BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
June 5, 1963

EXAMINER HEARING

IN THE MATTER OF: (Reopened) Case 2554 being reopened pursuant to the provisions of Order No. R-2253, which order established temporary 80-acre proration units for the South Lane Pennsylvanian Pool, Lea County, New Mexico, for a period of one year. All interested parties may appear and show cause why said pool should not be developed on 40-acre proration units.	Case 2554

BEFORE: Elvis A. Utz, Examiner.

TRANSCRIPT OF HEARING

(Whereupon, Applicant's Exhibits Nos. 1 through 15 were marked for identification.)

MR. UTZ: The hearing will come to order. Case 2554.

MR. DURRETT: In the matter of Case 2554 being reopened pursuant to the provisions of Order No. R-2253, which order established temporary 80-acre proration units for the South Lane Pennsylvanian Pool, Lea County, New Mexico, for a period of one year.

MR. WHITE: If the Examiner please, Charles White of Santa Fe, New Mexico appearing on behalf of the applicant. We

have one witness to be sworn at this time.

(Witness sworn.)

WALTER N. HAHN

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

DIRECT EXAMINATION

BY MR. WHITE:

Q Mr. Hahn, will you state your full name, by whom you are employed and in what capacity?

A Walter N. Hahn, employed by T. F. Hodge as petroleum engineer in Fort Worth.

Q Are you the same Walter Hahn that previously testified in this case?

A Yes, I am.

Q Since the last hearing have you conducted any additional studies of this pool?

A Yes, I have. We have attempted to secure additional information in this field as we have developed it.

Q Have you secured any additional reservoir data?

A Yes, we have. We have some reservoir data that we've added to our original information.

Q Have you also made additional studies and calculations as to the estimated amount of recoverable oil?

A Yes, we have. I would like to refer to this Exhibit 1, if I may.

Q All right. Exhibit 1 is --

A Page 1 in the brochure. This is a field history of the South Lane Pennsylvanian Pool and it gives the location, the producing formation, which is the Bough "C" production from approximately 9700 feet. The date of discovery was March 21, and the cumulative oil production is 233,796 barrels. The rate of production during April was 32,244 barrels. Original bottom hole pressure was 3,473 pounds per square inch, and our present pressure is 2,873. It is a solution gas drive with a possible partial water drive.

Q How many new producing wells are there in the pool since May 10th, which was the date of the original hearing in this case?

A There are twelve new wells not counting the discovery well, two near completion and two locations that are probably drilling at this time.

Q Do you have any completion data?

A Yes. Refer, please, to Exhibit No. 2, or page 2 in the brochure, which shows the well completion data on each of the wells completed to date. This gives the operator, lease, the well number, the date of completion, the perforations, the

treatments and the initial potential.

Q Is there any further explanation you would care to make?

A No, I think it's all self-explanatory there.

MR. UTZ: How many wells were in this pool when you had the last hearing?

A Just one.

Q Do you have any oil production data?

A Yes. Refer to the next page now. This is Exhibit 3, oil production data, South Lane Pennsylvanian Pool. The production is shown by month, by operator, by lease, and it indicates we now have a cumulative production of 233,796 barrels. I don't think that there's anything else that needed to be added to that right now.

Q Exhibit 4 is a corollary to that, is it?

A Exhibit 4 is a plot of oil production rate, number of wells and reservoir pressure versus time. It shows, of course, that the field was discovered back in the early part of '62 and brings production data up through '63. It shows the decline in the reservoir pressure from the original down to the present reservoir pressure, and you can see also the number of wells as we move through that time period.

Q Is this exhibit otherwise self-explanatory?

A Yes.

Q Will you refer to Exhibit 5 and give the gas-water production?

A The gas-water production are shown on figure 5, or Exhibit 5, and this gas production was calculated by using a gas-oil ratio of approximately 1390, which appears to be the average over the past six or seven months. Some of the gas is being vented, very little of it is at the present time. Some of it is being used for field operations, and a large portion of it is going to the Warren Gas Plant. The water production is also shown there, as recorded in the New Mexico Conservation Booklet.

Q Have you prepared a structure map indicating the structure of the Bough "C" formation?

A Yes, I have. It's the large map, which I think is marked as Exhibit No. 6.

Q Will you explain that, please?

A The initial completion in this reservoir was in Section 26. It was in the Southeast Quarter of the Southwest Quarter. The structure map merely shows the structure on top of the Bough "C" formation, the general dip from the west, and it comes back up on this feature and then goes off to the east again.

This also, of course, shows the wells that are in the field, starting with the Apache well to the north and going down through

the Hodge and Humble wells, Tenneco, Texaco and on down to the Tenneco wells in the south end of the field. I believe that's all on that.

Q Now, will you refer to your cross section map, Exhibit 7, and explain it, please?

A Exhibit 7 is a cross section, it's a north-south cross section starting with the Apache well in the north portion of the field and it goes to the south end, and ends with the Tenneco A No. 2 well.

Q On the far right?

A Yes. The plat on the right shows the area that's being covered on this cross section. The top of the Bough "C" formation is evidenced, if you'll notice, on the T. F. Hodge Humble State No. 1, the Bough "C" is that fairly thick section, the first one that you come to, and the top is easily identifiable on any log in the area. The porosity, of course, starts down a few feet from the top of the formation.

Q Mr. Hahn, what are the reserve rock and fluid properties?

