BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
February 5, 1964

EXAMINER HEARING

IN THE MATTER OF:

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

Case No. 2987

BEFORE: DANIEL S. NUTTER, EXAMINER

TRANSCRIPT OF HEARING

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MR. NUTTER: Call Case 2987.

MR. DURRETT: Application of Shell Oil Company for a waterflood project, Chaves 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 Shell Oil Company.

(Witness sworn)

GEORGE G. CARNAHAN,

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

DIRECT EXAMINATION

BY MR. MORRIS:

Q Please state your name, by whom you are employed, and in what capacity and where your office is located?

A I am George G. Carnahan, Senior Reservoir Engineer with Shell Oil Company in Roswell, New Mexico.

Q Mr. Carnahan, you have testified before the Commission or one of its examiners, have you not?

A I have.

Q Are you familiar with Shell's application in this case?

A I am.

Q Have you done most of the work in putting together this pilot waterflood project?

A Yes.

Q What is it that Shell seeks by the application?

A We seek approval of a pilot waterflood project to be conducted in the South Bitter Lake-San Andres Field on a 320 acre Shell-Cannon lease and also the unorthodox location of the three injection wells involved.

Q Referring to what has been marked as Exhibit Number One in this case, which is a plat of the South Bitter Lake-San Andres Pool, would you point out the pertinent features of that exhibit?

A On Exhibit Number One, outlined in red is the 320 acre Shell-Cannon lease, which comprises the pilot waterflood project

area.

Q All right.

A Within the project area there are three injection wells to be drilled which are shown in red, along with four existing San Andres producers shown in black, numbered One through Four, and four producing wells to be drilled. The pilot waterflood pattern is a 40 acre inverted five spot with injection wells so located as not to offset any wells outside the project area. The three proposed injection wells are to be drilled at unorthodox locations to establish a 20 acre well spacing within the waterflood pattern. The locations of the three injection wells are as follows: The first well to be located 1315 feet from the South line, and 2635 feet from the East line of Section 27, 10 South, 25 East. The second injection well will be located 1315 feet from the South line and 1325 feet from the East line of Section 27, Township 10 South, Range 25 East. The third and last injection well is to be located five feet from the North line and 2635 feet from the East line of Section 34, Township 10 South, Range 25 East.

MR. DURRETT: Excuse me. On your second well, you said, I believe, 1325 from the East line?

A Right.

MR. DURRETT: Is that what you mean?

A 1325 feet from the East line, right.

MR. DURRETT: Of Section 27? The reason I am asking or questioning you on this, and I want to do it at this time, I note

that the application says 1325 feet from the West line on that well.

A I am reading the wrong run. 1325 feet from the West line, right.

MR. DURRETT: All right, sir. Thank you.

A Also shown on Exhibit One are all wells and leases within the two mile radius of the proposed injection wells. It should be noted before we pass from this exhibit that there is an error on the exhibit. The Gorman Federal Number Two, located in Unit "O" of Section 26, 10 South, 25 East, is erroneously shown as a former San Andres producer. This well was temporarily abandoned after a completion attempt. It was never actually completed in the San Andres as a producing well.

Q (By Mr. Morris) Do you have a structure map showing the geological data in the area of your proposed pilot waterflood project?

A Yes. If you will refer to Exhibit Number Two contoured on the top of the Slaughter-San Andres zone, this map was constructed utilizing available well logs and shows a gentle eastwardly dipping San Andres feature. The top of the Slaughter zone is encountered at approximately 850 feet in the South Bitter Lake Field area.

Exhibits 3-A and B are north-south, east-west cross sections, traversing the South Bitter Lake Field, and indexed to this cross section presented on each exhibit. The Slaughter zone, the top of which is correlated on these cross sections, is a

continuous porous interval present in all wells that have penetrated the zone in the field area. Lithologically, the Slaughter zone is a light brown, very fine crystalline Dolomite, placed for core analysis data, average porosity indicated to be 10½ percent with a permeability of 2.2 millidarcies. The produced crude is about 22 degrees API gravity, and the solution gas-oil ratio is estimated to be less than 200 cubic feet per barrel, and the oil is currently being trucked, and the negligible casinghead gas production is being flared at this time.

Q Do you have a series of exhibits, Mr. Carnahan, showing the development and the production history in this pool?

