BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
September 28, 1966

EXAMINER HEARING

IN THE MATTER OF:

Application of Skelly Oil Company for a unit agreement, Lea County, New Mexico, Case No. 3466

Application of Skelly Oil Company for a waterflood project, Lea County, New Mexico. Case No. 3467

BEFORE: Elvis A. Utz, Examiner

TRANSCRIPT OF HEARING

MR. UTZ: Case 3466.

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

(Whereupon, Skelly's Exhibits 1, A through I were marked for identification.)

MR. JACOBS: Ronald J. Jacobs, appearing for Skelly Oil Company. We would ask that the Case 3466 and Case 3467 be consolidated for the purposes of testimony.

MR. UTZ: 3466 and 67 will be consolidated for the purposes of testimony only.

MR. JACOBS: We have two witnesses we would like to have sworn, please.

(Witnesses sworn.)

MR. UTZ: Are there any appearances? Proceed.

MR. JACOBS: We call as our first witness Mr. A. H. Hurley, H-u-r-l-e-y.

A. H. HURLEY

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

DIRECT EXAMINATION

BY MR. JACOBS:

Q That's your full, correct name, Mr. Hurley?

A Yes, sir.

Q You are employed by Skelly Oil Company?

A That's right.

Q In what capacity?

A As a unitization engineer.

Q As a unitization engineer, what generally are your duties with regard to unit agreements?

A To supervise the preparation, negotiation, final drafting of the unitization instruments.

Q And did you act in that capacity with regard to the Lovington Paddock Unit, the unit under consideration today?

A Yes, I did.

Q Have you heretofore testified before this Commission as a petroleum engineer and as a unitization engineer?

A Yes, I have.

Q I direct your attention to what has been marked as Exhibit 1, which is the Unit Agreement. Mr. Hurley, what type of a unit agreement is this?

A Basically Federal form agreement following a pattern more or less established for Federal units containing Federal acreage. This particular agreement was patterned after our East Bisti and Lovington-San Andres Units.

Q And the provisions, the general provisions contained in the Unit Agreement are very similar to those

others, is that correct?

A That's correct.

Q Have you examined the application and the Unit Agreement and does the definition of the unit area as contained in the application and the Unit Agreement, is that the correct definition of the unit area?

A Yes, sir, it is.

Q I won't ask that you read the definition word for word because it does contain a number of lots; is that because of the township correction lines, range correction lines occurring right about in the center of this unit?

A That's correct. The unit is divided by four corners in four townships and, of course, there are correction lines all along both edges of this corner.

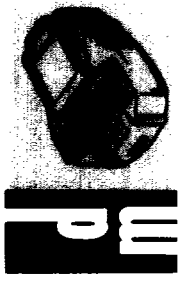
Q I direct your attention to Exhibit A attached to the Unit Agreement. Is this a plat of the unit area?

A Yes, sir, it is.

Q And it designates the type of acreage that is included in the unit, is that correct?

A That's correct.

Q Exhibit B attached to the Unit Agreement defines each one of these individual tracts comprising the unit area and describes the necessary information pertaining to each tract, is that right?



A That is correct, yes, sir.

Q What is the total number of acres contained in the unit area?

A There are a total of 3,324.63 acres in the unit area.

Q And does the Unit Agreement contain a division of the unitized formation?

A Yes, sir, it does.

Q What is that definition?

A The formation to be unitized is the Lovington, Glorieta or Paddock Formation underlying the unit area, the same being the heretofore established underground reservoir which has been found to occur between the depths of 6,010 feet and 6,838 feet in Skelly Oil Company's State "O" Well No. 12, as indicated by Schlumberger's E. S. gamma ray log, run No. 1, taken August 9, 1952, said log being measured from a derrick floor elevation of 3,829 feet above sea level. The location of this well is 1650 feet from the South Line, 2310 feet from the East Line, Section 31, Township 16 South, Range 37 East.

Q Exhibit A attached to the Unit Agreement is the plat. Is that well shown on that plat, Mr. Hurley?

A Yes, sir, it is.

Q I notice you have that indicated as if it is a location. What is the reason for that?

A The well is not actually a unit well, it is completed in the Abo Formation, and one of the wells in the area which completely penetrated the Paddock pay and was used only to find the unitized formation.

Q What response have you had with regard to sign-up of this Unit Agreement and Unit Operating Agreement, Mr. Hurley?

