Pages 10-45

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

CASE 537: Application of Lowry et al Operating Account for order establishing pool rules for the Pettigrew-Tocito Pool, Rio Arriba County, New Mexico, with attention to spacing regulations, the fixing of gas-oil ratios, establishment of a casing program, and related matters.

TRANSCRIPT OF HEARING

May 19, 1953
Date

BEFORE: Honorable Ed. L. Mechem, Governor
Honorable E. S. Walker, Land Commissioner
Honorable R. R. Spurrier, Director, OCC

STATE OF NEW MEXICO)
ss
COUNTY OF BERNALILLO)

I HEREBY CERTIFY That the within transcript of proceedings before the Oil Conservation Commission is a true record of the same to the best of my knowledge, skill, and ability.

DONE at Albuquerque, N. M., this 29th day of May 1953.

E. E. Greeson

E. E. Greeson
Notary - Reporter

My Comm. Exp.:
August 4, 1956

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO.
RECEIVED
JUN 1 - 1953

A-1

COMMISSIONER SPURRIER: We will move on to Case 537.

(Mr. Graham reads the call of the case.)

MR. KELLAHIN: If the Commission please, Jason Kellahin, representing Lowry et al Operating Account.

This case, as the petition states, is an application for the establishment of pool rules for the Pettigrew-Tocito Pool. As the Commission will recall, there is a case pending before the Commission at the present time having to do with the change of the name of pools, and it is our request any pool rule established for this pool be made applicable in case the name is changed.

Briefly, the application is for the establishment of a uniform spacing pattern on the basis of one well to each 80 acres; for the establishment of a uniform gas-oil ratio for the pool, and at the rate of 2000 cubic feet of gas to each barrel of oil, which is in conformance with the present statewide rule in the absence of a special setting by the Commission; and for the establishment of the uniform casing program for the protection of the producing strata and the water formations.

I would like to mention this: at the present time the Lowry et al Operating Account holds leases on the entire area which is within the defined boundaries

of the pool.

We will have three witnesses: Mr. Henry Birdseye, Mr. Art Holland, and Mr. Robert Anderson.

Will you gentlemen stand and be sworn, please?

(Witnesses sworn.)

MR. KELLAHIN: I would like to call Mr. Henry Birdseye as the first witness.

———o———

HENRY BIRDSEYE,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name, please?

A Henry S. Birdseye.

Q By whom are you employed, Mr. Birdseye?

A Lowry Oil Company.

Q What position do you hold with that company?

A Geologist.

Q How long have you been connected with the Lowry Oil Company, Mr. Birdseye?

A Approximately nineteen months.

Q And have you had any special education or training to fit you as a geologist?

A Yes, sir; I have a Bachelor of Arts degree with

major in geological science.

Q From what school is that?

A Harvard University.

Q Have you testified before this Commission in your capacity as a geologist before?

A I have.

MR. KELLAHIN: Will the Commission accept the witness' qualifications as an expert?

COMMISSIONER SPURRIER: It will.

Q Mr. Birdseye, as geologist for the Lowry Oil Company, have you had occasion to study and are you familiar with the Pettigrew-Tocito Pool?

A Yes, sir, I have. I have supervised the geology on all of the wells drilled in that pool, with the exception of the discovery well.

Q And you have made an intensive study of the pool since your employment?

A Yes, I have.

Q Are you familiar with the field limits of the pool as of the present time?

A As established by the Oil Conservation Commission, I am, sir.

Q Do you have a plat showing those limits?

A I do.

Q Mr. Birdseye, I hand you what has been marked as

Applicant's Exhibit 1 and ask you to state what that is.

A This is a plat showing a portion of the Lowry acreage in Rio Arriba County, and defining the limits of the Pettigrew-Tocito oil field as established by the Oil Conservation Commission.

Q How are the limits of the present Pettigrew-Tocito Pool delineated on this map?

A Includes all of Section 9, all except the NE quarter of Section 10, the SE quarter of Section 7, the SE quarter of Section 4, the North half of Section 16, the NW quarter of Section 15.

Q Now, referring to Exhibit 1, what does the colored area show?

A The colored area includes a portion of the Lowry acreage whichis shown on this plat.

Q Within the defined limits of the pool, is all the ownership of leases in the Lowry Oil Company, Lowry et al Operating Account?

A Yes, sir, all of the limits -- all of the acreage within the limits -- of the pool, as established by the Oil Conservation Commission, is operated by the Lowry et al Operating Account.

Q Now, does this map reflect the producing wells which have been drilled to the Tocito formation within the limits of the pool?

A Yes, sir, it does.

Q How are those shown on the map?

(Off the record.)

A This plat shows both the gas wells and the oil wells, which are -- which have been drilled and are operated by the Lowry et al Operating Account. The oil wells are as shown in the legend distinctly portrayed by a black dot with a small ring around them.

Q And the gas wells, are they drilled to the Tocito formation?

A No, the gas wells in that vicinity are all producing from the Pictured Cliff formation.

Q How many producing wells are there within the pool?

A There are now ten producing oil wells.

Q And are all those within the boundaries of the pool?

A They are, with the exception of the last completed well, which was completed approximately a month or five weeks ago, and has not yet been placed within the limits of the pool.

Q Have you made application to this Commission to have that well included in the pool?

A We have filed a form on that.

MR. KELLAHIN: We would like to offer Applicant's

Exhibit 1 in evidence.

COMMISSIONER SPURRIER: Without objection, it will be received.

Q Are you familiar with the lease ownership within the region of the Pettigrew-Tocito Pool, Mr. Birdseye?

A Yes, sir, I am. I have prepared a map showing the Lowry leases in relation to the leases of surrounding operators.

Q In reference to Exhibit 2, marked Applicant's Exhibit 2, what does that show, Mr. Birdseye?

A This Exhibit No. 2 shows the wells which have been drilled on and in the vicinity of the Lowry leases. It shows the ownership of the leases which are included in and surround the Lowry lease block in Rio Arriba County.

Q Does that -- What does the colored section on the exhibit show?

A The Lowry acreage is colored in in yellow.

lb Q Does that map accurately reflect who is concerned in the area of the Pettigrew-Tocito Pool and would be interested in this application?

A It does.

MR. KELLAHIN: I offer in evidence Applicant's Exhibit 2.

COMMISSIONER SPURRIER: Without objection, it will

be received.

Q Now, Mr. Birdseye, have you prepared a contour map showing the Tocito formation, the top of the Tocito?

A I have.

Q I hand you what has been marked as Applicant's Exhibit 3 and ask you what that shows, Mr. Birdseye?

A This is a map of the area which includes the Pettigrew-Tocito oil pool. It is primarily a structure contour map of that pool with the contours on top of the Tocito pay sand.

Q From what information did you derive those contours?

A Primarily from an interpretation of electrical logs of those drilled oil wells.

MR. KELLAHIN: We offer in evidence Applicant's Exhibit 3.

COMMISSIONER SPURRIER: Without objection, it will be received.

Q Now, Mr. Birdseye, do you have electric logs -- I mean cross sections of the Pettigrew-Tocito formation?

