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BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

November 29, 1961

EXAMINER HEARING

IN THE MATTER OF:

Application of Humble Oil & Refining Company for approval of a pressure maintenance project in the Cha Cha-Gallup Oil Pool, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project in the Cha Cha-Gallup Oil Pool by the injection of water into certain wells located on the Navajo Indian Reservation in Sections 13 through 29 and 33 through 36, Township 29 North, Range 14 West, San Juan County, New Mexico. Applicant further seeks the promulgation of special rules and regulations governing said project.

CASE NO.
2447

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

EXAMINER NUTTER: We will call Case No. 2447.

MR. WHITFIELD: Application of Humble Oil & Refining Company for approval of a pressure maintenance project in the Cha Cha-Gallup Oil Pool, San Juan County, New Mexico.

MR. VERITY: I have a motion to make in this case.

MR. BRATTON: Howard C. Bratton on behalf of Applicant, Humble Oil & Refining Company.



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EXAMINER NUTTER: Are there any other appearances in Case No. 2447?

MR. VERITY: George L. Verity, representing Southwest Production Company. I have a motion to make with regard to the matter.

MR. BUELL: Guy Buell, on behalf of Pan American Petroleum Corporation.

MR. SWANSON: Kenneth Swanson, representing Aztec Oil & Gas.

EXAMINER NUTTER: Are there any other appearances?

MR. WOLF: Walter Wolf, Jr., representing the Navajo Tribe. I am not entering an appearance before the Commission but I am here as an observer on behalf of the royalty owner.

EXAMINER NUTTER: You may proceed.

MR. VERITY: On behalf of Southwest Production Company I would like for the record to show that they have never received the usual and customary letter that the Commission refers to interested parties regarding setting of these matters, and they were not advised as to this hearing until a very recent date. They have had no opportunity to make any study of the application and are not in any position at this time to either cross-examine witnesses that might be put on nor are we in any position to make any presentation whatsoever. The truth of the matter is that Southwest is not even in a position to know whether or not they want or need to oppose the application.



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In this connection, I would like to direct the Commission's attention to the fact that the application does not contain the requirement with regard to names and addresses of interested parties. I am sure this is the reason that Southwest did not receive the customary letter with regard to the matter. Also, I have a notice that the application makes reference to unitization of lands, that there has been a request that it be pooled. Southwest Production Company has had no opportunity to discuss entering the unit, to discuss the nature of it or to have any opportunity to join in it.

We feel that at this time it's premature from this standpoint to have a hearing regarding the matter. We feel that it is necessary that the matter be continued until such time as study can be made to note whether or not we need to oppose the application, to investigate the possibilities of having the unit cover all of the area that is affected by the application and to know whether or not there is need to oppose, to know whether or not this formation in the South half of 16 will be damaged, and whether or not there is need to oppose it. We feel that it's improper at this time to proceed to hear the application.

MR. BRATTON: Humble Oil & Refining Company resists this motion. We are all here today. We are prepared to proceed with the presentation of this case. Southwest Production Company received the notice that we all receive in cases and month after month I have appeared before this Commission having received notice



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of such cases as being in the same position in which Mr. Verity is and until I hear the case, we are deciding our position right up to the last minute. That's just the way the rules of the Commission are set up. That's the way the cases are heard every month. Secondly, I think we can demonstrate to the Commission and to the satisfaction of Mr. Verity's clients that we are not affecting them. This project borders on the San Juan River and embraces solely the Navajo tribal lands to the north of it including those of Humble and Pan American, who are the applicants in this proposal. Those lands north of the River, I believe we will demonstrate to the Commission that every day's delay in the institution of a pressure maintenance program in this field will result in ultimate loss of oil. This application contains a plat as required by the regulations and Mr. Verity had three cases on the docket right in front of this. Southwest Production had, I assume, received the docket the same time that we did or anybody else did.

As far as a continuance, I think it would be a real waste of time. Mr. Verity knows the rules as well as the Commission does, or I do, and there is a procedure for a hearing denovo before the Commission if Mr. Verity thinks a wrong order has been entered. At that time, he has relief before the Commission. To establish a precedent of continuing a case because one party does not know what his position may or may not be in connection with the case, I think would be one that the Commission



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would regret. I might add that Mr. Verity sent me word yesterday that he would make this motion for continuance, but the procedure which I have certainly seen followed numerous times -- I would say monthly -- is that when a case appears on the docket in which a company owning adjoining acreage did not know whether it may be an interested party or what his position may be, they invariably call that applicant to see what it is all about. That is normal procedure. We have received no request for information. We would certainly have been happy to furnish it. We are willing to furnish it fully here today and, I might add, to the satisfaction of Mr. Verity. We are not going to damage his client. As a matter of fact, we are most anxious to cooperate with them and we will demonstrate that in the hearing today.

MR. VERITY: In response, with reference to the plat attached to Rule 701B, at one place it shows it to be within a two-mile radius. Southwest Production Company's acreage in the South half of 16, north of the River, is, of course, within the two-mile radius. It is actually within the land that is noted by the notice but their name does not appear on the plat as required by Rule 701B. Also, the rule requires that the application must give the names of the interested parties and the truth of the situation, of course, I did receive the customary notice the Commission sent out, but I do not follow the notice for each of these pools or the clients names who has any acreage in the area. Southwest Production Company had no knowledge whatsoever of the



fact and does not know whether the rule has been complied with. This would not have been the situation had they received notice in the customary manner.

We think it is improper and that the rights of Southwest Production Company may be violated with regard to the matter if they are not given ample opportunity to appear and cross-examine witnesses and present evidence in the case. We certainly do not have that opportunity at this time.

MR. MORRIS: May I make an inquiry, Mr. Verity? You say that improper notice has been given under the statute and rules of the Commission in this case?

MR. VERITY: I wouldn't go so far as to say that its failure to comply with the rules of the Commission may necessarily be jurisdictional. I am just not making that assertion. This I am saying: That the Commission promulgated the rules with which the Commission feels that applicants should comply so that applicants will not be surprised. Possibly they did not read the public notice in the newspaper or their attention was not called to the fact that their areas lay in the immediate vicinity. We think the Commission has promulgated these rules so that people who might want to protest will not be surprised, and in this case, they were and it can be traced directly to the failure to comply.

MR. BRATTON: What rule is that?

MR. VERITY: Rule 701(B-1) and Rule 1203.

MR. BRATTON: What failure in Rule 701 (B-1) are you

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referring to?

MR. VERITY: It provides among other things that the names of the lessees within a two-mile radius shall appear on the plat.

MR. BRATTON: Southwest Production's name appears on the plat that is attached to our application.

MR. VERITY: I beg your pardon, so it does.

MR. BRATTON: What other rule?

MR. VERITY: Rule 1203 regarding **a copy of an application** to interested parties.

EXAMINER NUTTER: Regarding the names and addresses of all interested parties known to the applicant?

MR. VERITY: Right.

MR. BRATTON: If that is to be interpreted as including every active operator in every application, it would come as a surprise to me. I think Rule 701 requiring our plat to show the lessees certainly supplies that information. If they were required, they were shown on the plat.

MR. VERITY: We feel that when you start talking about waterflooding a pool, a common source of supply, that you are not talking about something that someone can sit down and offer a map and come up with all the answers. The Christmas period is upon us and I feel that this matter should be continued until some time in January.

EXAMINER NUTTER: Mr. Bratton, you are proposing in

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your application to inject water on leases belonging to other than Humble leases.

MR. BRATTON: Humble, Pan American, and El Paso. They are all Navajo tribal leases. We are actually applying on behalf of the three companies for a cooperative agreement to institute a flood in this area. I might add for the benefit of the Commission and Southwest Production that we intend, and in fact, we will withdraw now our application to inject water into the Navajo well in the Southwest of the Southwest of Section 18. That is the Navajo G well No. 4 in the Southwest of the Southwest of Section 17. Also, the Pan American Navajo G Well No. 1 in the Northeast of the Northeast of Section 20. Going down to the Southeast part of the proposal, the Humble Oil Well No. L15 in Section 25. Now, we applied for nine wells and as the Commission can see, they're down the middle of the block owned by these three companies and are on Navajo tribal lands. We are limiting it to six wells right down the center, and I don't believe the closest well to Southwest Production Company is within a mile of them and there are three producing wells intervening. I cannot conceive of how it could affect them. We want to and we intend to -- we must work out a cooperative agreement along the edges of the flood. However, as our evidence will indicate to the Commission, we believe that time is of the essence and the thought of a continuance into January, I would protest. I believe we will be able to demonstrate loss of ultimate recovery every day

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between now and then. I don't believe that just because one operator doesn't know what his position is or may be, although he can certainly and fully protect his rights by applying for a denovo hearing before the Commission if he is dissatisfied, should delay the hearing. I think a hearing today is essential to the prevention of waste.

MR. VERITY: We must have some very detailed and technical study to know whether or not it will flood out our well. The fact that it's a mile away is only a matter of a very small period of time until the water reaches our area anyway, and it's difficult to know right at this juncture how fast the water will travel in one area because the water injected can travel across the one-mile distance in a very short period of time. The fact remains that we need to have an opportunity to study the situation and to cross-examine any witnesses when this case is presented and to present testimony with regard to it. The fact that we have an opportunity for a trial denovo hearing is true, but that doesn't mean that we shouldn't have the opportunity to present evidence when it's heard before the trial examiner. The Commission is dedicating itself more and more all the time to the philosophy of hearing these cases before the trial examiner. It's of no consequence if one party is not heard before the trial examiner merely because he can have a trial denovo hearing before the entire Commission, and this should not be allowed.

MR. BUELL: On behalf of Pan American, I would like to



support Mr. Bratton's remarks to the effect that the hearing should go forward. I couldn't help but observe as Mr. Verity in his remarks concerning the ills of Southwest that actually, the best medicine in the world is this hearing today. They should be hollering for the hearing to continue.

EXAMINER NUTTER: Mr. Wolf, do you have any comments to make?