A To date we have received ratification of 96.23% of the working interest, 95.59% of the royalty interest based on phase three unit participation.

Q Before we get into the unit participation, the various tracts that are shown on the Exhibit A, do you anticipate that all of these tracts will qualify for the inclusion into the unit area?

A Yes, sir, we do.

Q You have hopes of getting all of the remaining working interest owners signed up within the next day or two, is that right?

A That is correct. There's one outstanding working unit owner at this time.

Q And indications from that owner are that he will sign the Unit Agreement?

A That is correct.

Q I notice you mention a phase three participation,

Mr. Hurley, what is the participation formula for this unit?

A It consists of three phases, Phase One will become effective with the effective date of the unit and for the first 300,000 barrels of oil production from the unit. The formula for that period is 70% current oil production and 30% remaining primary recovery.

Phase Two becomes effective on the termination of Phase One and will remain in effect for the next 700,000 barrels of unit production. The formula for Phase Two is 70% remaining primary recovery and 30% current production.

Phase Three will become effective on the termination of Phase Two and is based 100% on ultimate primary recovery. Incidentally, Phases One and Two together cover the remaining primary period of production. Phase Three is the secondary recovery portion.

Q And that was used because I notice you said that Phase Three is 100% remaining primary, is that right?

A Hundred per cent ultimate primary.

Q And that is the figure that you anticipate will best represent the contribution of the tracts for secondary recovery purposes in that particular phase?

A That's right.

Q In your opinion, Mr. Hurley, will this Unit Agreement, is it protective of the correlative rights of all

the various interest owners within the unit?

A It is.

Q Have you received preliminary approval from any state agency for their lands involved within the unit area?

A We have received preliminary approval of the Commissioner of Public Lands of the State of New Mexico.

Q I notice there's a federal tract. Do you anticipate that the federal tract will also be qualified and ratified by the United States Geological Survey, is that correct?

A That is correct. We have not yet received their ratification, but our contact with them in Washington and Roswell indicates that they will sign probably subsequent to the effective date.

Q So that you do anticipate that the unit area will be 100% signed both as to work and royalty, is that right?

A No, that's not exactly right. There are several tracts which may have some outstanding royalty. These tracts have been qualified by vote and by procedure of Section 15-B of the Unit Agreement and will be qualified, but there are possibly one or two fee royalty owners unsigned.

MR. JACOBS: That's all the direct testimony I have of Mr. Hurley. We will have an engineering witness to go into the injection phase and waterflood phase of this

application.

MR. UTZ: Any questions in regard to the Unit Agreement? If not, the witness may be excused.

(Witness excused.)

LARRY R. HALL

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

DIRECT EXAMINATION

BY MR. JACOBS:

Q Will you please state your name, by whom you are employed and in what capacity?

A Larry R. Hall, H-a-l-l; employed by Skelly Oil Company, Hobbs District Office, in Hobbs, New Mexico as a production engineer.

Q Are you familiar with the proposed plan of operation for the Lovington Paddock Unit?

A I am.

Q Have you participated in the engineering sub-committee with regard to this unit, is that right?

A Yes, sir, I did.

Q Have you heretofore testified before this Commission as a petroleum engineer?

A No, sir, I have not.

Q Would you please, then, briefly outline your

educational qualifications and your experience?

A I graduated from Kansas State University in June of 1962. I have since then been employed by Skelly Oil Company. I have slightly over four years' experience. I have been in the Hobbs District Office those four years. I have dealt in phases of unitization work, secondary recovery projects, primary workovers and all phases of engineering.

Q And you have made an actual study with reference to the Lovington Paddock Pool, is that right?

A Yes, sir, I have.

Q And you prepared certain exhibits and testimony in regard to the hearing under consideration today?

A Yes, I have.

MR. JACOBS: Are there any questions as to his qualifications?

MR. UTZ: No, sir, he's qualified.

Q (By Mr. Jacobs) I direct your attention to the Exhibit A which appears to be a map of the unit area. Will you please explain that?

A Exhibit A is a map showing lessees, location of wells included in the project, all other wells within a radius of two miles from the proposed injection wells, and the formation from which said wells are producing or have produced. Also is shown the boundary outline of the

Lovington Paddock and Lovington San Andres Units. The proposed area includes all of the Lovington Paddock Unit with the exception of the Skelly C. S. Caylor No. 5 and No. 8, Skelly St. "O" 20 and 21. The C. S. Caylors are located in Section 6, 17, 37. The State 20 and 21 are located in Section 31, 16, 37. There is one undrilled tract, Pan American State "E" lease located in Section 1, 17, 36.

