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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 8, 1964

EXAMINER HEARING

IN THE MATTER OF:

Application of Shell Oil Company for a
waterflood project, Lea County, New
Mexico.

Case No. 3026

BEFORE: DANIEL S. NUTTER, EXAMINER

TRANSCRIPT OF HEARING



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MR. NUTTER: The hearing will come to order, please.

The next case will be Case 3026.

MR. DURRETT: Application of Shell Oil Company for a
waterflood project, Lea County, New Mexico.

MR. MORRIS: If the Examiner please, I am Richard Morris
of Seth, Montgomery, Federici and Andrews, of Santa Fe, appearing
on behalf of the applicant, Shell Oil Company. We will have one
witness, Mr. Richard Seba and I ask that he be sworn at this time.

(Witness sworn)

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RICHARD SEBA,

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

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Seba, please state your name, by whom you are employed
and in what capacity and where you are located?

A My name is Richard D. Seba, I am a Senior Reservoir
Engineer with Shell Oil Company in Midland, Texas.

Q Have you previously testified before the New Mexico Oil
Conservation Commission or one of its examiners?

A No, sir.

Q Then, would you briefly outline your education and your
experience in the oil industry since finishing your formal
education?

A I have a Bachelor of Science Degree in Petroleum Engineer-
ing from the University of Oklahoma and a Master of Petroleum
Engineering Degree from the University of Oklahoma, and a Doctor
of Philosophy Degree with a major in Petroleum Engineering from
the University of Texas. Upon graduation, I was employed by Shell
Oil Company and for three years was associated with their research
group in Houston doing reservoir engineering research. Since
August of '63, I have been in Midland doing reservoir engineering
work in West Texas.



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Q Are you familiar with the application of Shell Oil Company in Case 3026?

A Yes, sir, I am.

Q What is it that Shell Oil Company seeks by this application?

A Shell Oil Company seeks authorization to conduct water-flooding operations on the Wills Federal and Pubco State leases in the Jalmat Field in Sections 32 and 33, Township 26 South, Range 37 East, Lea County, New Mexico.

This project would be an expansion or extension of the present waterflood in the Scarborough Field in Winkler County, Texas.

Q If you would, refer now, Mr. Seba, to what has been marked Exhibit One in this case, which is your brochure, and refer to Enclosure Number One in this exhibit, which, I believe, is a plat of the area under consideration, and would you explain what is shown by that plat?

A Yes, sir. This is a map of the general area, including approximately two miles in each direction from the subject leases, the subject leases being the Wills Federal and Pubco State, and they are outlined in red. They are on the Texas-New Mexico line.

I have also included on this map a line marked "AA Prime" which is a cross section, which will be presented subsequently. I have also indicated the proposed injection wells by the red



circles around the well locations, for both the two leases in New Mexico, and adjacent leases in Texas.

I have also included in this map contours on the top of the Yates formation.

Q Would you briefly describe the history of this particular area, the development in the Yates formations and the status of the development, both in Texas and New Mexico, in the Scarborough and Jalmat Pools?

A The Jalmat Field and Scarborough Field produce from a common reservoir, which underlies portions of Texas and New Mexico. The Jalmat denotes that segment of the reservoir in New Mexico and the Scarborough Field that part in Texas.

The Scarborough Field was discovered in 1927, produces from the Yates formation at an average depth of about 3100 feet, however, the major development in it occurred in the late 1950's subsequent to the development of fracturing techniques. The Wills Federal and the Pubco State leases were drilled in 1958-59.

Waterflooding was started in the Scarborough Field in 1955 and currently most of the field is under waterflood, or will be in the near future.

The Yates formation in the subject area has a gross thickness of about 400 feet and composed of alternate layers of Sandstone, Dolomite, Shale and various combinations of the three.

The logs on the four injectors have been submitted to the



Commission, along with our application for this hearing. I have also prepared a cross section, which is Enclosure Two, which is the cross section marked on the first map "AA Prime", which is the North-South cross section, showing the Yates formation in this area of the reservoir.