MR. WOLF: No comment.

EXAMINER NUTTER: Mr. Swanson, do you have any comment to make?

MR. SWANSON: I have no comments.

EXAMINER NUTTER: Mr. Verity, I feel that sufficient notice has been given in this case to all parties that are concerned as far as the legal notice is concerned. However, it is a complex situation and one that does require considerable time to properly evaluate and assess as to what one's position would be in the case. For that reason, I think the case should be continued to the first Examiner Hearing in January.

MR. BRATTON: I would like to suggest that we are prepared to put on our evidence. We would propose to put on our evidence today and if there is an Examiner Hearing before January there is one December 11th -- that if Mr. Verity wants to decide between now and then that he would like to cross-examine our witnesses or to put on evidence, we would have no objection to that. We will bring our witnesses back and make them available.

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We have every intention between now and then of supplying him with all the available information and anything else that he might be interested in. There is no doubt in my mind that we can and will work out something. I assume this is just a boundaryline problem which we can work out. If Mr. Verity should decide between now and then, if he would notify us, say, by a week from tomorrow that he does want to cross examine our witnesses or put on evidence himself, we certainly will be willing to come back on the 11th.

EXAMINER NUTTER: In other words, you would put on your evidence today and more or less have a continuance to the next Examiner Hearing if Mr. Verity desires to come back and re-open the case.

MR. BRATTON: If he wants to. We want to satisfy Southwest Production's people, whatever their concern may be or their lack of knowledge of the proposal if we can satisfy them to where they feel they don't need to put on anything or they're satisfied that the project can go ahead, then there would be no necessity for further hearing on the 11th. On the other hand, if they want to, we will bring our witnesses back and they can bring theirs and go into whatever they might be interested in.

MR. VERITY: We feel the ruling is correct on the matter. In times past, in my experience, I have endeavored to cross-examine witnesses two, three, four weeks later after they testified, and I find it extremely difficult. I just don't think it fair to be

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asked to do that. In addition, I should like to call to the Commission's attention that the plan disregards the possibility of expanding the unit to include the lands of Southwest Production and possibly others that are fringe areas who might be damaged by a partial waterflood.

MR. BRATTON: If on the 11th Southwest can come here and say they need further time and can show a reason for it, we have no objection. I have seen these hearings held month after month and I don't think they will. I don't think they can or I don't think they will want to, either one.

EXAMINER NUTTER: Mr. Bratton, the Examiner Hearing scheduled for December 11 had slipped my mind when I made my previous ruling. It will be continued to the December 11th Examiner Hearing.

* * * * *

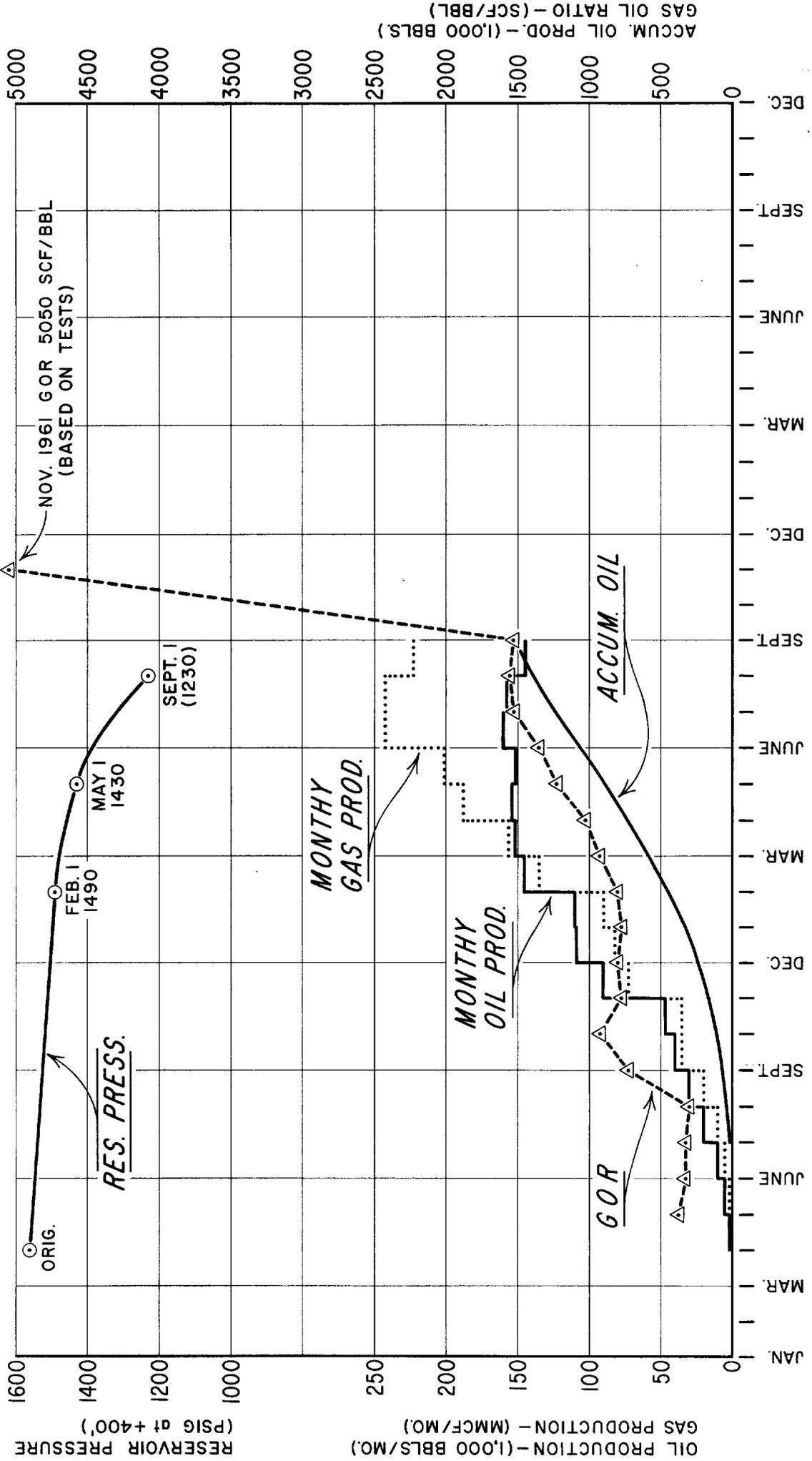
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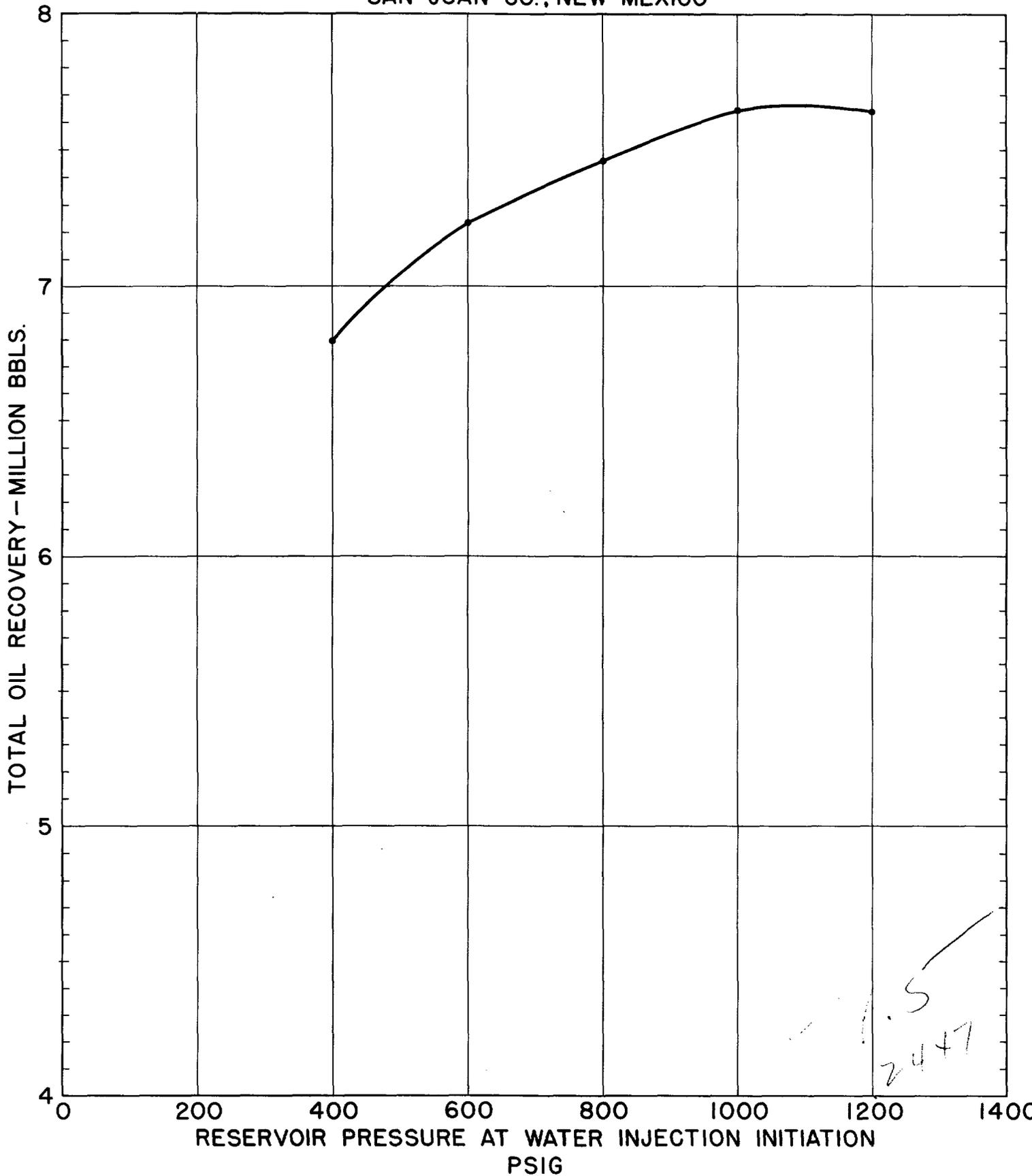


