BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
May 27, 1964

EXAMINER HEARING

IN THE MATTER OF:

Application of Kewanee Oil Company for a waterflood project, Eddy County, New Mexico. Dayton Grayburg Pool. Case No. 3061

Application of Kewanee Oil Company for a waterflood project, Eddy County, New Mexico. Atoka Grayburg Pool. Case No. 3062

BEFORE: Elvis A. Utz, Examiner.

TRANSCRIPT OF HEARING

MR. UTZ: Case 3061.

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

MR. UTZ: Do you wish to consolidate these next two cases for the purpose of testimony?

MR. MORRIS: Yes, sir.

MR. UTZ: Cases 3061 and 3062 will be consolidated for the purpose of testimony. Separate orders will be written.

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

MR. MORRIS: If the Examiner please, I am Richard Morris of Seth, Montgomery, Federici and Andrews, Santa Fe, New Mexico, appearing on behalf of the Applicant, Kewanee Oil Company, in these two cases. Mr. Joe D. Kenworthy of Kewanee Oil Company will be the witness in each of these cases. I ask that he be sworn at this time.

(Witness sworn.)

(Whereupon, Applicant's Exhibit No. 1 in Case 3061 and Exhibit No. 1 in Case 3062 were marked for identification.)

MR. MORRIS: If the Examiner please, we would like to concentrate our testimony first toward the Atoka Grayburg Pool and then follow up with information on the Dayton Grayburg Pool, since

our presentation follows more logically in that way.

We have prepared a brochure on each of these pools, and the brochures contain several exhibits, so that no confusion will arise in trying to find the various exhibits that we will be referring to throughout the course of the hearing.

I would like to say that the exhibits in here are in order and some are designated Figure I, Figure II, Figure III, and then they are followed by what are called Exhibit A, Exhibit B, C, D and so forth. The reason being that these attachments were taken from engineering reports prepared previously.

MR. UTZ: Each book will be an exhibit?

MR. MORRIS: Yes, sir.

JOE D. KENWORTHY

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

DIRECT EXAMINATION

BY MR. MORRIS:

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

A I am Joe D. Kenworthy, employed by Kewanee Oil Company as Chief Engineer in their Tulsa, Oklahoma office.

Q What is your area of responsibility, Mr. Kenworthy?

A Concerned with all of Kewanee's domestic operations,

which include Illinois, Oklahoma, Kansas, Texas, New Mexico, Nebraska and Wyoming.

Q Since the Examiner and those present at the hearing may not be familiar with the operations of Kewanee Oil Company, would you briefly outline the nature of those operations?

A I would be happy to. We are a rather proud organization. We claim to be the oldest independent oil company still in business, having started in 1872, operated continuously for ninety-two years. We have operated under the name of Kewanee Oil Company only for the past fifty years. Our operations are secondary recovery oriented in that over fifty percent of our production does come from secondary recovery projects.

We are presently operating thirty-five waterflood projects and participate as a non-operator in seventeen additional projects. We are actively negotiating on thirty-seven other projects that we hope to commence at some time in the future.

Q Is this your first operation in the State of New Mexico?

A No. We operated in the State of New Mexico during the 40's and into the middle 50's in the Maljamar field, which I'm sure the Examiner is familiar was a gas repressuring project, and Kewanee initiated a waterflood project in the Maljamar field in about 1954.

Q Mr. Kenworthy, are you thoroughly familiar with the

application of Kewanee Oil Company in these two cases to be presented to the Commission today?

A Yes, sir, I believe that I am.

MR. MORRIS: Are the witness's qualifications acceptable, Mr. Examiner?

MR. UTZ: Yes, sir, they are.

Q Mr. Kenworthy, what is it that Kewanee seeks by its application in Case 3062?

A Case 3062 is requesting permission to initiate a waterflood project in the Atoka Grayburg Pool by the injection of water into the Grayburg formation through a well to be drilled in Section 13, Township 18 South, Range 26 East, Eddy County, New Mexico.

Q Referring to your brochure on the Atoka Grayburg field which has been marked as Exhibit No. 1 in Case 3062, and referring to what is marked as Exhibit A within that brochure, would you state what that exhibit is and what it shows, please?