A I have prepared two cross sections of the electrical logs involving representative sections of the Pettigrew-Tocito field.

Q Do you have those here?

A I have them here.

Q. I hand you what has been marked Applicant's Exhibit 4 and ask you to state what that is.

A This is an electrical log cross section of four wells along the line as specified on the previously entered exhibit, which is a contour map of the Pettigrew-Tocito field.

Q By previously entered exhibit, you mean Exhibit 3?

A Exhibit 3; yes, sir.

Q Now, what does that reflect in relation to the continuity of the Tocito field, Mr. Birdseye?

A Well, we have found in drilling this Tocito field, that the pay sand is continuous and predictable within a reasonable plan of development. And we have also found from electrical log interpretations, from core analyses, and from sample examinations, there is every reason to believe that the sand is continuous within the limitations of the Pettigrew-Tocito field.

Q Have you encountered anything in your study which would indicate it wasn't continuous?

A We haven't encountered any faulting or any permeability and porosity barriers within the limits of the field.

Q How would you describe the Tocito formation from a geologic point of view?

A Well, the producing sand in the Tocito reservoir

is a sand lens of the upper cretaceous age. It is a typical shore line development which is found on the southwest flank of the San Juan Basin. It does not, as far as we have been able to determine, have any structural control in relation to the oil accumulation. Rather, it is entirely stratigraphic in nature due to the fact that the sand does not extend as a continuous formation with permeability and porosity over a wide area outside the limits of the field.

Q Have you in your study encountered any evidence of geologic barriers which would interfere with the continuity of the reservoir?

A Not within the field.

Q From your examination of the pool and the Tocito formation, do you consider that a good permeable sand?

A It appears to have remarkably high permeability in comparison with other sands found in the San Juan Basin. Core analysis shows an average permeability in the range of 125 milledarcys. And the interpretation of the electrical and micro logs substantiates the core analyses we have made, as does the performance of the wells.

Q Now, in your examination of the Pettigrew-Tocito field and your study of the geologic information, what have you found in relation to the presence of fresh, potable water-bearing strata?

A We found early in the development of the field that there is a stratum bearing fresh water at a relatively shallow depth averaging 450 feet. And we have drilled eight water wells to that stratum, which have produced all of the drilling and potable water used in the development of that area.

Q Do you have any recommendation to make to this Commission as to a casing program for the protection of that potable water strata?

A Well, we consider that that potable water should be carefully protected, as we have done already. That program of protection should continue in the future by setting a sufficient amount of surface casing in order to properly prevent -- to properly prepare for the protection of the potable water. We feel a minimum of 450 feet of surface casing is required.

Q In connection with your drilling of water wells, are any of those water wells located close to oil wells?

A Some are in close proximity. I can think of two within several hundred feet of these oil wells. The fact that our casing program has been ample, namely, setting through this water sand, is attested to by the fact that none of our water wells have shown any indication of drilling fluid whatsoever.

MR. KELLAHIN: Does the Commission have any ques-

tions?

COMMISSIONER SPURRIER: Apparently not.

MR. GRAHAM: What does the gentleman think of the closure of that pool extending northwest on the map?

MR. KELLAHIN: We will have some testimony on that from Mr. Holland, Mr. Graham, if you would care to hear it from him; although, I have no objection to this witness testifying to what he knows.

THE WITNESS: I would be pleased to say a few words on that, sir.

As you have seen, the structure map over there is probably considerably different than the Bagley Pool. As I stated earlier, this is a stratigraphic trap rather than a structural trap. Consequently, it isn't of an anticlinal or domal nature, and you cannot draw closed contours of a producing formation. In other words, the reason for the accumulation is sand conditions rather than structural position. And variations in sand thickness and porosity and permeability appear to be the defining factors in limiting the accumulation.

MR. GRAHAM: It could go southeast or northwest?

A Yes, sir; it could.

MR. GRAHAM: Drilling will find that out.

A Yes, sir; it will.

MR. KELLAHIN: That is all.

I would like to offer in evidence Applicant's Exhibit 4.

COMMISSIONER SPURRIER: Without objection, it will be admitted.

MR. KELLAHIN: That is all, sir.

COMMISSIONER SPURRIER: Are there any other questions of this witness? If not, the witness may be excused.

MR. KALLAHIN: I would like to call Mr. Art Holland.

(Off the record.)

———o———

ART HOLLAND,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name, please?

A My name is A. F. Holland.

Q By whom are you employed, Mr. Holland?

A By Lowry Oil Company.

Q In what capacity?

A As petroleum engineer.

Q Do you hold an official position in that company?

A I do.

Q And what is that position?

A I am in charge of the engineering department.

Q Have you had any special training and experience to qualify you for that position?

A I have a BS Degree in Petroleum Engineering from the University of Oklahoma. And I have practiced my profession approximately six years.

Q Have you testified before this Commission before in your capacity as an engineer?

A I have.

MR. KELLAHIN: Will the Commission accept the witness' qualifications as an expert?

COMMISSIONER SPURRIER: It does.

Q Now, Mr. Holland, are you familiar in connection with your work with the Lowry Oil Company, with the history of the Pettigrew-Tocito Pool in Rio Arriba County?

A Yes, sir, I am. I have followed the development in the field since the time of, roughly, when the first three wells were completed. The discovery well of that field was the Lowry et al Operating Account Federal 2-17A. It is located in the center of the NW quarter of the SE quarter of Section 9, Township 26 N, Range 6 W, Rio Arriba County, New Mexico.

Thewell was completed in the Tocito formation at a total depth of 6,692 feet on July 10th, 1951. The initial

potential of the well was 720 barrels per day. Since that time, Lowry has completed nine additional wells.

To April 30th, 1953, the field had produced 522,972 barrels of oil, and 810,032,000 MCF of gas.

Q Mr. Holland, have you prepared a performance history of the pool in the form of an exhibit?

A I have. The production information on the --

Q I hand you what has been marked as Applicant's Exhibit 5 and ask you if that is that exhibit.

A Yes; that exhibit gives factual data on the Pettigrew-Tocito field.

Q Continue, then, on your history.

A To continue on the history a little more: The crude oil averages approximately 43.8 degrees API, which is a relatively high gravity crude. It is a good quality crude of paraffin type. And it is suited for topping and cracking to give high yields of good quality gasoline.

The oil in the field is purchased by the Malco Refining Corporation. The oil is transported by pipe line from the Pettigrew-Tocito field to their refinery at Prewitt, New Mexico.

Q Does that include all the production of the pool, Mr. Holland?

A That includes the entire pool production.

Q Are you familiar with the field history, Mr.

Holland?

A Yes, sir; I am.

Q Referring to Applicant's Exhibit 5, will you state what that exhibit shows in connection with the field history?

A As to production information?

Q Yes, sir.

A In Exhibit No. 5 we have tabulated the production history of the field from inception to April 30th, 1953, showing the following information:

The monthly oil production in barrels, the monthly gas production MCF, the producing gas-oil ratio in cubic feet per barrel, the daily average oil production in barrels per month, the daily average gas production MCF per month, the cumulative oil production, and the cumulative gas production from inception through that period.