Q And those areas you have described are cross-hatched in green?

A Cross-hatched in green on Exhibit A.

Q What is the reason that the particular tracts or the wells contained thereon will not be in the initial project area?

A The Pan American tract located in Section 1 is an undrilled location. There is no present well committed to the Paddock Unit on that location. The four Skelly tracts on the east side of the unit will not be in the initial project area due to the fact that we will delay conversion of three injection wells pending the offset operations to the eastern side of the unit.

Q I notice that you have also indicated by a red circle around certain wells. What does the red circle indicate?

A It designates the proposed injection wells.

Q And those are the wells that are enumerated in the application as proposed injection wells, is that correct?

A That is correct.

Q Around these two wells in Section 31 and one well in Section 6 you have a dashed line around those three wells. Are those the three wells that you are referring to that will be converted at a little later time?

A That is correct.

Q You do anticipate using those wells for injection but not in the first initial phase of conversion, is that right?

A That is right.

Q You have indicated by a color code, I believe, on the map, the formations from which the wells spotted thereon are completed or have produced, is that right?

A That is correct.

Q Now, the red color is the color representing the Paddock wells, which is the reservoir we're concerned with here today?

A That is correct. Skelly proposes to inject water from the Ogalalla Formation into the Glorieta Formation by the use of 19 injection wells indicated on Exhibit A. It will be used in an inverted nine-spot pattern. Our future plans include the conversion of the three wells on the east

side to inject at such time that the offset operations will permit. The injection rates are 9,000 barrels per day or an average rate of 475 barrels per day for the initial 19 injection wells. Maximum waterflood allowable oil production for the 77 project wells will be 5,725 barrels per day. Pool operators report that 7,531,829 barrels of stock tank oil have been produced from the unit area. Of this, 7,070,265 barrels have been produced from this project area. The average cumulative production per well has been 92,500 barrels. A copy of this application for the waterflood project and all attachments have been sent to the State Engineer's Office, Capitol Building, Santa Fe, New Mexico.

MR. JACOBS: Are there any of those figures that Mr. Hall gave that you would like to have him repeat?

MR. UTZ: Yes, I think I would. What was your original figure total production?

A The total production from the pool has been, now this is from the unit area as outlined on Exhibit A, 7,531,829 barrels.

Q (By Mr. Jacobs) That was as of a particular date?

A As of August 1st, 1966.

MR. UTZ: I think that will be all that's necessary.

Q (By Mr. Jacobs) I direct your attention then, Mr. Hall, to the next exhibit, which is marked Exhibit B for

identirication. Would you please describe that exhibit?

A Exhibit B is a primary performance graph for the Lovington Paddock Pool. Shown on this graph is the monthly oil production, cumulative oil production, and the number of producing oil wells. Included in this performance graph is data pertaining to wells outside the project area. These data are for the four wells included in the unit area, but not in the project area, plus those more recently developed wells in Sections 29, 30, 31, 32 and 33 of Township 16 South, Range 37 East and Sections 4 and 5 of Township 17 South, Range 37 East. This is immediately east of our project area.

Q I direct your attention to what has been marked for identification as Exhibit C. What does this exhibit show?

A Exhibit C is a primary performance graph for the unit area. This exhibit indicates the remaining primary oil to be 950,000 barrels as of January 1st, 1966. The Lovington Paddock Pool is located in all or parts of Sections 25, 25, 35 and 36 of Township 16 South, Range 36 East; Sections 29, 30, 31, 32 and 33 of Township 16 South, Range 37 East; Sections 1, 2, 12, Township 17 South, Range 36 East; and Sections 4, 5, 6 and 7, Township 17 South, Range 37 East, Lea County, New Mexico.

As stated in Mr. Hurley's testimony, because of the corrections along the township lines, the exact description

of the unit area is given in our Exhibits A and B of our Unit Agreement. The Paddock reservoir is the middle of three oil-producing horizons, the San Andres, Abo and Paddock. The Paddock field was discovered by the W. D. McBee State "A" No. 2 on June 11, 1952. There are presently 106 producing wells in the pool, of which 77 are located within the project area. The present monthly oil-producing rate in the project area is approximately 14,300 barrels or an average of six barrels of oil per day per producing well.

