

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

EXAMINER HEARING

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)
IN THE MATTER OF:)

)
Application of Reserve)
Oil and Gas Company)
for a unit agreement,)
Lea County, New Mexico)
-----)

Case No. 4405

AND

-----)
)
IN THE MATTER OF:)

)
Application of Reserve)
Oil and Gas Company)
for a waterflood project)
Lea County, New Mexico)
-----)

Case No. 4406

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

MR. NUTTER: First Case, No. 4405.

MR. HATCH: Application of Reserve Oil and Gas Company for a unit agreement, Lea County, New Mexico.

MR. LOSEE: I am A. J. Losee, Artesia. I have two witnesses who have earlier been sworn. This is a companion case to 4406. I request they be consolidated for hearing purposes only.

MR. NUTTER: We will call 4406.

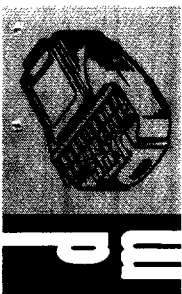
MR. HATCH: 4406, Application of Reserve Oil and Gas Company for a waterflood project, Lea County, New Mexico.

MR. NUTTER: For purposes of testimony, Case 4405 and Case 4406 will be consolidated. Both your witnesses are sworn and under oath. You may proceed, please.

MR. LOSEE: Let me first, Mr. Examiner, in our application on 4405, which is for the unit agreement approval of the South Langlie-Jal Unit agreement, ask to amend it so that the unadvertised formation is shown to be the Seven Rivers and down to a 150 feet above the base of the Queen, in affect, deleting the bottom 150 feet of the Queen.

MR. NUTTER: You are amending your application since the vertical limits are not specified in the legal notice of this case.

MR. LOSEE: We also wish to amend our application in 4406 to delete three proposed injection wells at this time



realizing that they may subsequently be converted to injection. It's unit tract No. 7, Well No. -- page two, Unit K, Section 8. Delete it down the last two wells, Unit Tract 9, Well No. 1, Unit K, Section 17, Tract Unit, Tract 10, Well No. 2-D, Unit M, Section 17.

MR. NUTTER: The three or four mentioned wells will be deleted from the application and so the application, Mr. Losee, in 4406 would be for institution of waterflood project of water injection through ten wells into the Seven Rivers and Queen formations.

MR. LOSEE: Yes, sir.

MR. NUTTER: So the application is amended, then, and we will hear the case for ten wells in this waterflood.

JOHN N. FINGRIE,

a witness, being first duly sworn according to law, upon his oath, testified as follows:

DIRECT EXAMINATION

BY MR. LOSEE:

Q Mister Pingrie, when did the engineer commence study on the South Langlie-Jal Unit agreement?

A In June 1969.

Q How many acres are within the proposed unit area?

A One thousand eighty acres.

Q Are any of these lands owned by the US or State of New Mexico?

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A No, no land owned by either one.

Q What formations are unadvertised under the South Langlie-Jal Unit agreement?

A From the top of Seven Rivers down to 150 feet above the base of the Queen formation.

Q What participation formula is adopted in Article 5 of the unit agreement?

A It has just one phase, which is a hundred per cent primary.

Q What are some of the other participation factors considered by the operators?

A Six other developed acres, 1968 oil production, 1968 casing head production, 1968 current income cumulative oil and remaining primary.

Q Why were these other factors disregarded?

A Because the working interest owners could not agree on equitable participation using any of these factors.

Q Under the provisions of Article 9 of the unit agreement, when does a tract become qualified for participation?

A When we have received one hundred per cent of the interest owners, of the working interest owners for application unit and 85 per cent of the royalty owners for ratification of the interest and 85 per cent of the royalty interest owners for ratification of the unit.

Q Who is designated as unit operator?

A Reserve Oil and Gas Company.

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 the owners with the exception of two, one owner under Tract 5 and one royalty owner under Tract 6.

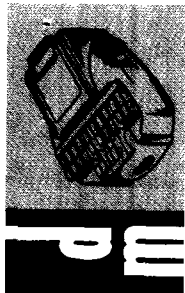
Q Why did you not contact those people?

