shows the characteristic productive zone as exists in the lower Seven-Rivers Queen formations. The average depth of the productive zone is about thirty-five hundred feet and is either Seven-Rivers or Queen, depending upon the structural position of the individual well. The Seven-Rivers is the predominant producing formation within the unit area and that formation may be described as fine to medium crystalline dolomites and dolomitic limestones interbedded with fine to medium grained sands with zones of porosity occurring irregularly as intercrystalline and fine vugular in the carbonates and as intergranular in the sand bodies.

If you will refer to Exhibit 3, which is a structure map contoured on top of the Yates formation. Regionally, the unit area is located on the western edge of the central basin platform of the Permian Basin but locally it is on a structurally low area or syncline. The regional dip of the area is west-southwest toward the Delaware Basin but is abruptly interrupted by a structurally high trend produced by the Cooper-Jal Reef located to the west of the unit area. The northwest-southeast trending syncline produced by this reversal of dip extends beyond the unit area in both directions and is abnormally low locally to actually form a closed low in which most of the unit is located. As a result of these

structural conditions the oil accumulation has been greater in the beds than this whole area. The oil bearing zones are progressively higher structurally to both the east and west until they pinch out or become altered by facies changes in those directions. Along the axis of the syncline the formations involved are all oil productive elsewhere, particularly in local, abnormally low areas such as that of this area.

Q What is the porosity and premeability of the Langley-Mattix zone in this area.

A In this particular zone we have only a limited amount of core analysis data and based on forty-five samples available, the average premeability was nineteen point five millidarcies and the average porosity of fourteen point two percent.

Q Can you briefly outline what the primary operations were in this area?

A The first oil production occurred in 1941. By the end of 1950 twenty-five wells were producing and by the end of 1956, when the last well was drilled, approximately fifty-three wells had been drilled. The year of greatest drilling activity was 1954 when twenty wells were completed. At the end of 1969 thirty wells were producing from the Langley-Mattix pool. As many of the wells had been plugged back to the Jalmat zone or temporarily abandoned, the cumulative production to January 1, 1970 was two million twenty-eight

thousand barrels. During December of 1969 the daily average oil producing per well was only 2.1 barrels, which, once again, indicates the advanced stripper stage of depletion.

Based on our decline curve analysis it is estimated as of January 1, 1970 the remaining primary oil reserve is for approximately sixty five thousand barrels. The ultimate, up to the primary oil recovery, is estimated to be two million barrels of oil. Based on these estimates the reservoir at this time is ninety-six point nine percent depleted of primary oil reserves. The reserves produced by solution gas drive and the original reservoir pressure is unknown. The average G.O.R. for 1969 was nineteen thousand five hundred cubic feet per barrel.

Q Would you tell us something about your plans for recovery of additional oil by waterflooding?

A Yes. If you would refer to Exhibit 4, we have shown thereon the proposed injection pattern. We do not plan to install a pilot flood since we believe the other floods in the area have adequately indicated that a favorable response may be anticipated. The initial injection rate will be approximately three hundred fifty barrels per injection well per day. Injection pressure is estimated to be twelve hundred P.S.I. at the well head. However, our injection plant and system will be designed for eighteen hundred forty-five P.S.I.

Q How do you plan to inject the water into these wells?

A Referring to Exhibits No. 5, 6, 7, and 8, we have shown as diagrammatic sketches the diagram of the typical injection well. All of the injection wells will be completed essentially as shown on the diagrammatic sketches. Injection will be down 2-3/8" entirely coated tubing below a tension type packer approximately fifty feet above the casing shoe and into the lower Seven-Rivers and Queen formations through perforations or open holes as the case may be. Except for dually completed wells producing gas out of the annulus, the tubing case annulus will contain fresh water inhibited for corrosion protection.

Q Now, please refer to what is Exhibit 9 and explain what is shown by this exhibit.

A This exhibit contains the tabulation of the casing tubing and packer settings for all of the injection wells in the project area. The minimum cement coverage above the injection interval is one hundred feet. However, this is the minimum point and most of the wells will have far in excess of this amount.

Q In this manner do you believe there will be positive protection against pollution of the fresh water acquifer?

A Yes. All acquifers from the surface down to total depth of the completed interval will be protected by the existing casing strings and by maintaining this condition. Also a periodic checking of the pressure on the tubing casing

annulus will immediately provide any indication of any trouble.

Q Now, you mentioned dual injection wells. Will you explain that a little further, please?