The Lovington Paddock Unit includes 82 proration units which ultimately will comprise 60 producing wells and 22 injection wells. Initially, the project area will exclude the four developed wells in the unit area and four in the undrilled location in Section 1, Township 17 South, Range 36 East. As stated earlier, our future plans are to convert three wells to injection status. The tract in Section 1 will be drilled at such time as response to injection has been noted in the area.

Q You mentioned that the average production of wells within the project area is something about six barrels per day, is that correct?

A That is correct.

Q What is the maximum and minimum range of that daily production per well?

A The minimum daily production is zero and the maximum is 17 barrels of oil per day.

Q I direct your attention now to what has been marked for identification as Exhibit D. Exhibit D contains some seven pages, is that correct?

A That is correct.

Q Would you explain this exhibit and what it purports to show?

A Exhibit D are well completion data for wells within the unit area. Shown in this tabulation are operator, the well number, the location, elevation, total depth, casing program, including the diameter, setting depth and volume of cement used, and the producing interval. Also noted under the "Remarks" column are those wells scheduled as water injectors.

Q I direct your attention now to what has been marked for identification as Exhibit E. Would you please explain this exhibit?

A Exhibit E is a supplemental well data sheet showing the completion date, the initial and current producing rates, and cumulative oil production to August 1st, 1966, per well. The 77 project area wells are currently completed in the Glorieta Formation with 50 wells producing from open hole, one well producing through both perforations and open

hole, and 26 wells producing through perforations only.

Q I direct your attention now to what has been marked for identification as Exhibit F, which contains 22 pages. Would you please explain that exhibit and what it purports to show?

A Exhibit F, as you said, contains 22 pages. These are downhole diagrammatic sketches of the 22 proposed injection wells. Initially only 19 wells will be converted. Administrative approval to expand the project area to include the remaining wells will be requested as circumstances permit. Shown on the sketches are all casing strings, diameters and setting depths, quantities of cement used, tops of cement, perforated or openhole intervals, tubing strings, including diameters and setting depth, and type and location of the packer.

Q I notice that you have indicated a packer and tubing. I assume you intend to inject the water through tubing set on the packer, is that right?

A That is correct.

Q And I notice you also indicated that the tubing is to be plastic coated. What is the reason for this, Mr. Hall?

A The water source we propose to use is a fresh water, however, it contains a lot of oxygen and we have to

coat the tubing for purposes of protection.

Q In your opinion will this type of injection arrangement prevent any contamination of any other formation, including fresh water-bearing formations up the hole?

A Yes, sir, it is my opinion it will do so.

Q I direct your attention to what has been marked for identification as Exhibit G, which contains some 18 items. What is this exhibit, Mr. Hall?

A Exhibit G are the available well logs on the proposed injection wells. There are 18 logs in that exhibit.

Q These are 18 of the wells that will be converted to injection?

A That is correct.

Q I direct your attention now, Mr. Hall, to what has been marked for identification as Exhibit H. Will you please describe what this exhibit is and what it purports to show?

A The Lovington Paddock Pool is an anticlinal structure, as may be noted on Exhibit H. It produces from an intercrystalline dolomite formation at a depth of approximately 5900 to 6350 feet. The reservoir has a gross productive thickness of approximately 200 to 300 feet with the first pay encountered from 50 to 150 feet below the top of the Glorieta.

The Lovington Paddock reservoir produces

predominately by solution gas drive. Pressure data indicate original bottom hole pressure was 2,400 psi. The reservoir originally existed in an under-saturated state with the reported bubble-point of the reservoir fluid being 1695 psi.
The producing gas-oil ratio and average daily oil production per well for the unit area is approximately 2900 standard cubic feet per barrel and six barrels of oil per day, respectively. The water cut averages approximately 20 per cent.

Average rock properties of the Paddock reservoir have been determined from core analyses on eight wells. The average weighted porosity was found to be 6.3%. The weighted arithmetric average permeability was 2.8 millidarcys. The average residual oil saturation and total water saturation was 16.9 and 33.8% respectively. Ultimate primary recovery for the unit is estimated to be 8,384,252 barrels. The remaining primary life for this area is indicated to be approximately eight and one-half years.

Secondary oil reserves by waterflood of the Lovington Paddock Unit have been estimated to be 6.29 million barrels. These reserves assume that recoverable secondary oil would be equal to 75% of the estimated ultimate primary recovery. Waterflood performance is anticipated to yield a peak producing rate of 3620 barrels per day in three years.

