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

October 28, 1964

EXAMINER HEARING

IN THE MATTER OF: Application of Texstar Petroleum Company for a unit agreement, McKinley County, New Mexico

Application of Texstar Petroleum Company for a waterflood project, McKinley County, New Mexico.

Case No. 3131 & 3132

BEFORE:

DANIEL S. NUTTER, EXAMINER

TRANSCRIPT OF HEARING

MR. NUTTER: We will call Case 3131.

MR. DURRETT: Application of Texstar Petroleum Company for a unit agreement, McKinley County, New Mexico.

MR. MORRIS: If the Examiner please, I am Richard

Morris, of Seth, Montgomery, Federici, and Andrews, Santa Fe, appearing on behalf of the Applicant, Texstar Petroleum Company. At this time I move that Case 3132 be consolidated with Case 3131 for the purpose of testimony.

MR. NUTTER: We'll call the next case, 3132.

MR. DURRETT: Application of Texstar Petroleum Company for a waterflood project, McKinley County, New Mexico.

MR. NUTTER: Cases 3131 and 3132 will be consolidated for testimony.

MR. MORRIS: We will have one witness. I ask that he be sworn at this time.

(Witness sworn.)

(Whereupon, Exhibits 1 and 2 in Case 3131 and Exhibits 1 through 4 in Case 3132 were marked for identification.)

DIRECT EXAMINATION

BY MR. MORRIS:

Q Mr. Andreen, will you please state your name, by whom you are employed, and what position and where you are located?

A My name is Gilbert M. Andreen, I'm employed by the Texstar Petroleum Company in San Antonio, Texas. I am their Vice-President in charge of production and

engineering.

Q What is the extent of Texstar Petroleum Company's business in New Mexico, and elsewhere, briefly?

A Well, we operate, have direct operations in eight states. We are the only working interest owner and sole operator in the Hospah Field in McKinley County, New Mexico, which is the extent of our operations in the State of New Mexico.

Q Are you in the general waterflood business throughout your area of operation?

A Yes, sir. We operate a number of waterfloods. In South Texas we have two large waterfloods that we operate, we have two up in Oklahoma, which are smaller size, and we have one, two, three, four, five in Kansas in various stages of development, some in which injection has just started, some are in the design phase right at the moment. These are primarily in the southeastern part of Kansas.

Q What are your duties as Vice-President of Texstar Petroleum Company?

A Well, I'm in charge of all of the production operations and all of the engineering functions. In addition to that, being a relatively small company, I catch many other assorted duties also, including property purchases, evaluations, financial functions, personnel functions, and everything else.

Q Does the area of waterflood operations come within your direct scope of responsibility and duty?

A Yes, it does. I have quite a long history of experience in waterflooding.

Q Would you go into that briefly and give your education and experience?

A Very briefly, I have testified in the past before the New Mexico Commission but it's been ten or twelve years ago, now. To reiterate my experience, I graduated from the University of Pittsburgh in 1942 with a Bachelor of Science degree in Petroleum Engineering. At the invitation of Uncle Sam, I spent a few years in the Navy. In 1946, I joined Magnolia Petroleum Company and served in their Engineering Department all over Texas, Oklahoma and Louisiana. I was with Magnolia approximately ten years. During this time of course, I designed, installed, had jurisdiction and operation over many waterfloods and production problems of all sorts in all three of the states I mentioned. I left Magnolia and went with the Engineering Consulting Department of Core Labratories in Dallas where I was their so-called secondary recovery expert and in this capacity designed waterfloods and did reservoir engineering studies in connection with projects of this nature, not only all over the United States, but in Canada and South America and other

associated places. I left Core Laboratories after four years and went with Texstar Petroleum Company when they were formed in 1959.

Q Are you familiar with the applications of Texstar Petroleum Company in Cases 3131 and 3132?

A I am.

Q What is it that Texstar seeks by these applications?

A We seek to form a unit in the Hospah Field, the field unit area which would encompass the area described by the four base leases which cover the entire productive area of the Hospah Field. Two of these leases are owned by the Santa Fe Railroad and two by the State of New Mexico. Within this field unit area, we propose to form a unit for the Hospah Gallup Sand and a unit for the Seven Lakes Sand. We are forming this unit for the ultimate purpose of conducting secondary recovery operations in both of these horizons.

Q Referring now, Mr. Andreen, to what has been marked Exhibit Number 1 in Case 3131, would you describe that as a summary of the testimony you intend to give in this case?

A This is a summary of the testimony, and I've prepared this just as a means to make sure that we've covered all of the points.

