STATE OF NEW MEXICO
ENERGY, MINERALS, AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO

18 November 1987

EXAMINER HEARING

IN THE MATTER OF:

Application of Sohio Petroleum Company (Standard Oil Production Company) for a waterflood project, Lea County, New Mexico.	CASE 9260

BEFORE: David R. Catanach, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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I N D E X

E X H I B I T S

MR. CATANACH: Call next Case 9260.

MR. TAYLOR: The application of Sohio Petroleum Company for a waterflood project, Lea County, New Mexico.

MR. CATANACH: Are there appearances in this case?

MR. IVES: Yes. Peter Ives with Campbell & Black on behalf of applicant Sohio Petroleum Company, Standard Oil Production Company.

MR. CATANACH: Are there any other appearances in this case?

How many witnesses do you have, Mr. Ives?

MR. IVES: I have one witness with me today.

MR. CATANACH: Okay, will the witness please stand to be sworn in?

(Witness sworn.)

STEPHEN GURLEY,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. IVES:

Q Mr. Gurley, would you please state your name and place of residence?

A Stephen E. Gurley, 1014 Millstone, Sugarland, Texas.

Q And by whom are you employed and in what capacity?

A Standard Oil Production Company as a reservoir engineer.

Q And could you please summarize for the Examiner your educational background and work experience?

A I have an Associate degree in applied science from Lincoln County Junior College in Illinois.

I worked as a reservoir engineering technician for five years for Cities Service Oil & Gas in Midland prior to getting my degree in -- BS in petroleum engineering from the University of Texas, Permian Basin, in 1979.

I then worked for two years as an engineer for Cities Service, two years as a production engineer for Coquina Oil Corporoation, and the last five years as a reservoir engineer for Standard Oil Company.

Q And are you familiar with the application that has been filed in this case and the wells and other

matters that that application deals with?

A Yes, sir.

MR. IVES: I would tender the witness as an expert reservoir engineer at this time.

MR. CATANACH: He is so qualified.

Q Could you briefly state what you are seeking in the application?

A We're seeking approval to inject water into five wells on our Phillips Lea State lease. It will be into the San Andres formation in the Vacuum Field in Lea County, New Mexico.

Q And if I could refer you now to Exhibit Number One, could you please identify what page one is and explain what it shows?

A This is Form C-108 for Application to Inject Water. We are requesting permission to initiate a secondary recovery project. It will not be an expansion of an existing project.

And we also have included the attachments that are required on the form.

MR. IVES: We propose to go through the various pages of Exhibit One, essentially page by page, and identifying those in turn and what those are and what they show.

Q Could you briefly turn to page two of Exhibit One and explain what that is and what that shows?

A Page two is a summary of some of the questions that were asked on Form C-108. We will get into them in more detail as we come to these questions later on in the questioning.

Q If I could ask you to turn to pages three and four of Exhibit One and explain what those are and what they show?

A Pages three and four are a plat of the area around the proposed project.

Page three was submitted with the original permission.

Page four is just a simple blow-up of Figure 3 for clarification purposes as far as being able to read it better.

Q Is the information that's shown on pages three and four identicial, then?

A Other than cleaning up the map a little bit, make it more easy to read, yes, sir, that's correct.

Q What is the portion of the map on page four that is shaded in yellow?

A That is our proposed area for a secondary recovery project, the Phillips Lea State Lease.

Q And does that -- does page four show the

location of the subject wells?

A Yes, sir, there's going to be five injection wells; three wells will be convergents from producers, Wells Nos. 5, 7, and 8. We're also proposing two new leaseline injection wells on the east side of the lease, Wells Nos. 9 and 10.

We've been in communication with ARCO and they are in agreement with the wells.

Q And does the map on page four also show all the wells within a 2-mile radius of the injection wells?

A Yes, sir, and we've also drawn a half mile circle around each one of the injection wells.

Q And those half mile circles define the area of review?

