CASE 2449: Application of PAN AM. for pressure maintenance project on its NAVAJO TRIBAL "H".

-asa/76.

2449

plication, Transcript,

hall Exhibits, etc.

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

COPY

April 16, 1962

Pan American Petroleum Corporation
P. O. Box 480
Farmington, New Mexico

Attention: Mr. T. M. Curtis

Gentlemen:

Reference is made to your letter of March 19, 1962, wherein you requested that certain wells be substituted for the water injection wells authorized for your Totah Gallup Pressure Maintenance Project by Order No. R-2162.

No objections have been received from offset operators during the prescribed 20-day waiting period. Pan American is, therefore, hereby authorized to convert to water injection in the Gallup formation the following wells:

Navajo Tribal "H" No. 9, NE/4 NE/4 Section 23
Navajo Tribal "H" No. 13, NE/4 SW/4 Section 13,
both in Township 29 North, Range 14 West.

As authorized in Order No. R-2162, Navajo Tribal "H" No. 2, NE/4 NE/4 Section 24, Township 29 North, Range 14 West, will also be used for water injection.

Authority for water injection use of Navajo Tribal "H" No. 4, NE/4 NW/4 of Section 14, and Navajo Tribal "H"

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

No. 6, SW/4 SW/4 Section 13, Township 29 North, Range 14 West, is hereby rescinded.

Very truly yours,

A. L. PORTER, Jr.,
Secretary-Director

ALP/DSN/og

cc: Mr. Phil McGrath
U. S. Geological Survey
Farmington, New Mexico

Mr. E. C. Arnold
Oil Conservation Commission
Aztec, New Mexico

FORM 470 2-57

PAN AMERICAN PETROLEUM CORPORATION

P. O. Box 480, Farmington, New Mexico
March 19, 1962

File: N-249-416

Subject: Pressure Maintenance Project
Totah Gallup Pool
San Juan County, New Mexico

file
case 2949
w/copy of
ltr of approval

Mr. A. L. Porter, Jr.
New Mexico Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Dear Sir:

In accord with Rule No. 12 of Order No. R-2162, which granted Pan American Petroleum Corporation authority to institute pressure maintenance projects in the Totah Gallup Field, San Juan County, New Mexico, Pan American requests Administrative Approval to revise its injection pattern. Attached is a plat showing revised water injection wells in Project Area No. 1, a log showing the perforated intervals, and a schematic drawing of the proposed injection wells. By copy of this letter we are advising offset operators of our proposed changes in injection wells.

The injection wells authorized by Order No. R-2162 were planned to be consistent with the proposed field-wide crestal injection pattern. Now, however, it appears that the field will not be flooded using a crestal injection pattern, and instead a tranverse line drive will be used. Therefore, Pan American proposes to use a tranverse line drive in order to conform to the field-wide pattern and will initially inject water into Navajo Tribal "H" No. 9, NE/4 NE/4 Section 23, and Navajo Tribal "H" No. 13, NE/4 SW/4, Section 13, both in Township 29 North, Range 14 West. Navajo Tribal "H" No. 2, NE/4 NE/4 Section 24, will remain as a boundary injection well between Pan American and Aztec Oil and Gas Company leases. Navajo Tribal "H" No. 4, NE/4 NW/4 Section 24, and Navajo Tribal "H" No. 5, SW/4 SW/4 Section 13, will not be injection wells, although Navajo Tribal "H" No. 5 may be converted to an injector sometime in the future after it has watered out or if additional injection capacity is required.

Yours very truly,

PAN AMERICAN PETROLEUM CORPORATION

T. M. Curtis
District Superintendent

RBB:ep
Attach.

cc: Aztec Oil and Gas Company
Sunray Mid-Continent Oil Company

MR. MORRIS: Let the record show Mr. Rundell was sworn in the previous case.

DANIEL J. RUNDELL,

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

DIRECT EXAMINATION

BY MR. BUELL:

Q Will you state your name, your complete name, by whom you are employed, in what capacity, and at what location, please.

A Daniel J. Rundell. I am employed by Pan American Petroleum Corporation as a petroleum engineer and I am now stationed in Farmington, New Mexico.

Q You have testified in a prior Commission case and your qualifications as a petroleum engineer are a matter of public record, are they not?

A Yes.

(Applicant's Exhibit No. 1 marked.)

Q (by Mr. Buell) Would you look now at what has been marked Pan American's Exhibit 1 and briefly state for the record what that exhibit reflects?

A Exhibit 1 is a map of the Totah-Gallup area and Pan American's project areas for their pressure maintenance project in that field.

Q Have you designated those two project areas, Mr.

Rundell?

A The two project areas are shaded in yellow and outlined by heavy blue lines on Exhibit 1. Also shown within the project areas A and B are three wells in project area B which are colored in red. Those wells are proposed water injection wells.

Q Mr. Rundell, what is the significance of the blue dots with a dark blue cross through it in each of the project areas?

A That is our proposed water well which will be developed from the Morrison formation.

Q I notice running through each of the project areas a green line. What is the significance of that green line?

A The green line running through project areas A and B are traces of cross sections which are designated as A, A^1, B, B^1. A, A^1 runs through project area A and B, B^1 runs through project area B.

Q Are you ready to discuss these two cross sections now?

A Yes, sir.

(Applicant's Exhibits Nos. 2 and 3 marked.)

Q (by Mr. Buell) Mr. Rundell, cross section A, A^1, running through project area A has been designated as Pan American's Exhibit 2 and B, B^1, running through project area B has been designated as Pan American's Exhibit 3. Briefly state for the record what those two cross sections reflect.

A Cross Section A, A^1 is a log cross section which runs through project area A. This cross section shows the Gallup formation under project area A as continuous and is susceptible to pressure maintenance for water injection.

Exhibit 3 is cross section B, B^1. It is also a log cross section of the Gallup formation colored yellow and again it shows the Gallup formation as continuous throughout project area B and that it is susceptible to water injection.

(Applicant's Exhibit No. 4 marked.)

Q (by Mr. Buell) All right, sir. Would you look now at Pan American's Exhibit 4, Mr. Rundell, and state what that exhibit reflects.

A Exhibit 4 is a drilling completion program for the proposed Morrison water supply in the Totah-Gallup area.

Q As I recall from Exhibit 1, you reflected a proposed Morrison water supply well for each project area. Is that because you feel there will not be sufficient water production from one supply well to both project areas?

A We have two wells proposed, one in each project area, and that is because the terrain between the two project areas is very, very rough and the problems encountered in building a pipe line to connect the two areas would be just as expensive, probably, as drilling a second well.

Q Based on your evaluation, what do you predict the

capacity of these wells to be?

A We expect each well to produce 10,000 barrels of water per day.

Q What is the contemplated initial injection rate of water into each of the proposed injection wells?

A We anticipate to inject 1,000 barrels of water per day into each well.

Q Do you have any comments you'd like to make about the data contained on Exhibit 4 or is it self-explanatory?

A I see no need for any other comments.

(Applicant's Exhibit No. 5 marked.)

Q (by Mr. Buell) Looking now at Pan American's Exhibit No. 5, would you briefly state for the record what that exhibit reflects?

A Exhibit 5 is a casing cementing program for five water injection wells in project areas A and B. This exhibit shows the Gallup formation adequately covered with cement and if we inject into the Gallup formation it can reasonably be assumed to stay there until produced from another well.

Q In other words, you feel the casing program is such that we can put the water exactly where we want to?

A That's right.

Q All right, sir. Now, I believe, Mr. Rundell, that logs of each of the five wells were submitted to the Commission along

with our application, is that correct?

A Yes, sir, that is correct.

Q Do you see any need for burdening the record by duplicate exhibits of the logs?

A No, sir.

(Applicant's Exhibit No. 6 marked.)

Q (by Mr. Buell) Would you go now to Pan American Exhibit 6 and state briefly what that exhibit reflects?

A Exhibit 6 is a pertinent data sheet showing the fluid properties of the Totah-Gallup field.

Q Again, are most of these tabulated data sheets self-explanatory?

A Yes, sir.

(Applicant's Exhibit No. 7 marked.)

Q (by Mr. Buell) Looking now at what has been marked Pan American's Exhibit 7, would you briefly state for the record what that exhibit reflects?

A Exhibit 7 is an oil production rate versus time curve for the project areas in the Totah-Gallup field. On this exhibit is shown the primary performance predicted, secondary performance of the pressure maintenance project. This exhibit shows -- due to pressure maintenance, we can expect an increase in ultimate recovery of 890,000 barrels of oil.

Q Mr. Rundell, in your opinion as an engineer, does it appear to you that an increase in ultimate recovery of that magnitude is a significant conservation effort?