A These people -- we were unable from pipeline purchasers or from internal records -- we have in one case contacted the people's attorney and believe we will be able to get ahold of them soon.

Q Under the requirement of one hundred per cent of the working interest and 85 per cent of the royalty interest are all of the tracts within this unit qualified for participation?

A Yes, upon the ratification of Atlantic Richfield Company. We have not secured their ratification. However, we understand they have wired the New Mexico Oil Conservation Commission to the effect they are agreeable and have ratified the unit subject to ratification by their production payment holders.

Q Did they also advise you that their production payment holders had orally consented on the telephone to



commitment of their interest to this unit?

A They have so advised.

Q What tracts are affected by Atlantic's ratification or without their ratification would not be committed?

A Two, three, four and eleven.

Q Please refer to what is Exhibit 2 and explain what is shown by this exhibit, Mr. Pingrie.

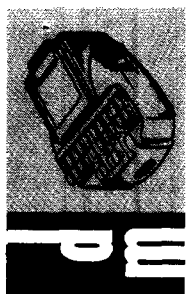
A Exhibit 2 is a schedule by tract listing the working interest owners and of the overriding royalty and the royalty interest owners under each tract. The percentage tract ownership interest set over for each owner is their net interest in that lease and tract. The total interest figures total forty-seven hundred dollars, which, in addition to showing, calculate the hundred per cent ownership under the least. You will note in pencil that there has been some percentages set out as to the signed and unsigned portion under each tract and under each owner of the per cent that is signed and unsigned.

Q Does this Exhibit 2 show that all tracts have at least a hundred per cent of the working interest and at least 85 per cent of the royalty interest except for Atlantic's commitment under Tracts 2, 3, 4 and 11?

A Yes, it does so show.

Q Under Article 17, when does the unit become effective?

A The unit will be effective as determined by the working



interest owners and set out by a Certificate of Effectiveness in Lea County, New Mexico, after the current three things: first, that we have 80 per cent of the unit area has qualified by ratification of each tract as to one hundred per cent of the working interest owners and 85 per cent of the royalty interest owners and after approval of the unit by the Oil Conservation Commission and three, the filing of the unit agreement of record in Lea County, New Mexico.

Q Now, with Atlantic's commitment all of these things will have been accomplished except one, the approval of the Commission and the Certificate of Effectiveness?

A And the recording.

Q And the recording. In your opinion, is the plan contained in the unit agreement for development of and operation of the South Langlie-Jal unit agreement a proper conservation measure?

A Yes.

Q Will it protect the correlative rights within the unit area?

A Yes, it will.

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

MR. NUTTER: Are there any questions of Mr. Pingrie?

You may be excused.

MR. LOSEE: We would ask the Commission to make the telegram a part of the record.

MR. NUTTER: Yes, it will be made a matter of record. You might read that into the record right now.

MR. HATCH: "A telegram addressed to the Oil Conservation Commission dated August 18, 1970, Reference Case 4405, unit agreement, Case 4406, waterflood docket number 19-70, South Langle-Jal Unit, Lea County, New Mexico. Atlantic Richfield Company has this date approved the referenced unit agreement dated May 1, 1970 and has executed ratification thereof. The execution of said ratification is subject to obtaining the consent of the production payment owners. John Nolan for Atlantic Richfield Company."

WYNDELL THOMAS,

a witness, after first being duly sworn according to law, upon his oath, testified as follows:

DIRECT EXAMINATION

BY MR. LOSEE:

Q You are the same Wyndell Thomas that testified earlier in 4402, 3 and 4?

A Yes, sir.

Q What is the purpose of this application in 4406?

A Reserve Oil and Gas Company seeks approval to install a waterflood project in a portion of the Jal-Mattix and Langlie-Mattix Pools located in Lea County, New Mexico in order to inject water into Seven Rivers and Queen formation for the purpose of recovering oil reserves



which otherwise would not be produced.

Q How many acres are included within the project area?

A We have a total of 1,080 acres in the project area.

Q How many wells are there within the project area?

A A total of twenty-seven wells.