You will note that the Yates is composed of nine distinguishable zones, each one is separated by an impermeable layer of Dolomite. Within each one of these zones, there are sand stringers, which are the oil reservoir in the case of this field. Sand development does vary considerably between adjacent wells, however, in general, the deeper sand beds near the center of the field exhibits better continuity. In the Northern part of the field, which is the area we are interested in, the deeper sands are not as well developed, whereas, sandstone in the upper part of the Yates section showed improved reservoir characteristics.

Generally, zones One through Five, are productive on the leases in question today. The upper sands are not as widespread as the deeper erratic sands. The upper sands do possess some high porosity and looks like a good waterflood prospect.

Q I believe you said, Mr. Seba, it is the upper five zones of the Yates, as marked on your cross section, that we are primarily interested in today. By that, do you mean that these are the zones into which you propose to inject water as proposed in this waterflood project?

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A We propose to inject water into all five zones, subject to testing before injection to determine if anyone of these zones will act as thief zones. In the absence of any one of these being a thief zone, we will inject water into all five zones.

Q What data do you have concerning engineering data concerning this reservoir and especially these five zones?

A The primary producing mechanism of the Scarborough Field and the Jalmat Field are solution gas drive. Due to the low permeability of the Yates Sand, the production rate has declined quite rapidly resulting in poor primary recovery for these fields. Tabulation perimeters are presented in Enclosure Three. I would like to just briefly mention a few of those that are of interest.

As I stated before, the average depth in this case is about 3,050 feet, the average pay - - effective pay thickness now for all five zones together is about 50 feet, average porosity of about 17 percent, and average horizontal permeability of about 15 millidarcies with a range from zero to 22. We estimate that the connate water saturation is about 45 percent and the oil in this reservoir is about 36 degrees API.

In looking at the zones, we have determined that all zones have roughly similar porosities and permeabilities and other reservoir characteristics and we anticipate that all zones will take water roughly in proportion to their thickness; unless we



do find a thief zone, why, we will anticipate they will take water quite uniformly. Therefore, we will inject into all simultaneously.

Q There will be no selective injection?

A We do not anticipate it at the present time.

Q Mr. Seba, what is the current status of the wells in the North Scarborough and Jalmat Pools?

A In the vicinity of the area under consideration here today, generally, the wells in this area of the field have approached the stripper state of production after a rapid decline in the production rate on these two leases. The maximum production rate was achieved shortly after the initial drilling in 1958 and '59, and have declined quite rapidly.

I have presented a production curve for both leases in Figures Four and Five, from the time that the wells were originally drilled on these leases. You can see from those two curves that the production rate has declined quite rapidly and at the present time, the Pubco State lease is producing at an average rate of about one barrel of oil per day, whereas, the Wills Federal lease is producing at approximately three barrels of oil per day, which we feel classify them in the stripper state of production.

Q There a waterflood project presently being conducted in the Scarborough Field?

A Yes. Currently, most of the Scarborough Field is under waterflood, and we have recently gotten permission to extend this



waterflood up to the New Mexico-Texas state line, so that all of Shell's leases and most of the other leases in this field, will be under waterflood within the near future.

Q What type of a pattern is in existence in the waterflood project immediately adjacent to the New Mexico state line?

A Generally, it is an irregular pattern due to the existing ^e wall pattern and the irregular shape of the leases. Therefore, you might say that the proposed waterflood in the State of New Mexico will be roughly a line drive, and this was selected so that we could balance injection and production across lease lines to protect correlative rights of all parties involved. All of the injectors are flowed with casing cement through the Yates formation with perforations in one or more of the sand zones. I have presented the details of our completions in Enclosures Six, Seven and Eight and Nine. I might just look at one to explain what I have. They are all similar with the exception of the precise numbers.

Reference to Enclosure Six, as an example, we have a surface casing set roughly, in this case, at 609 feet with 400 sacks of cement. We have casing to total depth of the well, in this case, cemented with 200 sacks of cement. We anticipate producing this thing under a packer set at approximately the top of the Yates formation with perforations in the desired zones. I have also indicated on all of these the completion that was used at the time



these wells were drilled.