A Yes, sir.

(Applicant's Exhibit No. 8 marked.)

Q (by Mr. Buell) All right, sir. Would you now look at Pan American's Exhibit 8 and state briefly what that exhibit reflects?

A Exhibit 8 is also an oil production rate versus time for project area B in the Totah-Gallup field. Again, it shows primary performance and predicted secondary performance. We can expect through pressure maintenance to increase our ultimate recovery by 1,087,000 barrels of oil.

Q Again, that is a substantial incremental increase in recovery and certainly a significant conservation effort?

A Yes.

Q Turning to Exhibit 1 for just a moment, Mr. Rundell, I would like to particularly direct your attention to the proposed injection wells on both project areas A and B. What type of injection pattern would you call that?

A I would call that a crystal center line injection program.

Q Is that one of the injection patterns evaluated by the engineer committee during unit negotiations?

A Yes, sir.

Q Mr. Rundell, it might be proper at this point to interrupt your testimony to state for the record what while unitization efforts in the Totah field on a field-wide or semi-field-wide basis have not been completely abandoned, the decision has been made in the interest of saving time and getting water into the ground at the quickest possible time on a lease or cooperative lease basis. I believe one other operator in the pool has filed an application which will be set for the Examiner Hearing the 24th of this month.

With that thought in mind, Mr. Rundell, of course, you can't at this time predict what the offset leases to the two project areas, what pattern will be followed there in the way of injection?

A No, sir.

Q Let me ask you this: Are the rules that you are recommending flexible enough such that if any adjustment in the injection pattern is necessitated by the operation of offset operators that those adjustments can be administratively made in a quick period of time?

A Yes, sir, I believe so.

Q All right, sir. What rules, types of rules, are you recommending, Mr. Rundell, that the Commission adopt for our pressure maintenance programs in project areas A and B?

A I recommend that the rules for project areas A and B in the Totah-Gallup field be patterned after Order R-2026 which

authorizes Pan American Petroleum Corporation to institute a pressure maintenance project in the Horse Shoe-Gallup Pool. This order was dated July 13, 1961.

Q In that connection I might point out that a photostatic copy of that order has been designated Pan American's Exhibit No. 9.

(Applicant's Exhibit No. 9 marked.)

Q (by Mr. Buell) In that connection, since this order authorizes the program in the Horse Shoe-Gallup Pool, will there be any necessity for any modification in the language or provisions of this order?

A Yes, sir, there will be some modifications necessary. The Horse Shoe-Gallup field has 40-acre spacing, whereas the Totah-Gallup Pool has 80-acre spacing. In that regard, the changes necessary would be from 40-acre spacing to 80-acre spacing.

Q Will there be any other modifications necessary?

A Yes, sir. There is one more. On Rule No. 8 in the proposed project rules, there is a reservoir pressure versus C curve for the Horse Shoe-Gallup Pool. This curve will not be adequate for the Totah-Gallup Pool. We have attached to Exhibit 9 a Z curve factor versus reservoir pressure which will be acceptable in the Totah-Gallup field.

Q With those two minor modifications, you are recommend-

ing that the order as reflected by Exhibit 9 be adopted for our two project areas?

A Yes, sir.

Q Do you have anything else that you'd like to add at this time, Mr. Rundell?

A No, sir.

MR. BUELL: That's all we have at this time, Mr. Examiner. May I formally offer our Exhibits 1 through 9 into the record?

EXAMINER NUTTER: Applicant's Exhibits 1 through 9 will be admitted in evidence.

Are there any questions of Mr. Rundell?

MR. VERITY: George L. Verity, on behalf of Southwest Production Company. I have one question of the witness.

CROSS EXAMINATION

BY MR. VERITY:

Q I'm curious, more from an academic standpoint than any other, as to why there was a longer maximum peak production in your area B than there was in area A.

MR. BUELL: Are you referring to Exhibits 7 and 8?

MR. VERITY: I am referring to your curve in the project area in the Totah oil production versus time.

THE WITNESS: Are you referring to secondary recovery?

Q (by Mr. Verity) No, I am referring to the primary that you have already experienced. If you notice, your maximum

peak on your primary only lasted a month.

A Yes, sir.

Q The maximum peak on area B lasted nearly a year.

A The reason for that is that we had production up until October of 1961 and at that time the decline started on project area A. In October of '61, on project area B, we were still climbing and the reason it fell off in project area A is that the well declined to that extent. On project area B the wells were curtailed in their production by a flare order which limited the production to that rate. That's our estimated rate that we will produce and since it will continue until it declined, it has to last longer to get primary production out of the field.

MR. VERITY: No other questions.

MR. SWANSON: I am Kenneth Swanson, associated with Aztec Oil & Gas Company in this case.

CROSS EXAMINATION

BY MR. SWANSON:

Q Will you briefly summarize the points of the rule that you are proposing for this project area?

A I believe the rules aren't too briefly consolidated. However, what part were you interested in most of all, the allowables?

Q Yes. The allowable aspect.

A The allowables for the project would be the sum of the

allowables for the several wells in the project areas.

MR. DUEL: Would it help you if you were looking at a copy of that?

THE WITNESS: Yes.

A (continuing) That is Rule No. 2. Allowable for the injection wells may be transferred to producing wells within the project area. That is Rule 3. Roughly, that's what it states, that in the interest of more efficient operation of the project, wells can be shut-in or curtailed because of high GORs or various other reasons which are listed, including pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

Q The allowable, then, would be made up. This is in substance, I assume, essentially the standard allowable rule that is put in effect for pressure maintenance projects which would give a project allowable consisting of top allowable for any well that was converted to an injection well?

A Yes, sir.

Q Plus the sum of all the allowables of the producing wells based on, I suppose, the latest well test?

A Yes.

Q Is it contemplated, then, that as the results of the flood are felt on the individual wells they will be re-tested and increased allowable will result?

A I believe Rule No. 6 states that the allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3 shall be determined by a 24-hour test at a stabilized rate, and it shall be the final 24-hour period of a 72-hour test.

Q You're recommending, then, is that the well would be subject to re-test at such time as the operator deemed it appropriate?

A Yes, sir.

Q Are there any provisions for limiting production from wells offsetting the wells operated outside the project area boundary?

A Yes, sir, Rule No. 7. Rule No. 7 states that any well which offsets, directly or diagonally offsets an offset operator can produce no more than twice the maximum field allowables.

Q Would you have any objection if it was agreeable with the Commission for such an offset well to be granted an allowable equally that of the well within the project area having a double allowable?

A Not unless it has a pressure maintenance project started.

Q Then you would object to it?

A Yes, sir, I would object if there was no pressure maintenance project started in the offset field, in the offset

operator's lease.

MR. SWANSON: That's all.

FURTHER CROSS EXAMINATION

BY MR. MORRIS:

Q In some of the pressure maintenance projects that have been approved by the Commission, a provision has been put in Rule 10, there, that the wells offsetting wells outside the project area would be limited to producing twice the normal allowable. They could not produce twice the normal unit allowable until they had received a substantial response from the water injection program which would preclude a well on the exterior of the unit producing more than the normal unit allowable whenever it got response from the water injection program, the idea being that the additional allowable should be oil being pushed toward the well as a result of the water injection program rather than the well just producing oil that might be drained from outside the unit area. Now, in the cases that we have considered such a restrictive provision has been placed in Rule 10. It is not in the proposed rule you have there. Perhaps a provision of that sort is what Mr. Swanson is asking if you would accept.

MR. BUELL: From a legal standpoint -- and then I will let Mr. Rundell give his engineering answer -- I can't help recall, Mr. Morris, the difficulty you had this morning in another case. If you want to open a Pandora's box of interpretations, the words substantial response to all of the people in

this one room, not a single of them would agree on what a substantial

response is.

That provision seems to me to be incapable of administering. Now, that is my answer from a legal standpoint.

MR. MORRIS: Mr. Buell, would you have an alternative wording for such a restrictive provision?

MR. BUELL: Mr. Morris, I stand foursquare behind the rule. I think it's well for this Commission to consider the correlative rights of people who are not in a conservation effort, but I also think it is your duty to consider protecting correlative rights of those operators who are engaged in conservation efforts. It's a two-headed coin. In my opinion, the provision that you have just referred to doesn't protect or intend to protect the correlative rights of a person engaged in preventing waste.

MR. SWANSON: It seems there is a problem if the Commission recognizes that allowables may be transferred throughout the project area. You have a problem of protecting correlative rights. If at the very inception of this project, it would be possible to transfer allowables to lease lines, it would be possible, even before the effects of the pressure maintenance project were felt, for the offset operator who had then begun secondary recovery operations to produce at a rate at least double that of his offset operator.