Q Are there any other waterflood projects in this area?

A Yes, sir, there are several projects in operation in this reservoir. The nearest project is the Langlie-Mattix Woolworth Unit located approximately one and one half miles to the northeast of this proposed unit. There are two projects of the north boundary of the Langlie-Mattix Woolworth Unit which are cooperative injection projects operated by Shell and George Buckels on the south boundary of the Langlie-Mattix Woolworth Unit. Gulf operates the Stewart Langlie-Mattix Unit. There are several other projects planned in the general area and Union Texas Petroleum is in the final stages of forming their Langlie-Jal Unit, which will join the northern and eastern boundaries of this proposed unit.

Q This proposed waterflood project covers only a portion of the Pool, does it not?

A That's correct.

Q Have you negotiated or entered into any lease or borderline agreements?

A Not as yet. However, we plan to cooperate with the

Langlie-Jal Unit on our north and east boundaries.

It will be necessary for the Langlie-Jal Unit to become effective before any agreement can be reached. We will show later the initial well has only one injection well which will directly offset the proposed Langlie-Jal Unit and as the injection program is expanded, two additional wells will offset the Langlie-Jal Unit and we feel confident we will be able to work out a suitable boundary agreement with that unit which will be mutually beneficial.

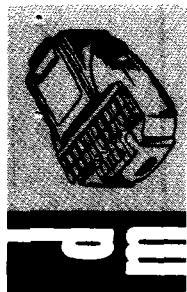
Q Do you feel there will be any need for any lease-line agreements on the west and south boundaries of the unit?

A No, all the wells which are adjacent to the west unit boundary are producing from the Yates zone which is above the interval proposed for unitization. Two of these wells, the Dowport Winters "B" Number 2 and the Ralph Lowe, Maggie Rose Number 3 are Yates gas wells and the remaining wells to the west are Yates oil wells. Initially, no lease-line injection agreement will be required or desirable on the southern boundary of the unit since we do not plan to inject any water into the wells located adjacent to this boundary. If there is response to our initial injection program, we do plan to convert the Reserve Oil and Gas Company and Woolworth D-2 from a producer to an injector at such time as this well

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is converted. It may be possible to work out a suitable boundary injection agreement with the offset operator to the south which would be beneficial to both parties.

Q If any of these previously mentioned waterflood projects responded to water injection?

A Yes. Langlie-Mattix Woolworth Unit and the Shell and Buckles projects have all shown favorable response to the water injection operation. The Gulf Stewart-Langlie-Mattix injection program has not been in operation for a sufficient time to obtain response to the program.

Q Are each of these units in the Langlie-Mattix Pool designated by the Commission?

A Yes.

Q Are the wells in the South Langlie-Jal Unit also classified in the Langlie-Mattix Pool?

A No, the wells in the proposed South Langlie-Jal Unit are classified in the Jal-Mattix Oil Pool by the Commission. The proposed vertical unitized interval of the project area covers the lower portion of the Jal-Mattix Pool classification and all but the lower 150 feet of the Langlie-Mattix Pool classification. The vertical limits of the Jal-Mattix Oil Pool are designated to be from the top of the Tansil formation to a point 100 feet above the base of the Seven Rivers. However, we do not

propose that the entire interval designated as the vertical limits of the Jal-Mattix Oil Pool be included in the unitized interval. Only that interval from the top of the Seven Rivers formation to a point 100 feet above the base of the Seven Rivers. In summary, the vertical interval to be unitized is the entire Seven Rivers formation and all but the lower 150 feet of the Queen formation.

Q And the reason you actually have deleted the lower hundred and fifty feet of the Queen formation is by reason of ownership of the horizons?

A That is correct and as well as the zones dipping into water along the western boundary.

Q You previously stated that the purpose of the waterflood application was to inject water into Seven Rivers and Queen formations. Would you tell us about the reservoir in this project area?