PRODUCTION DATA PROPOSED N.W. CHA CHA UNIT CHA CHA GALLUP FIELD NEW MEXICO



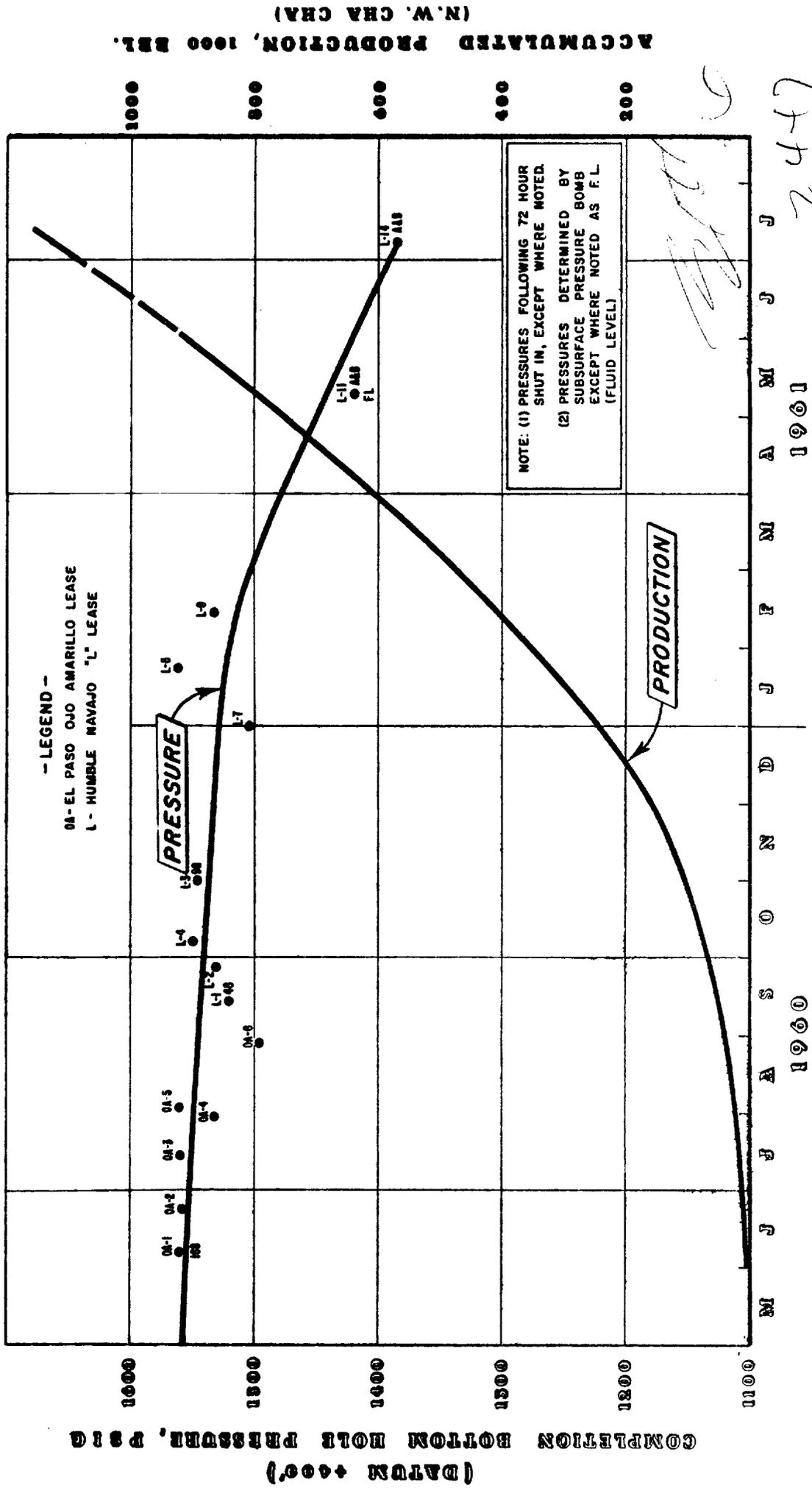
— 1 9 6 0 — — 1 9 6 1 — — 1 9 6 2 —

TOTAL RECOVERY
VS
RESERVOIR PRESSURE AT WATER INJECTION INITIATION
N.W. CHA CHA GALLUP UNIT
SAN JUAN CO., NEW MEXICO



COMPLETION BOTTOM HOLE PRESSURES vs. TIME ACCUMULATED OIL PRODUCTION vs. TIME

**CHA CHA GALLOP FIELD
SAN JUAN COUNTY, NEW MEXICO**

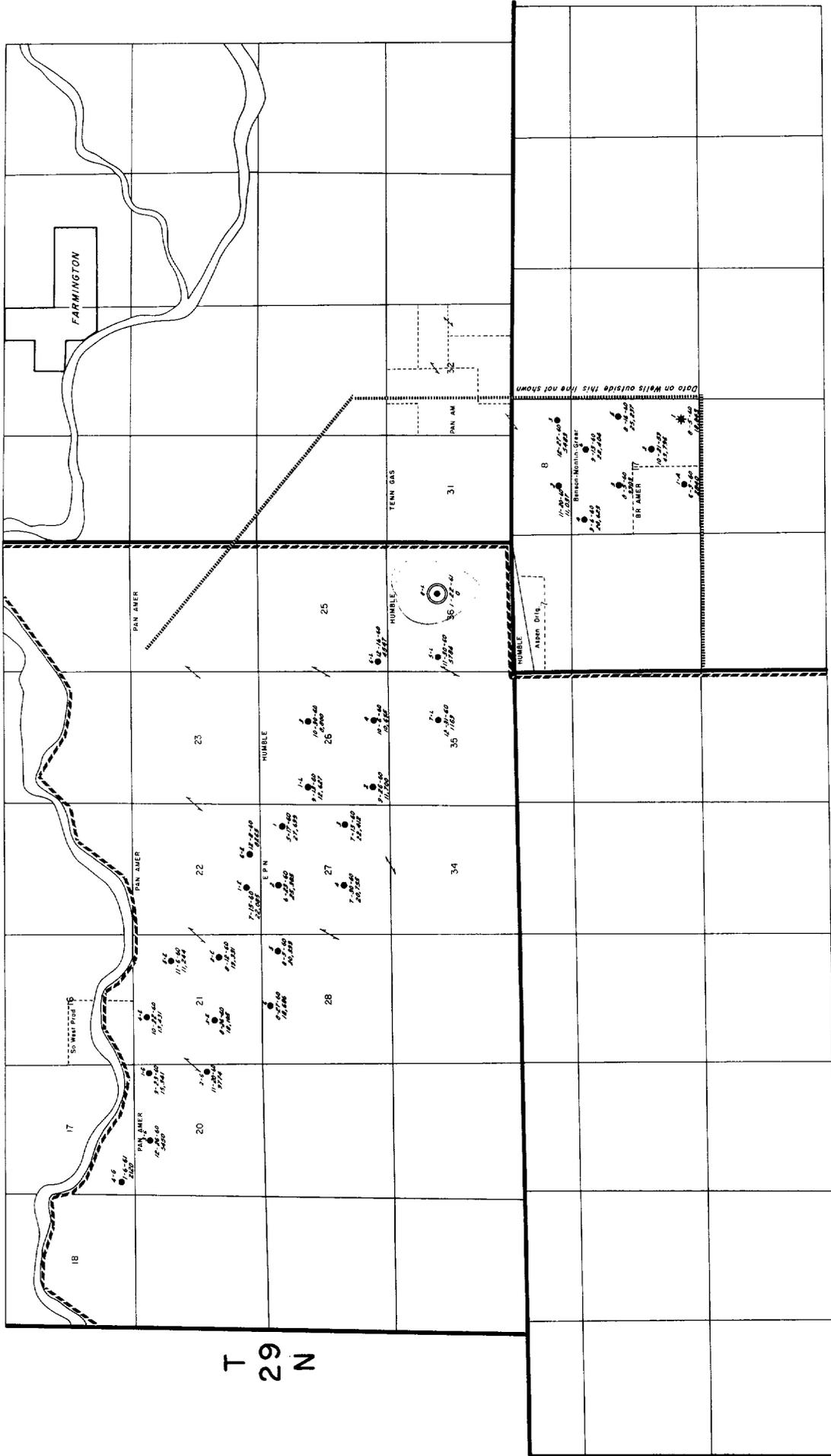


R 14 W

R 13 W

T 29 N

T 28 N



HUMBLE OIL & REFINING COMPANY
 DENVER AREA
CHA CHA GALLUP FIELD
 San Juan County, New Mexico

Notes:
 Total Accum. Oil Prod. (1-22-61)
 OF Wells Shown = 475,330 BBLs
 Total Accum. Oil Prod. (1-22-61)
 OF CHA CHA GALLUP FIELD = 507,798 BBLs
 Status on Jan. 22, 1961
 Completion Date L-8: 1-22-61

Legend:
 | Well No.
 5-17-60 Completion Date
 27,699 Accum. Oil Prod. BBLs (1-22-61)

[Handwritten signature]