This information is also reflected in this exhibit in graphical form.

Q Does that reflect the reservoir pressures during the life history of the pool, Mr. Holland?

A It does.

Q What does it show in that connection?

A The initial reservoir pressure as determined in the discovery well at a datum of minus 100 feet was 2,109 PSI. Since the completion of the discovery well, bottom-

hole pressure has been taken at completion of each and every well. In addition to that, during this producing period four general bottomhole pressure surveys have been conducted.

These surveys were conducted by shutting all the wells in the field in for a minimum of 72 hours and taking bottomhole pressures at a datum of minus 100 feet. The results of these four surveys, pressure results, which are volumetric averages, were 2,130 pounds, 2,095 pounds, 2,037 pounds and 2,001 pounds.

Q Have you prepared a further exhibit reflecting the bottomhole pressure test results, Mr. Holland?

A Tabulated in the exhibit is a record of each and every test that has been conducted. That is, bottomhole pressure tests that have been conducted for this pool.

In connection with the four general surveys I mentioned, those -- the dates of those surveys were as follows:

The original pressure was determined on July the 26th, 1951, the first general survey was taken May the 1st, 1952, and the second survey was taken August the 18th to 20th, 1952. The third general survey was taken January the 12th to the 14th, 1952. And the fourth general survey, which is a very recent survey, was conducted April the 27th to 28th, and the exhibit shows 1952; it should

be '53.

Q Were you present when these surveys were made, Mr. Holland?

A I was present and conducted -- We conducted the surveys with our own equipment with the exception of the first survey and initial test.

2b Q Would you describe to the Commission the procedure that was followed in making those surveys, briefly?

A Our procedure was toleave the well shut in at least 72 hours to obtain the proper stabilization and build up pressure. After the 72-hour period, we determined the bottomhole pressure of each well with an Amerada type surface pressure guage. And this guage was calibrated for the existing reservoir temperature.

Q Have you prepared a further exhibit showing the isobaric map reflecting the bottomhole pressures?

A In Exhibit 5 there are four isobaric maps reflecting the pressure conditions determined on each of the four general pressure surveys. This isobaric plat or map was used to determine the average pressure of each 40-acre tract considered productive for the field. And the pressures obtained on each 40-acre tract were volumetrically weighed, with sand volumes determined by a sand isopac map, which will be presented later in this hearing. And the results of the average pressures represent volumetric pres-

sure determinations.

Q Did you find in connection with your studies there was a higher pressure on one side of the field than on the other?

A On the east side of the field the pressures are somewhat lower than on the west side of the field. The density of drilling has been somewhat greater on the east side of the field. However, from our pressure behavior, we do not think that the field will extend to an appreciable distance in the east or southeasterly direction.

Q Have you been able to enclose the field on the west side?

A We --

Q Under your present information.

A From our present information, we have assumed that the field -- the sand lens -- disappears in that direction. And this will be reflected on the isopac map, which will be presented later in the hearing.

Q Yes.

A We have continued the sand -- we have estimated the extent of the sand -- in the east or southeasterly direction by a continuation of the isopac lines determined from wells that have been drilled.

Q Have you prepared a further exhibit reflecting

the gas-oil ratio information, Mr. Holland?

A I would like to elaborate a little more on these isobaric maps.

Q Pardon me.

A They are not closed on the westerly or northwesterly edge of the field, because the field limits have not been determined in that direction as yet. And we believe that the field -- the sand lens -- will continue in that direction. We have made -- attempted to delineate -- the actual field outline in that direction.

Q To go back to the tabulation of bottomhole pressures on the individual wells, does that reflect a drop in pressure in later wells as compared to earlier wells?

A During the development program of this field, we have determined that the initial pressure of each well drilled subsequent to the drilling of the discovery well has been considerably lower than the initial reservoir pressure.

Q And could you state to the Commission how much lower?

A I can. However, we have an exhibit showing that. We have a later exhibit.

Q I am sorry, sir. Now, have you prepared an exhibit reflecting gas-oil ratio information?

A Contained in the Exhibit 5 is a tabulation of all

the gas-oil ratio tests conducted for wells of the Pettigrew-Tocito Pool. We have a fairly complete record of each and every well here. We have spent considerable time obtaining the data for these tests in order that we might properly determine the production characteristics of the pool. And tabulated in this exhibit are those tests.

Q By reference to your exhibit and your experience in the pool, do you have any recommendation to make to this Commission in regard to producing gas-oil ratios?

A For the efficient operation of this pool, we believe that a limiting gas-oil ratio of 2000 cubic feet per barrel should be established.

Q Have you prepared an exhibit reflecting the core records of the Pettigrew-Tocito Pool?

A Also contained in Exhibit 5 is a description of the coring that has been done by Lowry et al Operating Account in the field.

Q How many wells have you cored?

A Four wells out of ten, representing forty percent of the wells, have been cored.

Q Were they cored through the entire section?

A The entire section was cored. And approximately 100 percent recovery was achieved, except for one well, Federal 23-24-129. I believe there was about three feet

of core in a relatively unimportant portion of the sand that wasn't recovered.

Q In selecting the wells to be cored, were they dispersed through the producing field?

A They are pretty well -- the four wells cored are a representative -- represent a representative area of the field there. The wells were: Federal 413-132, Federal 22-45-207, Federal 23-49-129, and Federal 24-50-177.

Now, those wells will be detailed on a plat to show what dispersion was achieved.

Q Have you prepared a record of the history of the individual wells?

A Exhibit 5 also contains a summary of the pertinent information on the ten producing wells of the Pettigrew-Tocito field showing the -- among other things -- the location, the elevation, the time at which drilling commenced and was completed, when the well was put to production, the pipe program, the total depth, and any special completion procedure that was performed on the wells.

Q In that connection, Mr. Holland, are all the producing wells in the Pettigrew-Tocito Pool drilled and operating by the Lowry et al Operating Account?

A Lowry et al Operating Account operates the ten producing wells in the Pettigrew-Tocito Pool.

Q And that is all the wells in the pool?

A That represents the entire field production.

Q Have you prepared an exhibit reflecting drill stem test results?

A Drill stem test results are also included in this Exhibit No. 5. And our procedure recently where the sand can fairly well be predicted by the use of electric logs has not necessitated drill stem testing. However, we recently drill stem tested a portion of the Tocito sand. This test was conducted on Federal 25-51-127 to determine if the lower portion of the sand zone was productive.

Q And what was the result of that test?

A On that test there was no oil recovery and no gas recovery. And it is concluded that the lower portion of the Tocito sand in that immediate area wasn't productive.

Our core analysis has shown that in some wells this lower portion has porosity and permeability development of a low magnitude. And in certain areas we consider it productive, but in the immediate area of this well, as proved by drill stem test, it wasn't.

Q I hand you what has been marked as applicant's Exhibit 6 and ask you what that reflects, Mr. Holland.

A That exhibit is a core analysis report on the Lowry Federal 4-13-132.

Q Now, do you have other core analysis reports?