A Those are shown in Exhibit No. 8. It shows the gross pay section of approximately 30 feet. Net pay of 13.5. The net pay is the average over the pool. The porosity is an average of 7.95%, and that is an average that's taken from core analysis

on three wells, the T. F. Hodge Humble State No. 2, the Tenneco State No. 1, and the Humble "BQ" No. 1. The water saturation is estimated at 25%, the permeability is 1,069 millidarcies for an average on the Humble State lease of Well No. 1 for Hodge, or Well No. 2 that should be rather than the No. 1.

Q That's exhibit corrected to recite Well No. 2?

A Yes, it should show No. 2. The other permeabilities that were shown on the Tenneco and Humble wells were not included. The reason that they weren't was that we felt like that several of them were fractured permeabilities, they were extremely high up, as high as 7,000 millidarcies, so as an average I used the one core on our permeability calculation. It does indicate we do have a very permeable formation, and probably slight fracture through it.

MR. UTZ: There were other cores?

A There are other three. Those are the only ones that I know that have been cored in the pool.

MR. UTZ: This figure is an average?

A No, this figure is probably low. I didn't include the Tenneco or Humble wells because I didn't think I could get a reasonable average from them, because, as I said, I believe the Humble Oil had one permeability that showed 7,000 millidarcies and the Tenneco has two or three that were recorded as above

3,000 millidarcies, so we didn't, it wasn't anything that I could average to a well. I think if anything this is probably a little lower than the Tenneco well and probably a little higher than the Humble well, if you could average them.

MR. UTZ: All right, sir.

A The original reservoir pressure is 3,473. That was measured with a bomb on the T. F. Hodge Humble State No. 1. The saturation pressure shown as 2,950 pounds per square inch, and that is pressure that I've derived from empirical formulas that are in common use for this type work. We do not have a PCT sample on the well, so I don't know definitely what the saturation pressure is.

Reservoir temperature is 143 degrees. Gas in solution is assumed to be the same as the produced gas-oil ratio, which is 1,390 cubic feet per barrel. Formation volume factor was calculated to be 1.76, and the gravity of the oil is 47.5.

Q Now give the original bottom hole pressures by referring to Exhibit 9.

A Exhibit 9 shows each of the bottom hole pressures that were available in the pool at the time this information was prepared. I've arranged these in the order, chronological order by dates, which shows the hours shut-in and the bottom hole pressure. This is all at the subsea datum, which I don't believe I've

recorded here, but it's midway in the perforations on the Hodge Humble State Well No. 1. The thing that I think is important here is to notice that on each of the pressures, as you move down through the time that the pool has been developed, each of them are decreasing with the exception of the one Tenneco State Well No. 1, which was taken on 6-30-62. I feel there may be an error in that pressure, which shows to be 3,486 pounds. That well offset the discovery well one location and it doesn't seem reasonable that it would be that high.

Q What significance is this exhibit, in your opinion?

A I think that it shows that the pool can adequately drain a very large area. It shows that we can hold the pressure in one portion of the field and drill a well in another portion of the field and you almost have the same pressure in almost the same place that you drilled.

If you look at Humble State "BQ" Well No. 1, which was taken on 10-18-62 , we had a pressure of 3,040 pounds. At that time, if you will refer to your large map there, which I believe is Exhibit No. 6, that well is located in the Northwest Quarter of the Southwest Quarter of Section 26. That well was completed on 9-30-62, or approximately a half month before this pressure was taken, yet the pressure 3,040 fits in very well with the pressures of the other wells to the south. The Humble State

"Y" Hodge and the Tenneco wells. So this again indicates to me that we're draining at least 80 acres and our pressures are approximately the same throughout the reservoir.

You might also note here that the three pressures I've averaged together about halfway down the chart are on three different wells taken on the same date. This was done purposely to see if the pressures are approximately the same at the same time on different wells located in different areas in the pool.

Q Will you now explain Exhibit 10?

A Exhibit 10 is a productivity index calculation that was calculated from the data that we secured on the Hodge Humble State Well No. 1. This was, we presented this same information in the first hearing. We had just completed the data at that time, but you can see that the productivity index is 3.232 barrels per day per pound square inch drop in reservoir pressure.

Q What does this exhibit indicate?

A This again exhibits to me that we have good permeability and we can drain a large area with very little pressure drop.

Q Will you now explain Exhibit 11?

A Exhibit 11 fits in with Exhibit 10. It's a part of the data that was secured when we took the productivity index test on the Hodge Humble State No. 1. The only reason for enclosing it here is to show that there was a very short time re-

quired to arrive at full build-up pressure after the well had been flowing for a certain period of time.

Now, to go back into this productivity index a little farther, we flowed the well for approximately twelve days before we took any pressures in order to more or less stabilize the well. Then we ran a bomb in the hole and recorded our flowing bottom hole pressure of 3385 pounds per square inch. We shut the well in, leaving the bomb in the hole, and recorded the pressure for the next twenty-four hours.

This graph on Exhibit 11 is a tabulation of the pressures that were recorded from the time the well was shut in until, oh, approximately twenty-four hour period. The well built up from the flowing pressure of 3385 pounds per square inch to the 3411 pounds per square inch in approximately six minutes, and this chart shows from six minutes on over to approximately twenty-four hours. But you can see that in approximately five or six hours the well was completely built up and the reservoir pressure was static.

Q Do you have any core analysis data?

A I've enclosed in this brochure for Exhibit 12 the Hodge Humble State Well No. 2 core analysis. This is the one that I used in arriving at the average permeability for the zone. The permeabilities, as you can see, ranges from a low of approximately

1.4 on up to about 3,000 millidarcies. The porosity fits in very well with this 7.95 that we were talking about a minute ago.

Q Which again indicates what?

A This again just is additional data to show that the permeabilities are good throughout the section and that drainage is excellent.