A This is a map of the general area of the Atoka Grayburg. It is the third map in the brochure, if you have difficulty locating that.

MR. MORRIS: It is designated Exhibit A.

A On this map we have designated the wells that are producing from the Atoka Grayburg Pool by circling the well in the

block. There are seven wells shown on Kewanee's operating lease, and one well on Standard of Texas lease, that is a dual in the Atoka Grayburg and Atoka San Andres field. The wells not designated by the square are the triangles produced from the Atoka San Andres Pool.

Q Do you have indicated on this exhibit anywhere the location of your proposed injection wells?

A Yes, sir, I do. The proposed injection well is Leavitt No. 13, would be 330 feet from the South line and 330 feet from the East line of the Northwest Quarter of Section 13.

MR. UTZ: Section 13?

A Yes, sir, the Northwest Quarter of Section 13, 330 out of the South and East.

MR. DURRETT: Has it got a red square around it?

A Yes, I marked it, I think, on all copies but my own.

MR. UTZ: How far would that be from the section lines, the North and West?

A Assuming that is a standard section, that would be 2310 from the North and 2310 from the West.

MR. UTZ: Continue.

Q (By Mr. Morris) Is that a presently existing well?

A No, sir, this is a well we propose to drill for water input.

Q Could you give the Examiner now some background information, Mr. Kenworthy, concerning the geology of this pool?

A Yes, sir. On Figure II we have contoured on top of the Premier Sand, which is the producing zone in the Atoka Grayburg field, note that the Premier Sand dips to the East following the regional dip of the area with no indicated structural trap for the oil.

You might refer now to Exhibit D, which is a log of a well in the Atoka field, and we can further identify the Premier Sand. The Premier Sand is indicated, the interval on this log from 980 to 995 feet. This is the sand on which our structure map was constructed.

Q I believe you've said, Mr. Kenworthy, that you have very little structure in this area. I think that was adequately shown on Figure No. II. What is the basis of an oil accumulation in this area?

A Accumulation of oil in this particular sand is due undoubtedly to stratigraphic conditions, loss of porosity and/or permeability surrounding the oil reservoir. I have prepared a couple of exhibits, Exhibits F and G, which indicate the permeability conditions that exist in this field.

We might refer to Exhibit F first. Exhibit F is a north-south cross section across the productive area of the Atoka

Grayburg field. The wells included on this cross section are identified in the insert map on the side there. The permeabilities shown below the log in each case are those measured from actual core analysis. You'll note beginning in the south, the Leavitt No. 4 well, I beg your pardon, the Leavitt No. 4 is on the north end, was too tight to submit to lab for analysis.

Coming south, Leavitt 10 exhibits some permeability, perhaps an average of 50 millidarcies. On further south in the main part of the field we have permeabilities in excess of 300 millidarcies with an average in excess of 150 millidarcies. On further south in the extreme edge of the field the permeability is decreased to perhaps 5 millidarcies. Exhibit G shows similar conditions in an east-west direction.

MR. IRBY: If I may interrupt, the index map on the right of Exhibit F doesn't correspond with the logs if we're going south. A is at the north, A^1 at the south, and as I recall, on discussing your logs, you started at A^1 and progressed to the left.

A That's right. I thought that I corrected that, A^1 was north and I was going south.

MR. IRBY: Well, that's wrong.

A A^1 is north.

MR. IRBY: Is it?

A And A is the south.

MR. IRBY: Then the exhibit is wrong?

A The coding on the exhibit is wrong. The Leavitt is the north well, the Fanning No. 1 "S" is the south well.

MR. UTZ: We'll correct the exhibit.

A Referring now to Exhibit G, which is an east-west cross section prepared in the same manner that Exhibit F was prepared, it is very apparent that permeability does exist in what we are calling the Atoka Grayburg field, and is absent in wells to the west and diminishing in wells to the east. So from this we must conclude that this is a stratigraphic trap and the Grayburg surrounding, or the Premier Sand surrounding this has little or no permeability.