Q Referring now to what has been marked Exhibit

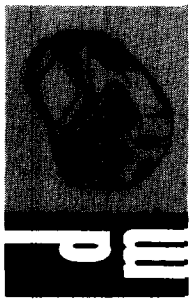
Number 2 in this case, would you state what that is and what it shows?

A Exhibit 2 is the form of the Unit Agreement which we have prepared to cover the formation of the units as I have previously mentioned. We have gone over this with Mrs. Rhea of the Land Commissioner's Office, and other people. We have contacted all the fee ownership, such as Santa Fe Pacific Railroad and all of the overriding royalty interests. We have received approval from them of the formula and the tract factors as they are shown on Exhibits E-1 and E-2 which are part of the unit agreement.

Q Refer to the plat attached to the unit agreement, if you will, Mr. Andreen, and explain to the Examiner just what your proposal is and what has been done to form this unit.

A The Exhibit B attached to this unit agreement shows the outline, which is the hashered line, the outline of the proposed Hospah Field unit area. This is the area that's covered by the four base leases that are described in Exhibit A attached to the Unit Agreement. It shows, of course, on this plat, all of the wells that have been drilled, in the area, all of these wells were drilled seeking production in the Hospah Gallup Sand.

Q I believe you said earlier that Texstar is the



owner of the entire working interest in this unit?

A Right. We are the only working interest owner.

Q Who are the other interest owners in the unit?

A The base leases are owned by the State of New Mexico and the Santa Fe Pacific Railway. There are some overriding interests that are scattered among individuals who live in, there's about eight of them that live in California, and I oelieve one of them lives in New York.

Q Have all the royalty interest and overriding royalty interests been contacted concerning the formation of this unit?

A Yes, they have.

Q What has been the result that you have achieved so far as a result of that?

A We have received their approval of the proposal to unitize on this bases presented of productive acre feet and the tract factors as are given in Exhibit E-1 and E-2 attached to this agreement. We have had a hundred percent participation by all of the interest owners, all of the fee interest owners in this respect.

Q Some of the acreage you say, is state acreage. Have you been in touch with the State Land Office concerning this unit?

A I have.

Q Where do you stand with them at the moment?

A I have received tentative approval of the form of this unit agreement.

Q What are the unitized formations in the unit agreement?

A We propose to unitize just the Hospah Gallup horizon and the Seven Lakes horizon.

Q Those two formations being the formations with which we'll be concerned with in the waterflood portion of the hearing, is that correct?

A That's right.

I might enlarge a little bit on the Seven Lakes horizon. There is no production currently from the Seven Lakes horizon. It is a shallow horizon found at a depth roughly of 300 feet. It contains a very viscous oil. During the time at which the Hospah Field was developed, this section was cored and there was available to us core analysis, and of course, this section was penetrated by all of the existing wells so that the geology and so forth of this particular section could be determined. We propose on the Seven Lakes horizon, to obtain additional laboratory information, and from this laboratory information determine what type of processes we feel this reservoir would be amenable to. We have currently, several new methods of

handling viscous crudes which even a year ago did not exist. We have reason to believe that one of these processes will enable us to establish commercial production from the Seven Lakes horizon.

Q Do you have anything further to add to your testimony concerning the unit formation before we turn to the waterflood portion of the testimony?

A No. I have nothing unless there are some questions that I can answer.

MR. MORRIS: Would the Examiner care to question at this time?

MR. NUTTER: Go ahead with the other portion of the Case.

Q (By Mr. Morris) Referring now to what has been marked as Exhibit Number 1 in Case 3132, would you characterize that as a summary of your testimony in this Case?

A It is.

Q Referring to what has been marked as Exhibit Number 2 in this case, what is that, please?

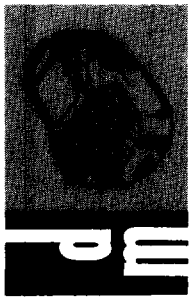
A That was the sample log. Exhibit Number 2 is a sample log on which we have shown and colored both the Seven Lakes and the Hospah horizons. These are gamma ray neutron logs that we had run last year. Actually during the original development of this field they did not do any electric logging

or anything within the Hospah Sand, so we had to go in and obtain these logs so that we could work out the geology that is presented in the exhibits attached to this little summary.

Q Would you refer to your summary of testimony and go through it briefly outlining your proposal for waterflooding in this area?

A I can just read part of this. It probably would be the easiest way. If there are any questions that come to mind as I read this, please interrupt me, I'll enlarge them at that time.