Q Have you made any additional comparisons of this pool with the Allison Penn Pool since the last hearing of May 10th, 1962?

A Yes. I have now. I'll go back to explain why I did this, initially when we asked for the 80-acre spacing we compared this to the Allison Pool, and we had this chart, Exhibit 13, in the original data. I've gone back into that data and changed the information, more or less brought it up-to-date with what we know now for the South Lane Penn.

The purpose in presenting this is that we know the Allison Penn is on 80-acre spacing and is adequately draining the reservoir. We feel that this is a very similar type reservoir and compares very well in both fluid and rock characteristics. I don't think it's necessary to go through each one of these items that are listed here.

Q Have you made any additional recovery calculations?

A Yes. I've altered my calculations on recoveries and

I've shown those in Exhibit 14.

Q How does this compare with the original exhibit you introduced May 10th of '62?

A The porosity, I believe, is slightly lower, the water saturation is higher. On the water saturation before we used 15% and I'm assuming now that it's approximately 25% due to the amount of water that we're producing. You recall the Humble State Well No. 1 didn't, at the time of the original hearing, produce water and still doesn't. However, there are a number of wells in the field that do at the present.

The net pay has changed some. We're now showing 13.5 feet, which is an average over the entire pool that's been developed to date. Recovery factor, I've increased that from, I believe 25% initial, or for the initial hearing, and I'm now using 35%. The reason I changed that, I felt that there is at least a partial water drive, the magnitude I don't think we can determine at this time, but it does appear that the pressures are leveling off some when compared with the amount of barrels produced per pound per square inch drop in pressure. So I think that the 35% oil in place is a reasonable assumption at this time.

The formation volume factor, 1.76, is approximately the same as we used before. These calculations show that the recoverable oil on 40-acre spacing, or under a 40-acre tract would

be approximately 49,720 barrels, and for an 80-acre tract it's 99,440 barrels.

Q On an 80-acre tract?

A That's right.

Q Have you made any additional economic studies?

A Yes. Exhibit 15 shows the results of a comparison of income with cost. This isn't a real complete table in that I haven't included several things here, but the income, of course, on 40 acres and 80 acres, I've assumed everybody had a normal one-eighth royalty, which probably isn't true, and probably the income from most of the leases on 40 and 80-acre spacing will be less than what I have shown here.

The $2.82 per barrel is the normal price for crude reduced by the amount of taxes that we have in the area. Then for cost I've shown the drilling and completing cost of a well to be approximately $130,000. The completion cost and drilling cost on our initial well, I believe, is $135,000. So this is a reasonable number here.

Flow lines and tank battery were included to bring the total cost to approximately $137,000. Now, this does not include operating costs, which will be deducted from the income, nor does it include pumping equipment which would be included on most of the wells on the cost side of the ledger.

Q Mr. Hahn, what conclusions have you drawn as a result of these studies?

A I feel that this pool can definitely be efficiently and economically developed and drained on 80-acre proration units, and also that by developing the pool on a 40-acre proration unit will cause the drilling of unnecessary wells and lead to economic waste.

Q Do you have anything more to offer in this case?

A We'd like to request that the temporary rules that were originally set up be accepted and made permanent for the South Lane Pool.

Q In other words, continued in effect?

A That's right.

Q Where these exhibits prepared by you or under your direction or supervision?

A Yes, they were.

MR. WHITE: At this time we offer the exhibits in evidence.

MR. UTZ: Without objection, Exhibits 1 through 15 will be entered into the record of this case.

(Whereupon, Applicant's Exhibits 1 through 15 were offered and admitted in evidence.)

MR. WHITE: That concludes our testimony at this time.

If the Examiner please, I believe I have in my file the exhibits that were offered in the former hearing, if you care to refer to them for any comparisons.

CROSS EXAMINATION

BY MR. UTZ:

Q The actual communications tests as between wells in this pool have not been run, have they?

A No, not as such they haven't.

Q Your proof of communication, that is all the proof that you have exhibited here, is on your Exhibit No. 9?

A Is that the bottom hole pressure exhibit?

Q Yes.

A Yes, sir. I think essentially that does give you the same thing as an interference test.

Q Your contention, then, is that the initial pressures throughout the field as now developed are the same?

A Approximately, of course, it would vary some, but I think that they're very nearly the same. I might add a little to that, in that our initial effort in this area where we were taking our P.I. tests, we had this rapid buildup in pressures and we have excellent permeabilities, so that we feel that the pressure drawdown in a particular area is felt fairly quickly over the entire pool.

Q You feel now that the approximate average pool pressure is around 2873?

A That's right.

Q 400 pound drop for the amount of production that has been produced?

A That's right.

Q Did the other two cores which you have not demonstrated here show any fracturing?

A I don't recall if they did or not. However, I believe I have those cores with me, I could get them and check, just a second. No, I'm sorry, I don't have those with me. I can get them and furnish them to you. I don't recall whether those two cores showed fractures or not.

Q The core that you used here was for a T. F. Hodge Humble State No. 1?

A No. 2.

Q Did that core show any fracturing?

A No. He doesn't record any in here. However, it's my understanding that it does appear to be slightly fractured, yes. I have never actually looked at the whole core, but the people that have explained that it does have some small fractures in it.

Q Referring to your Exhibit No. 12, in relation to this coregraph, what is your perforated interval?

A I believe that initial brochures had the initial perforation on it along with the log there. The perforation on that No. 2 are 9736 to 40. However, that core will probably need to be adjusted a little bit for that depth. It may not coincide exactly with the electric log.