A Yes, sir.

Q And does the map on page four also show lease ownership in the area?

A Yes, sir, it does.

Q And could you briefly identify what leases are within the area of review?

A The ARCO State Vacuum Unit is immediately to the east of our unit.

Phillips has several San Andres wells on the north. ARCO has three or four San Andres wells on the west, and Baxter operates a Queen waterflood to the south

and east of the proposed area.

Q And is Kincaid and Watson also --

A Yes, sir, Kincaid and Watson is included in our section. They haven't expressed any desire to participate in the waterflood.

Q In connection with the location of the two proposed injection wells labeled on page four as 9 and 10, could you briefly explain the reasons for locating those wells were they are?

A Yes, sir. We felt those were the ideal locations in order to prevent waste and prevent (sic) correlative rights, and like I said earlier, ARCO has pretty much agreed with the locations and has agreed to participate in the sharing the cost.

MR. IVES: Mr. Examiner, if you should have any questions at any time on the various pages, please interrupt.

MR. CATANACH: Okay.

Q Let me now ask you, Mr. Gurley, to turn to pages 5 and 6 of Exhibit One and explain what those are and what those show?

A This is a tabulation of the wells in the area of review that's included in those half mile circles around the injection wells.

We have made a few corrections to this

sheet from a prior submittal.

The Phillips Lea No. 23, we felt that it should be added even though it was not completed in the zone of interest.

The Malco Phillips State No. 1 was an old, dry hole drilled in 1950 that we had trouble finding information from the District office on. We found out the information yesterday here at the office as far as the TD and the casing sizes that were run.

On the Standard Oil Production Phillips Lea No. 1 Well, the original location on the original submittal was 1980 from the north line and 1980 from the north line. That should have read 1980 from the north line and 1980 from the west line.

The Standard Oil Production Company Phillips Lea No. 8, the original location on the initial submittal was 990 from the south line, 1650 from the west -- or from the north line. It should have read 990 from the south line and 1650 from the west line.

We've also for simplicity included the current well names on the State Vacuum Lease that ARCO operates. For example, the 2 Hale State is also known as the State Vacuum Unit No. 2. We've included those new numbers, and also indicated which wells were injection wells.

Q And you've been referring to page 5 of Exhibit One. Could you now look at page 6 of Exhibit One and identify any additional information that has been put thereon?

A Yes, sir. The only changes here are again the additions of the new names on the State Vacuum Unit.

The No. 1 State is also known as the State Vacuum Unit No. 11.

This tabulation includes the operator, the well name, the date the well was spud, its location and API number, total depth, completion interval, IP formation, casing, and the amount of cement that was used to set the casing, and the current status of the wells. Where there's no status it's just an active producer.

MR. CATANACH: Mr. Gurley, before we go any further, I'm going to have to get you guys to also list any surface casing in these wells, cement, and I'm going to have to ask you guys to estimate cement tops behind the production strings, either calculate them or see if there's any information about temperature surveys or bond logs or anything like that.

A Okay.

MR. CATANACH: You can just submit that, if you don't have that now you can just submit

that after the hearing this morning.

A Okay.

Q Mr. Gurley, in connnection with the two wells which are identified on pages 5 and 6 of Exhibit One, which were not identified on the initial application submitted, are those wells shown on the map that was submitted with the original application, which is page 3 of Exhibit One?

A Yes, sir, they are.

Q Did the addition of those two wells necessitate any change in notice being sent out to persons with interests within the area of review?

A No, sir. Phillips already operated several wells in the area of interest and they also have the acreage that was assigned to the dry hole.

Q Let me ask you to turn to pages 7 and 8 of Exhibit One and explain what those are and what they show.

A These are the wellbore schematics of the two dry holes in the area.

On page number 7 the Baxter Mobil State No. 1, the last word the District office had in Hobbs was that this well had not been -- the plugging had not been completed. It was in progress.