The Hospah Sand is found at a depth of approximately 1,550 feet and is the only sand that produces in the field. The 39 currently active wells produce 233 barrels of oil and 700 barrels of water per day. An engineering study of the Hospah Sand, prepared by the Engineering and Consulting Department of Core Laboratories, Inc., of Dallas, Texas, indicates that a peripheral water-injection program for the Hospah horizon will increase the future production from this zone by 1,500,000 barrels of oil over and above that expected by continued primary operations. The proposed injection plan as indicated on Figure 1, which is attached to this pamphlet, calls for the drilling of six injection wells and the conversion of two abandoned oil wells to injection purposes. It is anticipated that the maximum rate of



injection will be 6,000 barrels per day and that the maximum oil-producing rate will not exceed 1,000 barrels of oil per day. The life of the project is estimated at seventeen years.

All of the injection wells will be completed by cementing pipe through the formation and selectively perforating. All completion practices used will be such as to insure that the injected fluids will be confined to the zone under flood. The source of the extraneous water necessary to the project has not yet been determined. From old records, we believe there are potential water-source sands between 600 and 1,000 feet, and if necessary, water can be obtained from the Hospah Sand on the downdip side of the fault which forms the southern boundary of the productive area. The final selection of the water source will be determined from tests to be run on the quality and quantity of the water each zone contains.

As Seven Lakes Sand is found at a depth of approximately 300 to 350 feet. Although cores taken in this section in the early 1940's indicate oil saturation and good sand characteristics, no attempt was ever made to establish commercial production because of the viscous nature of the crude contained in the section. Engineering studies indicate this zone contains approximately 4,000,000 barrels of oil in place, and it is thought that approximately

1,000,000 barrels of this oil may be obtained by the application of one of the more exotic types of secondary recovery such as thermal, or pusher floods.

The feasibility and selection of the process to be used is contingent upon the results of special laboratory tests run on cores taken from the section. The process to be used will affect the design of the development and injection pattern, and as a consequence, no specific plans in this regard can be given at this time. While the type of process to be used in attempting to establish commercial recovery from the Seven Lakes horizon is not yet known, it is recognized that the wells drilled to this zone must be completed in a manner which will confine all injected substances to the zone under flood.

Upon approval of the Hospah unitization, which is Case 3131, Texstar's plans call for the immediate consolidation of the production-handling facilities and the installation of an automatic-custody system to handle production from all leases. During the summer of '65, it is expected that the facilities necessary to start injection into the Hospah horizon will be installed and operating. During the same period, it is planned to obtain representative cores from the Seven Lakes horizon, and in the winter months of 1965-'66 special tests will be run on these cores to

determine the most feasible method of establishing commercial production from the zone. By the summer of 1966 Texstar hopes to be in a position to install at least the pilot phase of the secondary-recovery program for the Seven Lakes Sand.

Attached to this testimony are the following:

(1) Plat of the Hospah Field Unit.

If you have any questions concerning the Figure 1, it just shows the outline of the unit area that we have seen before in the unit agreement. The second is a structure map of the Hospah Sand. You will note that all of these exhibits were prepared by Core Laboratories, Inc., in Dallas, Texas, their Engineering Consulting Department. They did that in conjunction with the formal study that they did on the field. I was involved at the time the study was done and actually checked the correlations and we agree with them as to their geological interpretations and also as to their conclusions concerning the feasibility of this flood and what we may expect to get out of it.

Q All of these exhibits prepared by Core Laboratories have been verified by you or those under your supervision?

A That's right.

Q Would you go on and identify and briefly describe the other exhibits attached to your outline of testimony?

A Exhibit 3 is the gross sand isopach of the Hospah Sand on which we have shown both the unit area, and within the blue line we have shown the proposed Hospah Sand unit area. The waterflood will affect all of the sand within the area of this blue line, and participation factors for the Hospah Sand unit have been based on the volume of sand within that blue line as determined by plenimetering a base map of this figure.

Figure 4 is the Proposed Injection Pattern for the Hospah Sand. You will note on this figure that we plan to drill six of the eight injection wells. The only two that we plan to convert are the two wells way to the north. All the other ones will be drilled and will be new wells and will be completed in a manner that we can confine our floods to the zone that we plan to flood.

Figure 5 is a Structure Map of the Seven Lakes Sand. I might point out one thing, that these maps in this report are the first time that there has been a log available on all of the wells in the field and we ran the neutrons last year to do this geology. The faults that you see on the structure maps are faults that are in existence. I have verified them and they are sufficient to cause complete separation of the production section on the south and partial separation on the one to the north.