WATER INJECTION WELL DATA
PROPOSED N.W. CHA CHA UNIT
 SAN JUAN COUNTY, NEW MEXICO

| Name | Completion Date | Location | Total Depth | Plugback Total Depth | Casing Size | Casing Depth | Top Cement (Est.) | Perf. Interval |
|--------------------------------------|-----------------|-----------------------|-------------|----------------------|-------------|--------------|-------------------|--------------------|
| El Paso Natural Gas Products | | | | | | | | |
| Ojo Amarillo No. 2 | 6-23-60 | NE NW Sec. 27-29N-14W | 6105 | 5330 | 5 1/2 | 5376 | 4120 | 5322-44 |
| Humble Oil & Refining Co. | | | | | | | | |
| Navajo "L" No. 1 | 9-13-60 | SW NW Sec. 26-29N-14W | 5488 | 5447 | 4 1/2 | 5484 | 4800 | 5390-5400 |
| Navajo "L" No. 4 | 10-6-60 | SW SW Sec. 26-29N-14W | 5591 | 5587 | 4 1/2 | 5587 | 3100 | 5499-5510 |
| Navajo "L" No. 5 | 11-30-60 | SW NW Sec. 36-29N-14W | 5627 | 5588 | 4 1/2 | 5624 | 3100 | 5528-41 |
| * Navajo "L" No. 15 | 9-8-61 | SW NE Sec. 25-29N-14W | 5416 | 5385 | 4 1/2 | 5414 | 4418 | 5305-15 5360-65 |
| Pan American Petroleum | | | | | | | | |
| Navajo "E" No. 2 | 8-12-60 | NE SE Sec. 21-29N-14W | 5289 | 5238 | 5 1/2 | 5283 | 4600 | 5145-53 |
| Navajo "E" No. 3 | 8-26-60 | NE SW Sec. 21-29N-14W | 5270 | 5226 | 5 1/2 | 5270 | 4600 | 5116-26 |
| * Navajo "G" No. 1 | 9-23-60 | NE NE Sec. 20-29N-14W | 4828 | 4796 | 4 1/2 | 4832 | 4200 | 4681-89 |
| * Navajo "G" No. 4 | 1-6-61 | SW SW Sec. 17-29N-14W | 4669 | 4626 | 4 1/2 | 4661 | 3900 | 4578-84 |

* Conversions to be delayed until satisfactory Lease Line agreements are effected.

11/2/61

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BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
December 12, 1961

EXAMINER HEARING

IN THE MATTER OF:)

)
)
Application of Humble Oil & Refining)
Company for approval of a pressure)
maintenance project in the Cha Cha-)
Gallup Oil Pool, San Juan County, New)
Mexico. Applicant, in the above-)
styled cause, seeks permission to)
institute a pressure maintenance pro-)
ject in the Cha Cha-Gallup Oil Pool)
by the injection of water into cer-)
tain wells located on the Navajo)
Indian Reservation in Sections 13)
through 29 and 33 through 36, Township)
29 North, Range 14 West, San Juan,)
New Mexico. Applicant further seeks)
the promulgation of special rules and)
regulations governing said project.)

Case 2447
(Continued)

BEFORE: Elvis A. Utz, Examiner

TRANSCRIPT OF HEARING

MR. UTZ: Case 2447.

MR. MORRIS: Application of Humble Oil & Refining Com-
pany for approval of a pressure maintenance project in the
Cha Cha-Gallup Oil Pool, San Juan County, New Mexico.

MR. BRATTON: Howard Bratton, appearing on behalf of
Humble Oil & Refining Company. Associated with me is Mr. John



Knodell. We have one witness.

(Witness sworn.)

MR. UTZ: Do we have other appearances?

MR. VERITY: George L. Verity for Southwest Production.

MR. BUELL: For Pan American Petroleum Corporation,
Guy Buell.

MR. MASON: For El Paso Gas Products Company, John Mason.

MR. MORRIS: Mr. Mason, you are associated with the
firm of Grantham, Spann and Sanchez?

MR. MASON: Right, represented by the written appearance
of Mr. Spann of the firm of Grantham, Spann & Sanchez.

MR. MORRIS: Mr. Buell, you are associated with counsel
in this case?

MR. BUELL: No.

MR. UTZ: Any other appearances? You may proceed, Mr.
Bratton.

JAMES A. KELLY

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

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, by whom you are employed, and
in what capacity?

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A My name is James A. Kelly. I am employed by Humble Oil & Refining Company as area engineer.

Q That's in the Denver area?

A That is correct.

Q Does your area include the Northwest Cha Cha Unit?

A Yes, it does.

Q Have you previously appeared before this Commission as an expert witness?

A Yes, I have.

Q Are you familiar with the proposed Northwest Cha Cha Unit and the matters contained in the application?

A Yes, I am.

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

Q Mr. Kelly, will you refer to what has been marked as Applicant's Exhibit No. 1 and identify that?

A Exhibit No. 1 is a map of the Navajo Tribal Lands, and those lands in the immediate area surrounding the Navajo Tribal Lands located in the Cha Cha-Gallup Pool of San Juan County, in New Mexico. Also shown on this map is a proposed plan of injection to accomplish a pressure maintenance program on these tribal lands.

Q Now, the unit boundaries are identified by the dotted line, is that correct?

A That is correct.



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Q There are three Navajo Tribal leases within the proposed unit?

A More than that, there are six Navajo Tribal leases within the unit.

Q All of the lands within the unit are Navajo Tribal Lands?

A That is correct.

Q The royalty ownership, of course, is common throughout?

A That is correct.

Q And there are no overriding royalty interests throughout?

A That is correct.

Q There are no lands within the unit other than Navajo Tribal Lands, is that correct?

A That is correct.

Q And the unit contains all of the Navajo Tribal Lands in the Cha Cha-Gallup Field?

A That is correct.

Q Will you please explain the detail on the proposed injection wells?

A It is planned upon the approval of this Commission to immediately convert six wells to injection service. These wells are shown on this exhibit colored in green. Also shown are three wells colored in red, which will be converted at a later date, that conversion will occur only after satisfactory lease line



agreements have been reached with the people outside the Navajo lands.

Q I believe at the previous hearing we agreed to convert those wells upon administrative approval at a later date?

A That is our request, yes.

Q What type of flood is this, Mr. Kelly?

A It will be a crestal type injection with the input wells or injection wells to be located down the center, or approximate center, of this Northwest, Southeast trending sand bar.

Q Have you submitted application for this project to the United States Geological Survey as required by the regulations?

A Yes, we have.

Q Mr. Kelly, could you state why this particular area was chosen as a proposed pressure maintenance unit?

A This particular area was chosen primarily because it contains only Navajo Tribal Lands. We have had recent experience in efforts to communitize Navajo lands with other lands, and it is extremely difficult to accomplish, and it was our firm belief that to attempt to unitize lands other than Navajo in this case would result in extreme delay of flood initiation.

Q Later in your testimony I believe you'll indicate that in your opinion you can not avoid delay in instituting pressure maintenance without suffering ultimate loss?

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A That is correct.

Q In your opinion does this proposed unit constitute a reasonable area for a pressure maintenance project?

A It is. We feel that the area is large enough that we can initiate a flood at this time, excuse me, a pressure maintenance program at this time, exercise complete control over it without adversely affecting lands outside the tribal boundaries.

Q Was this basic idea of a Navajo unit separate from the other lands in the pool discussed and agreed upon at an early stage of development of the pool?

A It was. The first Cha Cha-Gallup Engineering Committee meeting was held in December of last year. That was attended by most of the operators who are presently producing from the Cha Cha-Gallup Pool. At that time, or shortly thereafter, in January, 1961, at a subsequent meeting it was recognized by most parties that efforts to communitize Navajo Tribal Lands with other lands would undoubtedly result in a delay, and as a result of that it was agreed by those present that the people owning Navajo Tribal Lands would separate from the other group and proceed to unitize only the tribal lands.

Q Now, the operators of the Navajo Tribal Lands are Humble, Pan American and El Paso Natural Gas Products Company?

A That is correct.

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Q Pursuant to that decision have you reached an operating agreement with those two companies?

A Yes, we have.

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

Q I'll hand you what has been marked as Applicant's Exhibit 2 and ask you to identify that.

A Applicant's Exhibit No. 2 is a joint operating agreement for the Northwest Cha Cha Unit area of San Juan County, New Mexico. It has been executed by Humble, Pan American and El Paso Natural Gas.

Q That is what is known as a working interest owners' operating agreement, is that correct?

A That is correct.

MR. VERITY: Do you have an extra copy?

MR. BRATTON: That's the only one. We can furnish one later.

MR. UTZ: Do you want to look at it now, George?

MR. VERITY: I'll check it later.

MR. BRATTON: We have an unexecuted copy.

MR. VERITY: Thank you.

Q (By Mr. Bratton) The Navajo royalty extending throughout the whole lease, it was felt there was no need to form a

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royalty and working interest owners' unit agreement?

A Not at this time.

Q But pursuant to that agreement, the working interest throughout is held in common by the three companies?

A That is correct.

Q And under that Humble is designated as operator of the project area?

A Yes.

Q With the authority to institute operations throughout the entire area on behalf of all three companies?

A Right.

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

Q Mr. Kelly, refer to what has been marked as Applicant's Exhibit No. 3, what is that, Mr. Kelly?

A Applicant's No. 3 is a reservoir study of the Northwest Cha Cha Unit, in the Cha Cha-Gallup Field, San Juan County, New Mexico, which was jointly prepared by Humble, Pan American and El Paso Natural Gas.

Q That was completed as of May, 1961, is that correct?

A That is correct. This report was completed effective as of that date. However, included in the report are many, many tables and other factual data, certain engineering computations

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and calculations, all of which are still valid. On the fly leaf of the report an updated isopach map has been inserted. The effective date of that isopach map on the fly leaf is 9-13-61.

Q But the computations and the projections made in the report are still valid, needing only to be projected out to date?

A That is correct.

Q Go through that exhibit, if you will, Mr. Kelly, going through the various tables which start on page 8, and explain each of those tables as you go through in brief, if you will, please.

A Table I is entitled "Pertinent Data Sheet, Cha Cha-Gallup Field". On that is contained data such as the date of discovery, the location of the discovery well, the structural features of the reservoir, the reservoir factors of the pool, various characteristics of the rock from which the oil is produced. That continues over to page nine, on which is computed important volume data, ultimate primary recovery calculations, ultimate water flood or secondary recovery calculations.

Q Now, I notice that that calculation is made on the basis of instituting a pressure maintenance project at 1200 pounds per square inch?