A We have, and are submitting our complete core analysis record, which represents core analyses on the four wells previously mentioned, and in some cases an analysis by three different laboratories.

Q Now, I hand you what has been marked as Applicant's Exhibits 6 to 13, inclusive, and ask you if those are the core analyses reports.

A Exhibit 7 represents a core analysis -- that is Federal 4-13-132 -- performed by Oil Research Field Laboratories at Chanute, Kansas.

Q The next exhibit, Mr. Holland, is on Federal well No. 4-13-132, prepared by the Oil Field Research Laboratories.

A That is the one I just finished describing.

Q That is Exhibit 6A.

(Off the record.)

Q You were referring -- When you referred to Exhibit 7, you meant Exhibit 6A?

A Yes, sir.

Q And Exhibit No. 7.

A Exhibit No. 7 represents a core analysis on Federal 22-45-207, performed by Core Laboratories, Incorporated.

Exhibit No. 8 isthe core analysis report by Oil Field Research Laboratories on the same well, Federal 22-

45-207.

Exhibit No. 9 represents the porosity determinations performed for Federal No. 4-13-132, and Federal 22-45-207, performed by Petroleum Products Laboratories of Dallas, Texas.

Exhibit No. 10 is a core analysis and water permeability report for the same two wells, Federal No. 4-17-132 and Federal No. 22-45-207. And this report was performed by Oil Field Research Laboratories.

Exhibit No. 11 is a core analysis report on Federal No. 23-49-129 of the Pettigrew-Tocito field, performed by Petroleum Products Laboratories.

Exhibit No. 12 is a core analysis report prepared by Petroleum Products Engineering Company for Federal No. 24-50-177.

In those exhibits, Nos. 6 to 12, inclusive, they represent all of the core information that has been assembled by Lowry et al Operating Account for wells of the Pettigrew-Tocito Pool.

Q How many laboratories, then, made the analyses for you, Mr. Holland?

A We had three different laboratories.

Q Have you had occasion to study those core analyses that were presented by those laboratories?

A I spent considerable time reviewing and analyzing

and compiling statistics reflecting the contents contained in those core analysis reports.

Q Now, in connection with your study, have you prepared an exhibit summarizing the information reflected by those core analyses?

A Exhibit 13 is a summary of the extracts from the core analysis information presented that the Lowry Oil Company uses in evaluating the Pettigrew-Tocito Pool.

The first item presented in this exhibit is the porosity data. The average, the weighted average porosity, is tabulated by wells, and varies from 14.90 percent to 13.18 percent. In addition, the porosity was volumetrically, was weighed, it wasn't volumetrically weighed, as to each well. And to each of the four wells cored, the weighted field average was determined. And this field weighted average is 13.90 percent.

Now, those statistics relate to the upper portion of the Tocito sand, which is the principal producing portion of the sand.

Also presented in the report is porosity data for the lower portion of the sand, which is considered productive for two wells of the field. Those wells are Federal No. 4-13-132 and Federal No. 23-49-129. The porosity values are considerably lower than those previously elaborated on.

Q You mean for the lower portion of the field?

A The lower portion of the sand, the porosity values are low. And the field weighted average is 10.96 percent.

Q Have you had any occasion to study the situation in regard to the lower portion of the sand in that vicinity?

A For the area of the two wells mentioned, that is Federal No. 4-13-132 and Federal No.23-49-129, porosity and permeability was developed of a low order for the lower portion of the sand. In addition to that, the sand was fractured. There were good vertical fractures. And for that reason, in spite of the low permeabilities, we do consider that we will salvage some oil from the lower portion of the sand in that area.

3b Q What do these reports reflect in regard to the permeability of the individual wells?

A The permeability data is tabulated in Exhibit 13 as to both horizontal and vertical permeability measurements, which were determined. For the principal producing portion of the sand, the permeabilities recorded were high. For instance, Federal No. 4-13-132 had permeabilities as high as 622 milledarcys. The weighted average for that well was 138 milledarcys.

For Federal No. 22-45-207, permeabilities as high as 413 milledarcys were measured. The weighted average for that well was 77.93 milledarcys.

For Federal No. 23-49-129, permeabilities as high

as 425 milledarcys were measured on cores from that well. The weighted average permeability was 83.17 milledarcys.

For Federal No. 24-50-177, the maximum permeability measured was 981 milledarcys. The average, the weighted average, for this well was 205.68 milledarcys.

Weighting the four wells, the field weighted average was determined to be 121 milledarcys.

Also, the exhibit shows vertical permeability measurements from cores of two of the four wells. Those wells were Federal No. 23-49-129 and Federal No. 24-50-177.

Vertical permeabilities in the upper portion of the sand were measured as high as 82 milledarcys for Federal No. 23-49-129. And the weighted average for that well was 20.43 milledarcys.

For Federal No. 24-50-177, the highest vertical permeability measured was 418 milledarcys. The weighted average was 48.99 milledarcys, resulting in a field weighted average, as determined from these two wells, as 31.61 milledarcys.

That data reflects that within the sand there is good vertical communication and with good horizontal permeability, good horizontal communication.

The lower portion of the sand horizontal permeabilities were measured for two wells, Federal No. 4-13-132 and Federal No. 23-49-129. Now, as this data reflects,

the sand is highly -- is not very permeable. The highest permeability measured for Federal No. 4-13-132 was 2.5 milledarcys. That is horizontal permeability.

And the horizontal permeability maximum for Federal No. 23-49-129 was 2.8 milledarcys.

The weighted average of those two wells respectively are .73 milledarcys and 1.32 milledarcys.

The vertical permeabilities of this lower portion of the sand were determined for Federal No. 23-49-129, and the maximum recorded was .6 milledarcys. And the weighted average of that well was .41 milledarcys.

Now, this data doesn't reflect the permeability of the fracture system. We consider that the zone is productive in the two wells representative -- represented by these analyses. And is productive because the sand was fractured.

Q I hand you what has been marked as Applicant's Exhibit 14 and ask you what that is.

A Exhibit 14 represents a portion of all the electrical logs and all of the micro log surveys performed by Schlumberger Electrical Log Company. Included in this exhibit are these logs from the ten producing wells of the field, and from one well which is producing from a deeper horizon, that penetrated the Tocito formation.

Q Does that exhibit consist of an extract from the

complete well log?

A It shows just the Tocito sand section.

Q Do you have logs --

A Perhaps forty or fifty feet above and below.

Q Do you have micro logs on all the wells?

A We have micro logs on all the wells except one. Federal No. 1-134. We do not have a micro log.

I might mention from the electrical logs, in conjunction with the core information presented, we have determined what we consider to be the net effective productive sand for each well. And these extracts are presented to the Commission for their review to show the net effective sand that has been assigned to each well.

Q In connection with your study of the reservoir, Mr. Holland, have you made a study of the reservoir fluids?

A We have had two analyses performed on samples, on bottomhole samples, obtained from wells of the Pettigrew-Tocito field.

Q I hand you what has been marked Applicant's Exhibits 15 and 16, and ask you if those are the reports and who made them.