Q Would you discuss now the history of the development of this pool and present whatever production data on the pool you have available?

A The Atoka Grayburg field was discovered on July 22, 1956 by Jones and Arthur's Classen No. 1, which is now Kewanee's Leavitt No. 1. Seven additional wells have been drilled, seven additional producing wells have been drilled in the Premier Sand, and the reservoir limits have been fairly well defined by San Andres completions which penetrated this sand.

Figure I indicates the limits of the field as determined from

logs and core analysis. Figure I is an isopach of net oil pay in the Premier Sand. The eight wells in the Atoka Grayburg field had produced 171,550 barrels to January the 1st of 1964. Current production is approximately 470 barrels per month. Exhibit B is a graphical representation of the production of the field since January 1st, 1957. Also shown on Exhibit B are the completion dates for the wells in the field, and we have extrapolated the production trend on this curve which indicates a remaining primary reserve of approximately 4300 barrels, to give an ultimate primary of 176,000 barrels from this field.

Presently the wells are averaging less than a barrel and a half per day per well, and on Exhibit E we have included the most recent well test on Kewanee's wells in this field. These wells are certainly at the marginal state and will be no longer economical to operate on primary means. You might note on Exhibit E that three of the wells are showing a very slight amount of water, less than a barrel of water each.

Q From the development in this pool, what reservoir data has been obtained? Could you give us the reservoir characteristics at this time?

A We had several core analyses on wells in the area which permitted us to very well evaluate the reservoir characteristics. We determined from our isopach that there's some 1,553 acre feet

of oil-bearing rock on about 325 acres, gives an average thickness of around five feet. Average porosity was determined to be 23.5 percent, and the average permeability, 96.8 millidarcies.

We estimate that the connate water saturation is approximately 31 percent. This gives this an oil in place in this particular reservoir of about 1,400,000 barrels.

Q Based upon this data, Mr. Kenworthy, have you determined the feasibility of secondary recovery in this area?

A On the primary performance it is certainly indicated it's been a solution gas drive field, which is known to be inefficient, we estimate that the ultimate primary recovery will be only about 13 percent of the oil in place, and certainly these conditions are such that it would be desirable to waterflood this field to obtain additional oil.

Q What is your proposal and plan for development of these properties by secondary recovery?

A We propose to drill the Leavitt 13 previously referred to as a water injection well. We propose to inject about a thousand barrels a day into this well. The completion technique used on this well is exhibited in Exhibit C. We propose to complete this well in a manner to isolate our injected water to the Premier Sand of the Grayburg by cementing the casing to the surface, injecting through Rock Island fiberglass tubing below a

packer set immediately above the formation. We feel that this completion will permit confining the injection water to the Premier Sand.

Q Will the annulus of this well be filled with some fluid?

A Yes. We would put some non-corrosive fluid in the annulus at a moderate pressure so that any change in pressure could be detected at the surface.

Q By the pressure gauge, as shown on your exhibit?

A Yes, sir.

Q Have you located a source of water for your project?

A Yes, sir. We propose a multiple source. First we will collect our own produced water from the San Andres. We are discussing with Standard of Texas possibilities of collecting their produced water from the San Andres, and although we have not received a final answer from them, they've indicated they are giving it their favorable consideration. This would amount to about 300 barrels of water a day at the present producing rate, and we have negotiated a contract with the land owner to furnish water from the shallow Artesian Basin to supplement this water to give us our desired rate of a thousand barrels a day.

Q What total amount of water would you estimate that you'll need from outside sources for this project?

A From outside sources something under half a million

barrels is our estimate. And, of course, cycled the water produced from the Atoka Grayburg, and we will probably handle some two and a half million barrels of water altogether.

Q By your proposal to inject water into the Grayburg formation through the installation as shown on Exhibit C, is it your engineering opinion that the water so injected can be confined to the Grayburg oil sand?

A Yes, sir. We believe that this completion technique permits immediate detection of any problem that might develop where the water wouldn't be confined and readings could be taken at that time.

Q Will fresh waters in the area, and other possible productive zones in the area, be adequately protected by this installation?