A That is correct. However, later in the testimony I will relate that recovery to other pressures. On Table II,

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which is on page 11 of the report, we have a table that shows only basic core and log information for various wells located in the Northwest Cha Cha area. Table III on page 12 is a computation of oil in place, primary recovery and the secondary recovery that can be expected with some of the factors that were used to make these computations.

Table IV, which starts on page 14, lists the economic factors and proposed investment schedule in order to ascertain the feasibility and profitability of the flood.

Table V is an amplification of Table IV showing the profitability of the flood. Following these tables we have various maps, the first of which noted is figure 2, and it shows the structure on the top of the Gallup A sand marker.

Figure 3 is the following map, it shows the net pay isopach as of the effective date of this report, which was May, '61. As I previously stated, there is an updated isopach map on the fly leaf of the report.

Figure 4 is a net sand isopach of the B interval of the Gallup sand which is located immediately below the A sand. Figure 5 is a cross section following the crest of the Cha Cha-Gallup development through the Navajo lands. Figure 6 is a cross section at right angles to the previous cross section, which shows the Northeast-Southwest extent of the same.



Figure 7 is another cross section located at a different point in the pool. Figure 8, again, is a third point crossing the pool showing the cross sections. Figure 9 is a map which is a key to the previously mentioned cross sections, showing cross section AA, BB, CC and DD.

Q Now, Mr. Kelly, do all of these cross sections and your structure map and your isopach map, do they show continuity of the sand throughout the proposed unit area?

A Yes, they do.

Q I might ask, there are two stringers, are there not?

A That is correct.

Q Are you proposing to flood or put water into both stringers or one or just what are your proposals?

A Ultimately it will be in both. The initial flood plan does not anticipate it.

MR. UTZ: Which is the initial?

A The A or upper is the initial. The B is an extremely poorly developed tight sand with a permeability that averages some .33 millidarcies in the Navajo Tribal Lands. That compares with the upper or A zone, which has an average permeability of 57 millidarcies.

Q Does the information through which you have gone indicated that pressure maintenance would be effective in the



upper sand?

A It does.

Q And possibly might help in the lower sand?

A That is correct.

Q Is there anything further you care to state with relation to all of your structure and cross section information?

A Not with relation to those items.

Q All right.

A I might point out that there are additional data contained in this report which follows the last mentioned, showing the capillary pressure determinations, the permeability of the oil versus permeability of the gas relationships, the relative permeability of the oil and the gas properties of the gas produced in the area, the change in oil viscosity with the reservoir pressure.

Also, in figure 16, we have a calculated or theoretical primary depletion diagram which is a mathematical approach to predicting the performance of this pool. Figure 17 amplifies that previous diagram and has the primary depletion plotted against time rather than against the cumulative percent recovery. The only other figure that I would refer you to is figure 19, the last in the report, which is the computed performance of the Northwest Cha Cha area or tribal lands under a pressure

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maintenance program.

Q Mr. Kelly, based on the data in this report, I believe your conclusions are shown on page 2 of that report, that your primary recovery will be in the order of 13.7% and that the institution of a pressure maintenance program would increase the total recovery to 38.3% of oil in place?

A That is correct.

Q The recommendation of the Engineering Committee was that it be maintained on a center line pattern?

A That is correct.

Q And that injection be initiated at the earliest possible date?

A That is correct.

Q Those are the basic conclusions of the Engineering Committee contained in this study?

A Right.

(Whereupon, Humble's Exhibit No. 4 was marked for identification.)

Q Refer now, Mr. Kelly, to what has been marked as Applicant's Exhibit No. 4, identify that and explain its significance, if you will, please.

A Exhibit 4 is a graph on which is depicted various factors concerning production from the tribal lands in the Northwest Cha Cha-Gallup Field. Shown on it are a plot of

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accumulated oil produced, monthly oil production rate, gas-oil ratio, monthly total gas produced and reservoir pressure. The two significant curves are the plot of gas-oil ratio and the reservoir pressure. On it will be noted that the gas-oil ratio has increased tremendously within the past two to three months.

As a corollary to that, the pressure likewise came down and is continuing to drop at a rather **accelerated** rate.

Q What is the significance of those two facts with relation to the institution of a pressure maintenance program?

A The reservoir pressure dropping at this rate is permitting gas to come out of solution in the reservoir without efficiently moving all the oil with it that could be expected under other types of operation. Likewise, the viscosity of the oil is increasing, there is a point which will be demonstrated later at which ultimate loss of recoverable oil will occur unless this trend is halted.

Q That fact is demonstrated on your Exhibit No. 5, is it not, Mr. Kelly?

A That is correct.

(Whereupon, Humble's Exhibit No. 5 was marked for identification.)

Q Will you identify Exhibit No. 5 and explain its significance?

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A Exhibit No. 5 is a plot of the total recovery versus reservoir pressure at water injection initiation for the Northwest Cha Cha-Gallup Unit area which encompasses these tribal lands.

There is a semi-curve plotted on that, on the bottom of the graph is shown a plot of reservoir pressure; on the left side is a plot of the total oil recovery in millions of barrels that is to be expected as a result of this pressure maintenance program.

You will note that in the range of 1,000 to 1,200 pounds per square inch, we have a maximum recovery from the reservoir. Below a thousand pounds per square inch, reservoir pressure, the anticipated recovery begins to drop rather quickly. The last point plotted on this is a pressure of 400 pounds per square inch, at which point it is indicated that some 6.8 in round figures, 6.8 million barrels will be recovered, whereas at the optimum pressure the recovery will be on the order of 7.6 million barrels. So there is a decided loss in production with decrease in reservoir pressure below this optimum pressure.

As was shown on the previous exhibit, the pressure in the Navajo Tribal portion of this reservoir at this time, or as of September 1st, 1961, was 1230 psi. It indicates that we are approaching this optimum pressure at which to flood.

Q And your Exhibit No. 4 shows that pressure to be declining steadily, is that correct?

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A That is correct, and rather rapidly.

Q Mr. Kelly, then, I take it that the significance of these two exhibits would be that if a pressure maintenance program is not initiated in the immediate future, there will be loss of ultimate recovery from the reservoir?

A That is correct.

Q And the longer the delay in initiation, the more the loss?

A That is correct.

Q Ranging up to 800,000 barrels of recoverable oil that could be lost?

A That is correct. It is in excess of that if the pressure were allowed to get below 400 pounds per square inch, but as shown on that exhibit, it's in the order of 800,000.

Q Mr. Kelly, it is true that the pressure decline has probably leveled off somewhat from the very rapid decline shown on the previous exhibit, but undoubtedly it is still a steady decline?

A That is correct. As a result of an institution of the no-flare order and the imposition of the 2,000 to 1 gas-oil ratio, the rate of pressure reduction is not as great as it was prior to November the 30th when the order became effective. However, that pressure is continuing to drop at a rather high rate.



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Q Along that line, Mr. Kelly, what are or would be the results, as far as correlative rights, if production from the entire pool were drastically cut back, or let's say even shut in, what would be the effect on correlative rights in the pool?

A The pressure information that is now available indicates that the average reservoir pressure in the tribal land area of this pool is on the order of 250 pounds per square inch higher than in the Southeastern portion of this same pool.

As a result of that pressure differential, any drastic curtailment in rate of production would inevitably result in drainage from the Navajo lands.

Q In other words, a drastic curtailment of production would tend to level off the pressure throughout the pool which would drain substantial quantities of oil from the Navajo lands to those to the Southeast?

A That is correct.

Q Which would be a violation of the correlative rights of these operators and of the Navajo Tribe?

A That is correct.

Q Based on those observations, Mr. Kelly, would it be a fair observation that the immediate institution of a pressure maintenance project in the Navajo Tribal lands is the only means to prevent waste and to protect correlative rights?



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A That is correct in that it would immediately begin to reduce gas-oil ratios, it would immediately begin to stop this increase in viscosity of oil in the reservoir. As the viscosity of the oil in the reservoir goes up the efficiency of a flood goes down.

Q Is there anything else you care to point out with relation to the previous two exhibits?

A I believe they have been covered unless there are some questions.

(Whereupon, Humble's Exhibit No. 6 was marked for identification.)

Q Turn, then, to your Exhibit No. 6, Mr. Kelly, and if you will, identify that and explain what it reflects.

A Exhibit No. 6 is the same as Humble introduced as testimony on the Cha Cha-Gallup spacing hearing which was held some two to three months ago. On that is plotted completion pressure of individual wells versus completion time. Also shown is accumulated production on the Navajo Tribal Lands also plotted against time.

The one significant point which I wish to bring out here is that the well shown on this exhibit as L-8, which is located in the section shown in the extreme Southeast portion of these Navajo Tribal Lands, I'll point to it on the map on the wall, well



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L No. 8 is the one shown here. As shown on this plot, L No. 8 appears to be anomalous in that it's higher than the curve would normally indicate it to be under these particular conditions. However, there is a good reason for that if the conditions at the time the L-8 was completed are taken into consideration.

Those conditions are simply this, that at the time of the completion of L-8, the development of the lands outside the Navajo Tribal Land and immediately Southeast of the Southeast corner of the Navajo Tribal Lands had not been developed. That is shown by the following exhibit which is a map which depicts the amount of development that had occurred as of that effective date.

This map clearly illustrates that immediately offsetting the Navajo Tribal Lands to the Southeast the pool had not been developed. That naturally resulted in a high pressure higher in that immediate area. This high pressure area prevented, and to this day is still preventing, migration from the Navajo Tribal Lands to the Southeast. This situation can not continue forever, which it's well recognized. However, I might point out that we are among the operators initiating the necessary steps to protect the Navajo Tribal Lands from this pressure differential which does exist between the Northwest and Southeast portions of the pool.



Q Mr. Kelly, let's identify that map as Exhibit No. 7, the one showing the development of the pool at the time the Navajo L-8 well was brought in.

A Right.

(Whereupon, Humble's Exhibit No. 7 was marked for identification.)