MR. BUELL: Certainly, under the rules we are recommend-

ing, an operator engaging in pressure maintenance operations can transfer to his line twice the normal top allowable. That wouldn't hurt the offset operator who is not engaged in conservation efforts. It might cut down on the amount of oil from the operator engaged in conservation efforts. I don't consider that a violation of his rights.

MR. SWANSON: It would be possible at the time you commenced injecting water to transfer your allowable to your lease line wells and produce them at double the rate of the offsetting operator. It seems to me necessary to have some sort of adjustment.

MR. BUELL: I don't believe the rules contemplate setting up a project or unit allowable until you're engaged in pressure maintenance operations. The rules do provide that when you convert the wells for injection purposes, you can transfer its allowable and certainly I see no difficulty in getting the well converted to injection. It would be for a very short period of time you'd be producing a transferred allowable from injection wells before the water went down the well bore but it would be for a very short time.

MR. SWANSON: Perhaps you have already answered my next question and that is Pan American's feeling at this time is not that it wishes to abandon unit negotiations?

MR. BUELL: None of the operators in the Totah Field have completely turned their backs irrevocably on field-wide

or semi-field-wide units.

MR. SWANSON: That's our feeling, so unitize the whole pool may not be possible but if my interpretation of what you said, instituting this application, in view of the possibilities that it may not be successful, you would like to prepare yourself for lease injection.

MR. BUELL: In the interest of saving time. Based on the relations between Pan American and Aztec in the past I don't think we'll have one bit of difficulty forming a unit.

MR. SWANSON: That's more encouraging.

MR. BUELL: Aztec's attitude has always been one of full and complete cooperation in all regards and no one has been any more interested in preventing waste in this pool than Aztec.

MR. MORRIS: May I ask a question of the witness?

EXAMINER NUTTER: Yes, sir.

FURTHER CROSS EXAMINATION (continued)

BY MR. MORRIS:

Q Mr. Rundell, we have been talking a lot about the wells that are going to be offsetting the Aztec acreage and what they might produce. Could you tell me, with reference to area A, first, what the producing capacity of Well No. 7, located in the Southeast quarter of Section 24, Township 29 North, Range 4 West, please?

A It is approximately 98 barrels per day.

Q And the normal unit allowable in the Totah pool at the

present time is quite a bit in excess of 93 barrels per day, is it not? You shouldn't transfer more to that well than it could produce until it was actually receiving a response from your water injection program?

A That's correct.

EXAMINER NUTTER: Is that a penalized figure?

THE WITNESS: This is the November production figure.

MR. MORRIS: I was asking about the capacity of the well to produce.

EXAMINER NUTTER: Under the limiting GOR of that pool?

THE WITNESS: That is the maximum fluid the well can produce. This figure is the average November daily production.

MR. BUELL: I still don't think you get the significance of Mr. Nutter's question. The production from that well results from a penalized allowable due to having a high GOR?

THE WITNESS: No, sir.

EXAMINER NUTTER: What is the ratio?

THE WITNESS: At that time it was less than 2000. I don't know what it is right now.

EXAMINER NUTTER: In other words, it has an allowable based on the old GOR test and this rate of production was not the rate of production which would be assigned and permitted under these new ratios recently run?

THE WITNESS: No, sir.

MR. BUELL: It would probably be much less.

Q (by Mr. Morris) Are there any other wells in area A that offset any wells that will be producing that directly offset any of Aztec's?

A In project A, the only producing well directly or diagonally offsetting Aztec's acreage, Well 2 directly offsets one of Aztec's wells.

Q Now, referring to area B, was this Well 117, that's up in the extreme Northwest quarter of Section 35, Township 29 North, Range 13 West --

A That well has not yet been completed.

Q Is that --

A It is drilled but it is not yet completed.

Q -- a Gallup well?

A Yes.

Q A producing well?

A Yes.

MR. BUELL: Is that a top allowable well or less than a top allowable well?

THE WITNESS: Less than top allowable.

Q (by Mr. Morris) Are there any other wells in project area B which will offset Aztec's acreage?

A No, sir. That is the only producing well that directly or diagonally offsets any of Aztec's acreage.

Q What about your Well No. 87 which is also in the Northwest quarter of Section 35? Do you have the ability of that

well to produce?

A Yes, sir. It is presently producing approximately 20 barrels per day.

Q At least as far as Aztec is concerned, there is very little danger of being able to transfer allowables to any well in excess of the normal unit allowable. The Commission is just concerned with Aztec, here. As to your other offsetting operators, do you contemplate that allowables will be assigned to any wells on the extremity of either of these two areas which will be able to produce in excess of normal unit allowable until those wells have received a response from the water injection program?

A The only other well in Section 35 is Well No. 99 which offsets one of Aspen's wells, Well No. 1, and that well is presently producing approximately 112 barrels per day. Pardon me, 124 barrels per day, not 112.

Q Than, in that state of affairs, Mr. Rundell, Pan American should have no objection to the inclusion of the limitation or possibly Aztec should have no objection to a limitation being left out. It's rather moot, isn't it?

MR. BUELL: The principle isn't moot. We realized that we had that answer available to us. All of our wells offsetting another operator were limited. As far as actually taking any advantage of that provision, we don't feel it's a matter of principle. People who are engaged in conservation efforts are entitled to protection of their rights just the same as those

who are not.

Q (by Mr. Morris) In your opinion, will the approval of these two project areas in any way impede the formation of the field-wide unit in this area?

A From an engineering standpoint, I can see no reason at all to think that it would stop the formation of a unit.

MR. MORRIS: Mr. Buell, from a legal standpoint, do you think the formation of that, the approval of these two project areas would impede future progress toward a field-wide unitization?

MR. BUELL: No, sir. One, I don't think it would interfere under even normal circumstances and it certainly can't interfere when the operators have agreed to proceed in this manner in order to serve conservation to the utmost while unitization negotiations are being re-evaluated, I don't see how it can impede it in any way. This was not just the decision of Pan American, this was the decision of the operators, as I understand it.

Is that right?

MR. SWANSON: Well, I think the operators have now decided that we will follow this procedure. It's my recollection that Pan American originally initiated this type of approach. However, there is a deterrent to the formation of the unit and obtaining approval for lease-wide injection at this time.

Q (by Mr. Morris) Are the wells that you are going to convert to injection in each of these areas high GOR wells?

A Yes, they are.

Q All of them?

A Yes, sir. I don't know the exact number, but as I recall, all or most of these wells are now high GOR.

Q So the amount of gas being produced should drop off appreciably upon the institution of this project?

A Yes, sir. I don't mean to say they are any higher than the others.

EXAMINER NUTTER: All of the wells in the pool are high GORs?

THE WITNESS: Yes, sir.

Q (by Mr. Morris) They should help the gas-gathering situation in this area to some extent?

A Yes, it may.

Q Is there any reason for recommending urgency of approval of this particular project? Are you in a pressure decline to the point where you have to get water in the ground within thirty days?

A We probaly could get water in the ground within thirty days if it were approved. However, we are anxious to get started. We want to drill the water supply wells and we don't want to start any work whatever until we have an order granted and we are ready to start work. For that reason, we would like to see an order as soon as possible.

MR. MORRIS: I believe that's all; thank you.

EXAMINER NUTTER: Does anyone have any questions of Mr. Rundell?

FURTHER CROSS EXAMINATION

BY MR. VERITY:

Q On your allowable, will your production from each of the unit areas be greater or less if this order is granted prior to the time that the waterflood takes effect?

A Our production from either one of these areas will be less.

Q After you get an order granted, will you take your five injection wells off production immediately after the order is granted?

A No, sir.

Q When would you take them off?

A When we are ready to begin injecting water into the formation; at that time.

Q What is your project area's allowable to date under the proposed rule?

A After we went to injecting water, the project area allowable will be the sum of the allowables of the various wells within the project area. As I understand the order, until the project area is actually under pressure maintenance program, the allowable will remain the same as it is now based on the productive capacity of the well and the limiting GOR.

Q After you start converting your five producing wells

to water injection wells, will your total production decline or increase for a time?

A It will probably decline for a time.

Q So, you will actually produce less oil after you start your project than you are presently producing?

A For a short time. However, we hope that that time will be very short.

Q Well, that time would continue from the time you start converting to water injection wells until such time as there is a substantial effect from the waterflood?

A I don't know. I'd have to dig into the matter a little further.

Q Your production wouldn't increase from your other wells until the waterflood takes effect, will it?

A No, sir, it won't.

MR. BUELL: Our proposed injection wells are not top allowable?

THE WITNESS: No, sir. Under that here when we convert those wells to water injection, we can transfer top allowable.