A If you will refer to Exhibit 2, we have shown a typical well log from one of the wells within the unit area and we have noted on this log the top of the proposed unitized interval and the bottom of the proposed unitized interval, the average depth of these sands, producing sands, in the proposed unit is approximately 3,270 feet. The reservoir rock consists of dolomite in the Seven Rivers formation, having a fine crystalline

anhydrite imbedded with fine grained sandstone. The Queen sands may be described as fine grained sandstone slightly anhydritic with some silty shale partings. The subsurface formations within the unit lie on the west flange, on the northeast, southwest and the anticline structure in the proposed area is elongated anticline dipping steeply to the southwest. If we would refer to Exhibit 3, which is a structure map contoured on top of the pay zone, you will note the nosing of the contour lines down towards the southwest portion of the unitized area. Oil-water contact at approximately 312 feet subsea defines the down-dip productive limit to the west and southwest side of the unit boundary. The gas-oil contact is present at an estimated 100 feet subsea. Pay sections made up of a series of alternating layers of sand and anhydrite. Generally, the thickness of these layers is fairly uniform. Three zones are contoured throughout the entire unit area with the lower zones dipping into water on the west and south of the unit area. From the data that we had available we determined the average porosity to be approximately 23 per cent and the average permeability and the net pay to be 23 milidarcies with a range from 0.1 to 177 milidarcies.

Q What data was available to determine these reservoir

characteristics?

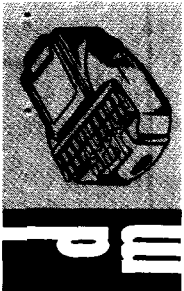
A Approximately twenty-four of the twenty-seven wells in the proposed unit have been logged and there was also core analysis available for study.

Q Is the reservoir information to determine the original oil in place?

A No, there was not sufficient core analysis for this purpose and the quality of the log is not sufficient for qualitative determination of the net pay. Therefore, no attempt was made to construct a net pay isopac map from which an estimate of the original oil in place could be computed.

Q Would you please tell us something about the primary operations in this area?

A The initial production from the unit area was in April of 1948 and by 1955 the last well had been completed. The greatest rate of development occurred during 1952 and '53 when fifteen wells were completed. The original reservoir pressure was approximately 1,450 psi at 200 fee subsea datum. However, as the development of this area was later than some of the other areas of the reservoir, reservoir pressure was less than the original reservoir pressure. The cumulative oil production from the proposed unit area to January 1, 1970, was 1,246,000 barrels. This is average of 46,000



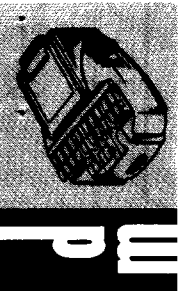
barrels per well based on declining curve analysis. The remaining primary reserves as of January 1, 1970 were 16,400. If primary operations continue the primary reserves are anticipated to be produced by January 1 of 1971. As of January 1, 1970, the reservoir under the unit area was 98.7 per cent depleted as to remaining primary reserves. The ultimate primary recovery is estimated to be 1,262,000 barrels. As is normal for solution gas dry reservoir in the final stages of depletion the gas-oil ratio is quite high. December 1969 the average gas-oil ratio was 21,600 cubic feet per barrel. Water production during December of 1969 amounted to only 195 barrels.

Q What is the daily average production per well?

A December 1969, the average daily production per well was approximately 1.35 barrels which indicates we are in the later stages of depletion.

Q Would you please outline briefly your plans to recover additional oil by waterflood?

A If you would refer to Exhibit 4, we have shown thereon our proposed injection pattern. The initial injection program will include ten injection wells forming four closed, eighty acre, five-spot patterns. Three additional injection wells will be provided after a satisfactory response to the initial injection and



operation will be observed. You will note those wells are shown with dashed lines. This pattern will permit cooperative lease-line injection wells with the proposed Langlie-Jal Unit on the north and east boundaries of this unit. The injection pattern will utilize existing well with no additional drilling contemplated at the present time.

Q What injection rate is contemplated at this time?

A With the initial we will inject 350 barrels per day to each injection well. The injection pressure will not exceed twelve hundred psi at the well head. However, we have designed our injection plan and distribution system for a maximum of eighteen hundred forty-five psi.

Q Specifically, how do you plan to inject water into these ten wells?