Q And that Navajo L-8 well is the one circled in the extreme Southeast corner of the unit?

A That is right, on Exhibit 7 it does have a double circle shown around it. Back on Exhibit 6 the plot of L-8 confirms that migration or pressure maintenance, to use a better word, was occurring there and preventing migration at that time.

Q Anything further you care to point out with relation to Exhibit 6 or 7?

A I believe they have been covered.

(Whereupon, Humble's Exhibit No. 8 was marked for identification.)

Q Refer to your Exhibit No. 8, Mr. Kelly, explain what that reflects.

A Exhibit No. 8 lists only the pertinent and necessary data concerning the wells which it is proposed to convert to injection service in the Tribal land portion of the Cha Cha-Gallup Pool. On this is shown the list or the name of the wells, the datum which it is completed, the location, the total depth, the

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plug back total depth, the casing size in the well, the depth at which the casing was set, the estimated top of the cement behind the pipe and the perforated interval.

This list includes all wells which will ultimately be used or it is planned to use in injection service. It is not the intent to convert all of these wells at this time.

Q It includes the three wells which we have withdrawn at the moment and will convert to injection upon the working out of **satisfactory line agreements with the offset operators?**

A That is correct.

Q Have you supplied to the State Engineer all of the information and materials required by Rule 701?

A Yes, to the best of my knowledge we have.

Q In your opinion is there any danger of contamination of any fresh water sources that might exist in the area?

A No, there is not.

Q Mr. Kelly, what are the rules which you are proposing or requesting in this hearing?

A Referring to the application which was submitted to this Commission, we are requesting the following rules: the conversion of certain producing wells to water injection service. This application has been amended by withdrawal of some certain wells.

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Q Leaving the six wells requested, the ones in green, and deleting the outside injection wells, you might call it?

A That is correct. That the allowable for the project area be the sum of the allowable of the several wells within the project area, including those wells which may be shut in, curtailed or used as injection wells. That the allowables for injection wells be transferred to producing wells within the project area as well as 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 pressure or changes in characteristics of reservoir liquids or progress of sweep.

Item (d), that the allowable assigned to any well which is shut in or which may be curtailed in accordance with the applicable special rules, and which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test period prescribed by the special rules, or greater than the top unit allowable for the pool during the month of transfer, whichever is less.

Item (e), that the allowable assigned to any injection well on an 80-acre proration unit shall be the top unit allowable

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for the Cha Cha-Gallup Oil Pool. Item F, that the ability to produce of any well which is shut in or curtailed in accordance with the special rules shall be determined by a **twenty-four hour** test at a stabilized rate of production, which shall be the final twenty-four hour period of a seventy-two hour test, throughout which the well should be produced in the same manner and at **the** constant rate. The daily tolerance limitation set forth in Commission Rule 502-1(a) and the limiting gas-oil ratio 2,000 to 1 for the Cha Cha-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 so desired.

Item G, that the top allowable assigned to each producing well in the project shall be equal to the well's ability to produce or to the top unit allowable of the Cha Cha-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 unit allowable for the pool. Each producing well shall be subject to the limiting gas-oil ratio 2,000 to 1 for the Cha Cha-Gallup Oil Pool, except that any well or wells within the project area producing with a



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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 in accordance with such equitable formula as may be determined by the Commission, including credit for daily average net water injection through any injection well located within the project area.

H, that the project operator submit each month, within a reasonable time after the normal unit allowable for Northwest New Mexico has been established, to the Commission, a pressure maintenance project operators' report on a form prescribed by the Commission, requesting allowables for each of the several wells in the project area as well as the total project allowable.

I, that the Commission calculate the allowable for each well in the project area, and that the sum of the allowables so calculated be assigned to the project so that the same may be produced from any well or 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 Cha Cha-Gallup Oil Pool.

J, that provision be made for the administrative approval by the Commission of the conversion of additional producing wells to injection wells, and the drilling of additional producing and



injection wells, ~~and~~ the expansion of the project area under such reasonable conditions as may be prescribed by the Commission.

Q Referring to that later request, I assume you certainly would want any offset operator notified of the proposed conversion of any additional wells to injection?

A That is correct.

Q Mr. Kelly, are these the rules which are in effect in the Atlantic and Pan American pressure maintenance projects in the Horseshoe-Gallup Pool?

A Insofar as I know, they are.

Q And they were drawn to request those same rules that are in effect in those projects?

A That is correct.

Q Is there anything you care to state with regard to the suggested rules?

A No, not that I'm aware of.

Q What are your proposed rates of injection initially in your project?

A The six wells shown in green on one of the previous exhibits, I believe it was either the first or second exhibit, we are anticipating injecting water at the rate of a thousand barrels per well per day, or a total of approximately 6,000 barrels per day.

Q Do you have any estimate, Mr. Kelly, how soon that would

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start to reduce your gas-oil ratio and halt your pressure decline?

A On the wells which immediately offset those injection wells, and by immediately I'm referring to wells which are within the one-quarter of a mile of it, the effect of pressure injection should be detectable within three months. That will be, excuse me, if I may, that effect will not be an increase in oil **initially**, but a decrease in gas-oil ratio. The increase in oil will follow that.

Q Limiting your injection wells **initially** to the six proposed in your estimate, would that have any effect on operators outside of the unit?

A Not within the reasonably foreseeable future.

Q And prior to that time you are going to work out line agreements to protect the correlative rights of the parties inside as well as outside?

A That is our intent.

Q Mr. Kelly, in your opinion is the granting of this application at this time essential to the prevention of waste?

A Yes, it is.

Q Would the application protect the correlative rights of the parties inside and outside the unit?

A It is our belief that they will.

Q Exhibits 1 through 8 were prepared by you or under your

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supervision?

A That is correct.

Q Do you have anything further you care to state with regard to the application at this time?

A Not that I'm aware of.

MR. BRATTON: We would offer in evidence Exhibits 1 through 8 inclusive, and that concludes our direct examination.

MR. UTZ: Exhibits 1 through 8 inclusive will be entered into the record of this case.

CROSS EXAMINATION

BY MR. UTZ:

Q What did you call this type? *5-1*

A Crestal. We could also easily refer to it as an inverted five spot. By inverted, I mean only that the input well in general is surrounded by producers. The development of this sand in an elongated bar does not lend itself readily to a full pattern type flood as we normally refer to them such as five spot or modified land drive.

Q Well, the effect of this flood will be to push oil out to the edges of the trend, will it not?

A That is correct.

Q What's going to happen to the oil that is pushed by your outside wells?

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A I'm sorry, I didn't hear you.

Q I say, what is going to happen to the oil that is pushed by the outside wells, out into the questionable producing area?

A I can refer to several established floods, the Upper Cypress Sand flood in the Hyattsville Pool of Kentucky, the Dixie flood in Kentucky, several floods in Oklahoma, Illinois, and two specific floods in Canada, wherein it has been proven conclusively that this type injection does not water out these edge wells and trap a significant amount of oil beyond those wells into the limits of the reservoir itself.

Test wells that have been drilled in two of these particular floods have indicated very decidedly that the pattern of the flood sweep is such that it does go around behind the producing wells and largely sweeps out the effective portion of the reservoir. It does not result in any appreciable oil being trapped between the outside edge producing wells and the edge of the reservoir.

Q Do you have any explanation as to why the oil would actually go out around these wells?

A Do I have any explanation why?

Q Yes.

A It is just a matter of pressure differentials that are



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created from input to producer. It is agreed that the direct line is the shortest path between those points. However, that direct line does not have sufficient transmissibility or capacity to transmit the total flood injected to prevent this pressure differential itself from existing on each side, and to a large degree even, behind the edge producing well.

All we need to move oil to that producing well is a pressure differential, and that pressure differential does exist. Our calculations, all of our studies have shown that this type flood has the approximate same efficiencies as a full pattern flood. That has been confirmed by the people who were associated with us in this study and the data as shown in this Engineering Committee report; Pan American's experience and background, although not on the identical pools, the results apparently are completely similar.

Q Why, then, are you anticipating requesting that your No. 15 well be put on injection at some later date?

A That well is approaching an edge well and we feel that we will need to work out suitable lease line agreements with people outside the Navajo Tribal Lands.

Q You feel, don't you, that you need to inject in that well in order to drive the oil back toward the other wells?

A Well, that is correct. The only reason that possibly I



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missed your point there, the No. 15, which breaks the so-called crestal pattern here, if you will refer to the map which is contained in the fly leaf of the Engineering Committee Report, you will notice that the sand width is greater in that particular area, it bulges out to the Northeast, giving a generally greater width than we have in other parts of it, and that conversion there will simply be an expediency of time.

It is not absolutely required to efficiently flood, but the big factor is this, that the sand is so thick in that portion and so far from the crestal injection, that the time of injection would make it uneconomic to flood in that portion unless we stepped out and away from the crestal pattern.

Q Mr. Kelly, is the gas gathering system connected in this area at the present time?

A I'm sorry, I couldn't hear you.

Q Is the gas gathering system connected in this particular area?

A Yes, it is, currently, and by currently I am referring to a check which I made last week. The Northwest Cha Cha Unit area which we are proposing here of these tribal lands was producing into the pipeline 6.3 million cubic feet of gas per day.

Q Is that all the gas that's being produced?

A That is all that's being produced. We are restricting



ourselves to available compressor capacity, there's no gas being flared.

Q How soon do you think that you'll be injecting water into these wells if this application is approved?

A That is somewhat difficult to estimate in that we have two other agencies, Governmental agencies that we must have their permission to start, and it's impossible and also dangerous to predict how soon said agencies will approve any given project. However, we have made application to the United States Geological Survey, we do know they have it under serious consideration.

I was informed by Mr. Anderson last Thursday that if he had any questions that he would call me on Friday. However, he did not call. I can assume only that he had no questions with respect certainly to them that was to go here, and he also indicated that there would be no undue delay from that agency in that the approval for the project rests solely with Mr. Anderson and will not have to go to his Washington office.