MR. BUELL: That's assuming we have the capacity on the other wells in the project area there that can make it?

THE WITNESS: That's right.

MR. BUELL: It also assumes we are not under an arbitrary limitation of gas handling facilities. I believe, Mr. Rundell, your testimony was accurate. Our production should not

increase although we have an opportunity to when we convert to water injection.

MR. WHITE: You're actually going to decline in the amount of oil that you take out of the ground for a time until your waterflood takes effect.

MR. BUELL: Assuming we have no current unused capacity and I think that's a correct situation.

EXAMINER NUTTER: As soon as you put a well on water injection you would have a certain amount of equivalent gas volume due to that water that was being injected which could increase the allowable assigned to those high GOR wells and you could conceivably produce more liquid.

MR. BUELL: We are dealing with a situation here where we have allowables. Now, we are not producing due to the limitation of gas handling facilities so obtaining credit against high GOR wells for water injection, I don't believe at this time or probably not in the forseeable future is going to be beneficial.

EXAMINER NUTTER: It would depend on the gas handling facilities?

MR. BUELL: Yes.

CROSS EXAMINATION

BY MR. NUTTER:

Q You have given us the proposed rules here as well as the curve for the C factor. Now, referring to Rule 8 in your

proposed rules in the formula in average reservoir pressure at mid point, could you give me a datum that could be prescribed?

A The datum, plus 900 feet.

MR. BUELL: Are you sure of that?

Q (by Examiner Nutter) You don't have a datum for the Horse Shoe-Gallup? Do you have a pressure for this area which you would use in addition to the bottomhole pressure?

A The reservoir pressure now?

Q No, sir. You have the average reservoir pressure at mid point in the Horse Shoe-Gallup Oil Pool in project area, psig. Do you have atmospheric pressure to use here?

A I still didn't understand the question, Mr. Nutter.

Q The 12.01 that you have for the Totah. Will that have to be another figure?

A I think that's fine for atmospheric pressure.

Q How about reservoir temperature?

A Reservoir temperature is, I believe, 158 degrees. I can verify that in just one second.

MR. BUELL: 155.

Q (by Examiner Nutter) Is that the same datum that you used for bottomhole pressure?

A Yes, sir.

Q Referring to your cross section there, we see that most of the wells in the cross section appear to have this main Gallup connected by the yellow line across the two cross sections. Are

those the only perforated intervals in these wells?

A In these particular wells, the wells that belong to Pan American, they are; and as for Aztec, I am not sure about Aztec's wells here.

Q Will the injection wells here have the same perforated interval and be putting water into the same bench of the Gallup sand as the producing wells will be producing from?

A No.

Q No sands will be under flood and water won't be put into sands that are not being produced?

A In these injection wells, all the water we will inject will go into this main Gallup sand. Now, on some of the other wells, there is one other zone which is open in the formation. However, it won't be subjected to water injection.

Q Are they some of the other wells that Pan American operates?

A Yes, sir, in the Totah-Gallup field, the Navajo Tribal "H" No. 7 is also producing from the lower zone and also No. 9 is producing from both the upper and lower, and No. 11 is producing from the upper and lower. The rest of the wells produce from this main sand, which is colored in yellow only.

Q No. 7, 9, and 11 are producing from the upper and lower, is that correct?

A No. 7 is producing from the lower zone only.

Q You are going to be injecting into the upper zone?

A Yes.

Q Is this well in the Southeast quarter of Section 24?

A Yes, sir.

Q So, you wouldn't expect that that well would receive any stimulation whatsoever from the injection program?

A I'm sure that the well will be opened in the main zone.

Q Do you plan additional perforations?

A I would certainly recommend it to my management for that to happen.

Q Now, the exhibit that you gave pertaining to the Morrison water well. Is that pretty much applicable to both of your proposed Morrison water wells?

A Yes, sir, it is.

Q And, on your Exhibit No. 8 and Exhibit No. 7, the primary plus your secondary on area B totals 1,600,000 barrels?

A Yes, sir.

Q You estimate an ultimate primary of 513,000 barrels?

A Yes, sir.

Q So your secondary would be 1,087,000 barrels?

A Yes, sir.

Q Now, in area A the difference between the two would be approximately 890,000 barrels?

A Yes, sir, that is correct.

EXAMINER NUTTER: Are there any further questions of Mr. Rundell?

FURTHER CROSS EXAMINATION (continued)

BY MR. MORRIS:

Q Mr. Rundell, on Exhibits 7 and 8, I note there a point on each one the word "buzz". Is this water that you are injecting into it?

A The "buzz" in this case means when we expect to get an increase in production.

EXAMINER NUTTER: That's the "substantial response"?

THE WITNESS: Yes, a substantial response.

EXAMINER NUTTER: Does anyone have any further questions of the witness?

He may be excused.

(Witness excused.)

EXAMINER NUTTER: Do you have anything further?

MR. BUELL: No, sir, that's all we have.

EXAMINER NUTTER: Does anyone have anything they wish to offer in Case No. 2449?

MR. ANDERSON: John Anderson, with the USGS. We have no objection to the proposed pressure maintenance project on a lease basis. However, both of them, rather, the two together, involve Indian and Federal acreage; and in this case, why, it will be necessary for Pan American to file applications for approval of each project in duplicate with the Survey.

EXAMINER NUTTER: Is there anything further?

MR. VERITY: Southwest Production Company has no objec-

tion to the granting of the application.

MR. SWANSON: Aztec has no objection to granting the application by the Commission but would recommend that the Commission consider points we covered relative to our allowable.

EXAMINER NUTTER: If there is nothing further in Case No. 2449, we will take the case under advisement and the Hearing is adjourned.

(The taking of testimony concluded at 4:10 p.m.)

* * * * *

STATE OF NEW MEXICO)
) ss.
COUNTY OF SAN JUAN)

I, THOMAS F. HORNE, NOTARY PUBLIC in and for the County of San Juan, State of New Mexico, do hereby certify that the foregoing and attached transcript of hearing was reported by me in stenotype and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

Thomas F. Horne
NOTARY PUBLIC

My Commission Expires:

October 2, 1965

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2449, heard by me on 1-4, 1962.

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

155°
+60
615

within each project area.

Use Fig 8 & 9 for reservoir pressure datum of +200' & a reservoir temp of 155°F expressed as 615° absolute.

Use following Z factors

0	1.000
50	.983
100	.969
150	.958
200	.948
250	.939
300	.932
350	.924
400	.918
450	.9102
500	.907
550	.902
600	.897
650	.893
700	.888
750	.884
800	.880
850	.876
900	.872
950	.868
1000	.864
1050	.860
1100	.856
1150	.852
1200	.848
1250	.8465
1300	.841
1350	.837
1400	.833
1450	.829
1500	.825
1550	.821
1600	.817

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 1-9-62

CASE 2449 Hearing Date 9am 1-4-62 DSN @ SF

My recommendations for an order in the above numbered cases are as follows:

Enter an order approving the San American Petroleum Corporation Tabah Pressure Maintenance Project No. 1, w/ the project area defined as S/2 Sec 13, All of Sec 14 South of the mid channel of the San Juan River, NE/4 Sec 23, and N/2 and SE/4 Sec 24, T 29 N, R 14W

Injection Wells authorized are: Navajo Tribal "H" No 2, (NE/4 NW/4 Sec 24, Navajo Tribal "H" No 4, NE/4 NW/4 Sec 24, and Navajo Tribal "H" No 5, SW/4 SW/4 Sec 13.

? →

Also approve the San American Petroleum Corporation Tabah Pressure Maintenance Project No 2, w/ the project area defined as all of Partial Sec 12 & the NE/4 Sec 13, T 28 N, R 12 W and all Sec 35, T 29 N, R 12 W. Injection wells authorized are Gallegos Canyon Unit No 92, NW/4 SW/4 Sec 35 and Gallegos Canyon Unit No 100, Lot 3, Section 12, Scott Number

Provide rules identical to R-2154, except w/ definite provision that allowable transfers be limited to

THE NAVAJO TRIBE

WINDOW ROCK, ARIZONA

OFFICE OF THE GENERAL COUNSEL

3 January 1961

Mrs. Ida Rodriguez
Oil Conservation Commission
State of New Mexico
Post Office Box 871
Santa Fe, New Mexico

Dear Mrs. Rodriguez:

I appreciate very much your including me on your general mailing list and your thoughtfulness in including a note with reference to Cases 2448 and 2449 coming up for hearing on January 4 or 5. I am not certain whether or not I will be able to attend these hearings.