A Yes, sir.

Q Referring to Figure III again, what is your predicted performance of this project on secondary recovery?

A Well, Figure III is a graphical representation of a predicted oil production and water production. We believe that the waterflood program, as we propose, will increase the recovery from this field by about 290,000 barrels.

Q Going back to the first exhibit that you referred to in your testimony, being Exhibit A, the well location plat, I notice

that on this plat the wells in the Atoka Grayburg Pool all are located on your properties with the exception of one well, being a Standard of Texas well immediately east of the property, is that correct?

A Yes, sir, that is correct.

Q Have you discussed or had any negotiations with Standard of Texas concerning your proposed waterflood project?

A Yes, we have. We realize the wheels of industry grind pretty slow. We have submitted two proposals to Standard of Texas, one being a cooperative proposal, the other a unitization proposal. They are still working on this and are not in a position to give us an answer on it yet, but we're inclined to believe that they will accept one or the other of these proposals.

Q Do they stand to benefit from your injection program?

A Yes, sir, I believe they will.

Q In your opinion will correlative rights of all interest owners in this pool be protected?

A Yes, sir.

Q Was this brochure on the Atoka Grayburg field, being Exhibit 1 in Case 3062, prepared by you or under your direction?

A Yes, sir.

MR. MORRIS: At this time we offer Exhibit 1 in Case 3062.

MR. UTZ: Exhibit 1 in Case 3062 will be accepted

into the record.

(Whereupon, Exhibit No. 1 in Case 3062 was admitted in evidence.)

MR. MORRIS: Do you desire for us to proceed into the other aspect of this case or do you desire cross examination?

MR. UTZ: Any questions in regard to Case 3062?

MR. IRBY: Yes, sir.

CROSS EXAMINATION

BY MR. IRBY:

Q I'm not sure I got this straight, Mr. Kenworthy. I think that Mr. Morris asked you the age of the wells?

A He asked me the development, I believe, and I indicated that the first well was drilled in 1956, and on Exhibit B the completion dates of the other wells are shown, not by number, but by well in the field. I believe this note will show one early in '56 and one in '57 up to the present eight.

Q Each of these circles represents a well?

A Well, the scale, of course, is on the left-hand side, on the log scale there we show one, two, three, --

Q I see. I'm not sure I do either.

A From June of '58, for example, until February of '61 there were four wells in the field. February of '61 there were two wells completed, giving a total of six, and then in March

there were two more, giving a total of eight up to now.

Q I understand you now. When you spoke of this configuration of the pay sand there, I believe it's the Premier, when you say it's the configuration of the top, is this the oil or the top of the porosity? In other words, is there some void space up there that's porous and permeable?

A If it were porous and permeable and connected to the other it should contain oil, so the top of the oil section should be the top of the permeable porosity in that there has been no indication of a gas cap initially here.

Q There has been some oil taken out, though, hasn't there?

A Yes, sir.

Q Couldn't there be a void space in there without there being a gas cap?

A Well, perhaps you are referring to a secondary gas cap since the field has been on production.

Q I don't know enough about the industry to put you the question intelligently maybe, but maybe this will get it. Do your contours in this exhibit showing the top of the pay indicate the top of the porosity and permeability within the Premier Sand?

A The top of the oil-bearing porosity and permeability, and should be the top of the permeability in the Premier Sand.

Q Have most of these wells been either acidized or fracked?

A Yes, sir. They have most of them been fracked. It required some 1600 pounds surface pressure to frack these wells on an average.

Q Is there any indication as to what effect the fracking may have had on the cement, on the casing, or on the formation above and below the Premier Sand?

A Well, you could surmise some indication of this in that fracturing stimulated the oil production, which is an indication that it did treat in the Premier Sand. Had there been sufficient damage to the cement or to the formation in a vertical either direction, either upward or downward, there should have been considerable production of fresh water from the wells. To the best of my knowledge this didn't occur in any of the wells in the field.