Q Do the perforations shown here indicate the perforations or projected perforations?

A They are the perforations in the wells. We do anticipate additional perforations to open up some zones that are currently behind the pipe, therefore, enable us to flood all of the zones that are productive in this area.

Q This enclosure that you have just referred to, is it similar to Enclosure Seven, Eight and Nine?

A Yes, sir.

Q On the other injection wells?

A Yes, sir. And I have also included in Enclosure 10 a tabulation of this to see the similarities between all of the wells. Just a summary of the data that appears in Enclosures Six through Nine.

Q Now, in the Scarborough Field, the waterflood project currently underway there, Mr. Seba, what rate of injection is being employed for the water injection wells?

A The waterflood currently in operation in the Scarborough Field indicates that the water injection rate for expansion will be about 100 barrels of water per day per injector. This is the injection rate in the proposed areas of Sections 32 and 33, and commensurate with existing waterflood wells on the proposed waterflood on the Shell leases adjacent to these in Texas.



The Santa Rosa formation is the source of water for the proposed waterflood expansion in this case. The Santa Rosa water is relatively fresh and has been proved to be an excellent source of water for waterflood. The water project has been discussed with the office of the State Engineer and we have discussed at that time the physical installation of the wells, the source of the water, and we furnished him with a copy of water analysis, rates and all other aspects of this project. I believe the State Engineer's office has advised the Commission that they have no objection to this project.

I have also included some data just for your information of the completion techniques of our water source well, and also, a copy of the analysis of that water. I have also presented in Enclosure 11 a map of our water distribution system, which indicates we will be importing water into the State of New Mexico from Texas. The source well being located on the lease directly south of the Wills Federal lease in the State of Texas. I have also indicated on that plat the estimated injection rate of 100 barrels a day for all of the injectors located in this area.

Q Mr. Seba, what performance of this waterflood on the subject lease can you predict at this time?

A If you will refer back to Enclosure Four and Five, I have also included there an estimate of the performance that we expect on this water injection program. Let me further explain what we

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have here. We anticipate to start water injection approximately June 1st, subject to approval, of course. We anticipate that we will start getting response from this in approximately six months, or roughly December of '64, and then, throughout '65, this project's production rate will increase to a maximum roughly in December, 1965. Thereafter, it will remain roughly constant until we get water breakthrough and as the water cut increases, it will decline to its economic limit, roughly at the end of 1975.

Q Still referring to those enclosures, Four and Five, what are the figures for each lease, showing the peak production per month, on each lease?

A The peak production for the Wills Federal lease is estimated to be around 8,000 per month, whereas, for the Pubco State lease, the maximum production rate will be about 2500 barrels per month.

Q Or, 10,500 barrels per month for the entire project?

A That's correct.

Q At the period of peak performance?

A Yes, sir.

Q Are you familiar with Rule 701 of the Commission's Rules and Regulations?

A Yes, I am.

Q Have you computed the allowable to which the project would be entitled under Rule 701?



A Yes, I have. I have calculated that these will both be operated under a unit allowable in this case, and there will be nine 40 acre units. The allowable per well, or per unit, rather, is 42 barrels per day, thus yielding 378 barrels per day for the project, or 11,340 barrels per month. This figure is in excess of the predicted maximum production rate that we can expect from this flood, therefore, we will be able to produce at maximum capacity throughout the life of this project.

Q I believe you have already testified, Mr. Seba, that, in your opinion, correlative rights will be protected by the location of the injection and producing wells in this project?

A Yes, I have.

Q Do you have any opinion concerning whether this project will prevent waste?

A Yes, it will. At the present time, these wells have reached the economic limits and unless something is done to revive the production from this area, why, we will produce no more oil from this area.

Q Was Exhibit Number One, with all the enclosures, prepared by you or under your direction?

A Yes, it was.

MR. MORRIS: We move the introduction of Shell's Exhibit One in this case, and that completes the examination of Mr. Seba at this time.