I have found from examining the Gas Proration Schedule that we are not involved insofar as our Tribal lands are concerned, and therefore, it is not necessary that I continue to receive the Gas Proration Schedule.

Thank you very much for your many courtesies.

Very truly yours,

Walter J. Wolf Jr.

Associate Attorney

New Mex. Commission
1/5/61
122

GOVERNOR
EDWIN L. MECHEM
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

P. O. BOX 871
SANTA FE

January 17, 1962

Mr. Guy Buell
Pan American Petroleum Corporation
Box 1410
Fort Worth, Texas

Re: CASE NO. 2449
ORDER NO. R-2162
APPLICANT:
PAN AMERICAN PETROLEUM CORP.

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC x

OTHER Mr. Kenneth Swanson (Aztec Oil & Gas Co.)
Mr. George Verity (Southwest Production)

County, New Mexico, said unit to be dedicated to the Anderson Well No. 2, located 1650 feet from the South line and 330 feet from the East line of said Section 21. Applicant further seeks an exception to Rule 34 (A) of the special rules and regulations for the Blinebry Gas Pool as contained in Order No. R-1670, to permit the gas produced from said Anderson Well No. 2 to be produced into a low-pressure separator only.

CASE 2471: Application of Leonard Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Federal Ginsberg Well No. 8, located in Unit M of Section 31, Township 25 South, Range 38 East, Lea County, New Mexico, as a dual completion (conventional) in the Langlie-Mattix and Justis-Blinebry Pools, with the production of oil from both zones to be through parallel strings of 2 3/8-inch tubing, separation of the zones to be by a liner re-entry shoe seal assembly.

CASE 2472: Application of Newmont Oil Company for approval of a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the West Loco Hills Grayburg No. 4 Sand Unit Agreement, covering 5320 acres, more or less, in Townships 17 and 18 South, Ranges 29 and 30 East, Eddy County, New Mexico.

CASE 2473: Application of Newmont Oil Company for expansion of its Loco Hills Waterflood Project, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks permission to expand its Loco Hills Waterflood Project to include the proposed West Loco Hills Grayburg No. 4 Sand Unit Area, comprising 5320 acres, more or less, in Townships 17 and 18 South, Ranges 29 and 30 East, Eddy County, New Mexico.

320-acre non-standard gas proration unit in the Eumont Gas Pool, comprising the S/2 of Section 22, Township 21 South, Range 37 East, Lea County, New Mexico, said unit to be dedicated to the Turner Well No. 7, located at an unorthodox location 1650 feet from the South line and 330 feet from the West line of said Section 22.

CASE 2467: Application of Shell Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Livingston Well No. 12, located 4620 feet from the South line and 660 feet from the East line of Section 4, Township 21 South, Range 37 East, Lea County, New Mexico, as a dual completion (tubingless) in the Drinkard and Blinebry Oil Pools, with the production of oil from both zones to be through parallel strings of 2 7/8-inch casing cemented in a common well bore.

CASE 2468: Application of Shell Oil Company for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Livingston Well No. 11, located 3300 feet from the South line and 660 feet from the West line of Section 3, Township 21 South, Range 37 East, Lea County, New Mexico, as a triple completion (tubingless) in the Drinkard Oil, Tubb Gas and Blinebry Oil Pools, with the production of oil from the Drinkard and Blinebry zones and the production of gas from the Tubb zone to be through parallel strings of 2 7/8-inch casing cemented in a common well bore.

CASE 2469: Application of El Paso Natural Gas Company for an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico, including provisions for 160-acre proration units and a limiting gas-oil ratio of 4000 to 1.

CASE 2470: Application of J. R. Cone for a 40-acre non-standard gas proration unit and for an exception to Order No. R-1670, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the establishment of a 40-acre non-standard gas proration unit in the Blinebry Gas Pool comprising the NE/4 SE/4 of Section 21, Township 21 South, Range 37 East, Lea

No. 1-62

DOCKET: EXAMINER HEARING - THURSDAY - JANUARY 4, 1962

9 A.M. - OIL CONSERVATION COMMISSION CONFERENCE ROOM
STATE LAND OFFICE BUILDING - SANTA FE, NEW MEXICO

The following cases will be heard before Daniel S. Nutter, Examiner, or Elvis A. Utz, as alternate examiner:

CASE 2448: (Continued)

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its C. J. Holder, State Holder Oil Unit, State "CA", State Oil Unit and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Cha Cha-Gallup Oil Pool with water injection initially to be through five wells located in Sections 8 and 16, Township 28 North, Range 13 West, and Section 23, Township 28 North, Range 12 West, and requests adoption of special rules to govern the operation of said project.

CASE 2449: (Continued)

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its Navajo Tribal "H" and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Totah-Gallup Oil Pool with water injection initially to be through five wells located in Section 35, Township 29 North, Range 13 West, Section 12, Township 28 North, Range 13 West, and Sections 13 and 24, Township 29 North, Range 14 West, and requests adoption of special rules to govern the operation of said project.

CASE 2429: (Continued)

Application of Standard Oil Company of Texas for approval of the Jurnegan Point Unit Agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the Jurnegan Point Unit Agreement embracing 10,240.84 acres, more or less, of State and fee lands in Township 24 South, Ranges 24 and 25 East, Eddy County, New Mexico.

CASE 2452: (Continued)
Application of Southwest Production Company for an order pooling all mineral interests in the Basin-Dakota Gas Pool in the W/2 of Section 7, Township 30 North, Range 11 West, San Juan County, New Mexico. Interested parties include Maleta Y. Brimhall, Phoenix, Arizona, and Barbara Brimhall Burnham, Aztec, New Mexico.

CASE 2463: Application of Amerada Petroleum Corporation for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its L. M. Lambert Well No. 2, located in Unit G of Section 6, Township 20 South, Range 37 East, Lea County, New Mexico, as a dual completion (conventional) in the Grayburg and McKee zones in the Monument Field, with the production of gas from the Grayburg zone to be through a string of 1 ½-inch tubing and the production of gas from the McKee zone to be through a parallel string of 2 3/8-inch tubing.

CASE 2464: Application of Amerada Petroleum Corporation for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its State NJ "A" Well No. 1, located in Unit A of Section 2, Township 25 South, Range 37 East, Lea County, New Mexico, as a triple completion (combination) in the McKee, Fusselman and Ellenburger zones in the North Justis Field, with the production of oil from the Fusselman and Ellenburger zones to be through tubing installed within parallel strings of 3 ½-inch casing and the production of oil from the McKee zone to be through a parallel string of 2 7/8-inch casing, all of said casing strings to be cemented in a common well bore.

CASE 2465: Application of Skelly Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Hobbs "N" Well No. 1, located in Unit D of Section 8, Township 18 South, Range 35 East, Lea County, New Mexico, as a dual completion (conventional) in the Vacuum-Abo Pool and in an undesignated Drinkard pool, with the production of oil from both zones to be through parallel strings of 2 1/16-inch tubing.

CASE 2466: Application of Shell Oil Company for a 320-acre non-standard gas proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to establish a

BEFORE THE NEW MEXICO OIL CONSERVATION COMMISSION

RE: IN THE MATTER OF THE APPLICATION
OF PAN AMERICAN PETROLEUM CORPORATION
FOR A PRESSURE MAINTENANCE PROJECT,
SAN JUAN COUNTY, NEW MEXICO.

Case No. 2449

ENTRY OF APPEARANCE

Comes now L. C. WHITE of GILBERT, WHITE AND GILBERT, Santa Fe, New Mexico, and hereby enters his formal appearance in the above entitled matter as resident counsel for Aztec Oil & Gas Company.

L. C. WHITE

GILBERT, WHITE AND GILBERT
ATTORNEYS AT LAW
SANTA FE, NEW MEXICO

12-20-61

FORM 446 4-58

PAN AMERICAN PETROLEUM CORPORATION

OIL AND GAS BUILDING

FORT WORTH, TEXAS

ALEX CLARKE, JR.
DIVISION ENGINEER

December 22, 1961

Case 2449

File: GWK-440-986.510.1

Subject: Hearing to Consider Pressure Maintenance Program, Totah-Gallup Oil Pool San Juan County, New Mexico

Mr. A. L. Porter, Jr.
Secretary-Director
New Mexico Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Dear Sir:

Our letter dated November 8, 1961, File: GWK-388-986.510.1, requested that a hearing be scheduled to consider our application for approval of a pressure maintenance program on our Navajo Tribal "H" and Gallegos Canyon Unit Leases, Totah-Gallup Oil Pool, San Juan County, New Mexico. This hearing was scheduled for November 29, 1961, and continued to the January 4, 1962, Examiner Docket as Case 2449.