A Exhibit 15 represents a reservoir fluid study of a subsurface sample obtained from Federal No. 1-134. This-- as reflected in this exhibit --

Q By whom was that exhibit prepared?

A The exhibit and the test were performed by the West Texas Engineering Service of Midland, Texas.

This exhibit reflects that the saturation or bubble point pressure of the reservoir was 2,054 PSI guage.

The reservoir temperature was 175 degrees Fahrenheit.

The gas contained in solution with the oil was 862 cubic feet per barrel.

That the oil -- That the formation volume factor of the oil at saturation pressure was 1.526.

Q At what pressure does that come out of solution, Mr. Holland?

A That is -- That would be at the saturation pressure.

Now, Exhibit 16 is a reservoir fluid study for Federal No. 21-40-182, performed by Core Laboratories, Incorporated. This exhibit reflects that the saturation pressure of the reservoir was 2,051 PSI, which is three pounds difference than that determined by the West Texas Engineering Service.

The gas in solution was determined to be 862 cubic feet per barrel, which is exactly the same as determined by the West Texas Laboratory. The formation volume

factor was determined to be 1.512 at saturation pressure.

And the oil viscosity was determined to be .39 centerpoise at saturation pressure.

As reflected by this exhibit, the oil is highly fluid. The viscosity is low, which means that the transmission of the fluid through the reservoir will require a minimum amount of reservoir energy.

Q Do those reports, in your opinion, support your recommendation for a gas-oil ratio of 2000 cubic feet of gas per barrel of oil?

A The data reflects that the fluid has a relatively high solution gas-oil ratio; that with a relatively high shrinkage factor will mean that the producing gas-oil ratio for the Pettigrew-Tocito field will be relatively high. It is a depletion type reservoir. And as depletion proceeds, gas-oil ratios will increase. The 2000 to 1 gas-oil ratio limit will safeguard reservoir gas energy, and will aid the ultimate oil recovery achieved from the pool.

Q Would you characterize the Pettigrew-Tocito Pool as a gas energy reservoir?

A It is a depletion type reservoir, solution gas drive.

Q Have you encountered any evidence of a water drive in connection with your studies of the pool?

A To date, we have encountered no water-oil contact. We have one well drilled low on structure. The sand apparently, instead of being saturated, has shaled, has low permeability, because of the shaling condition of the sand. We do not believe there is any water influx into the reservoir.

Q In connection with your study of the pool, have you had any occasion to study the drainage?

A Among the tests that have been conducted for wells of this pool are productivity index tests. Exhibit 17 represents a productivity index test for Federal No. 2-179, performed by the West Texas Engineering Service.

That exhibit reflects the producing characteristics of the well at various producing rates, and records the bottomhole pressure drop per barrel of oil produced at these different production rates; which is termed the productive index test of the well.

For this well, that is Federal No. 2-179, the productivity index varied from .842 barrels per pound drop in pressure to 1.162 pounds per pound drop in reservoir pressure.

And this data in my opinion reflects what has previously been demonstrated by core analyses, that the sand is highly permeable and the productivity index is relatively good.

Exhibit 18 also is a productivity index test, conducted for Federal No. 4-13-132. The data reflected by this exhibit is the same as that for Federal No. 2-179.

The productivity index figures are somewhat lower and are lower than we had expected for this well. And we believe that during the drilling of the well, the mud, due to the high permeability, penetrated the producing formation. Considerable trouble and delay was occasioned by this fact in the completion of the well. Therefore, the low PI,we believe, is the result of the completion problem, completion difficulty caused by mud infiltration.

Q I hand you what has been marked as Applicant's Exhibit 19 and ask you what that is.

A Exhibit 19 is a pictorial representation of the initial pressures achieved or measured for wells of the Pettigrew-Tocito field.

As we developed the field, we noticed that the initial reservoir pressures on all the wells were considerably lower than that measured for the discovery well, Federal No. 2-179. As an example of this, picking at random Federal No. 23-49-129, the well was located 3,663 feet from any other producing well of this pool. At the time of completion the pressure of this well was 86 pounds lower than the initial reservoir pressure.

This exhibit reflects that there is good communi-

cation in the reservoir, and that good drainage over a wide area can be and has been achieved.

Q I notice, Mr. Holland, that one of the wells is very -- shows a very low bottomhole pressure. Would you identify the well and explain to the Commission the reason for that?

A That well is Federal No. 1-134. It is a marginal well. It produces roughly ten barrels of oil per day. It was initially drilled to the Dakota formation, but during the drilling to the deeper formation, the drilling fluid was exposed to the Tocito zone. And the producing interval was fairly well mudded off. A considerable amount of time and money was spent in attempting to successfully complete this well in the Tocito zone.

There evidently is a low permeability portion of the reservoir there. It is on the edge. And the data reflected on that well is not representative, as a great amount of time was spent trying to complete the well.

4b Q Mr. Holland, would you state to the Commission what the bottomhole pressure of the most recent well completed is as reflected by Exhibit 19 -- as compared to the bottomhole pressure of the initial well?

A The most recent well completed was the Lowry Federal No. 25-51-127. The completion date for that well was April 20, 1953. The initial bottomhole pressure was

2,108 PSI, representing an 89 PSI drop from the initial reservoir pressure. And it should be noted this well is located 2,740 feet from any other producing well of the Pettigrew-Tocito Pool.

COMMISSIONER SPURRIER: Let's take a five-minute recess.

(Recess.)

———o———

MR. KELLAHIN: If the Commission please, we will call Mr. Anderson as a witness in this case as he is anxious to get away and return to Roswell. And with the consent of the Commission, we would like to interrupt Mr. Holland and take Mr. Anderson's testimony at this time. It will be very brief.

COMMISSIONER SPURRIER: Very well.

———o———

ROBERT ANDERSON,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Willyou state your name, please?

A Robert Anderson, president of Malco Refineries, Incorporated, Roswell, New Mexico.

Q Mr. Anderson, in your capacity as president of the Malco Refineries, have you any interests in the vicinity of the Pettigrew-Tocito Pool?

A Yes, sir; we constructed a pipe line in to serve the field and completed it in Februaryof this year.

Q Are you purchasing all of the oil produced in that pool?

A Yes, sir.

Q Have you had any occasion to make a study of the productivity of the Pettigrew-Tocito Pool from an economic standpoint?

A Yes, sir; we had a very substantial investment in the pipe line and had to make some capital investments at the refinery to handle the oil from the Pettigrew-Tocito field. And we made a very careful study of the reservoir before we went ahead with the investment.

Q In connection with that study, did you arrive at any conclusion as to the quality of the Pettigrew-Tocito Pool from an economic standpoint?

A Yes. We concur almost one hundred percent in the findings Lowry Oil Company has presented here today as far as reservoir characteristics, with the only possible exception that in the opinion of our engineers and our geologists, their reservoir estimates could be somewhat on the optimistic side. Our people -- The big difference

between our two thinkings -- is the average acre feet of pay throughout the reservoir.

Q And from the basis of your studies have you reached any conclusion as to whether a well could be economically drilled on a 40-acre spacing pattern?