Q At this point, will you refer to what has been marked as Exhibits 3 and 4 --

A Right.

Q -- which are cross sections through the field, and point out briefly the features of those exhibits?

A Well, these exhibits were really prepared for my conversations with Mr. Irby over here that we had yesterday. They actually are on the Seven Lakes horizon. Exhibit, cross section A-A 1 shows it is a northeast, southwest cross section of the Seven Lakes horizon and shows the existence of the zone where the water contact is and where we feel the sand is and where the oil-productive section shown in yellow on this exhibit lies in this section, as near as we can tell from our records and the present condition.

MR. NUTTER: This is just the Seven Lakes?

A This is the Seven Lakes. The Hospah is not shown, nor do I have a cross section on the Hospah Sand. The B-B 1 is perhaps a little more significant because on this particular section you can see the separation caused by these two faults. It appears on the cross section between the Santa Fe Number 25 and the Santa Fe Number 19, and between Santa Fe 52 and Santa Fe Number 9 and is complete separation insofar as the Seven Lakes Sand is concerned, and

actually is the complete separation as far as the Hospah Sand is concerned. This fault is the same fault that projects on downward into the Hospah Horizon.

Q (By Mr. Morris) If you will turn to your outline, Mr. Andreen.

A Number 6 is a gross sand isopach of the Seven Lakes Sand as prepared by Core Laboratories and participation factors for the Seven Lakes horizon were obtained by plenimetering this map.

Figure Number 7 is a tabulation of the sand characteristics and some of the basic formation fluid data that we have available on both the sands and the fluids that are contained in these reservoirs.

Figure 8 is a tabulation of the past production of the Hospah Gallup Sand in the Hospah Field. It shows that we have produced a total of four and a half million barrels, approximately four and a half million barrels from this horizon to date.

Q Mr. Andreen, does that exhibit also show the current levels of production in this area?

A Yes, it shows the production by lease and cummulative for all these leases.

Q Would it be proper to state that production in this area presently is in the stripper stage?

A I believe it is. The average production is somewhere around five barrels a day per well. Incidentally, the Hospah Field is one of your oldest fields in the State of New Mexico. It was discovered initially in 1927. It looked relatively dormant because it's way up in the middle of the Navajo Reservation and even today is hard to get to. It stayed dormant until the late '30's when there were three or four more wells drilled and then in the early '40's arrangements were made to build a pipeline from the field to the town of Prewitt, New Mexico where a refinery was constructed.

Then in the period between the war years of '40 through '44, the big field development occurred and there has been a total of, I think, roughly 50 wells, 49 wells perhaps, drilled in the field over its life. It's had a long history of constantly declining rate of production. The last exhibit that I referred to in this is the sample log which we have already previously discussed.

Q In summary then, Mr. Andreen, where do we stand on obtaining approvals of the various State agencies at this time that are concerned with this application and what is your recommendation to the Examiner?

A I will start at the tail end and come back. For the purpose of preventing waste and increasing the ultimate

recovery from the field, it is requested that the Commission grant Texstar Petroleum Company permission to conduct secondary recovery operations in both the Seven Lakes and Hospah horizons of the Hospah Field by the injection of extraneous fluids into these horizons. At such time as Texstar has determined the source of its extraneous water for injection into the Hospah Sand and determined the nature of the secondary-recovery process to be applied to the Seven Lakes horizon, the Engineering Department of the Commission, the State Engineer's Office and the State Land Commission's Office will be advised of the details of the program and their clearance obtained before actual injection operations commence. If injection into the Seven Lakes horizon, subject to the aforementioned administrative approval, cannot be granted as a result of this hearing, please delete this portion of the request and injection in the Seven Lakes horizon will be the subject of a future hearing.

I can determine my actual source of water for Hospah. I will come back and see Mr. Irby and go over in detail where our water is coming from and I will give him at that time, the schematic sketch of how we intend to complete the new wells and what we will put in them, because part of now we would like to handle these, it would insure that this

thing will stay there throughout the seventeen years of future life, can depend on the quality of water I must deal with and the corrosive qualities and things of that particular nature. We do plan to use water at least of the same salinity as that produced by the Hospah Sand and perhaps even a higher salinity.

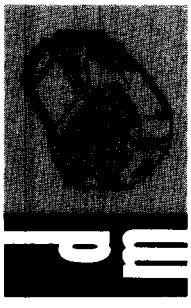
Q Would it be satisfactory with you, Mr. Andreen, and with your company, if some form of administrative procedure were established by the order of the Commission whereby some of these matters might be disposed of in the future when more information becomes available without the necessity of further hearing?