This letter is to supplement information previously furnished in our application. Attached is a copy of a plat showing the proposed water injection wells in this pressure maintenance program as well as all other pertinent information regarding wells in the Totah-Gallup Oil Pool. In addition, we are attaching copies of electrical logs for each of the five injection wells, being Navajo Tribal "H" Well Nos. 2, 4, and 5, and Gallegos Canyon Unit Well Nos. 92 and 100. These proposed injection wells were originally completed as oil wells by setting casing through the Gallup formation and then perforating casing for completion. Plans are to inject water through perforated casing into the Gallup formation. Present plans are to inject approximately 1,000 barrels of water per day into the Gallup formation of each injection well. Plans are to obtain the injected water from the Morrison formation by drilling water supply wells. At the hearing we plan to request special rules to govern this pressure maintenance operation similar to those granted Pan American by the Commission in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, being Order R-2026.

Yours very truly,

ATWOOD & MALONE
LAWYERS

JEFF D. ATWOOD (1883-1960)
ROSS L. MALONE
CHARLES F. MALONE
RUSSELL D. MANN
PAUL A. COOTER
BOB F. TURNER

P. O. DRAWER 700
TELEPHONE MAIN 2-6221
ROSWELL PETROLEUM BUILDING
ROSWELL, NEW MEXICO

November 22, 1961

Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Re: Case No. 2449 before the Oil Conservation Commission of the State of New Mexico

Gentlemen:

We are local counsel for Pan American Petroleum Corporation and as such wish to enter our appearance in the captioned case. Pan American will also be represented by Guy Buell, a member of the Texas Bar, and a company employee. The actual presentation for Pan American will be made by Mr. Buell.

Very truly yours,

ATWOOD & MALONE

Bob F. Turner

By: Bob F. Turner

BFT/tc

cc: Guy Buell, Esq.
Harry Hickman, Esq.

Mailed 12-20-61

Case 2449

FORM 446 4-56

PAN AMERICAN PETROLEUM CORPORATION

OIL AND GAS BUILDING

FORT WORTH. TEXAS

ALEX CLARKE, JR.
DIVISION ENGINEER

November 8, 1961

File: GWK-388-986.510.1

Subject: Application for Hearing to Consider Pressure Maintenance Program - Totah Gallup Oil Pool, San Juan County, New Mexico

Mr. A. L. Porter, Jr.
Secretary-Director
New Mexico Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Dear Sir:

Pan American Petroleum Corporation respectfully requests that a hearing be scheduled for the November 29, 1961, Examiner Docket to consider its application for approval of a pressure maintenance program on its Navajo Tribal "H" and Gallegos Canyon Unit Leases, Totah Gallup Oil Pool, San Juan County, New Mexico.

Initially, water will be injected in Navajo Tribal "H" Well Nos. 2, 4 and 5, located in Sections 13 and 24, T-29-N, R-14-W, and in Gallegos Canyon Unit Well Nos. 92 and 100, located in Section 35, T-29-N, R-13-W, and Section 12, T-28-N, R-13-W. Pan American will also request adoption of special rules to govern the operation of this pressure maintenance proposal.

Yours very truly,

Alex Clarke Jr.

Alex Clarke, Jr.

GWK:ts

Docket Mailed 11-16-61

Mailed 12-20-61

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 2449
Order No. R-2162

APPLICATION OF PAN AMERICAN PETROLEUM
CORPORATION FOR PRESSURE MAINTENANCE
PROJECTS, SAN JUAN COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on January 4, 1962, at Santa Fe, New Mexico, before Daniel S. Nutter, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 17th day of January, 1962, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Daniel S. Nutter, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Pan American Petroleum Corporation, proposes to institute two pressure maintenance projects in the Totah-Gallup Oil Pool, one project area to comprise the S/2 of Section 13, all of Section 14 lying South of the mid-channel of the San Juan River, the NE/4 of Section 23 and the N/2 and SE/4 of Section 24, Township 29 North, Range 14 West, NMPM, San Juan County, New Mexico, and one project area to comprise all of partial Section 12 and the NE/4 of Section 13, Township 28 North, Range 13 West, NMPM, and all of Section 35, Township 29 North, Range 13 West, NMPM, all in San Juan County, New Mexico. Initial injection into the Gallup formation would be through certain wells located in Sections 13 and 24, Township 29 North, Range 14 West, Section 12, Township 28 North, Range 13 West, and Section 35 of Township 29 North, Range 13 West.

(3) That the applicant proposes that an administrative procedure be established whereby said pressure maintenance projects may be expanded for good cause shown, and whereby additional wells in each project area may be converted to water injection.

(4) That Special Rules and Regulations for the operation of the Pan American Petroleum Corporation Totah-Gallup Pressure Maintenance Projects should be promulgated and, for operational convenience, such rules should provide certain flexibility in authorizing the production of each project allowable from any well or wells in each respective project in any proportion, provided that no well in either project area which directly or diagonally offsets a well outside that project area producing from the same common source of supply should be allowed to produce in excess of top unit allowable for the Totah-Gallup Oil Pool until such time as the well has experienced a substantial response from water injection. When such a response has occurred, the well should be permitted to produce up to two times top unit allowable for the Totah-Gallup Oil Pool. Production of such well at a higher rate should be authorized only after notice and hearing.

IT IS THEREFORE ORDERED:

(1) That the applicant is hereby authorized to institute the Pan American Petroleum Corporation Totah-Gallup Pressure Maintenance Project No. 1, San Juan County, New Mexico, by the injection of water into the Gallup formation through the following-described wells in Township 29 North, Range 14 West:

Navajo Tribal "H" No. 2, NE/4 NE/4 of Section 24;
Navajo Tribal "H" No. 4, NE/4 NW/4 of Section 24; and
Navajo Tribal "H" No. 5, SW/4 SW/4 of Section 13.

(2) That the applicant is hereby authorized to institute the Pan American Petroleum Corporation Totah-Gallup Pressure Maintenance Project No. 2, San Juan County, New Mexico, by the injection of water into the Gallup formation through the following-described wells:

Gallegos Canyon Unit No. 92, NW/4 SW/4 of Section 35, Township 29 North, Range 13 West, and
Gallegos Canyon Unit No. 100, Lot 3 of Section 12, Township 28 North, Range 13 West.

(3) That Special Rules and Regulations governing the operation of Pan American Petroleum Corporation Totah-Gallup Pressure Maintenance Projects Nos. 1 and 2, San Juan County, New Mexico, are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS
FOR PAN AMERICAN PETROLEUM CORPORATION
TOTAH-GALLUP PRESSURE MAINTENANCE PROJECTS NOS. 1 AND 2

RULE 1. The project area of Pan American Petroleum Corporation Totah-Gallup Pressure Maintenance Project No. 1, San Juan

County, New Mexico, shall comprise that area described as follows:

TOWNSHIP 29 NORTH, RANGE 14 WEST, NMPM
Section 13: S/2
Section 14: That portion lying South of the mid-channel of the San Juan River
Section 23: NE/4
Section 24: N/2 and SE/4

RULE 2. The project area of Pan American Petroleum Corporation Totah-Gallup Pressure Maintenance Project No. 2, San Juan County, New Mexico, shall comprise that area described as follows:

TOWNSHIP 28 NORTH, RANGE 13 WEST, NMPM
Partial Section 12: All
Section 13: NE/4

TOWNSHIP 29 NORTH, RANGE 13 WEST, NMPM
Section 35: All

RULE 3. The allowable for each project shall be the sum of the allowables of the several wells within each respective project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 4. Allowables for injection wells in each project area may be transferred to producing wells within each respective project area, as may the allowables for producing wells which, in the interest of more efficient operation of each project, are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 5. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 4, which allowable is to be transferred to any well or wells in the same project area for production, shall in no event be greater than its ability to produce during the test period prescribed by Rule 7, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 6. The allowable assigned to any injection well on an 80-acre proration unit shall be top unit allowable for the Totah-Gallup Oil Pool.

RULE 7. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 4, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the

well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Commission Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the Totah-Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire.