MR. NUTTER: Shell's Exhibit One will be admitted in evidence.

Does anyone have any questions of Mr. Seba?

MR. DURRETT: I have a question of Mr. Seba.

CROSS EXAMINATION

BY MR. DURRETT:

Q What will be the allowable for the portion of your flood that is in Texas?

A The Scarborough Field is one of the fields in Texas that is not prorated. Therefore, it may produce at capacity.

Q Have you received approval from the Texas Railroad Commission to conduct the flood; is that correct?

A Yes, I have.

Q Now, producing at capacity, will there be approximately the same amount of oil taken in Texas as there will be in New Mexico, or would you say more or less?

A I would say that if anything, there will be more oil produced on the New Mexico side than on the Texas, as a result of the injector, which is Number 13, on the Linberry lease just south of the Wills Federal. There is no producer between that injector and the New Mexico lease. Therefore, it will benefit from this injector and move any oil that is between Well Number 13 and this lease on into the New Mexico side.



MR. PORTER: This sounds good.

Q (By Mr. Durrett) You think we will protect New Mexico's correlative rights then?

A I think so, yes, sir.

* * *

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Seba, do you operate the acreage on the west part of the Section Two that is designated as Dr. S. G. Dunn?

A No, we don't.

Q Does Dr. Dunn have a permit for waterflooding that acreage?

A Yes, if you will refer to Enclosure One again, I have labeled two injectors on his lease and he is currently injecting into Wells Numbers 15 and Two. We approached Dr. Dunn to secure a cooperative agreement with him to inject water, but he declined to sign a cooperative agreement with us. However, he has indicated that he will inject water in Number 14 on that lease, so if he keeps his word, there will be one more injector in that lease, just to the south.

Q Now, how about the lease over in the east part of the Section Three in Texas, does he have any plans for injection in there that you know of?

A No, he doesn't.

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Q I presume that you are anticipating that any oil which is put in motion by this line drive flood on the northern part of the New Mexico leases would be intercepted by the row of wells along the Texas line before it entered the State of Texas?

A Yes, sir.

Q What has been the primary recovery from these two leases Mr. Seba?

A I believe it has been roughly in the neighborhood of 300 barrels- - I can't quote the figure to date, but it is something less than our anticipated secondary recovery. I recall a figure of approximately 350 barrels per acre, which is considerably less than the anticipated 2,000 barrels per acre that were anticipated with this flood.

Q How much acreages is in this again, some 400 acres, aren't they?

A 440, Yes.

Q 440.

A I think 300 barrels per acre.

Q 132,000 barrels on primary, and you are anticipating 800,000 on secondary?

A Yes. This is a very fine grain sandstone. I think it has shown very poor primary.

Q Has the flood down in the Texas portion of the field, which has been under operation for quite some time, yielded good



secondary recovery?

A There is a little bit of a strange situation. Some of these floods were started on it almost immediately with primary development, and it is difficult to separate primary from secondary, however, they performed very well. We have been very satisfied with the operation.

Q The older part of the field down in the Texas portion was developed on ten acre spacing, wasn't it?

A I don't believe so. I think that it was- -

Q Or, were the injection wells just infield wells?

A Well, for instance, in Section One, down here, it looks like the spacing is roughly 20 acres, which is slightly- - Well, half- - twice as dense, rather, as the section in New Mexico.

MR. NUTTER: I see. Any further questions of Mr. Seba? He may be excused. Do you have anything further, Mr. Morris?

MR. MORRIS: No, sir, I don't.

MR. NUTTER: Does anyone have anything they wish to offer in Case 3026? Take the case under advisement.

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STATE OF NEW MEXICO Ø

COUNTY OF BERNALILLO Ø

I, ROY D. WILKINS, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me, and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal of Office this 13th day of April, 1964.

Roy D. Wilkins
NOTARY PUBLIC

My Commission Expires:
September 6, 1967.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3024 heard by me on 4/8, 1964.

J. Simms, Examiner
New Mexico Oil Conservation Commission