A Yes, sir. Of the twenty-six proposed injection wells six wells will be duals. We have indicated on Exhibit No. 9, in the remarks column, which of these wells will be dually completed as injection wells. Listing the wells we have the Reserve Oil and Gas Gutman No. 1 which will be an injection well in the Langley-Mattix zone and a producer from the Jalmat Gas pool. The following wells will be injectors in both Langley-Mattix and Jalmat zones. They are the Petroleum Corporation Maggie Dunn No. 2; Cities Service Jack "A" Federal No. 1; Continental Jack Federal No. 1; Humble Hunter No. 4 and the Amerada Falby No. 3.

Q Again, these are wells listed in your application before the Commission, these dual wells?

A That is correct.

Q Do you see any difficulties in preventing the injection of water from entering the Jalmat zone of the Reserve Gutman well No. 1?

A No, sir. This well will have five and a half inch casing set three thousand four hundred forty-eight feet and the water will be injected beneath a packer set at approximately thirty-four hundred feet into the open hole interval from thirty four forty-eight to thirty-five ninety-one feet.

The Jalmat zone produces gas through perforations from twenty-nine forty-eight to three thousand forty-eight feet. The Jalmat zone will be adequately protected by four hundred feet of cement casing. Any comingling between the water injection zone and the gas producing zone will be immediately apparent.

Q What about the duals that will become dual injectors?

A Well, these wells will be completed as shown on the diagrammatic sketches. A permanent packer will separate the Jalmat zone from the Langley-Mattix zone and a tandem tension packer will be set approximately fifty feet above the Jalmat perforation. Injection will be down 2-3/8" internally coated tubing and the control of the injected water into each zone will be by means of two down-hole regulators as illustrated on the sketches. Casing tubing annulus will contain inhibited fresh water.

Q Now, again, Mr. Thomas, the source of your injection water, the quality and its treatment prior to the injection will be the same for the Langley-Mattix zone as for the Jalmat zone?

A That is correct.

Q How much additional oil do you think will be recovered from the project area due to the proposed program?

A We estimate a million five hundred seventy thousand barrels of additional oil will be recovered by this waterflood

project. This estimation is based on the waterflood recovery being seventy-five percent of the estimated ultimate primary recovery. Recovery of this additional oil will increase the productive life of the wells in the Unit area.

Q Do you believe that the proposed water injection project is in the best interest of conservation and will prevent waste?

A Yes, sir. Under primary operations on this, only a small percentage of the oil in place will be recovered. We feel the proposed water injection project will recover an additional fifteen percent of the oil in place and at the same time increase the productive life of the wells in the proposed Unit. We estimate eight years will be required to deplete the reservoir under waterflood operations and without this waterflood project most of the wells would be abandoned in the near future as many of them are near or below the economic limit.

Q Mr. Thomas, were Exhibits 1 through 9 in Case 4403 and Exhibits 1 through 7 in Case 4404 prepared by you or under your supervision?

A Yes, sir. They were.

MR. LOSEE: Let me ask the other witness one question.

Mr. Pingree, was Exhibit 2 prepared -- in Case No. 4402 -- prepared by you?

MR. PINGREE: Yes.

MR. LOSEE: We move introduction of the applicant's exhibits.

MR. NUTTER: Applicant's exhibits in Cases 4402, 03, and 4 will be admitted in evidence.

(Whereupon, Applicant's Exhibits were marked for identification)

MR. LOSEE: I have no further direct examination.

MR. NUTTER: Anyone have any questions of Mr. Thomas?

CROSS EXAMINATION

BY MR. NUTTER

Q Mr. Thomas, in Case No. 4404 you mentioned, when you were referring to the dual injectors that the annulus would be loaded with an inhibited fresh water. That also applies to the single injectors too?

A Yes.

Q So all injectors except the ones where you are producing through the annulus would have the annulus loaded with an inhibited fluid and that annulus can be equipped with a pressure gage to detect leakage?

A Yes, sir. They will be so equipped.

MR. NUTTER: Are there any other questions of Mr. Thomas?

He may be excused.

(Witness excused)

Do you have anything further in this case, Mr. Losee?

MR. LOSEE: No, sir.

MR. NUTTER: We will take these cases under advisement and I will recess the hearing until 1:15.

(Whereupon a recess was held which ended this oil hearing)

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STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, Peter A. Lumia, Court Reporter, 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 Commission was reported by me and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Peter A. Lumia
Court Reporter

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 4402, 4403, 4404 heard by me on 8/19, 1970.

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

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