RULE 8. The allowable assigned to each producing well in each project shall be equal to the well's ability to produce or to top unit allowable for the Totah-Gallup Oil Pool, whichever is less, provided that any producing well in either project area which directly or diagonally offsets a well outside that project area producing from the same common source of supply shall not produce in excess of top unit allowable for the pool until such time as the well receives a substantial response to water injection. When such a response has occurred, the well shall be permitted to produce up to two times top unit allowable for the pool. Production of such well at a higher rate shall be authorized only after notice and hearing. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Totah-Gallup Oil Pool, except that any well or wells within either project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the Totah-Gallup Oil Pool within that project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times F_a \times 2{,}000}{\frac{P_g - I_g}{P_o}}$$

where:

A_{adj} = the well's daily adjusted allowable

TUA = top unit allowable for the pool

F_a = the well's acreage factor

P_g = average daily volume of gas produced by the well during the preceding month, cubic feet

I_g = the well's allocated share of the daily average gas injected during the preceding month, cubic feet

P_o = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{P_g - I_g}{P_o}$, to be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 9. Credit for daily average net water injected into the Totah-Gallup Oil Pool through any injection well located within each project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in each project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$E_g = (V_{w\ inj} - V_{w\ prod}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^\circ}{T_r} \times \frac{1}{Z}$$

where:

E_g = Average daily gas equivalent of net water injected, cubic feet

$V_{w\ inj}$ = Average daily volume of water injected, barrels

$V_{w\ prod}$ = Average daily volume of water produced, barrels

5.61 = Cubic foot equivalent of one barrel of water

P_a = Average reservoir pressure at a datum of + 200 feet above sea level, psig + 12.00, as determined from most recent survey

15.025 = Pressure base, psi

520° = Temperature base of 60° F expressed as absolute temperature

T_r = Reservoir temperature of 155° F expressed as absolute temperature (615° R)

Z = Compressibility factor from analysis of Totah-Gallup gas at average reservoir pressure, P_a, interpolated from compressibility tabulation below:

Pressure Psig	Z	Pressure Psig	Z	Pressure Psig	Z
0	1.000	550	.902	1100	.856
50	.983	600	.897	1150	.852
100	.969	650	.893	1200	.848
150	.958	700	.888	1250	.845
200	.948	750	.884	1300	.841
250	.939	800	.880	1350	.837
300	.932	850	.876	1400	.833
350	.924	900	.872	1450	.829
400	.918	950	.868	1500	.825
450	.912	1000	.864	1550	.821
500	.907	1050	.860	1600	.817

RULE 10. Each month the operator of the projects shall, within three days after the normal unit allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in each project as well as the total allowable for each project. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for each project.

RULE 11. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in each project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to each project and may be produced from the wells in each respective project in any proportion except that no well in either project which directly or diagonally offsets a well outside that project producing from the same common source of supply shall produce in excess of two times top unit allowable for the pool.

RULE 12. The conversion of any producing wells to injection, the drilling of additional wells for injection, and expansion of each project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of the proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area;

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval,

and depth, showing that the injection of gas or water will be confined to the Gallup formation.

(3) A letter stating that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 20 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively in a similar manner when good cause is shown therefor.

(4) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

A. L. PORTER, Jr., Member & Secretary

S E A L

esr/

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

January 4, 1962

EXAMINER HEARING

IN THE MATTER OF:
Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its Navajo Tribal "H" and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Totah-Gallup Oil Pool with water injection initially to be through five wells located in Section 35, Township 29 North, Range 13 West, Section 12, Township 28 North, Range 13 West, and Sections 13 and 24, Township 29 North, Range 14 West, and requests adoption of special rules to govern the operation of said project.

CASE NO. 2449

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

EXAMINER NUTTER: The Hearing will come to order, please. The next case is 2449.

MR. MORRIS: Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico.

MR. BUELL: For Pan American Petroleum Corporation, Guy Buell. We have one witness, Mr. Daniel Rundell.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 4, 1962

EXAMINER HEARING

IN THE MATTER OF:

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its Navajo Tribal "H" and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Totah-Gallup Oil Pool with water injection initially to be through five wells located in Section 35, Township 29 North, Range 13 West, and Sections 13 and 24, Township 29 North, Range 14 West, and requests adoption of special rules to govern the operation of said project.

CASE NO. 2449

BEFORE:

Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

MR. NUTTER: We will call next Case 2449.

MR. MORRIS: Mr. Examiner, the applicant in this case requests that it be dismissed with the understanding that they may at a later time refile their application.

MR. NUTTER: Case 2449 will be dismissed with that understanding.

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 4th day of January, 1962.

Ada Dearnley
COURT REPORTER-NOTARY PUBLIC

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. 2447, heard by me on 1/4, 1962.

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

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

November 29, 1961

EXAMINER HEARING

IN THE MATTER OF:
Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its Navajo Tribal "H" and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Totah-Gallup Oil Pool with water injection initially to be through five wells located in Section 35, Township 29 North, Range 13 West, Section 12, Township 28 North, Range 13 West, and Sections 13 and 24, Township 29 North, Range 14 West, and requests adoption of special rules to govern the operation of said project.

CASE NO. 2449

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

EXAMINER NUTTER: We will call Case No. 2449.

MR. WHITFIELD: Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico.

MR. BUELL: Guy Buell for Pan American.

MR. VERITY: George Verity representing Southwest Production Company.

MR. SWANSON: Kenneth Swanson for Aztec O I & Gas, associated with local counsel.

MR. WOLF: Walter Wolf, Jr., appearing as observer for the Navajo tribe.

MR. VERITY: I would like to move this case be continued until the first Examiner Hearing in January.

MR. BUELL: May it please the Examiner, in view of your two prior decisions, Pan American will not resist the motion for continuance to the first Examiner Hearing in January.

EXAMINER NUTTER: Case No. 2449 will be continued to the first Examiner Hearing in January.

The Hearing is recessed.

* * * * *

DEARNLEY-MEIER REPORTING SERVICE, Inc.
ALBUQUERQUE, N. M.
PHONE 243-6691
FARMINGTON, N. M.
PHONE 325-1182

STATE OF NEW MEXICO)
) ss.
COUNTY OF SAN JUAN)

I, THOMAS F. HORNE, NOTARY PUBLIC in and for the County of San Juan, State of New Mexico, do hereby certify that the foregoing and attached transcript of hearing was reported by me in stenotype and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

Thomas F. Horne
NOTARY PUBLIC

My Commission Expires:

October 2, 1965

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2447, heard by me on 11-27, 1967.

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

(SQUARE LAKE (LOWER GRAYBURG AND UPPER SAN ANDRES WATERFLOOD) POOL—Cont'd.)

TOWNSHIP 16 SOUTH, RANGE 31 EAST, NMPM
EDDY COUNTY, NEW MEXICO

Section 19: S/2 SE/4
Section 28: W/2 SW/4
Section 29: S/2 N/2 and S/2
Section 30: NE/4 and E/2 SE/4
Section 32: N/2
Section 33: N/2, SE/4 and E/2 SW/4
Section 34: S/2, W/2 NW/4 and SW/4 NE/4

(2) That all of the above-described acreage which was not included in the previously authorized Square Lake Waterflood Project is hereby designated a legitimate expansion of said project, and shall be exempt from the allowable provisions of Rule 701 E.

(3) That the provisions of Orders Nos. R-1110 and R-1110-A shall remain in full force and effect.

(4) That the waterflood project as expanded by this order shall be operated in accordance with the provisions of Rule 701 E of the Commission Rules and Regulations, except as provided in Paragraph 2 above.

(5) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

HORSESHOE-GALLUP POOL
(Pan American Pressure Maintenance)
San Juan County, New Mexico

Order No. R-2026, Authorizing Pan American Petroleum Corporation to Institute a Pressure Maintenance Project in the Horseshoe-Gallup Pool, San Juan County, New Mexico, July 13, 1961.

Application of Pan American Petroleum Corporation for a Pressure Maintenance Project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, and for special rules governing the operation of said project.

CASE NO. 2317
Order No. R-2026

ORDER OF THE COMMISSION

BY THE COMMISSION: This cause came on for hearing at 9 o'clock a.m. on June 28, 1961, at Santa Fe, New Mexico, before Elvis A. Utz, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 13th day of July, 1961, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Elvis A. Utz, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Pan American Petroleum Corporation, proposes to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool in Township 30 North, Range 16 West, San Juan County, New Mexico, by the injection of water into the Gallup formation through 20 wells initially, all of which wells are within the proposed project area.

(3) That the proposed pressure maintenance project, to be known as the Northeast Hogback Pressure Maintenance Project, includes lands formerly designated by Order No. R-1494 as part of the Northeast Hogback Unit.

(4) That the applicant proposes that the Special Rules and Regulations to be established for the Northeast Hogback Pressure Maintenance Project be identical with the rules established by Order No. R-1699 for The Atlantic Refining Company Horseshoe-Gallup Pressure Maintenance Project.

(5) That such identical rules should be established in order to prevent conflict in the event the two projects eventually merge.