Q In other words, the perforated interval isn't your higher permeable areas of this core?

A That's right, it is on this particular well. Now, some of the other wells that we have drilled in there, that's not true. For instance, the T. F. Hodge Humble State No. 3, we perforated from 9751 to 53 because we felt that it was connected throughout, and there was no problem in draining say the upper section or the lower section.

Q Then the only well that was drilled subsequent to discovery that did not show a decline in shut-in pressures was the Tenneco State 1?

A That's right, and it's located one location south of the discovery well. However, there are other pressures, for instance, the next to the last pressure shown on Exhibit 9 is another pressure on the same well. So is one of the pressures used in the average about halfway up the chart, so it's now fitting in very well with the pool average, so it leads me to believe that this initial pressure might not have been an exact

pressure. Sometimes your bombs get off a little bit.

Q On your Exhibit 14, on your reserves of oil in place you've used exactly twice the amount of reserves for your 80-acre tract as you do 40?

A That's right.

Q Do you feel that one well will recover as much oil on 80 as one well on a 40 or twice as much oil?

A I think for all practical purposes you can assume that it would. I don't think exactly twice, no. It would be something a little less than that probably, but it would be very insignificant in a reservoir that's this permeable.

MR. UTZ: Are there other questions of the witness?

MR. DURRETT: Yes, sir, I have a question or two.

MR. UTZ: Mr. Durrett.

BY MR. DURRETT:

Q Mr. Hahn, going along with this idea of the acreage that a well will drain, you stated that you feel a well on 80 acres will not drain exactly twice the amount of oil that a well on 40 acres would. Under that idea, if the application was approved, it would at least leave a little oil in the ground that would be recovered on 40-acre spacing?

A Well, it might or it might not. Of course, we are not real sure of the magnitude of the water encroachment, whether

it's a water drive, partial water drive or not, it would depend a lot on the location of the wells. If it's a pure water drive, probably you would recover as much on 80 exactly as you would on 40's.

Q At least there would be a possibility, theoretically, that you wouldn't require twice as much?

A That's possible, yes.

Q You expressed an opinion concerning the economic waste caused by drilling unnecessary wells, and that you didn't feel it would be necessary to drill a well over 40 acres in order to effidiently and economically drain this pool. Would it be true because of the economic limits of production of oil and the saving that would result from drilling one well on only an 80 instead of a 40 that you would actually recover more oil on 80-acre spacing than you would on 40 because of the economic limits?

A I think that would be true, I think for one thing you might not adequately, assuming that it's a complete solution gas drive reservoir, which I'm not sure, but possibly there would be some wells that would never be drilled if it were drilled on 40's.

Q Even if they were drilled on 40's would they not be abandoned quicker because of the economic considerations?

A I'm not sure that they would be abandoned any sooner, no, because I think your cost per well would still be approximately

the same. They might be abandoned sooner as far as time is concerned, yes.

Q As far as time?

A Yes, but each well would have to stand on its own, I mean if the economic limit is two barrels a day, when it got down to that point, whether it was on 40 or 80, you would still abandon it at that time.

MR. DURRETT: Thank you. I believe that's all I have.

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

(Witness excused.)

MR. BRATTON: Bratton on behalf of Humble. Humble Oil and Refining Company is a lease holder and operator in this area and supports the application of T. F. Hodge that the temporary rules be made permanent.

MR. BLACK: C. R. Black with Texaco. As the testimony showed, Texaco is the operator of one well in the reservoir. We believe that the evidence presented substantiates the fact that a well completed in this reservoir is capable of efficiently and effectively draining in excess of 80 acres. We think this evidence shows excellent communication within the reservoir. We concur in T. F. Hodge's request and ask that the temporary rules be made permanent.

MR. DURRETT: If the Examiner please, the Commission has received a letter from Tenneco Oil Company signed by A. W. Lang, District Production Superintendent, stating in general that they recommend approval of the application in this case to make the rules permanent. This will be in our files if someone would like to read it in its entirety.

We also have received communications from Midwest Oil stating that they are in favor of 80-acre proration units. In this case also have received a communication in the form of a telegram from Sam Boren and Major and Giebel Oils stating that they agree with the request of T. F. Hodge that the temporary 80-acre spacing rule be made permanent.

All of these communications will be in our files if someone would like to consider them in their entirety.

MR. UTZ: Are there other statements? The case will be taken under advisement.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 13th day of June, 1963.

Ada Dearnley
Notary Public-Court Reporter

My commission expires:

June 19, 1963.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2554, heard by me on June 5, 1963.

, Examiner
New Mexico Oil Conservation Commission

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
May 10, 1962

EXAMINER HEARING

IN THE MATTER OF: Application of T. F. Hodge for an order creating a new pool and establishing temporary rules, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order creating a new pool for Pennsylvanian production; the discovery well for said pool is the Humble-State Well No. 1, located in Unit N of Section 26, Township 10 South, Range 33 East, Lea County, New Mexico, completed in the Bough "C" zone of the Pennsylvanian formation with perforations from 9667 feet to 9671 feet. Applicant further seeks establishment of special rules and regulations governing said pool, including 80-acre proration units.	Case 2554

BEFORE: Daniel S. Nutter, Examiner.

TRANSCRIPT OF HEARING

MR. NUTTER: We will call next Case 2554.

MR. MORRIS: Application of T. F. Hodge for an order creating a new pool and establishing temporary rules, Lea County, New Mexico.

MR. WHITE: If the Examiner please, Charles White of

Gilbert, White and Gilbert appearing on behalf of the applicant, T. F. Hodge. We have one witness to be sworn at this time.