The Malco Phillips State No. 1 was a

schematic that we -- we put together yesterday after discovering the records in the Santa Fe office that weren't available in the District office earlier. These are the only two dry holes in the area of review.

Q Let me ask you now to turn to pages 9 through 18 of Exhibit One and identify each of those in turn and explain what they show.

A Page 9 is an injection well data sheet summary for the Well No. 5. It's currently a producer; it will be converted to injection. On the initial submittal we did not know at that time what type of tubing we would be using. We're now going to be using fiberglass lined tubing with a Baker Lok-set packer.

The number 10 is a wellbore schematic of the Phillips Lea No. 5 showing the completion dates, casing data, downhole equipment and the perforation intervals.

Page number 11 is an injection well data sheet summary for Well No. 7. It's also going to be a conversion from an existing producer. We'll be using fiberglass lined tubing set in a Baker Lok-set packer.

Number 12 is a wellbore schematic for No. 7 Well showing the same data as far as the completion dates, casing data, downhole equipment and perforated interval.

Page number 13 is an injection well data sheet for the Well No. 8 with again the tubing will be

fiberglass lined and set in a Baker Lok-set packer.

Page 14 shows the wellbore schematic for that well showing the completion dates, casing data, down-hole equipment, and perforations.

Page number 15 is an injection well data sheet for the new proposed leaseline injection Well No. 9. We're proposing to use fiberglass lined tubing in it, also, and set in a Baker Loc-set packer.

Page 16 is the proposed wellbore schematic we plan to use for that well with the casing that we propose to use and depths, cement, and the perforated interval.

Page number 17 is an injection well data sheet for the new, also the new injection Well No. 10, with again we're using fiberglass lined tubing and a Baker Loc-set packer, and the wellbore schematic for that well is shown on page 18.

I might add that on the original submittal we had the locations on Wells 9 and 10 as 15 -- on Well No. 9 we had the location 1565 from the north line and 1250 from the east line. We have moved that in to 1350 from the east line to get it approximatelyl 30 feet on our side of the leaseline.

The -- as far as -- if you look back at the map on page 4, or even on page 3, the original wells are

spotted correctly. The distance from that lease line was just incorrect. We moved it 400 feet in on a -- to the west on both Wells 9 and 10.

Q On pages 9, 11, and 13, which are the injection well data sheets for Wells Nos. 5, 7, and 8, are the footage location descriptions set forth there correct?

A Yes, sir.

Q And were they correct in the original application --

A Yes, sir.

Q -- that was made?

A And we've been in communication with ARCO on the changes we made and they're in agreement with us.

Q So it is your intention and you will be using lined tubing in these wells?

A Yes, sir.

Q Will the annulus be filled with -- will the annulus be filled with an inert fluid?

A Yes, sir.

Q And do you agree to do pressure testing of the fluid in the annulus as required by the Federal Underground Injection Control Program?

A Yes, sir.

Q And into what formation do you propose to inject?

A The San Andres.

Q And could you give us the thickness and formation relating to the perforations?

A Net thickness is approximately 45 feet. Depth of the formation at an average depth of 4650. It's a fractured dolomite with a 9.5 percent average porosity; pretty much a depletion drive reservoir with current bottom hole pressures around 100 pounds.

Q What is the source of the water that you propose to inject in the subject wells?

A We have two sources. We're going to use approximately 150 barrels per day of the produced fluid that is currently being produced on the lease.

We will also have to buy make-up water from the Phillips fresh water line that supplies Carlsbad. It's branched off and it has a line going to the ARCO unit and we're going to either share in the cost of the line or buy water from ARCO to make up the additional 1100 barrels a day required.

Q And what is -- what are you presently doing with this water?

A The 150 barrels per day we're currently producing is going into a disposal well and it's being disposed into the aquifer, San Andres aquifer on the lease.

Q And what volumes do you propose to in-

ject?