Q Well, my thoughts are going not only to the well construction, but also to the waters that exist both above and below this Premier Sand, and I know that you are familiar with my apprehension in this matter. I'm just trying to do the best I can to satisfy myself that we are not going to get any contamination into this water, because the waters in the San Andres both above and below this move quite freely, almost like a pipeline. It's the San Andres where the water exists is very highly permeable and porous, and I want to be as nearly sure as I can on this.

I don't mean to keep you here all night, but I feel like I need to get the answers.

On this Exhibit E, no, I don't believe that's the one. Yes. You show your permeability in millidarcies on Exhibit F. Is this right under each well?

A Yes, sir.

Q Is there any indication further east than this? No, I want the other one that runs east and west.

A That's Exhibit G.

Q Yes. Is there any indication to the east of your Leavitt No. 11 that there is clearly a pinchout in this porosity?

A As far as we know the Standard of Texas didn't core either their No. 1-C or their No. 2-C in the Northeast Quarter of that section, if you refer to the insert map there.

Q Yes.

A Now, their No. 1-C, and it's somewhat difficult to see there above the B1, was an attempted completion in the Premier Sand. This well produced nothing natural and was fracked, I believe, with a pretty heavy frack job. After this frack it did not recover the load, which should be a pretty good indication that it was an extremely tight sand and non-permeable. I have nothing further on wells further to the east.

Q I appreciate you understand my language. I should have

said permeability instead of porosity. The water you are going to use will be produced water from the San Andres from your own wells, and possibly from Standard of Texas, supplemented by fresh water to be taken from the Fanning properties, is this correct?

A That's correct.

MR. IRBY: Thank you.

MR. UTZ: Any other questions?

MR. DURRETT: I have one question.

BY MR. DURRETT:

Q Mr. Kenworthy, referring to your Figure II in your Exhibit 1, where you show your proposed unit area, I was wondering about this Terry Well No. 2 in the Northwest of the Northeast of 14, that is apparently, you've left that out of the proposed area. Is that because of its structural position, or what would be the reason for leaving that out?

A If you will refer to the Figure I immediately in front of that, it's indicated that there was no permeable sand in the Premier on any 40-acre tract.

Q It's because the entire tract is indicated to be non-permeable?

A This is our interpretation of the core data that we had, that the reservoir limits doesn't extend that far.

Q Why is that well in the Northeast of the Southeast

marked "deep"? Why is that one included?

A Northeast of the Southeast?

Q Of 14.

A Of 14?

Q Yes. It looks like the Everest, or something similar to that. Everest No. 1, it's got a "deep" by it.

A Yes, sir, the Everest No. 1 is the 40 you are referring to. As Dick pointed out, these exhibits were pulled from other reports, a couple of engineering reports that were prepared. As you can see on Figure I, there is a small amount of oil-productive Premier Sand in that quarter corner. One proposal to unitize was based on acre feet of Premier Sand. If this were included in the formula of that tract, would get some equity in the unit.

MR. UTZ: Any other questions?

MR. MORRIS: I will continue with the other part of the case, if I may.

MR. UTZ: Yes, sir.

REDIRECT EXAMINATION

BY MR. MORRIS:

Q Turning your attention now, Mr. Kenworthy, to what has been marked as Exhibit 1 in Case 3061, which is a brochure concerning the Dayton Grayburg field, first, would you state what it is that you seek by your application in Case 3061?

A We seek authority to initiate a waterflood project in the Dayton Grayburg Pool by injecting water into the Grayburg formation through one well in Section 25, Township 18 South, Range 26 East, Eddy County, New Mexico.

Q Now, referring to this brochure, and again referring to what is shown as Exhibit A, state what Exhibit A is and what it shows, please, concerning this Dayton Grayburg field.

A Exhibit A shows the wells drilled in the immediate area of the Dayton Grayburg field. The wells classified as Dayton Grayburg wells are circled by a triangle shown on this lease, or included on this map, are in the Dayton Grayburg field, and the area that we propose to waterflood.

Q Is your proposed injection well circled in red?

A It's not on mine. Is it on yours? It is Williams No. 6. I think I again circled it red on all copies but my own.

Q What is the location of that well?

A I'll have to refer to another exhibit here. Could I give that by Quarter Quarter or do you need a footage location on that?