The other agency with which we must deal is the Navajo Tribal Council and the Bureau of Indian Affairs. We have submitted all data to them and requested their approval. They have not indicated when they will approve it. However, they have stated that they have got it under serious study, request that we proceed with these preliminary plans, and that as soon as feasible they will

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approve it. So, it is our hope that within the next thirty to sixty days at the most we will actually have water going in the ground.

Q Then if you are injecting within the next sixty days and it takes three months from the beginning of injection to have any effect on your offset, it will be approximately five months, or possibly longer, before you'll have any increased production?

A That is correct.

Q By that length of time do you anticipate that you will have a gas gathering system installed with enough compressors so that you'll be able to take the additional gas?

A Well, our tentative thinking in that respect is that we will continue to observe the no-flare order. There is no immediate plan to increase the capacity of the gas gathering system or of the compression equipment. You are, to some extent, defeating the entire purpose of this flood if you produce the maximum amount that could be produced under the 2,000 to 1 gas-oil ratio in that that continues to void the reservoir at a fairly high rate, whereas if we can get water going, get the gas-oil ratios down, it is entirely conceivable that in the year coming that we'll have the gas-oil ratios down to the point where the existing compression facilities and gathering system will handle all gas produced. We are anticipating gas-oil ratios less than

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three hundred.

Q You are not actually anticipating any great increase in production, but rather to arrest the decrease in pressure?

A That will be the immediate reaction. There will be ultimately an increase in production, it will follow this decrease of gas-oil ratio and gas production. That is borne out very clearly in the results of the Horseshoe-Gallup Pool in which we operate a pressure maintenance program some fifteen, seventeen miles Northwest of here. This water has been injected in that particular pool now since December of last year, a year to date.

Gas-oil ratios begin to drop very noticeably within seven months after the initiation of the program at a reduced injection rate in comparison to this one. And it is only now that we are first beginning to detect an increase in oil production in those wells immediately offsetting the injection wells.

Q In seven months?

A A year for the increase in oil. Seven months for a very noticeable decrease in the gas-oil ratios.

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

MR. VERITY: I have just a few.

MR. UTZ: Mr. Verity.

CROSS EXAMINATION

BY MR. VERITY:

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Q If I understand you, you hope to be injecting water in your six injection wells in a relatively short period of time. Can you tell us whether those wells are producing at capacity or not or whether or not they are making a top allowable at this time?

A Which wells?

Q The injection wells.

A The injection wells. Yes, I can tell you, if you'll let me refer to a list that I have here. Starting over on the West side, the first well shown in green there, which is the Navajo Tribal "E", No. 3, that well currently is capable of producing at a rate of 132 barrels per day. The gas-oil ratio on the well is 5,853 cubic feet per barrel. It's allowable under the present limiting 2,000 to 1 gas-oil ratio is 56 barrels per day. So, in answer to your question, that well will not produce top allowable currently. Moving on to the East, Well No. 2 on the Navajo Tribal "E" lease, that well is capable of producing 70 barrels of oil per day. Gas-oil ratio on it is 79,506 cubic feet per barrel, it's oil allowable under the limiting ratio is 35 barrels per day.

To clarify one point, these are tests that were run in November of this year. In moving on to the Southeast to the El Paso Natural Gas No. 2 Ojo Amarillo lease, that well is currently producing 44 barrels of oil per day with a gas-oil ratio of 12,886, giving it a present allowable of 25 barrels per day.



Further to the East on the Navajo "L" lease, Well No. 1, that well is currently capable of producing 90 barrels per day with a gas-oil ratio of 2,489, giving it a current allowable of 90 barrels per day.

Well No. 4, further to the Southeast on the Navajo "L" lease, currently is capable of producing 171 barrels per day with a gas-oil ratio of 5,363 with an allowable associated therewith of 61 barrels per day.

The Navajo "L" No. 5 in the Southeast edge of the project, or Navajo Tribal Land area is capable of producing 204 barrels per day with a GOR of 3,608, giving it an allowable of 91 barrels per day.

Those are the six wells that we are currently anticipating converting to injection service.

Q If I understand your requested rules, you request the privilege of having a project allowable assigned?

A That is correct.

Q And in calculating that project allowable you have requested top allowable for these six injection wells?

A That is correct.

Q By virtue of this, does this mean that prior to the time that your injection of water takes effect that you would actually increase the amount of oil that you can produce from the project

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area over what you are able to produce today?

A Mr. Verity, before I could give you an absolutely definitive answer on that I would have to check every well.

Q Can you approximate that answer?

A Let me just check these various injection wells and see the capacity of the wells they would be transferred to. That's the only way I can.

Q Let me pass it for a moment, then, without burdening you doing that, and ask you if you believe that you should be allowed to increase the amount of oil you are presently producing prior to the time that your water injection makes a reaction in the wells you are going to produce?

A Yes, I think we should simply for this reason, we are going to great expense and are taking some risk to get a project started here which ultimately should result in conservation in a large amount of oil, certainly a large amount of gas, and what minor production increase you would get as a result of this would be a very poor rate of return on the expense that you are now encumbering ourselves with to get this project started.

Q You understand, do you, that I'm speaking about the period of time prior to your substantial or your reaction from the water flood injection?

A Yes, sir, I do.

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Q Now, if you do increase the overall amount of oil that you are presently capable of producing under your present allowable as to edge wells that might be offsetting other production, will this also possibly increase what they're able to produce?

A I'm not sure I followed your question right at the last.

Q My question was a little involved. What I'm saying is that this being the case, your answer, it follows, does it not, that edge wells that are offsetting production outside the project area can also be increased over present allowables?

A Can be?

Q Under your requested rules, yes.

A Yes, that is correct.

Q Well, this being the case, wouldn't it also follow, then, that you would create drainage from those offset wells during this interim period prior to the effect of your flood?

A Well, it will depend entirely on the amount of oil that is transferred to those individual wells and their ability to produce is going to be one of the controlling factors that will determine how much you are capable of transferring.

My point is simply this, to illustrate, just take any particular well, say we do have a matter of, oh, for conversation purposes, 600 barrels of oil to transfer, and that is conversation I have not checked it, we must of necessity distribute that to



wells that will be capable of producing it or we will be unable to realize the full benefit of permission to transfer. So to definitively answer your question, I think we should probably ascertain specific wells and discuss those as such.

Q All right, let me make reference now, you said that these rules were the same as those that were in effect someplace else, and I didn't quite get your answer to that question.

A Yes.

Q That is, your requested rules are now in effect, where did you say, in other pressure maintenance projects?

A Well, there's Atlantic's Horseshoe-Gallup and Pan American.

MR. BRATTON: Pan American's Horseshoe-Gallup.

A Pan American's Horseshoe-Gallup.

Q Do you have objection to the rules that were promulgated by the Commission for Humble's Horseshoe-Gallup water pressure maintenance?

A Well, objections, no, I could have hoped for something a little better, but certainly no objections. It's an embarrassing question.

Q I wonder if you would object to an inclusion of the rules that you propose, or the rules for this pressure maintenance, of something similar to Rule No. 7 of Order R-1745, which is that

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Humble Horseshoe-Gallup?

A Would you mind reading that, or permitting me to read it?

Q This rule provides, and I quote, "The allowable assigned to each producing well in the project shall be equal to the well's ability to produce or to the 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 top unit allowable for the pool until such time as the well receives a substantial response to water injection."

A No, I do not think that we would strongly or seriously or even object to that, depending upon the definition of what is an edge well, of course.

Q Yes. Let's go to that next. Would you consider the Navajo 7-"E" in the Southwest Quarter of 16 to be direct or diagonal offset?

A No. Well, use your own definition there. Certainly it would be one or the other.

Q Well, that's what I meant, one or the other.

A Right.

Q What about the 4-"E", I believe it is in the Northwest quarter of 21?

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A 4-"E" is a little different situation, in that it is approximately a half mile back from any other well outside the project area. I will bring to your attention that the development on the Navajo Tribal Lands here has been on a pattern of one well to each 160 acres, whereas to the Northwest of the Navajo Tribal Lands, to the Southeast of the Navajo Tribal Lands you will find that the density of well development is much greater. I bring that out only to illustrate that the well No. 4 is considerably removed from the boundary of the tribal lands.

Q In that regard, I wonder if we could call the witness's attention to the fact that on your Exhibit 1, I believe the Fouts No. 1 State well is slightly mislocated.

A If it is, I apologize.

Q No apology required, it's been very recently drilled, and I think probably you didn't have proper occasion, but it is, we would like to stipulate with you that it is actually in the Southeast quarter of 16 rather than in the Southwest where you show it. It's approximately, what would you say, 800 feet due East of where they show it.

MR. WEIDEKEHR: Probably.

Q Approximately eight feet due East of where you show it on this map.

A All right, fine.

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Q If I understand one of your statements, you stated to the Commission that in your opinion, and I presume that this is the position of the Applicant, that this water flood can be controlled so that it will not in any wise damage any offsetting formations?

A That is correct. There are several approaches which can be used, Mr. Verity. The most logical method, and the one which we strongly prefer, is to work out cooperative agreements with those people offsetting this project. That's the No. 1 choice. We believe that we can do so. However, recognizing that the possibility exists that we can not do that, then we have other avenues that are open to us, that is, that we would drill the necessary wells along the boundary with the permission of this Commission, of course, to prevent the effect of the flood crossing the Tribal boundary itself.

I have, as a matter of my own information here, which I would be very happy to show you several possible and feasible cooperative plans which we can work out.

Q And if those can't be worked out, you still feel that you will so operate your water flood as not to damage offsetting properties, and particularly the properties to the North of the water flood in Section 16?

A That is correct.

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Q One more question. What do you envision in the nature of delaying the three injection wells until satisfactory lease line agreements are effected? If it should develop that you can't work out a satisfactory lease line agreement, then what do you propose for those three wells?

A Then it is my best estimate at this time that their position will have to be relocated in certain cases, and possibly left as producers to achieve this purpose that I formerly referred to.