A I do. Initially, production in the field was established May, 1960 with the completion of the DeCalb Federal Number One located in Unit F of Section 27. Referring to Exhibit One, it would probably be easier to locate this,by October, 1961, 21 wells had been completed in the field. No additional wells has been completed in the field since this time. Currently, there are seven producing wells, eight shut in wells, and six plugged and abandoned, former producing wells. Four San Andres wells on the Cannon lease were completed during the period, June, 1960 to January, 1961. Currently, wells Number One, Three and Four are shut in. Well Number Two is the only producer. Exhibit Four-A presents the complete production history of the South Bitter Lake-San Andres Field through November, 1963. Also shown is the production history of the Cannon lease; through November, 1961, the

South Bitter Lake Field had accumulated approximately 38,000 barrels of oil or an average of about 1800 barrels per well. The Cannon lease has accumulated approximately 7,700 barrels of oil or an average of approximately 1900 barrels per well. Exhibit Four-B presents the per well average daily production rate of the South Bitter Lake Field, and also the Cannon lease. Only the wells that actually produced during the month concerned were used in calculating these average rates. Currently, the field is producing on an average per well daily rate of three barrels, while the Cannon lease is producing at a rate of approximately two barrels per day per well. The wells in the field and on the Cannon lease are definitely stripper wells and are very near the end of their primary life.

Q Mr. Carnahan, just what are your plans for development in this pilot project?

A Initially, our plans call for drilling the first and second injection wells at the previously stated unorthodox locations, in Section 27, along with the two producing wells in Section 27, to be located in the approximate center of Units "N" and "O". The third injection well and the two remaining producing wells to be drilled in Section 34 will be drilled later, depending on the initial pilot results and subsequent evaluation requirements.

Exhibit Number Five is a diagrammatic sketch of a typical injection well, and depicted on this sketch is that we plan to set, in drilling these wells, seven inch casing at approximately

710 feet, this being an average of the three injection wells, and cement this to surface. The four and a half inch production casing will be cemented at approximately 840 feet, and also cemented to surface. The wells will be completed open hole. The packer, a retrievable hook wall packer, set slightly above the casing shoe, and internally plastic coated tubing used for injection purposes, and the casing to be- - or tubing annulus to be filled with inhibited water.

A copy of this sketch has been given to the State Engineer's office prior to this hearing. Initial injection rates are estimated to be approximately 150 barrels per day per injection well, or a total for the two initial injection wells of 300 barrels per day.

Q Assuming approval of this pilot project, Mr. Carnahan, what would be the top allowable under Rule 701?

A Based on the basic 42 barrel per day waterflood allowable, initial area of 242 acres in Section 27, the top allowable would be 280 barrels per day. Now, this would be taking credit for the fact that additional wells would be located in Units "N" and "O", the basic allowable for Units "N" and "O" would be 56 barrels, giving an additional one-third allowable for the additional well in the proration unit.

Q Looking at the project as a full 320 acres, what would be the allowable under 701?

A Based on the wells that we have indicated to drill, the

top allowable would be 378 barrels per day.

Q Now, you mentioned before that you would plan to inject approximately 150 barrels per day into each injection well. What is the anticipated source of that water?

A Present plans call for the purchase of sufficient water to supply our pilot requirement from the City of Roswell. This water will be supplied from their office,of Saline Water Well No. Three, located in the Northwest Quarter of the Southeast Quarter of the Southeast Quarter of Section 33, Township 10 South, Range 25 East. The subject well is flowing,shut in currently, but it has the capabilities of a flowing artesian well, completed in the artesian zone, and produces water too high in chloride content to be useable for domestic or irrigation purposes. This well is currently not hooked up to the Roswell water system, is not being used for any purpose at this time. It is my understanding that the City of Roswell is in the process of advertising to convert or dedicate a certain number of acre feet of water to this well in order that they may sell it to us under a contract.

Q Mr. Carnahan, we have been talking here in terms of just a pilot waterflood project. Can you look ahead at this point to see just what benefit you expect to receive under this project?

A Yes. Naturally, a pilot waterflood project is instituted to determine if you can economically recover additional oil. Therefore, we feel that should this project prove to recover additional oil by secondary means, injection of water, and this be in

economic quantities, that we would as a result appreciably increase the total recovery from this particular reservoir, and waste, as a result, will be prevented should this prove to be feasible by the recovery of additional oil that would not be recoverable under primary completion mechanism.

Q As well as preventing waste, will you also understand your proposed plan protects the correlative rights of all persons involved?

A Yes. As previously mentioned, the interior location of the injection wells with respect to the producing or shut in wells outside of the project area, should restrict the injection to within the project area, thereby, protecting the correlative rights.

Q Do you have anything further you would like to add?

A No.

Q Were Exhibits One through Five prepared by you or under your direction?

A They were.

Q We offer those exhibits at this time.

MR. NUTTER: Shell's Exhibits One through Five will be admitted in evidence. Are there questions of Mr. Carnahan?