MR. UTZ: We really need footage location. If you don't have it at the present time you can furnish it to us as soon as possible.

MR. MORRIS: I don't believe it's in the application.

A I thought perhaps we had included that in our application, but apparently we did not.

MR. MORRIS: We'll be glad to furnish the footage location of that well to you.

A I don't have that with me at this time.

Q (By Mr. Morris) Is there only one injection well on this project?

A This is all we propose initially, yes, sir.

Q This is an existing well, Mr. Kenworthy, that you are going to adapt?

A Yes, sir.

Q Briefly, could you go into the geology of the Dayton Grayburg Pool?

A The geology is very similar to that of the Atoka Grayburg field. Again, we are producing from the Premier Sand of the Grayburg formation. The structure was illustrated before on Figure II, which is also included in this brochure. Note that the Dayton Grayburg is some hundred feet lower structurally than the Atoka Grayburg field. Here again, the accumulation of oil is due to stratigraphic conditions in the Premier Sand.

Q Do you have a sample log that would be of any help in looking at the geology of this area?

A We had no log on the Dayton field proper. We did

include as Exhibit D the same log we included in the Atoka Grayburg report, which illustrates the sand that is oil productive in the area.

Q And you would say that it would be essentially valid because of the similarity of the two pools?

A Yes, sir. We believe the characteristics are very similar.

Q What data do you have to present to the Commission concerning the development of this area and the production to date?

A All the initial completion in the Dayton Grayburg field was on July 20, 1940, McCall No. 1 in Section 24, the Southwest Quarter of the Southwest Quarter. A total of eighteen wells have been completed in the Dayton Grayburg field, only ten of which are producing at the present time. Six of this ten are located in the properties operated by Kewanee included in this waterflood application. The other wells producing are classified as Dayton Grayburg wells to the west as shown on Exhibit A, and from the little information we could obtain, these wells are producing from the Moore dolomitic sand and the Premier Sand is the classification on the Williams lease.

Q Do you have cumulative production to date, any information concerning the remaining primary in this area?

A Yes, as I remember, the eight wells on Kewanee's

properties have produced approximately 112,000 barrels, and currently Kewanee's wells are averaging only 130 barrels per month, or 0.7 of a barrel per well, certainly below the economic limit.

Exhibit B is a graphical presentation of the oil production history since 1957.

Q What reservoir data has been developed on this area?

A The only available information was driller's logs, and from these we estimate that about 235 acres in the immediate area are productive average pay of about 4.5 feet containing approximately 1,000 acre feet, and we believe that the porosity and permeability are similar to that quoted for the Atoka field.

Q Based upon this information, would you say that this area is ripe for waterflooding at this time?

A Yes, sir. Again, we have a pool depleted by inefficient solution gas drive, leaving a great deal of the oil originally in place to be recovered by secondary waterflood.

Q What is your proposal and plan for secondary recovery of oil in this area?

A We propose to convert Williams No. 6, as indicated on Exhibit A, to water injection. Exhibit C shows the completion method we propose for this well. Again utilizing the fiberglass tubing, injecting below a packer with the Grayburg or the Premier Sand isolated in this manner. Now, the casing on this well was

cemented with 125 sacks, which should have been sufficient to bring cement back to the surface, but we have nothing that indicates that cement did circulate on this well. However, we believe by injecting through tubing, as shown on Exhibit C, that we can confine this water to the Premier Sand.

Q Would you intend to fill the annular space with some inert fluid as proposed in the previous case?

A Here again, we would use some non-corrosive fluid in the annulus at a sufficient pressure that could be detected, any change could be detected at the surface through our pressure gauges.

Q In your opinion, Mr. Kenworthy, will injection of water through this well, as you propose it, adequately protect fresh-water zones in the area, and other productive zones in the area, and confine the injected water into the Grayburg oil sand?

A Yes, sir, that is my belief.

Q What is the source of water that you propose for this project?

A In this project we will inject water from the shallow Artesian water sands. We have negotiated a contract with the same Mr. Fanning to furnish water on this project.

Q At what rate do you propose to inject water?