A We estimate approximately 1250 barrels per day average.

Q And what will be the maximum daily injection rates?

A Around 1300 barrels a day.

Q And will the system be opened or closed?

A It will be a closed system.

Q And will you be injecting that water under pressure or by gravity?

A It will be under pressure.

Q What is the maximum injection pressure you propose to use?

A We'd like to use 1250 pounds.

Q And why is that?

A The Commission has set limitations of .2 pounds per foot to the depth of the injection interval. This is based off a .7 overburden pressure minus a .5 hydrostatic head of super-saturated brine.

We're going to be using for the most part fresh water which has a gradient of .433. The difference in the two gradients would equal to about 1250 pounds. We'd still have the same bottom hole pressure if we had 1250-pound surface pressure with the fresh water.

Q And is the 1250 maximum injection pres-

sure you propose to use a conservative injection pressure figure which would not fracture the strata confining the injection formation?

A No, sir, it wouldn't fracture the formation.

Q And do you later intend to gather data to be offered to show that the strata confining the injection fluid has a fracture gradient which might support a higher injection pressure if that data so shows?

A Yes, sir.

Q And you do intend to be performing step rate tests in connection with this project?

A Yes, sir, as soon as we start injecting.

Q And are you aware of higher injection pressures being used by anyone in the immediate area of your proposed location?

A Yes, sir. In our verbal communications with ARCO they indicate that they are -- have a maximum 1400, 1450 pounds surface pressure on the State Vacuum Unit immediately to the east.

Q If I could now ask you to refer to pages 19 through 22 of Exhibit One and explain what those are and what they show.

A Pages 19 through 21 are water analysis reports on the produced water from five different locations.

Page 19 shows it from the Well No. 5, Phillips Lea State (unclear) No. 5. The Phillips Lea No. 7 is shown on page 20, and the sample from the South Tank Battery is shown on page 21. Pretty much show that this is typical San Andres water for the area with chlorides of around 200,000.

Q And could you now look at page number 22 and explain what that is and what that shows?

A 22 is a water analysis from the fresh water supply line from the Phillips fresh water line. It shows very low chloride which, of course, would be associated with a -- with fresh water.

Q If I could ask you now to turn to pages 23 through 25 of Exhibit One and identify what those are and explain what they show.

A We also had filtration tests run on the fresh water supply line to determine the amount of solids that were present in the fresh water. These tests indicate that there are very few solids over .5 microns, which would indicate that we should not have any plugging problems using the fresh water from that line.

Q And could you just identify each of the three pages in turn?

A Yes, sir. Page 23 is just a tabular summary of the test that was run as far as the volumes that were injected, the time required to inject that volume

through a 5-micron filter. Normally if you had plugging problems or a high amount of solids, the rate would get higher as you increase the volume of time because of the plugging that you would see across the filter.

There's very little fluctuation with time.

Page 24 is just a summary of this data showing which -- what type of materials were present, indicated that there was some sand and some iron from probably just the piping.

And 25 is a graphical solution of the tabular data.

Q I'd ask you turn -- to turn to page 26 of Exhibit One and explain what that is and what that shows.

A 26 is a comparison between the two waters as far as there were any scaling tendencies as the waters were mixed. We wanted to be sure that we weren't causing any scaling problems downhole or in the tubing as a result of mixing these waters, and as you can see there is very insignificant scaling tendencies as far as calcium sulfate, which is probably one of the major scaling -- scales in the area. We don't --

Q Okay.

A We don't anticipate any scaling problems from mixing the two waters.

Q And could I ask you now to turn to pages

27 and 28 of Exhibit One and explain what they are and what they show?

A 27 and 28 are just two additional water analysis reports from a separate laboratory and we just wanted to verify that we had the correct analyses and these are in agreement very much with the previous analyses shown earlier.

27 is the fresh water supply line and page 28 is from the Phillips Lea No. 5 Well.

Q Are there any fresh water zones in the area?