A Assuming the 1500-barrel per acre recovery that Lowry Oil Company have estimated as against ours of eleven or twelve hundred barrels, a well on a 40-acre location would not pay out, after deducting royalty, lifting cost and taxes.

Q Would it be feasible to drill on an 80-acre spacing pattern?

A Yes; we feel that the characteristics of the reservoir and the extreme permeability and communication are very fortunate, and an 80-acre spacing is an economic necessity. And the field can be developed without any significant loss of recoverable oil through such a pattern.

Q In your opinion, on the basis of the studies you made in connection with this pool, would one well economically drain and develop 80 acres?

A We feel that the reservoir can be developed and drained on an 80-acre pattern as effectively as any reservoir.

Q And in your opinion would such a pattern adequate-

ly protect correlative rights, including those of royalty owners?

A Yes. It is a very fortunate area inasmuch as the royalty is primarily held by the federal government, one royalty owner; and the leasehold by one operating corporation. And there really isn't too much danger of any difference of ownership of drainage involved in the area.

MR. KELLAHIN: I believe that's all. Does the Commission have any questions?

Thank you, Mr. Anderson.

(Witness excused.)

MR. KELLAHIN: Will you take the stand again, Mr. Holland.

ART HOLLAND,

having been previously duly sworn, resumed the stand and testified further as follows:

DIRECT EXAMINATION

(continued)

BY MR. KELLAHIN:

Q Mr. Holland, have you anything to add to your testimony in regard to the Exhibit No. 19?

A Just that in a review of those exhibits, it is demonstrated that good communication exists in the reservoir,

and good drainage can be achieved on the proration plan advocated by the Lowry Operating -- Lowry et al Operating Account.

Q Now, Mr. Holland, have you made any interference test in the Pettigrew-Tocito Pool?

A Exhibit 20 --

Q Just a moment. Have you made such a test?

A Yes.

Q Were you present when those tests were made?

A I was present when the tests were conducted under my supervision by the West Texas Engineering Service, Incorporated.

Q And do you have the report fromthe West Texas Engineering Service, Incorporated?

A The report of this West Texas Engineering Service is contained in Exhibit 20. The exhibit also describes the method of conducting the interference test.

Q Would you describe briefly to the Commission how the test was made?

A At the time of the interference test, May 1 to 3, 1952, four wells had been completed in the Pettigrew-Tocito field, and one well, Federal No. 1-134, was in the process of completion. All the wells in the field, with the exception of the well being completed, Federal No. 1-134, were shut in for at least 72 hours. And the bottom-

hole pressure of these wells, determined by the West Texas Engineering Service, Incorporated.

The results of these tests are detailed in Exhibit 20.

And the volumetric reservoir pressure at that time was determined to be 2,150 PSI.

Now, I would like to correct the exhibit in that more recent isopac studies have resulted in the average reservoir pressure at that time being determined as 2,130 PSI. This 2,150 PSI reflects a survey or a determination prior to the completion of wells subsequently drilled in this pool.

After the wells had been shut in 72 hours, all the wells in the field were placed on production, with the exception of Federal No. 19-34-157. This well was left shut in and the subsurface pressure guage was lowered in the tubing to approximately the top of the Tocito sand for that well. The guage was left in the well 40 hours with the well shut in and the other wells in the field producing at high production rates. At the completion of 40 hours, the guage was removed from the well and it was determined over the 40-hour period the pressure in Federal No. 19-34-157 as measured at the top of the Tocito formation had decreased 7 PSI.

Q What was the closest well to the well in which

the pressure guage was left, Mr. Holland?

A The distance of all the wells from the well used for the interference test, Federal No. 19-34-151, is detailed on the plat which represents part of Exhibit 20. And the nearest well to Federal No. 19-34-157 is 1,867 feet away.

Q And what would be the maximum distance that a well drilled on the 80-acre pattern, which is proposed in Lowry's application, would be?

A On a typical 80-acre spacing pattern the maximum drainage radius for any well is 1,320 feet.

Q And these tests reflect drainage on 1,867 feet?

A That is correct; it represents an area considerably in excess of the 80-acre pattern we are requesting.

Q Do the initial bottomhole pressure tests reflect a drainage of a larger area than that?

A They represent a drainage over a radius of at least 1,867 feet which I believe is roughly 160-acre spacing.

Q Are the wells that have been drilled in the Pettigrew-Tocito Pool drilled on a 160-acre pattern at the present time?

A They are drilled -- Some of the wells are drilled on a 160-acre spacing pattern and some on 80. In an attempt to define the limits of the Pettigrew-Tocito field

and establish field reserves, theprincipal drilling program has been to make step-outs on a 160-acre basis.

Q Mr. Holland, in connection with your studies of the Pettigrew-Tocito Pool, have you made any estimates on the ultimate oil recovery?

A Yes, sir, I have. These studies are reflected by Exhibit 21, which represents our present conception of the Pettigrew-Tocito Pool.

Presented in this exhibit is a sand isopac map of this pool, whichis based on the core analysis data and the electrical log data which has been previously presented in this hearing.

Q Does that reflect the thickness of the Tocito formation?

A Yes; the isopac map is a sand thickness map.

Q What factors were used by you in evaluating the ultimate production of the pool, Mr. Holland?

A These factors are set out in the first page of this exhibit. For the upper portion of the sand, the connate water saturation was 23 percent. The average porosity of 13.90 percent. The formation volume factor of 1.52 percent. A recovery factor of 25 percent.

For the lower portion of the sand, a connate water saturation of 45 percent was used. Average porosity was 11 percent. Formation volume factor of 1.52 per-

cent, and an estimated recovery factor of ten percent.

Using these factors, it was determined for the upper portionthat there were 546 stock tank barrels of oil in place per acre foot. And the recoverable oil for this upper portion was estimated at 137 barrels per acre foot.

For the lower portion, the stock tank oil in place was estimated as 311 barrels per acre foot, with an oil recovery of 31 barrels per acre foot.

Now, the area considered productive in the upper sand is represented by the isopac map.

And the area considered productive as to the lower portion of the sand was considered to be 160 acres, comprising the north half of the north half of Section 9, Township 26 N, Range 6 W, Rio Arriba County, New Mexico.

And the sand thickness used for the estimation of the reserves in the north portion of the sand was 11 feet.

Q Is that an average thickness according to your estimation?

A That is an average thickness for the two wells considered productive.

Q Did you give the Commission your estimate of the total amount of oil in place?

A It is reflected in a barrel per foot basis. It

is reflected in the exhibit.

Contained in the exhibit, for the upper portion, we consider 920 acres is proven area. And the semi-proven area consists of 1,615 acres.

Q Making a total of 2,535 acres?

A Making a total of 2,535 acres.

The lower portion considered productive is 160 acres, which is a portion of the 2,535 acres previously outlined.

Q On the basis of your studies, what do you estimate the total recovery to be expected from that pool?

A The total recovery estimated for the Pettigrew-Tocito field is 3,330,230 barrels. Of this, 1,617,970 barrels is considered as proven reserve. And 1,657,700 is considered as semi-proven reserve.