A We will attempt to inject at about a thousand barrels

a day, and we propose to go to about a thousand pounds of surface pressure to get this much water in the ground.

Q What would be your predicted performance of this reservoir on secondary recovery?

A We think that secondary recovery, as proposed in this application, will permit the recovery of an additional 170,000 barrels. Figure III illustrates the predicted performance under secondary waterflood.

Q In your opinion, Mr. Kenworthy, will correlative rights be protected by your proposed waterflood project?

A Yes, sir.

Q Was the brochure in this case, being Exhibit 1, prepared by you or under your direction?

A Yes, sir.

MR. MORRIS: We offer Exhibit 1 in Case 3061 at this time.

MR. UTZ: Without objection, Exhibit 1 will be entered into the record.

(Whereupon, Exhibit No. 1 in Case 3061 was admitted in evidence.)

MR. MORRIS: That completes my examination of Mr. Kenworthy.

MR. UTZ: Any questions of the witness?

MR. IRBY: Yes, sir.

RECROSS EXAMINATION

BY MR. IRBY:

Q Is it your opinion, Mr. Kenworthy, that this Dayton Pool is also a stratigraphic trap?

A Yes, sir, it is.

Q Is there any way you can test this bond between the existing casing and the formation?

A There are commercially available tools that purport to measure bond between pipe and the cement. One logging company claims that they can also measure or get an indication of bond between the cement and the formation. You see, we are talking about two bonds there actually.

Q Yes, this is right.

A Just how successful this tool is, I don't know.

Q Is this casing set in such a position that if you tried to set a formation packer below it and pressure up to test the casing and had an annular leak, that it could be done?

A I think that the formation above the Premier Sand would permit such a test. There might be some doubt that, say you did set a formation packer, you built pressure and it didn't hold, there would be the possibility that your packer was leaking and that your pipe was good, but perhaps if you got a good packer

seat, certainly you could test it in this manner.

Q Would Kewanee be willing to make such test?

A I think that perhaps we would be willing to make such test. I think it would be beneficial for us to make this test ourselves.

Q Did Mr. Morris inform you of our telephone conversation regarding the report I had from my engineer?

A Yes, sir, he did.

Q I think if we can do this test we might get by without one of his other suggestions, that the packer be set below the shoe.

A Well, certainly this possible water contamination problem is our problem as much as it is yours, and we certainly want to do whatever is necessary to insure that we do not contaminate any water. I think that the attempt to test the casing, as you propose, would certainly be a reasonable request.

Q Well, can we get this into the record that Kewanee will do this, or are you reluctant to do this because of some good reason?

A I might say this, that you might go in and run a caliper on this and find that the hole was not such to permit setting a packer. This is the only reason I can think of that we would be reluctant to put this in the record. We are assuming that the

hole will permit such a test, and we really don't know whether or not to.

Q Assuming the hole will permit the test, will you make it?

A Yes, sir.

Q Thank you. Would you have any objection to the fluid that you intend to put in this annular space having an organic dye in it?

A No, sir.

Q Then this will be one of the conditions of, or rather I propose that it be one of the conditions of approval, that the inert fluid in the annulus between the tubing and the casing have an organic dye in it, preferably fluorescein. It shines like a bright light. I believe you testified that there would be a pressure gauge on this annular space?

A Yes, sir. I doubt that the use of fluorescein in this annular space will be of much benefit, but we would have no objection to putting it in.

MR. UTZ: What would fluorescein show you that the pressure gauge wouldn't show you?

A I don't believe it would show anything.

MR. IRBY: Fluorescein, if it gets away, will show quickly and definitely, whereas pressure could be attributed to

other things.

A Well, fluorescein, as I understand it, is only detectable in concentrations in excess of ten parts per million. Certainly in our annular space we would have considerably more than ten parts per million if we put any in at all, because we are talking about a small volume of water, but if it gets away and into other water sections, very quickly it will be in a concentration less than ten parts per million and non-detectable.

Q (By Mr. Irby) If it gets into the water, in large quantities of water, this is certainly true.