A Yes, sir, there are.

Q And what are the depths of those fresh water zones above the injection interval and any water zones immediately below the injeciton interval?

A There are no fresh water zones immediately below. There are two water zones, fresh water zones above. The alluvium is at a depth of 20 feet, and the Ogallala is at a depth of 250 feet.

Q Are there any fresh water wells within one mile of the proposed injection wells?

A Yes, sir. We have three wells that are within that radius. The water analysis from those three wells is shown on pages 29, 30, and 31, respectively.

These indicate that the -- the date the

water samples were taken, which is October 19th, and also on the remarks section at the top, indicates the section -- the location of these wells.

Q And from what intervals are they producing?

A The Ogallala.

Q And your reference to the date of the samples was October 19, 1987?

A October 19, yes.

Q 1987.

A 1987. There they compare very closely to the (unclear).

Q And are there any other materials attached to Exhibit Number One?

A Yes, sir. We've attached three logs from the three producing wells that we propose to convert to injecting. These logs show the current perforated interval in the San Andres.

Q And was this information already provided to the OCD at an earlier time?

A Yes, sir.

Q And these have been attached --

A These have been attached for -- for the hearing.

MR. IVES: We would also offer

at this time, or note standard Exhibit Number Two, which is an affidavit concerning compliance with the rules and regulations of the OCD with regards to notice and that compliance has been -- notice has been provided to all persons to whom notice should have been provided.

Q Are you aware of similar applications which have been granted for salt water disposal in the same general area or pool as the subject application?

A Yes, sir.

Q And could you identify what those are?

A Yes, sir. Two of the units are on the map on page 4, the ARCO State Vacuum Unit, as mentioned earlier, is immediately offsetting to the east. Immediately the east of their unit is the West Vacuum Unit operated by Texaco, and off the map, which is further to the east, yet, is the East Vacuum Unit operated by Phillips.

Q Have you examined the available geologic and engineering data and have you found as a result of this examination any evidence of open faults or any other hydrologic connections between the disposal zone and any underground source of drinking water?

A No, sir.

Q Well, you have --

A Well, I've examined but there's no -- there's no communication.

Q In your opinion will granting this application prevent waste, protect correlative rights, and be in the best interest of conservation?

A Yes, sir.

Q How soon does Standard plan to commence drilling in this area?

A We have budget -- money budgeted for this year for initiating the project. We'd like to get it started some time in December, if at all possible.

Q And therefor, does Standard request that this application be expedited?

A Yes, sir.

Q Were Exhibits One and Two prepared by you or compiled under your direction and supervision?

A Yes, sir.

MR. IVES: I would offer Exhibits One and Two into evidence at this time.

MR. CATANCH: Exhibits One and Two will be admitted into evidence at this time.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Gurley, if I -- were you done?

MR. IVES: That's all I have.

Q Mr. Gurley, if I understand it, you're asking for a maximum injection pressure of 1250 psi at this time?

A Yes, sir.

Q Based on the fact that you're using fresh water?

A Yes, sir, that's the only reason for it.

Q I thought you were going to -- a partial amount of your injected fluid was going to be produced water.

A Be about 10 percent. With current -- initially we propose to use about 1150 barrels a day, or 1100 barrels a day of -- of fresh water and probably only about 150 of produced water, which will raise the gradient slightly but not that dramatically.

We're a little concerned that ARCO is injecting at higher pressures and what kind of sweeps we'll be able to get if we -- we will be getting on the east side, you know, giving ARCO's pressures, and we will be injecting at a lower pressure than they are.

Q How long have you been producing these wells out here in this (not clearly audible)?

A We purchased these leases in about mid -- early 1960's. We drilled the three larger number of wells, 7, 8, and 9, or 6, 7, and 8, in the late seventies as an

infill program.

Q Okay. Is this in the Vacuum San Andres Pool?

A Yes, sir, it's in the Vacuum Field.