A If you will refer to Exhibit 5 and 5-A, Exhibit 5 is a diagrammatic sketch of a typically proposed singly completed injection well, whereas Exhibit 5-A is a similar sketch of the proposed dually completed injection well. Injection will be down two and three-eighths internally coated tubing below a tension-type packer, set approximately fifty feet above the casing shoe and into the Seven Rivers and Queen formation through perforations or open holes as the case may be. Except for dually completed wells, the tubing casing annulus will contain

fresh water inhibited for corrosion.

Exhibit 6 is a tabulation of the casing, tubing and packer settings for all ten injection wells. The minimum amount of cement coverage above the injection interval is 224 feet with the rest of the wells being in excess of that.

Q In this manner, will there be a positive protection against pollution of the fresh water, aquifers?

A Yes, all aquifers from the surface down to total depth of the completed interval will be protected by the existing casing streams and by maintaining their condition, also periodic checking of the pressure of tubing casing annulus by use of gauges will provide any indication of any problem.

Q Now, you mentioned some dual wells. Will you explain these a little further, please?

A The Dowport-Harrison Well No. 1 and Reserve-Bosberg Well No. 1 are both dually completed wells. Also, both of these wells are proposed injection wells. These wells are dually completed in the Yates gas zone and the proposed unitized interval. The Yates gas is produced through the tubing casing annulus and water will be injected beneath a packer into the unitized interval as previously explained from the diagramatic sketches.

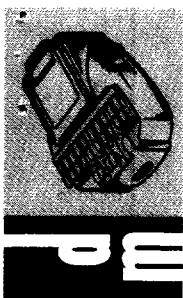
Q Do you see any difficulty in preventing injection water from entering the upper gas zone?

A No, sir, in the Dowport-Harrison Well No. 1 the Yates gas is produced through casing perforations from 2,820 to 2,976 feet. Five and one half inch casing is set at 3,234 feet. The water will be injected into the open-hole interval from 3,234 to 3,355 feet with the injection packer set at approximately 3,181 feet. The Yates gas zone will be adequately protected by 208 feet of cemented casing. Essentially, the same condition exists in the Reserve-Bosberg Well No. 1. In this well, the Yates gas is produced through perforations in the seven inch casing from 2,792 to 2,900 feet. The casing set at 3,168 feet. The total depth of the well is 3,336 and in this well 224 feet of cemented casing will separate the injection interval from the bottom of the gas zone. Any communication between the water injection zone and the gas producing zone will be immediately apparent.

Q Are any of the producing wells duals?

A Yes, the Dowport-Winters "C" No. 1 is a dual completion. It produces from the Yates gas zone and the Seven Rivers Queen oil zone.

Q Would you explain the status of Reserve-Woolworth No. 4



well?

A This is a Yates well. It has never produced from the unitized interval and as a result this well will not be in a proposed unit. The same is true of the Dowport-Winters "E" No. 1 gas well. This well produces only from the Yates gas zone. Another well producing from the Seven Rivers Queen zone is also completed in the same forty acre tract. Reserve-Woolworth "B" No. 1 Well is in a similar catagory. This well is completed only in the Yates formation. Reserve-Woolworth No. 5 Well is completed in the same forty acre proration unit as the aforementioned Well No. 1. Also, the Texas Pacific Oil Company Gutman No. 1 is producing only from the Yates formation. This well will not be in the unit as the Gutman three located on the same forty acre proration unit is completed in the unitized interval and will be in the unit.

Q What is the source of your water for the project?

A The injection water will be purchased from Skelly water system. In addition to the water purchased from Skelly, all water produced with the oil will be reinjected.

Q What is the quality of the water from this system?

A The water is saline and classified as nonpotable.

Q Will you treat it prior to injection?

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A No, our injection system and tubing will be coated to prevent corrosion. However, a test or performance indicates a filtration or chemical treatment is desirable. Appropriate action will be taken at that time.

Q How much additional oil do you estimate will be recovered from the project as a result of waterflood operations?

A The proposed project is similar to another proposed and operating waterflood project in this pool. As previously mentioned, sufficient reservoir data are not available to prepare net oil isopac maps on a producing horizon.