(Witness sworn.)

WALTER L. HAHN

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

DIRECT EXAMINATION

BY MR. WHITE:

Q Mr. Hahn, will you state your full name for the record, please?

A Walter L. Hahn, H-a-h-n.

Q By whom are you employed, Mr. Hahn?

A By T. F. Hodge.

Q And in what capacity? A Engineer.

Q Have you previously testified before the New Mexico Oil Conservation Commission or any of its Examiners?

A No, I haven't.

Q Will you briefly state your educational background and your professional qualifications as an engineer?

A I was graduated from Texas A & M with a B. S. in petroleum engineering, and I worked for a short period for Texas Petroleum Research Committee in College Station. I was with a major company about ten years doing reservoir and operation type

work, and I have been doing engineering work for Fred Hodge for approximately a year.

Q Are you familiar with the subject application?

A Yes.

Q Will you briefly state what the applicant is seeking by the application?

A We are seeking to establish temporary 80-acre spacing rules and 80-acre allowable for the area around our Humble State Well No. 1.

(Whereupon, Applicant's Exhibit No. 1 was marked for identification.)

Q Will you refer to what has been marked Exhibit No. 1 and point out the location of the subject well?

A Exhibit 1 is the large map that we have, and since we have just one well in the field at the time, there wasn't much you could place on the map. However, you'll notice that T. F. Hodge's Humble State Well No. 1 is located in Section 26, Township 10 South and Range 33 East. We also have two additional wells drilling at the present time. One is in Section 35, which we call our Anderson State No. 1, the other is in Section 22 which is the Tenneco State No. 1. Those are the only wells, I believe, drilling in the area at the present time.

Q What wells are producing in the area at the present

time?

A T. F. Hodge Humble State No. 1.

Q Do you have a cross section showing the structure relationship between your Humble State Well No. 1 and the other two wells?

A No, I have a cross section as Exhibit No. 2 that shows the logs for the T. F. Hodge Humble State No. 1 and the Jake Hammon State VNME No. 1, which is a dry hole in the northeast corner of Section 35. The cross section, I marked the top of the Wolfcamp, the top of the Pennsylvanian and the top of the Bough "C" formation.

(Whereupon, Applicant's Exhibit No. 2 was marked for identification.)

Q Have you made any studies as to the reservoir characteristics?

A Yes, sir, I have.

Q Would you relate them, please, to the Commission?

A I believe we might go into this well history first.

Q All right. Refer to your brochure marked Exhibit 3 and give the well history, if you will, please.

(Whereupon, Applicant's Exhibit No. 3 was marked for identification.)

A The well history as shown in Exhibit 3 indicates the

location of the well as we have previously described, the total depth of 9846 feet. We set 4½" casing at 9844. The drill stem test is shown on the exhibit, the interesting point in the drill stem test is the immediate build up in flowing pressure; our initial flow pressure was 1675 pounds per square inch, and our final flow pressure was 3071 pounds per square inch, indicating we have very good permeability in this formation. The results of the drill stem test are shown after the pressures, the strong blow, gas to the surface in 32 minutes, water blanket in 35 minutes and oil in 45 minutes. The estimated flow rate was 10 to 20 barrels per hour, recovered 1300 feet of oil and 100 feet of drilling fluid.

The well was perforated from 9667 to 9671, and the only treatment required was 500 gallons of mud acid. The initial potential was 468 barrels of 47 gravity oil on a 12/64 surface choke with a gas-oil ratio of 1550 to 1. The tubing pressure was 1250 and the casing pressure was 1500 pounds. The initial reservoir pressure was found to be approximately 3473 pounds per square inch.

Q Is that a bomb test?

A That was a bomb test.

Q Was that at mid point of perforations?

A At mid point of perforations.

Q Is this well presently on production?

A Yes, it is.

Q Will you review your studies as to the characteristics, and in so doing, turn to the page of the brochure and give the reservoir rock and fluid properties?

A It's a little difficult to estimate rock and fluid properties where you only have one well, but I worked with the information we had and arrived at these various parameters that are shown here. The depth of the formation we have already discussed, this is a vugular type dolomite. We have a gross pay of approximately 30 feet, a net pay of about 16. The porosity is calculated from sonic logs, 7.2%, the water saturation is calculated to be 15%. Now, in my estimation this is extremely low, and I would expect the water saturation to be something in the vicinity of 25%. I was using a lateral log and a microlateral log to calculate the water saturation, and the microlateral log is not a real good tool in this type of dolomite.

The permeability relative to oil was calculated to be 94. There's an error in the original typing of this and it has been corrected. The original pressure was found to be 3473, and you will notice I have the saturation pressure and the formation volume factor and the oil viscosity shown. These are calculated from charts that are accepted by the engineering profession, and the saturation pressure was 3270 pounds per square inch; formation

volume factor, 1.88, and viscosity, 0.18 (cp.); reservoir temperature, 143 degrees. The gas in solution was assumed to be the same as the original GOR. The oil gravity is 47 degrees API.

Q Have you made any studies as to the productivity?

A We ran a productivity index on this well last week, and the process we used in running this productivity index was to first stabilize the flow rate by measuring the oil production over hourly periods of time until we felt that the well was completely stabilized. At that time it was producing at the rate of 184.2 barrels per day. We took a flowing bottom hole pressure at that time and it was 3358 pounds per square inch.

We then shut the well in with a bomb in the hole and recorded the pressures over the twenty-four-hour period. The shut-in reservoir pressure is 3415 pounds per square inch.

Q How many minutes did it take to reach the maximum?