The life of the waterflood project has been estimated to be fifteen years from the start of injection.

The injection water will be produced from the Ogalalla Formation at a depth of approximately 190 feet. The two wells that will supply this fresh water currently exist and are serving the Skelly Lovington San Andres Unit.

Q I notice a number of times you have used the term Glorieta and sometimes you talk about the Paddock. We are talking about the same formation?

A That is correct.

Q I direct your attention now to what has been marked for identification as Exhibit I. Would you please explain that exhibit?

A Exhibit I are an analyses of this Ogalalla supply water and the produced Paddock water. Water injection in the unit's wells will be through internally plastic coated tubing set in a tension-type packer approximately 50 feet above the casing seat or uppermost perforation. Injection rates of approximately 475 barrels of water per day per well at maximum injection wellhead pressures of approximately 1,850 psi are anticipated.

MR. UTZ: What was your pressure?

A 1850.

Q (By Mr. Jacobs) Based on your studies of

this reservoir and your studies of engineering reports, preparation, is it your opinion, Mr. Hall, that it is necessary to institute a secondary recovery project in this area in order to recover oil which would not otherwise be recovered?

A Yes, that is correct.

Q And would such a project prevent waste?

A Yes, it will.

Q In your opinion was the proposed plan of operation and the Unit Agreement, will it protect the correlative rights of all the various interest owners within the unit area?

A Yes, correlative rights are protected.

Q Will the operation of the unit in any way abuse the correlative rights or the interest of those parties who are not within the unit area?

A No, sir.

Q Were Exhibits A through H prepared by you or under your supervision and direction?

A Exhibits A through H, with the exception of Exhibig G, were prepared by me or under my supervision.

Q Now, Exhibit G is the log?

A Injection well logs.

Q And Exhibit I is merely a water, or a supply water analysis prepared by a commercial laboratory, is that right?

A Prepared by a commercial laboratory for Skelly, yes, sir.

MR. JACOBS: We offer into evidence Exhibit 1 in Case 3466 and Exhibits A through I, inclusive, in Case 3467.

MR. UTZ: The exhibits mentioned by counsel will be entered into the record of these cases.

(Whereupon, Skelly's Exhibits 1, and A through I were offered and admitted in evidence.)

MR. JACOBS: That's all the direct testimony we have of this witness.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Hall, referring to your Exhibit F --

A Exhibit F?

Q Yes.

A Yes, sir.

Q -- am I correct in that all surface casing has been circulated?

A That is correct.

Q And that all injection will be through lined tubing and under a packer?

A That is correct.

Q If you said, I missed it, what do you intend to do with the annulus behind the tubing?

A We do not intend to load the annulus.

Q You do not?

A No, sir. That would cause undue stress within our tubing string.

Q Why would this cause undue stress?

A We would have to go down to a setdown packer rather than a tension type packer if we loaded the annulus.

Q You are using a tension packer?

A Yes, sir, that's correct.

Q You don't want the additional weight of the water on top of the packer?

A No, sir.

Q How will you determine, then, if you have any packer leakage into the annulus?

A This can be determined within two methods. We have used one and we have found two packer leaks, and you can find them readily. You can leave your annulus open and your water will come to the surface. We have found two packer leaks and we repaired almost immediately.

Q Now, this 1850 pounds will be surface pressure?

A That is correct.

MR. UTZ: Are there any other questions of the witness? He may be excused.

(Witness excused.)

MR. UTZ: Any other statements in this case?

MR. JACOBS: I believe your Commission file contains some correspondence, especially from the State Engineer, indicating his approval. We have discussed this matter with him and I think have answered all his questions. There may be some letters from other companies in support of this application.

MR. UTZ: We have a letter from the State Engineer dated September 14, in which he says he offers no objection.

MR. HATCH: We also have telegrams and letters in favor from Sunray DX, telegram dated September 26, 1966 from Amerada Petroleum Corporation in support of the application. A letter from Sunray DX Oil Company dated September 26th, 1966 also in support of the application.

MR. UTZ: Any other statements in this case? The case will be taken under advisement.

The hearing will be adjourned 'til 2:00 o'clock, at which time we will take up Tenneco's Case 3468.

I N D E X

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, 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 this 25th day of October, 1966.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1967.

I do hereby certify that the foregoing is a complete record of the proceedings in the examiner hearing of Case No. 3466-67 held on Sept 28, 1966.

Examiner
New Mexico Oil Conservation Commission