A That would suit us fine. We believe that this would be a method in which I can work very closely with these agencies and really, we can get into details such as they feel the need to meet their requirements.

Q Mr. Andreen, were Exhibits 1 and 2 in Case 3131 and Exhibits 1, 2, 3, and 4 in Case 3132, either prepared by you or under your direction or verified by you or those under your direction where those exhibits were prepared by other persons?

A Yes.

MR. MORRIS: At this time, Mr. Examiner, we offer the exhibits just mentioned into evidence.



(Whereupon, Exhibits 1 and 2 in Case 3131, and Exhibits 1, 2, 3, and 4 in Case 3132 were offered into evidence.)

MR. NUTTER: The Exhibits 1 and 2 in Case 3131 and Exhibits 1 through 4 in Case 3132 will be admitted into evidence.

(Whereupon, Exhibits 1 and 2 in Case 3131, and Exhibits 1, 2, 3, and 4 in Case 3132 were admitted into evidence.)

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

MR. DURRETT: I have a question.

CROSS EXAMINATION

BY MR. DURRETT:

Q Mr. Andreen, Do I understand correctly now, that the Commission does not feel it would have jurisdiction to enter an order authorizing the flood in the Seven Lakes, you would still want us to go ahead and authorize the Hospah Sand, is that correct?

A Yes, that's correct.

Q Am I also correct that you are only seeking authority to inject water at this time?

A For the Hospah Sand, yes, the Seven Lakes process I don't know, because I must go through a laboratory analysis of some new cores that I have yet to take on that sand to see which of these new processes will be applicable to

this reservoir.

Q But you don't propose to use those new processes on Hospah flood?

A No.

Q One other question. I don't have a copy of your exhibits, but do we have the exact location of your proposed injection wells for the Hospah?

A They're shown on Figure 4 attached to this exhibit, whatever number it is. It's Exhibit 1, I think, of 3132.

MR. MORRIS: I think Mr. Durrett is interested in a footage location of these wells. Could you supply him with a footage location?

A I can, yes.

Q (By Mr. Durrett) Could you furnish that to us?

A Yes.

MR. DURRETT: That's all.

CROSS EXAMINATION

BY MR. NUTTER:

Q This pool has produced approximately four and a half million barrels from the Hospah Sand?

A Right.

Q What is the source of reservoir energy here?

A There has been some limited water influx into this reservoir. If you will refer to the fault pattern,

it has come basically from the southwest up between these two faults. There has also been encroachment around this north part of the Hospah Sand so if you refer to the Figure 3 in this little book, you will see the blue line which outlines the Hospah Sand unit area. We have taken into account the volume of reservoir that has been really flushed by this natural encroachment of water.

Q So you have had at least a partial water drive?

A That's right. We have had a partial water drive and we have reached the point, reservoir-wise, where the natural influx now is no longer able to meet the withdrawal rights so that our productivity averages are just going down, down, and we are in a stripper stage insofar as the field is concerned.

Q You propose to augment this natural water drive by peripheral type flood?

A That is correct.

Q Has Core Laboratories, or have you, made any estimates as to the amount of additional oil that will be recovered as a result of this injection project?

A Yes, Core Labs have. I have gone over their figures and I agree with them, and as stated in this, it's about a million and a half barrels.

Q Any recovery which would be obtained from Seven

Lakes Sand as a result of an injection project would be all additional recovery?

A Would be all secondary. There's no primary potential in that field at all.

Q No primary?

A No.

MR. NUTTER: Any further questions of Mr. Andreen?

Mr. Irby, have you gone over the casing program for these wells?

MR. IRBY: No, sir, he doesn't have that yet. He proposes that this be set up on an administrative approval basis and that he will clear with me and with other interested State Agencies prior to completion of the well and injection of water. The State Engineer offers no objection to this procedure, having full confidence in the Engineering Staff of the Commission.

MR. NUTTER: If there's no other questions of Mr. Andreen, he may be excused.

(Witness excused.)

MR. NUTTER: Do you have anything further in these cases, Mr. Morris?

MR. MORRIS: No, sir.

MR. NUTTER: Does anyone have anything they wish to offer in Cases 3131-3132? We will take the cases under

advisement and call a 15 minute recess.

* * *

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 5th day of November, 1964.

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. 3132-3131 heard by me on 10/28, 1964.

Examiner
New Mexico Oil Conservation Commission

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EXHIBITS

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