A It took in the vicinity of six to eight minutes to get to the maximum pressure, it was almost an immediate build-up. Again, a good indication of good permeability. The productivity index calculation shown there was 3.232. Now, there's a problem involved in this productivity index, I feel it may be higher than what we have. We've only perforated a small portion of the reservoir and it may have some influence on the productivity index. The permeability calculations shown below is relative to

oil and it was calculated to be 94 millidarcys. Again, the perforations may have some effect on this. I feel the permeability, as measured by core analysis, of course, will be higher, and probably the relation to oil will be higher if we had perforated a full 16 feet of section.

Q Mr. Hahn, have you made any studies or calculations as to the estimated amount of recoverable oil from this well?

A Yes, I have.

Q Is that on the following page of the brochure?

A That's right, this is Exhibit No. 6.

Q Beg your pardon, I believe it's page 6 in Exhibit 3.

A All right.

Q Will you give the oil recovery calculation, please?

A Using the parameters that we have already discussed, the porosity, water saturation and net pay, and a recovery factor of 25% of the oil in place which is an optimistic estimate of recovery from a solution gas drive reservoir, we have come up with the oil in place and recoverable oil volumes that are shown for 40-acre spacing and 80-acre spacing on the bottom of the sheet there.

There, again, I would like to point out that we are using 15% water saturation, which I think is about 10% too low, and this would in turn reduce the oil in place and the recoverable

oil.

Q In other words, if the water saturation were increased, it would decrease the amount of oil recoverable?

A That's right. Also the recovery factor may be slightly high. I would normally use something in the range of 20%, but I didn't have something to guide me. The recoverable oil on 40 acres is 40,400 barrels; recoverable oil on 80 acres is 80,800 barrels.

Q It is my understanding this is the only producing well within this particular new pool, is that correct?

A That's right.

Q Have you made comparisons with other pools of similar characteristics?

A Yes, I have.

Q Will you refer to the next page of your brochure and explain those studies, please?

A Page 7 is a comparison of the rock and fluid properties from the Allison Penn. Pool and the T. F. Hodge Humble State No. 1. Now, the reason for making this comparison is, with one well in the area it's difficult to analyze the performance of the reservoir, so to get a little better feel for it in an area where the Commission has already established 80-acre spacing, we compared this with the Allison Penn. Pool. The

depths of the producing formations are approximately the same. The gross pay is about the same, the net pay in the Allison Penn. field is 8.94, and that's an average. The T. F. Hodge was 16.

Now, in the Allison Penn. field there are wells that have as high as 20 feet of net pay. Possibly, as future development takes place in this area of ours, we'll find zones or wells with more and less pay than this 16 feet. The porosities compare very well, 5.15 and 7.2. Water saturations, they're using 25%, I was using 15 based on log calculations which I have already said was, in my opinion, low.

Their permeability was 107.2. Our permeability relative to oil is 94. The P.I. for Allison, 5.01. Our P.I., 3.23. We note the reservoir pressures are very close, the saturation pressures are also close, and the solution ratio is 1,517 in the Allison and 1,550 in the Humble State. Reservoir temperatures are similar. The formation volume factor, 1.821 in the Allison and 1.88 in the Humble State No. 1. The oil viscosity, .19 in Allison and .18 in the Humble State. The oil gravity, 48 in Allison and 47 in the Humble State.

Q Mr. Hahn, will you explain the plot that you have prepared on the following page of your brochure?

A On page 8, and we should refer to page 9 at the same time.

Q That refers to the Allison Pool?

A This is the Allison Pool. This is initial bottom hole pressure information that was presented in the 80-acre spacing hearing for this field. The reason I put this in this report is that I think it's a real good indication of the drainage quality of the reservoir. You'll notice that on page 8 we have the initial pressures for four wells with the Gulf Federal Mills No. 1 being the original well in the field. On the next page I have circled the wells in the same color code to show the location on the map.

You'll notice that at the time the field was brought in the initial pressure was 3518, and as each of these other wells were drilled the initial pressure on those wells were much lower than the original pressure. It was noted that the Atlantic State "AD". No. 1, when it came in, had a pressure of 3110 pounds. That was also the pressure of the Gulf Federal Mills at that time. So the period of time that's been covered here is very short and the pressure drop has been fairly high, indicating to me from the map, the wells are located some distance from each other and there definitely has been very good drainage across the reservoir.

Q Mr. Hahn, from the studies that you have made of these characteristics, what conclusions have you drawn as to the new proposed pool and as to the Allison Penn. Pool?

A I feel they're very similar in both rock and fluid and producing characteristics. They are both from the Bough "C" formation, and they are both thin sections, good permeabilities, and evidently drain very wide areas.

Q In your opinion is the Humble State Well No. 1 producing in a new independent reservoir?

A Yes, sir, it is.

Q Are you asking the Commission to permit the development of this new pool upon a temporary 80-acre spacing pattern with the accompanying 80-acre allowable?

A Yes.

Q How do you desire the formation of the 80-acre units to be?

A We feel that the 80-acre units should be either the East Half, West Half, North Half or South Half of a single Governmental quarter section.

Q What are your recommendations for the location of a well in an 80-acre unit?

A Since we're asking for temporary rules, we feel that we should have some flexibility in these rules, and we would like to be able to locate the wells within 150 feet of the center of each quarter quarter section of the 80-acre unit.

Q Why do you believe this flexibility is desirable?

A We believe this is necessary because we have not by any means defined the limits of the pool with one well, and I think it would encourage development in the area if you have a little more flexible rule for the location of your well.

Q Could you illustrate this by referring to Exhibit No. 1?