As a result, it was not possible to compute the original oil in place. Based on an analysis of the permanence of waterflood project in the area the additional oil to be recovered as a result of the injection program is estimated to be 75 per cent of the ultimate primary recovery or approximately 940,000 barrels. Recovery of this additional oil will increase the production life of the wells in the unit.

Q Do you think the waterflooding is in the best interest of conservation and prevents waste?

A Yes, on the primary operation the reservoir drive of solution gas which recovers only a small portion of the oil in place. However, under the proposed waterflood project the ultimate recovery of the oil in place from

both primary and secondary will probably approach a total of thirty-five to forty per cent of the original oil in place.

Q How long do you think it will take you to recover this secondary oil?

A We estimate that approximately ten years will be required to recover the secondary reserve.

Q Did you **prepare** or were they prepared under your supervision, Exhibits one through six?

A Yes, sir.

Q Again, Mr. Pingrie, did you **prepare** Exhibit No. 2?

MR. PINGRIE: Yes.

MR. LOSEE: Mr. Examiner, we move the introduction of applicant's Exhibits one and two in 4405 and one through six in 4406.

MR. NUTTER: Applicant's exhibits in these cases will be admitted in evidence.

MR. LOSEE: I have no further direct examination.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Thomas, I was noticing on your Exhibit No. 6 there, the Harrison No. 1 is obviously a dual and Bosberg is obviously a dual but this Winters "D" 2 has a perforated interval as well as open-hole interval. Are those two

both intervals in the Langlie-Mattix or what is the score on that one?

A All right, sir. The perforated interval would, in referring to Exhibit 2, would indicate that that interval is open in the Yates formation in that that would occur on top of the Seven Rivers.

Q That would be a dolomite, wouldn't it?

A Yes, sir.

Q So this would be a dual too, wouldn't it?

A In that case, it would.

Q Will this well continue to be on production, do you know?

A The upper portion?

Q Yes.

A Not as a unit well. Not to the best of our knowledge, be continued as operated well by the present owner or --

Q Well, it appears though, from the perforated interval, that it should be classified as a dual completion there.

A Yes, sir, I do not have information available at this time to determine how the well is presently being produced.

Q And also this Woolworth B-4 apparently has a long, open-hole interval at the present time, being from 2,814 to 3,397 but I see you covered that on footnote. The lines will be set on that, won't they?

A Yes, sir.

Q And you have an interval from 3,200 to 3,397 for injection?

A That's correct.

Q Which is the Langlie-Mattix only?

A Right.

Q Could you find out what the status is of the Winters D-2 and the upper formation there and let us know?

A Yes.

Q Before we enter an order in this case?

A Yes, sir.

MR. NUTTER: Are there any other questions of Mr. Thomas? He may be excused. Do you have anything further Mr. Losee?

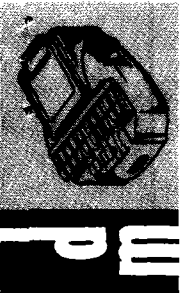
MR. LOSEE: No, Mr. Examiner.

MR. NUTTER: Does anyone have anything else they want to offer in Cases 4405 and 4406? We will take the case under advisement.

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WITNESS

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AND
ADMITTED

Applicant's Exhibits Nos. 1 & 2
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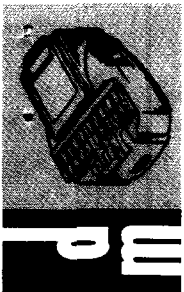
Applicant's Exhibits Nos. 1-6
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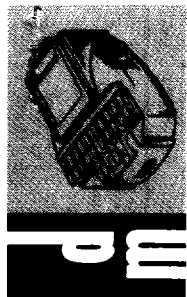
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STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, SOVEIDA GONZALES, 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 Conservation 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.

Soveida Gonzales
COURT REPORTER

I do hereby certify that the foregoing is a true and correct record of the proceedings of the Bernalillo hearing of Case No. 4405-4406 heard by me on 8/19, 1970.
[Signature], Reporter
New Mexico Oil Conservation Commission