A If it gets away with the pressure gauge on there, we are going to know that it got away, and regardless of what color it is, and we would be in a position to do some remedial work.

Q My principal thought in this fluorescein dye is not only in the annular space, if this should get away from us down in the area of the shoe and find a channel back up the annulus between the casing and the bore, this would show at the surface quickly, I think.

A Wouldn't this also show by loss of pressure on our annulus?

Q Well, I think it would, depending on the size of the leak. We can lose a little pressure and still not feel that we have a leak, isn't this right?

A Possibly so.

Q Have change of pressure. This is the point I am worrying about, because we have got a pretty thin section of impermeability between this zone and the water, and we have this artificial bore there that may be well cemented and bonded to both formation and the pipe, but these wells are old and they've, -- I presume these have been fracked as in the other case?

A I believe that's correct.

Q Fracked or acidized, one, and knowing the mixtures of cement used in those days I would say the cement was as susceptible to the action of the frack and the acidizing, and maybe more so, than the formation itself.

A We believe that the proposed completion, as shown on Exhibit C, will provide adequate information as to when and if there's failure in either the tubing, the casing string, or bond. We don't think that the addition of fluorescein will add any more benefit. We hate to see a requirement like this put in the order, but we would abide by it if the Commission so desires.

Q This pressure gauge won't have a recorder on it, will it?

A No, sir.

Q How often will this pressure gauge be observed and a record of the observation made?

A Well, it will be open to anyone that comes by. It will

be on there constantly measuring the pressure. I recall on one project where we had some trouble with casing failures for a time we were reading it every day, but in most instances this is not done because you would become aware of a problem without going to read the pressure gauge or your injection rates would increase. Injection pressure would decline. This would probably be the only time it would be observed, if something indicated that something was wrong, this would be the one place to go check.

Q Well, you'll have a field man down here, won't you?

A Yes.

Q That will be making frequent visits to both of these wells?

A Yes, sir.

Q Can you tell me approximately what the interval of his visits will be?

A He will be on the project every day. Whether he will go to these particular wells every day, I don't know.

Q Well, could we have, after injection gets under way, could we have a report on this pressure gauge reading, say weekly, at least for the first few weeks until we gain a little confidence?

A We would certainly be glad for your people to take a reading daily if they would like. We will read it when we feel

like that it's something wrong. Actually this annular space will only have less than 40 barrels of fluid in it. I don't see the necessity of the periodic reading on it unless there is some indication of some problem.

Q If you don't read it, how are you going to know there's going to be a problem?

A We will detect it on the loss of injection pressure, increase in injection pressure. Loss of injection rate, increase of injection rate. It would be observed every time he went to the well, but probably not recorded unless there was some change in it.

Q I take it, then, you are reluctant to give me a weekly reading for a few weeks?

A Oh, not particularly reluctant. We're pretty well paper bound and these reports keep increasing; we could do that for you. the pressure would just be reported.

Q The reason I'm insisting that you do it is that I don't feel any obligation to Kewanee Company to send a man fifty miles to read this gauge. I'm in the position that I have to insist that water be taken care of. I'm not certain that your program is adequate, I hope it is, but if we can get along amiably here for a few weeks, say, readings on this and reports once a week for two months, and reports, you'll keep a record on your injection pressures, won't you?

A Yes, sir.

Q If we could have copies of that report, which I understand you have to submit to the Oil Commission for the first two months, then we could be more sure of our position. If I can have these two reports, I'll withdraw my request for the fluorescein dye.

A Okay.

MR. MORRIS: It's a deal.

A Let me clarify my statements here. We are not wanting to hide anything from you people. You are welcome to look at all our records in the project. We hate to start the filing of another report, but we will be glad to do it.

Q You understand this is just for two months.

MR. IRBY: Thank you very much, Mr. Kenworthy.

MR. UTZ: Any other questions? The witness may be excused.

(Witness excused.)

MR. UTZ: Are there any statements in this case? The case will be taken under advisement. The hearing is adjourned.

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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 11th day of June, 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. 3061/62 heard by me on May 27, 1964.

....., Examiner
New Mexico Oil Conservation Commission