A Well, Exhibit No. 1, about all I could say there is, of course, we are drilling the Tenneco State Well No. 1 right now in Section 22. We don't expect it to be a dry hole, but those things happen to you sometime.

Q If it were to be a dry hole, what?

A If we were, say, expected to drill in, say, the northwest quarter of the section in 26, we would probably not drill that well due to the proximity of that well with this dry hole.

Q This is the dry hole in Section 22?

A In Section 22. However, if we had the flexibility to locate it in the South Half of that 80-acre tract in Section 26, we probably would still drill the well. I feel it gives us a little better chance to develop the field.

Q Have you made any economic studies as to the cost of drilling a well on a 40-acre spacing pattern versus an 80-acre spacing pattern?

A Yes, I have.

Q Are those studies reflected on page 11 of Exhibit No. 3?

A Yes.

Q If so, will you detail the information thereon?

A The recoverable oil used in this calculation was the same as we found back on page 6 of Exhibit No. 3, 40,400 barrels for 40 acres and 80,800 barrels for 80 acres. We assumed that everybody has a 7/8ths lease in the area, which isn't necessarily true, but a 7/8ths interest would reduce the reserves to the operator by a certain amount and give you on 40 acres, 35,300 barrels, and on 80 acres, 70,600 barrels. Then, applying the price per barrel to the gross operators oil we would come up with $94,600 as an income on 40 acres, $189,200 as an income on 80 acres.

Q That is an optimistic figure, is it not, by reason of your water saturation?

A That's true, it's optimistic for that reason, and also it's optimistic from the standpoint that some of the operators do not have a full 7/8ths interest in their lease.

Q This does not include operating costs either, does it?

A No. However, we would include that in the lower portion. Now, the cost shown below is the actual drilling and completing cost for the Humble State Well No. 1. It includes both the flow lines and the tank battery and the total cost was

$139,866.60. Again, this does not include operating costs. This is merely getting a well drilled and started producing. The operating costs over a period of time, of course, would increase this number to something above what it is now. If you compare your cost with the income, knowing that the cost is lower than if you included operating cost, it would be lower than what I have shown here, and also that I have been probably optimistic on reserves, and income would be less than what I have shown for 40 and 80 acres, it just is not economically feasible to drill a well on 40 acres in this field.

Q Mr. Hahn, you've shown by your testimony and the exhibits that this new pool is extremely similar to the Allison Penn. Pool. Are you familiar with the Commission's special rules and regulations pertaining to the Allison Penn. Pool?

A Yes, I am. By Order R-1389-B, entered August 26, 1959, the Commission established 80-acre spacing, drilling and proration units with the accompanying field rules.

Q In your opinion, this new pool would be efficiently and economically drained and developed on an 80-acre proration unit?

A Very definitely.

Q In your opinion would the development of this pool upon a 40-acre proration unit cause drilling of unnecessary wells and

lead to economic waste?

A Yes, it would.

Q Do you have any further testimony to offer at this time?

A No, I believe that's all.

Q Were these exhibits prepared by you or under your direction and supervision?

A Yes, they were.

MR. WHITE: At this time we offer Exhibits 1 through 3.

MR. NUTTER: T. F. Hodge's Exhibits 1 through 3 will be admitted in evidence.

(Whereupon, Applicant's Exhibits 1 through 3 were admitted in evidence.)

MR. WHITE: That concludes our direct examination.

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

MR. MORRIS: Yes, sir.

MR. NUTTER: Mr. Morris.

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Hahn, I call your attention to your Exhibit No. 1 and the Jake Hammon Well No. 1 shown thereon in Section 35,--

A Yes.

Q -- which I believe you stated was a dry hole?

A Yes. It was completed as a dry hole.

Q Did that well penetrate the Bough "C" formation?

A Yes, sir, it did.

Q Could you give any explanation of why the well was non-productive from that formation?

A Well, it is productive, it's a matter of economics, I think. If you'll refer to our Exhibit No. 2, I believe it is the cross section, I don't know if you can read the drill stem test that was shown on there or not, but if not, maybe I can read it from this one here. Some of those didn't come out too clear. They drill stem tested from 9855 to 9948 and they had gas in three minutes, mud in seven minutes, oil in nine minutes. It flowed 34 barrels of oil in one hour; gravity, 45.4; flowed 40 barrels of oil and 28 barrels of water in six and a half hours. Recovered 390 feet of salt water from below the sub and then the flowing pressures are there. So it may have been discovered to be uneconomic to drill the well. However, it is productive in that area.

Q Do you feel that if the subject application is granted that the Hammon interest could go in there and make a well out of this?

A No, sir, because we have the lease now.

Q Oh, you have the lease now.

A Yes.

MR. NUTTER: I see.

Q I see. From an examination of the log on the Hammon Well No. 1, do you feel that your calculations with respect to porosity, permeability and net pay are borne out?

A Yes, I think they are. Right now the porosity, I didn't actually calculate it on the Jake Hammon Well, but I think the drill stem test is a very definite indication of the permeability that you have there. It's extremely good.

Q Is there anything with respect to the Hammon well that is inconsistent with the information that you have presented to the Commission with respect to your Well No. 1?

A No.

MR. MORRIS: I believe that's all I have.

BY MR. NUTTER:

Q Mr. Hahn, why is a well uneconomic that flows 34 barrels of oil in one hour on a D.S.T.?

A I don't know. This well was drilled back in 1956.

Q That drill stem test went on way down below the base of the Bough "C" also?

A Yes, it did.

Q That's why it recovered that salt water possibly?

A Well, it's a possibility. I just don't know where the salt water came from.