Oil production from inception of the field to April 30th, 1953, was 522,972 barrels, leaving a remaining proven oil reserve of 1,149,588 barrels; and a remaining proven and semi-proven oil reserve of 2,807,258 barrels.

Q Now, have any other studies been made of the ultimate oil recovery of the Pettigrew-Tocito Pool, Mr. Holland?

5b A There have. A consulting firm by the Amstatz & Yates, Incorporated, of Wichita, Kansas, have made a material balance and core analysis basis report on the oil

reserve of the Pettigrew-Tocito Pool.

Q What does that exhibit reflect in comparison to your studies in regard to the ultimate oil recovery?

A The estimates are considerably lower than the estimates I have presented to the Commission.

Q How many acres did they consider proven or semi-proven?

A At the date of this report they considered -- Their analysis attempted to delineate the entire field -- They considered 2,730 acres would be proven in this pool; that there were 15,000,000 barrels of stock tank oil in the pool, a recovery factor of 15 percent, which represents 2,200,000 barrels of recoverable oil.

Q Have any later surveys been made?

A This firm has just recently finished another complete review of all the data on the Pettigrew-Tocito field.

Q Do you have a copy of that report, Mr. Holland?

A I have a copy of the report, which is dated May the 14th, 1953, and it gives the field dataas of April 28th, 1953.

Q In view of the fact that this is the only copy of the report that is available at this time, we ask permission of the Commission to use it in the testimony and file it as a late exhibit, file a copy of this report as a late exhibit.

COMMISSIONER SPURRIER: Very well.

Q What does this most recent report reflect, Mr. Holland, in comparison with your estimates?

A I would like to read into the record some of their conclusions.

Their conclusions and recommendations, No. 1: "It is our opinion that the Pettigrew-Tocito field reservoir originally contained approximately 17,000,000 barrels of stock tank oil in place. This conclusion is based upon the reservoir performance in the field from its discovery to April 28th, 1953."

The other portion of their conclusions: "The performance of the field to date indicates a primary recovery under present operations on the order of 15 percent of the stock tank oil originally in place, or 2,600,000 barrels of oil. Approximately 520,000 of this recoverable oil had been produced to May 1, 1953, leaving a reserve of 2,800,000 barrels."

That's all.

Q Now, Mr. Holland, in connection with your studies of the Pettigrew-Tocito Pool, have you made any analysis of the economic conditions and cost of development?

A I have compiled a development costs for typical wells of the Pettigrew-Tocito field.

Q Yes.

A And have made economic estimates of the drilling of the pool considered on a 40-acre proration unit plan.

Q I hand you what has been marked Applicant's Exhibit 23 and ask you if that is the report to which you refer.

A That is correct. Exhibit 23 reflects the average cost per well for drilling and completing wells of the Pettigrew Tocito field.

Q And what is that cost, Mr. Holland?

A The costs detailed in this exhibit are actual costs with the exception of reliable estimates for minor services, such as bulldozing work, road grading work, trucking, labor, and I believe that's all. Those are estimates. The rest are cost data, actual cost, obtained from records of the Lowry et al Operating Account. These minor items were estimated to save a great amount of time in running down the charges, as they do not represent a material proportion of the cost, and they are reliable estimates.

The costs are presented for the completion of two wells of the field, Federal No. 21-40-182 and Federal No. 22-45-207.

In addition, the cost of the tank battery which is utilized by these two wells is also detailed.

It was presented on this basis because our present completion procedure has one tank battery for each two wells.

From this review, we determined that the average cost for drilling and completing a Tocito well is approximately $110,000.

Reviewing the economics relating to oil recovery on a 40-acre field development plant, it is shown in this Exhibit 21 in detail, and shows that the oil recovery expected on a 40-acre tract amounts to 52,560.

The net income per barrel of oil amounts to $2.06, approximately.

Q Does that include any deduction for operating expense?

A No operating expense has been includedin this cost analysis.

Q All right.

A From the crude oil price received has been deducted royalty, severance tax, conservation tax and production tax.

Q And on the basis of that net income per barrel and a recovery of 1,314 barrels per acre as you have testified, what would be the ultimate income from one well, Mr. Holland?

A A well drilled ona 40-acre tract, an average well,

would recover $108,799.

Q That is compared to the cost of the well of $110,000; is that correct?

A Approximately $2000 less than the cost of drilling and completing Tocito wells without any deductions for operating expense.

Q Mr. Holland, on the basis of your engineering studies and economic studies which you have made, in your opinion will one well efficiently and economically drain and develop 80 acres?

A In my opinion one well will efficiently and economically drain at least 80 acres. The data we have presented has shown good communication in the reservoir, good permeabilities, better than average porosities, and that, with the interference tests, in my opinion, is conclusive that we can expect good drainage on the pattern proposed.

Q Would it be economic to drill wells in the Pettigrew-Tocito Pool on a 40-acre pattern?

A Our studies have indicated that the return would be less than the cost of completion without any deduction for operating costs.

Q Is ityour recommendation to this Commission, then, that a uniform 80-acre proration unit be established for the Pettigrew-Tocito Pool in the event of proration?

A We urgently request that the Commission grant an 80-acre proration plan for the Pettigrew-Tocito field.

Q And do you recommend uniform 80-acre spacing?

A We recommend the uniform 80-acre spacing pattern with wells to be located in the northwest and southeast quarter of each governmental quarter section.

Q Now, do the wells which have heretofore been drilled in the Pettigrew-Tocito Pool conform to that spacing pattern?

A We have six wells that do not conform to that pattern.

Q Are they earlier wells or wells more recently drilled?

A They are earlier wells of the field. The recent wells have been on this proposed spacing pattern, on this proposed location pattern.

Q Why do you recommend the spacing pattern which you do, Mr. Holland?

A As far as our position is concerned, it isn't mighty material as to the location of the wells. However as far as our offset operators are concerned, it is probably preferable that the location of the wells be in the northwest and southeast quarters of the governmental quarter sections.

Q And for what reason?

A The present trend of the Tocito sand in the direction of these offset operators gives evidence that they probably will have the better completions in these locations.

Q And do you ask that the Commission approve as unorthodox locations the wells which do not conform to this spacing pattern?

A Yes, we make that request.

Q In your opinion, Mr. Holland, if the Commission--if the recommendations which you have made to the Commission are adopted, would the correlative rights, including those of royalty owners, be protected?

A The plan I have proposed would protect the correlative rights of operators and royalty owners.

Q Have you anything you wish to add to your testimony?

A I have nothing further.

MR. KELLAHIN: If the Commission please, we would like at this time to offer Applicant's Exhibits Nos. 5 to 23, inclusive, in evidence and will offer the report of Amstatz & Yates as a late filed exhibit as the Commission has granted permission to do so.

COMMISSIONER SPURRIER: Is there objection? Without objection, they will be admitted.

MR. KELLAHIN: That is all the questions. If you

have any questions of this witness --

MR. GRAHAM: May I ask what is the significance of the blue colored land in there?

A Lowry operates for three different interests. And the colors merely represent, differentiate, between the different interests.

MR. GRAHAM: But no one else is interested in that as a working owner, just the Lowry under their interests?