CROSS EXAMINATION

BY MR. IRBY:

Q What is your anticipated injection pressure?

A Actually, we are anticipating pressure somewhere in the range of between and nine hundred pounds. This is something we are - - we really don't know. We are anticipating something in that range.

Q All right. Thank you.

MR. IRBY: That is all I have, Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Carnahan, have any estimates been made of the original oil in place here in this area?

A Based on our original look at this core analysis data, that was available, we felt like that this was something left to be desired in this information. As a result, we are going to core all these wells, but we estimate that there was originally approximately about eight million barrels of oil originally in place per section. Now, this is very rough, a very rough estimate.

Q Recoveries haven't been a very large percentage?

A Relatively they have been just about nill, being around 1800 barrels per well on 40 acre spacing.

Q You probably attribute this to being such shallow depth, lack of reservoir pressure, lack of solution gas.

A Permeability.

Q Heavy qualities of oil viscosity?

A Probably all three of those factors.

Q Do you have any estimate to what the secondary recovery will be then?

A What?

Q In relation to primary?

A Actually, we have no estimate, strictly just would be a guess would be all it would be. This type of reservoir is something that normally we shall- - we say we don't have too much information on this type of reservoir, to say we might anticipate so much recovery on waterflood, that is why we are going at a pilot aspect to start with.

Q You are not anticipating the use of any special additives to the water to change the surface tension quality figures or anything like that?

A I might add that there is a possibility, not initially, but should down the road it appear that we need to do so, we might I don't anticipate it would be like- - like I say, our initial plans are for just use of straight water, but this wouldn't preclude the use of some special additive.

Q What is your estimate of cost for drilling these water injection wells?

A Approximately $17,000.00 to drill and complete these wells.

Q Does that apply to the producing wells also?

A Approximately, there is a pump involved on producing the wells. I would say probably sixteen for injection, a thousand for

the wells, and 18 thousand for producing wells, an average of seventeen thousand for two types of wells.

Q Are there any further questions?

CROSS EXAMINATION

BY MR. DURRETT:

Q Mr. Carnahan, referring to your exhibit, Exhibit One, the wells in the Southwest Quarter of Section 27, your three wells there, I believe you stated were former producers, but shut in at this time, Number One, Three and Four, why are those wells shut in?

A I am trying to recall whether- -

MR. MORRIS: You can pretty well tell that from your Exhibit Four-A, can't you, Mr. Carnahan?

A Well, if you are particularly interested in each well as to when the last time the well produced, or as to when the wells were actually on production, Exhibit Number 4-A doesn't really show it too well. The production is so low that- -

Q (By Mr. Durrett) Well, just give me an approximate date, if you can?

A I would say that actually the wells on the lease were produced, well, all four of them were produced up through August, 1962, and after August, 1962, why, periodically during this time. Some months the wells were not produced at all, some months one or two of the wells were produced, but up through that time, the wells

were produced more or less on a regular basis.

Q They were produced just off and on after that?

A Right, like I say, we did not operate the wells during this period. All I can speak from is the commission record as to what months wells produced or they didn't produce.

Q Were they all three shut in,finally shut in about the same time?

A Yes. I would say that Well Number Four was or has not produced since August, 1962. Well Number Three has not produced since November of 1962, or shall I say October, 1962, and Well Number Two has or is actually the only well that is currently being produced. Well Number One last produced in February, 1963.

Q February, 1963?

A Yes, sir.

Q What is the approximate accumulation or accumulative production to date on your Number Two, which is the Southeast Quarter?

A Well Number Two had accumulated 1814 barrels through 1-1-63. And this is strictly an estimated figure. I am just looking at the figure. I would say it has produced an additional five hundred barrels since then, making it accumulate roughly 2300 barrels to date.

Q How many barrels a day does that Number Two well make, approximately?

A This is indicated directly on Number 4-B, because this is

the only well that produces on the lease, so it is currently producing at exactly 2.2 barrels during the month of November, barrels per day.

Q Your dotted line on 4-B actually is your Well Number Two?

A Essentially this last part of the year, it is.

MR. DURRETT: That is all.

* * * *

MR. NUTTER: Any further questions? The witness may be excused. Do you have anything further, Mr. Morris?

MR. MORRIS: No, sir.

MR. NUTTER: Does anyone have anything they wish to offer in Case 2987? We will take the case under advisement.

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STATE OF NEW MEXICO)
COUNTY OF BERNALILLO)

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 20th day of February, 1964

My Commission Expires: September 6, 1965

NOTARY PUBLIC

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2987, heard by me on Feb. 5, 1964.

Examiner
New Mexico Oil Conservation Commission