Q The well is structurally lower than the Hodge No. 1 Well?

A Yes, sir, it's about 200. I believe around 200 feet, in that vicinity.

Q Where are you anticipating to find the Bough "C" in your No. 1 Well that's drilling in Section 35?

A In Section 35.

Q At a point some place in between --

A Yes. Well, it would be proportional to distance there.

Q You expect it to come in lower than your discovery well?

A Yes, it will definitely come in lower, we have already correlated as a lower well. We expected it to be when we started it.

Q What is the current depth of that well?

A It's in the area of 5500 feet. That's not exact because I haven't checked on the last date.

Q What about the Tenneco well up there?

A It's about 7500.

Q What is the perforated interval in your well, Mr. Hahn?

A 9667 to 9671.

Q Four feet of perforation?

A Yes.

BY MR. MORRIS:

Q You have asked for temporary rules to be established here, I assume, for the period of one year?

A Yes.

Q During that period you intend to conduct interference tests between the wells in this area?

A Very definitely. We intend to secure PVT analysis, get a bottom hole sample of the fluid and get our PVT samples together and run periodic production curves and get the bottom hole pressures and get the best reservoir information we can to decide in our own mind and for the field as to what spacing we should actually be on.

MR. MORRIS: That's all.

BY MR. NUTTER:

Q Currently you don't have a bottom hole fluid analysis?

A No, we do not. These are calculated numbers that I have used.

Q So you have estimated your saturation pressure at 3270?

A That's right.

Q Which would be some 200 pounds below the initial bottom hole pressure?

A Yes, sir.

Q You stated on about the third page of the exhibit where

you calculate your P.I. --

A Yes.

Q -- that you got a stabilized producing rate of 184 barrels a day and a flowing bottom hole pressure of 3358?

A That's right.

Q Then you shut the reservoir in, and how long did it remain shut in?

A It was shut in for twenty-four hours. We would have left it shut in longer if necessary, but it had built up after about the third hour, I believe it was, there was no change in your pressure.

Q Reached maximum build-up?

A Reached maximum build-up in --

Q -- in three hours?

A There's an immediate build-up in about six minutes. I would like to present those. Dennis Owens ran those and he hasn't furnished us with the P.I. yet. Everything we have is obtained from them.

Q Would you furnish us that when you have it available?

A Yes, I will furnish it.

Q You calculate your P.I. at 32.3 barrels per day per inch?

A Yes, that's right.

Q Now, this $132,000 that you referred to as the cost of drilling the well, is this the actual cost of your discovery well?

A This $132,000, that's right. That's the actual cost.

Q Do you estimate that the cost on adjacent wells will be more or less?

A They'll be about the same. We will, of course, do some coring, which will increase the cost slightly, but I don't think it will materially affect us one way or the other.

Q Did you have any extraordinary expenses in the drilling of this well inasmuch as it was a wildcat, such as logging, extra logging or extra drill stem testing?

A No, we ran only two drill stem tests, which I think would be probably an average for some time to come in some of these wells. We tested the San Andres and recovered nothing but salt water in it, so I didn't include it in this analysis here. We will core the wells and we'll probably continue to run drill stem tests. So, actually, the well was a very economical well, I think, for the depth.

Q You didn't have a mud logging trailer?

A We didn't have a mud logging trailer on it, we ran three logs, which we will continue to do.

Q Did you have any loss circulation problem in the drilling of the well?

A No, we didn't.

Q So the cost might turn out to be an average cost?

A I think it's good evidence of future costs, I surely do.

Q In calculating your economics, you haven't given any credit to the sale of gas that would be produced from the well?

A No, I haven't. That will be coming in the future.

Q What is your GOR? A 1550.

Q And your saturation GOR?

A I assumed it to be the same. That's all I have was in the range of 1550.

Q Mr. Hahn, I just wanted to be sure about something. I notice that the Schlumberger lateral log on Exhibit No. 2 indicates that the location of the well would be in Section 25. It is in --

A I hope not.

Q It is, however, in Section 26, is it not?

A Yes, that's a mistake on the log.

MR. NUTTER: Any further questions of Mr. Hahn? He may be excused.

(Witness excused.)

MR. NUTTER: Do you have anything further, Mr. White?

MR. WHITE: That's all, thank you.

MR. NUTTER: Does anyone else have anything further

they wish to offer in Case 2554?

MR. SERGENT: W. M. Sergent, Jr., representing the Cabot Corporation. I would like to indicate Cabot's approval of Mr. Hodge's proposal, and most emphatically would recommend that the location of the wells on either of the quarter quarter sections be included in these rules.

MR. NUTTER: What office of Cabot are you from?

MR. SERGENT: Pampa, Texas.

MR. MORRIS: Mr. Examiner, the Commission has received a telegram with reference to this case from Humble Oil & Refining Company which supports the application in this case.

MR. NUTTER: Is there anything further in Case 2554?

MR. NANCE: Mr. Examiner, Wayne Nance with Tenneco Oil Company. Tenneco Oil Company is the owner of leasehold interest directly offsetting the Humble State No. 1. Tenneco Oil Company concurs with the recommendations of T. F. Hodge for the establishment of 80-acre units, flexibile spacing, and 80-acre allowables.

MR. NUTTER: What office of Tenneco do you represent?

MR. NANCE: Hobbs.

MR. NUTTER: Anything further? We will take this case under advisement and call Case 2555.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 7th day of June, 1962.

Ada Dearnley
Notary Public-Court Reporter

My commission expires:

June 19, 1963.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2554, heard by me on 6/10, 1962.

, Examiner
New Mexico Oil Conservation Commission