IT IS THEREFORE ORDERED:

(1) That the applicant, Pan American Petroleum Corporation, is hereby authorized to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation through the following-described wells in Township 30 North, Range 16 West:

PAN AMERICAN PETROLEUM CORPORATION
Northeast Hogback Unit Well No. 4, Unit J, Section 14
Northeast Hogback Unit Well No. 6, Unit B, Section 15
Northeast Hogback Unit Well No. 10, Unit E, Section 14
Northeast Hogback Unit Well No. 11, Unit F, Section 14
Northeast Hogback Unit Well No. 13, Unit E, Section 13
Northeast Hogback Unit Well No. 14, Unit I, Section 14
Northeast Hogback Unit Well No. 16, Unit K, Section 13
Northeast Hogback Unit Well No. 17, Unit M, Section 13
Northeast Hogback Unit Well No. 20, Unit B, Section 24
Northeast Hogback Unit Well No. 21, Unit D, Section 15
Northeast Hogback Unit Well No. 22, Unit G, Section 15
Northeast Hogback Unit Well No. 23, Unit B, Section 10
Northeast Hogback Unit Well No. 25, Unit D, Section 11
Northeast Hogback Unit Well No. 29, Unit F, Section 11
Northeast Hogback Unit Well No. 30, Unit L, Section 10
Northeast Hogback Unit Well No. 32, Unit L, Section 11
Northeast Hogback Unit Well No. 37, Unit P, Section 10

EL PASO NATURAL GAS PRODUCTS COMPANY
Williams Well No. 2, Unit P, Section 11
Williams Well No. 3, Unit J, Section 11

ABRAHAM
Federal Well No. 3, Unit B, Section 14

(2) That Special Rules and Regulations governing the operation of the Northeast Hogback Pressure Maintenance Project, San Juan County, New Mexico, are hereby promulgated, as follows:

SPECIAL RULES AND REGULATIONS
FOR THE
NORTHEAST HOGBACK PRESSURE MAINTENANCE
PROJECT

RULE 1. The project area of the Northeast Hogback Pressure Maintenance Project, hereinafter referred to as the Project, shall comprise the following-described acreage in San Juan County, New Mexico:

TOWNSHIP 30 NORTH, RANGE 16 WEST, NMPM
Section 10: E/2 and SW/4
Section 11: SW/4 NE/4, W/2 and the SE/4
Section 12: W/2 SW/4
Section 13: SW/4, W/2 NW/4 and the W/2 SE/4
Section 14: N/2, N/2 SW/4 and the SE/4
Section 15: NE/4 and the N/2 NW/4
Section 23: NE/4 NE/4
Section 24: NW/4 NE/4 and the N/2 NW/4

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or

(HORSESHOE-GALLUP (PAN AMERICAN PRESSURE MAINTENANCE) POOL—Cont'd.)

wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on a 40-acre proration unit shall be top unit allowable for the Horseshoe-Gallup Oil Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Commission Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the Horseshoe-Gallup Oil Pool, whichever is less, provided that any producing well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply shall not produce in excess of two times top unit allowable for the pool. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the Horseshoe-Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$Aadj = \frac{TUA \times Fa \times 2{,}000}{\frac{Pg - Ig}{Po}}$$

where:

Aadj = the well's daily adjusted allowable
TUA = top unit allowable for the pool
Fa = the well's acreage factor
Pg = average daily volume of gas produced by the well during the preceding month, cubic feet
Ig = the well's allocated share of the daily average gas injected during the preceding month, cubic feet
Po = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{Pg - Ig}{Po}$, to be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 8. Credit for daily average net water injected into the Horseshoe-Gallup Oil Pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$Eg = (Vw\,inj - Vw\,prod) \times 5.61 \times \frac{Pa}{15.025} \times \frac{520°}{Tr} \times \frac{1}{Z}$$

where:

Eg = Average daily gas equivalent of net water injected, cubic feet
Vw inj = Average daily volume of water injected, barrels
Vw prod = Average daily volume of water produced, barrels
5.61 = Cubic foot equivalent of one barrel of water
Pa = Average reservoir pressure at mid-point of the pay-zones of Horseshoe-Gallup Oil Pool in project area, psig + 12.01 as determined from most recent survey
15.025 = Pressure base, psi
520° = Temperature base of 60°F expressed as absolute temperature
Tr = Reservoir temperature of 87°F expressed as absolute temperature (547°R)
Z = Compressibility factor from analysis of Horseshoe-Gallup gas at average reservoir pressure, Pa, interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9725	300	.8325	550	.6560
100	.9465	350	.8030	600	.6135
150	.9215	400	.7710	650	.5655
200	.8885	450	.7220	700	.5220
250	.8600	500	.6900	750	.4630
				800	.3935

RULE 9. Each month the project operator shall, within three days after the normal unit allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in the project as well as the total Project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 10. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well outside the Project producing from the same common source of supply shall produce in excess of two times top unit allowable for the Pool.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Gallup formation.

(3) A letter stating that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 20 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

PERTINENT DATA SHEET

RESERVOIR ROCK AND RESERVOIR FLUID PROPERTIES
TOTAH GALLUP FIELD

Original Reservoir Pressure, psig	1623
Reservoir Temperature, °F.	155
Saturation Pressure at 155° F., psig	1463
Estimated Original Solution Gas-Oil Ratio, cu. ft./bbl.	550
Original Formation Volume Factor	1.375
Crude Viscosity, cp	.470
Crude Gravity, °API	41
Producing Mechanism	Solution Gas Drive
Average Porosity, %	14.33
Average Permeability, Md	143.2
Average Water Saturation, %	20
Average Net Pay Thickness, ft.	5.2
Gas-Oil or Water-Oil Contacts	None Indicated
Type Accumulation	Stratigraphic Trap (Sand Bar)

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
PAN AM's EXHIBIT NO. 6
CASE NO. 2414

PERTINENT DATA SHEET

RESERVOIR ROCK AND RESERVOIR FLUID PROPERTIES
TOTAH GALLUP FIELD

Original Reservoir Pressure, psig	1623
Reservoir Temperature, °F.	155
Saturation Pressure at 155° F., psig	1463
Estimated Original Solution Gas-Oil Ratio, cu. ft./bbl.	550
Original Formation Volume Factor	1.375
Crude Viscosity, cp	.470
Crude Gravity, °API	41
Producing Mechanism	Solution Gas Drive
Average Porosity, %	14.33
Average Permeability, Md	143.2
Average Water Saturation, %	20
Average Net Pay Thickness, ft.	5.2
Gas-Oil or Water-Oil Contacts	None Indicated
Type Accumulation	Stratigraphic Trap (Sand Bar)

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Pan Am's EXHIBIT NO. 6
CASE NO. 2449

CASING AND CEMENTING PROGRAMS
WATER INJECTION WELLS
PROJECT AREAS "A" AND "B"
TOTAH GALLUP FIELD

1. Navajo Tribal "H" No. 2

8-5/8" casing set at 210' with 180 sacks cement.
4-1/2" casing set at 5211' with 200 sacks cement.

2. Navajo Tribal "H" No. 4

8-5/8" casing set at 209' with 175 sacks cement.
4-1/2" casing set at 5156' with 200 sacks cement.

3. Navajo Tribal "H" No. 5

8-5/8" casing set at 203' with 190 sacks cement.
4-1/2" casing set at 5066' in stages. First stage cemented with 200 sacks. Second stage with 250 sacks cement.

4. Gallegos Canyon Unit No. 92

8-5/8" casing set at 210' with 160 sacks cement.
4-1/2" casing set at 5809' in stages. First stage cemented with 200 sacks. Second stage with 150 sacks cement.

5. Gallegos Canyon Unit No. 100

8-5/8" casing set at 213' with 175 sacks cement.
4-1/2" casing set at 5545' in stages. First stage cemented with 200 sacks. Second stage with 150 sacks cement.

1000 Bbls/Day

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Pan Ams EXHIBIT NO. 5
CASE NO. 2449

DRILLING AND COMPLETION PROGRAM
MORRISON WATER SUPPLY WELL
TOTAH GALLUP AREA

Estimated Top Morrison	6450'
Estimated Total Depth	7150'
Surface Casing	200' 13-3/8" Cemented to surface

Oil String Casing

7510' 8-5/8" cemented in two stages. First stage cemented back to top of Gallup. Second stage from 100' below Pictured Cliffs to surface.

Completion

Set-through type completion with Morrison sands jet perforated. The Morrison sands will be fractured with water if necessary to obtain desired productivity.

Estimated Production Rate

10,000 barrels of water per day.

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Rau Ams EXHIBIT NO. 4
CASE NO. 2449

K-E 10 X 10 TO THE ½ INCH 359-12
KEUFFEL & ESSER CO. MADE IN U.S.A.

GAS COMPRESSIBILITY FACTOR VS. RESERVIOR PRESSURE

CHACHA GALLUP FIELD
&
TOTAH GALLUP FIELD