A All the acreage that we have presented during the hearing has been colored in yellow. We represent the three different corporations that we operate for.

MR. GRAHAM: But you are the operator.

A Yes, sir.

MR. GRAHAM: Of the entire --

A Yes, sir, and we speak for the three different corporations.

MR. WHITE: This blue group is the Barrett?

A Yes, sir.

MR. WHITE: And do they recommend this 80-acre spacing pattern?

A Yes, sir; we speak for the three different groups.

MR. GRAHAM: You mentioned a while ago about considerable gas being produced. What is being done with that?

A I am sorry. Would you repeat your question?

MR. GRAHAM: I say you mentioned a while ago about considerable gas being produced.

A We're at present flaring all gas produced in the field. However, we have made plans and are continuing to make plans, as to the proper disposition of that gas.

We have two different concerns interested in the possibility of building a plant, a compression plant, for the field to boost the gas to enough pressure to interest gas pipe lines in the area.

And we ourselves are considering the installation of such facilities. We expect to resolve those plans at an early date.

MR. GRAHAM: Is there any other -- anyone -- objecting to your 80-acre proposal? Why do you want --

A We are -- The field limits are now approaching other operators. And, as you can see, the economics of drilling the field on 40 acres are prohibitive. Well, we need at least an 80-acre pattern for protection on the offset boundaries of our lease.

MR. GRAHAM: I don't recall your saying how long it took one of those wells to pay out. Say the best well.

A Well, some of the wells we have drilled have paid out. That will be reflected in your production figures. However, drainage from a wide area in the field is being

achieved and the production from our present wells has been obtained from outlying tracts. And the figure overall is prohibitive, as the testimony and data we have presented -- prohibits drilling on 40-acre basis.

MR. GRAHAM: According to your map, there is only one interest that may be drained and that would be the NE NE of Section 16. Is that the only other royalty owner concerned? Or, do you have numerous overrides?

A There are some overriding royalties on this area.

MR. WHITE: Have those people been notified of this thing?

A The official notice is the only notice that I know of.

MR. KELLAHIN: The official notice, Mr. White.

MR. WHITE: When do you think the gas will be able to be marketed?

A Sir, I can't answer the question. I do not know. We have a meeting scheduled this week, attempting to resolve that question. We are having a plant study made now by an individual consulting firm. Their report will be ready tomorrow. We have a meeting the last part of the week in an attempt to work out what our program should be.

16b MR. WHITE: If the gas should be marketed, that

would increase the income of your wells, wouldn't it?

A It would increase our income; yes, sir. However, in addition to the costs that were presented here, we would have our operating costs to consider. At such time as pumping equipment is needed -- that is another capital expenditure. The building of a plant is an expenditure on its own.

MR. WHITE: The main advantage you would be given, if the Commission granted an order, would be to give you protection against offset operators; is that right?

A Yes, sir.

MR. MACEY: How much casinghead gas are you flaring, Mr. Holland, approximately, a day?

A Roughly 1,800,000.

MR. MACEY: Isn't it a pretty close economic venture to construct a gasoline plant on 1,800,000 feet a day?

A We have contacted quite a number of people trying to sell them on the idea of building a plant. Roughly ten. And of those, we have two that are considering building a plant. It is a small, as you mentioned, a small thing as far as gasoline plant considerations are. We do think it will be an economic situation on a small scale. And do plan to conserve the casinghead gas.

MR. MACEY: You are not going to make a fortune at it.

A I don't think so.

MR. WHITE: One other question. What way would the State of New Mexico profit or benefit by the granting of an 80-acre spacing pattern as against the existing 40-acre pattern?

A In the overall view, the drilling on the 40-acre pattern is prohibitive. If you can't pay out your wells, you can't drill wells.

MR. GRAHAM: The first well drilled on a 40-acre paid out, didn't it?

A Has paid out?

MR. GRAHAM: Has it?

A It is true it was drilled on a 40-acre tract.

MR. GRAHAM: Came in about 700 barrels.

A Drilled on a 40-acre tract.

MR. KELLAHIN: I would like to point out for the benefit of counsel the Pettigrew-Tocito Pool isn't prorated. And I believe our testimony reflects we are getting drainage over considerably more than 40 acres. And there has been no limit on our production except the good judgment and the management of the company itself.

MR. MACEY: Mr. Holland, in your PI test I notice you have pretty high well potentials even today; is

that true?

A Yes, sir; we have potentials, Mr. Macey, as high as roughly 1700 barrels per day.

MR. MACEY: But approximately how much oil are you producing per day per well, an average?

A The average figure we are producing at the present time is 400 barrels from ten wells which is 40 barrels per well.

MR. MACEY: You have arbitrarily reduced the daily production in order to control your reservoir energy. Is that the primary purpose?

A Yes, sir; we have.

MR. MACEY: You are not restricted by present conditions or pipe line outlet, are you?

A No. In fact, Malco Refining Company, as they presented their testimony today, want to make it -- their demand is 7200 barrels. They are connected to approximately 500 barrels per day from the Hospah field, and the balance, without exception, I believe they are making up from distillate, comes from the -- the demand is for the Pettigrew-Tocito oil.

MR. MACEY: That is all I have.

COMMISSIONER SPURRIER: Anyone else have a question?

MR. WHITE: One other question. If this proposed

order is to protect you as against offset operators, that means this: that you set up -- your pattern is already set up on the 80-acre spacing pattern,isn't it?

A Yes, sir.

MR. KELLAHIN: For the most part on 160.

MR. WHITE: And if an offset operator came in and drilled on a 40, and then another 40, it would force you to go and drill on a 40.

A That's right.

MR. WHITE: If what you say is true economically and geologically and otherwise, it isn't feasible for them to go in and drill on a 40. Then you would have nothing to worry about. They would go ahead and drill on an 80-acre pattern too.

A If it were not feasible.

MR. WHITE: Yes.

A That is not always the case.

MR. KELLAHIN: Also, there would be no control over location of wells and you would have a direct offset on the 40-acre pattern. At least that possibility.

MR. GRAHAM: Does the USGS have any requirements as to spacing?

A As far as I know, they have no proration pattern. I believe their requirements are 330 from property lines.

MR. GRAHAM: They are not demanding you drill on

40 acres, 80 acres or 160 or anything?

A As far as I know, no, sir.

COMMISSIONER SPURRIER: Are there any other questions? If not, the witness may be excused.

MR. KELLAHIN: If the Commission please, that presents the presentation of our case. And we appreciate the patience with which the Commission has heard this somewhat lengthy presentation.

I don't want to take up any further time in summarizing this except to point out, I believe, our request for the pool rules, for the 80 acre spacing, the gas-oil ratio limitation, the casing program, and the uniform spacing pattern are amply supported by the geological information; that the rights of royalty owners will be adequately protected, and that the economics most certainly justify the order in this particular case.

I have prepared a form of an order for the convenience of the Commission which they may be able to use in reference to this case. I thank you.

MR. SPURRIER: If there is no further comment in this case, we will take it under advisement and move on to Case 540.

---o---