Q Would you know what your cumulative oil production on the lease was?

A About 750,000 barrels.

Q Mr. Gurley, have you done any decline curves on these producing wells?

A Yes, sir. We indicate there's probably 150,000, 200,000, remaining primary.

Q And have you also calculated what the additional recovery will be?

A Based off the response seen in the ARCO State Vacuum Unit, they have had -- they're going to see probably a .5 secondary to primary ratio and assuming the same response, that's the same response we'll get, we should get around, you know, 450-500,000 secondary recovery, given the data that we know on ARCO.

Q Well, would you say that the producing wells on the lease are more or less stripper wells at this -- at this point in time?

A Yeah, I know, for example, Well No 8 is the highest producer. It makes 14 barrels a day. The remainder, 1 makes 3 barrels a day; 2 makes 8 barrels a day; 7

makes 3 barrels a day; 6 makes 3 barrels a day; and 8 makes 5 barrels a day. So, yes, sir.

Q Okay, would you be willing to submit those decline curves and reserve estimates, recovery estimates?

A Yes, sir.

Q Okay.

A Just as long as we're not held to them all. That's our estimate of reserves and I probably could give you those, yes, no problem.

Q Was -- was Kincaid and Watson, did you try and get them to be included in the unit?

A We first tried to purchase their lease and they were interested in that. They we made them aware that we were going to initiate a waterflood and they didn't indicate any desire whatsoever to enter the unit.

I don't know whether they felt they would get response anyway, given the location of our, you know, Nc. 7 Well, or whether they were in a budget -- budget crunch and didn't have the money for sharing the cost.

Q Is this -- this is all a State lease?

A Yes, sir.

Q Okay, it's all commonly owned, I guess.

A I guess so. It won't take a unit, in other words, to form it.

Q Okay. Do you know how ARCO got their maximum injection pressure on to where it is at?

A Verbal conversations with their engineer, it was, of course, they ran some step rate tests, made sure they stayed below the, you know, the fracture pressure, and I think they talked with Mr. Sexton in -- in the Hobbs office and pretty much arrived at at maximum injection rate that they were -- or pressure they were limited at.

Q Okay, but this was after they recovered --

A Yeah, this flood was initiated in 1977.

Q So you feel that 1250 psi won't fracture anything above the San Andres.

A These wells, when they were fraced initially, the fracture pressure was 4500 pounds, so we've still --

Q Bottom hole pressure?

A Bottom hole pressure, yes, sir, so we still should be, you know, well below the fracture pressure indicated by those early (unclear.)

Q So what happens when you -- when your percentage of water changes and you get more -- you get more brine, start injecting more brine? You think that's going to be any danger?

A We've calculated, even with a super-sat

urated solution using up gradient, we still will stay below the -- well below the fracture gradient. I don't anticipate that we'll ever get up to a .5 gradient level on our -- on our fluid. The chlorides are high but it's not super-saturated in the pipe.

Q Okay, would Sohio be willing to run one or two tests just to verify the --

A Yes, sir.

Q -- stabilized --

A Yes, sir. We're going to do some step rate tests just for our own protection to make sure we stay below fracture pressure. We, you know, it's in our own interest to stay below it. We don't have any intentions of injecting above it.

MR. CATANACH: Okay, I think that's all I have at this time of the witness. He may be excused.

Mr. Ives, did you make note of all that you needed to submit?

MR. IVES: I think we have all the --

A Yes, we've got it here.

MR. IVES: -- information listed here.

MR. CATANACH: Okay. And going

by the corrections that you made in the application, I don't think that additional notice is necessary to any offset operators; it's not that important, so just go with what you have and as soon as you submit that other information, we'll just take the case under advisement.

A Okay.

MR. IVES: Great.

(Hearing concluded.)

C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division (Commission) was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 9260, heard by me on November 18 1987.

David R. Catanach, Examiner
Oil Conservation Division