Q Then, if I understand you, you are saying that you do not now request permission to inject these wells --

A That is correct.

Q -- unless you have written permission from the offsetting leases outside the project area?

A Well --

Q Then administrative approval from the Commission after?

A Right. If you will notice down on the **legend** at the bottom, those are indicated to be conversions to be delayed until satisfactory lease line agreements are effected, and in our application we asked that be handled by administrative approval. I would assume that the best way to show, to the satisfaction of whoever administers this project, a written agreement that we have reached said agreement.



Q Then, if that couldn't be obtained, I presume you would request, and have a hearing or whatever you would propose?

A Whatever action would be required, it would either be hearing or any other acceptable procedure.

MR. VERITY: I believe that's all.

MR. UTZ: Let's take a ten minute recess.

(Whereupon, a recess was held.)

MR. UTZ: The hearing will come to order. Are there any other questions of the witness?

MR. MORRIS: Yes, sir.

MR. UTZ: Mr. Morris.

CROSS EXAMINATION

BY MR. MORRIS:

Q There has been quite a bit of reference to the line agreements that are going to have to be at least attempted. In the event line agreements are consummated, will they in turn have to be submitted to the approval of the United States Geological Survey and the Bureau of Indian Affairs?

A Yes, it is our belief that they must be submitted to those people.

Q That would, presumably, occasion further delay, would it not?

A It could result in that, yes. However, I do not anti-

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cipate any undue delay as a result of that.

Q Has any notice been given to either of the two agencies that line agreements are going to be attempted and are they on notice that this is in the process?

A Yes. It has been discussed with both agencies.

Q What has been their comment?

A Well, I hope that I do not misquote anyone. I'll say this, that certainly we have had no adverse reaction provided we can negotiate acceptable lease line agreements, and that is only concerned with protecting the various equities involved.

Q Mr. Kelly, from a rundown of the production data that you gave on the wells that are going to be converted to injection wells, it's apparent that there is going to be a decrease in the overall gas production by converting those particular wells to injection, is that correct? In other words, you have taken your high ratio wells and anticipate converting them to injection?

A No, sir. They were not selected for that purpose at all. They were selected only because of their location and examination of the gas-oil ratios on other wells. In there we find wells that are just as high or higher than the ones I have referred to.

Q But it will have that effect whether or not they were selected for that reason?

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A Yes, yes, that is correct. I might amplify, in glancing over this I find gas-oil ratios up to as high as 16,579 cubic feet per barrel on one particular well.

Q I believe that you gave as one reason for urgency in this matter, that the production of gas should be contained within at least its present limits to prevent the penalty that would otherwise be incurred by those wells and the resultant loss of production by those wells as one reason for urgency in the formation of this project?

A No. If I inferred that I certainly didn't intend to. The urgency comes about for a different reason. That reason is that the loss of this gas from the oil presently contained in the reservoir has very adverse effects upon the oil itself and decreases the efficiency of the flood. It is not the increased revenue, that is not the primary purpose or current revenue at all.

Q But it would tend to maintain the pressure in this portion of the reservoir by containing the gas?

A That's correct.

Q Other than the reason that you just mentioned, could you summarize the reasons for recommending urgency in this matter?

A Yes, I would be happy to. I have forgotten the exact exhibit numbers, but I would refer you back to the exhibit wherein is plotted the production statistics on this particular portion

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of the Cha Cha-Gallup Pool which shows the gas-oil ratio increasing rapidly as a result of the loss in the reservoir pressure. That was Exhibit No. 4. Also Exhibit No. 5, that shows, unless we get this flood started in the very near future we will encounter a reduction in the total amount of oil that can be recovered, there will be waste that can not be prevented, simply as a result of pressure having been lost from the reservoir.

Q In other words, the pressure is dropping to the optimum point and that is the point at which your project should be commenced?

A That is correct.

Q You would cite those two factors?

A Those are the principal ones. If you wish, I'll be happy to amplify on why this occurs. It is contained, however, in the Engineering Committee Report.

Q I think that will be sufficient. What is the water source?

A The water source is somewhat in doubt as yet. However, at this time we propose and are under way on the drilling of an alluvium source well to tap the waters, the alluvium waters of the San Juan River. The area in which these wells will be located is in the Southeast quarter of Section 15, Township 29 North, Range 14 West of San Juan County.



If that test, which is currently under way, we're getting ready to start on it, is successful, then that alluvium source will become the source of water for the pool. However, we have an alternate plan in case the alluvium does not develop into a suitable source of water. We plan on drilling a Morrison sand water source well in an area that we have tentatively selected, and it is shown on the same map, well, I don't know the section number here.

MR. VERITY: 16 or 21.

A Section 21. It's shown circled with an "X" or something to distinguish. I might point out that further downstream on this same river, the San Juan, in the San Juan County of Utah where the Aneth, McKelver and Rutherford and White Mesa floods are under way, the alluvium has proven to be an acceptable source of flood water.

Q You are not planning to rely on surface appropriations from the river?

A Yes, there will be, alluvium water is considered.

Q Yes, but by well rather than by just surface appropriation.

A Correct, that is it.

Q Mr. Kelly, in the joint operating agreement I note that page 22a was inserted and it was inserted at such a point that the signature of El Paso Natural Gas Products Company to the



agreement appears before the page that was inserted. Does that have any effect?

A It has no significance, I would say that was just a bust on my part. This final executed copy came into our possession just very recently and we have been rapidly putting them together.

Q So El Paso Natural Gas Company, as well as the El Paso Natural Gas Products Company, are parties to the agreement?

A That is correct. However, you'll find that in the body El Paso Natural Gas Products Company is to vote and to exercise all interest of El Paso Natural Gas Company.

MR. MORRIS: I believe that's all. Thank you.

CROSS EXAMINATION

BY MR. UTZ:

Q The reason you gave, I believe, as to limiting this flood to its proposed boundaries, was so that you wouldn't have to work with the Indian people to unitize?

A No, sir, what I intended to infer was simply this, that from our experience we have found it much more difficult and time-consuming to effect a unit of Navajo Tribal Lands with lands other than Navajo Tribal; in the McElmo-Aneth area we have found that just recently we can ascribe to our attempt to unitize difficult royalties with Navajo Tribal Lands delayed that project well over a year. It is just the sheer size of the project that creates



that delay because justifiably they insist that they be convinced in every case that their equity is protected. That is just a time-consuming process.

Whereas, when we unitize only tribal lands, that is, the only thing we have to convince them on is that their equity is protected on the lease line agreements. That is only a small portion of the entire project.

Q But you have, in some cases, unitized Indian lands with other lands?

A We have, and I must say much to my regret, because it delayed it unduly.

Q Now, the lands in 29 North, 13 West, are those Indian lands?

A 29 North, 13 West?

Q Yes, in Sections 30 and 31.

A No, sir, they are not, if I have my finger on those. They are Federal leases, but they are not Navajo Tribal Lands. The Navajo Tribal leases, insofar as I know, are those that are located West of the East side of Range 14 West, South of the San Juan River.

Q Now, the wells that are shown to the Northeast are Totah wells, all of them?

A Yes, they are Totah wells.

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Q That includes the Navajo "H" No. 9 also?

A The Navajo "H" No. 9 is a Totah-Gallup well.

Q And you believe that there's an impermeable zone between the Totah and the Cha Cha in this area?

A Yes, sir, we do. I believe, if you will refer back to the spacing hearing that was held some two to three months ago, that that was demonstrated.

MR. UTZ: Any other questions?

CROSS EXAMINATION

BY MR. McGRATH:

Q Mr. Kelly, I believe you stated that there was approximately 250 pounds bottom hole pressure in the Northwest part of the Cha Cha than there is in the Southeast; if they start this water injection that will increase that water differential, won't it?

A That is correct. If we start this water injection program and a comparable program in the Southeast Unit is not instituted immediately, then that pressure differential will increase.

Q Something will have to be done to protect it?

A That is correct. Our preference is certainly that the people in the Southeast portion of this pool, which includes ourselves on the one tract down there and several other companies

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who are, at least Pan American is down in the Southeast, feel that the best solution to get that flood started, work out comparable agreements to take care of the lease line. However, failing to do that, there are other alternatives available such as drilling wells right along the Southeast border of the Navajo Tribal Lands. If this unit can not be put together down there and the necessary line agreements worked out, then we will feel that we must take that approach.

MR. McGRATH: That's all.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Kelly,, is the proposed flood to the Southeast adjoining this flood here?

A Yes, sir, that is under way at this time.

Q That's the Pan American flood?

A Yes, Pan American, I understand, will be the operator of that flood.

Q And you people are working on the same lease line agreements?

A Are we?

Q Yes.

A Yes, sir, that is one of the prime considerations for both of these.

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MR. UTZ: Any other questions?

REDIRECT EXAMINATION

BY MR. BRATTON:

Q I have a question. Mr. Kelly, referring to the rules which you have requested, they are the same as the Pan American and Atlantic Horseshoe-Gallup rules?

A That is correct, insofar as I know.

Q And the Humble Horseshoe-Gallup rules have only the additional requirement that an allowable can not be transferred to a well directly or diagonally offsetting an outside tract until it has received substantial response?

A That is my understanding, right.

Q When this application was presented, you had some injection wells right along the boundary?

A That is correct.

Q And, of course, if those wells were to be injection, you would need to transfer allowable right along the boundary?

A That is correct.

Q Before you get response? A That is correct.

Q If those wells should go on injection by administrative route after agreement from the offsetting operators, you would still need to transfer allowables along the boundary, would you not?

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A That is correct.

Q To protect the correlative rights inside?

A Yes.

Q One further thing, Mr. Kelly, just East of your Navajo 7-"E" and directly offsetting to the South the Foutz State well, there is a proration unit established, is that correct?

A That is correct.

Q That little triangle along the boundary is a non-standard proration unit that has been established?

A That is correct.

Q So that the No. 4 well to the South of that is not a direct or diagonal offset to a proration unit outside the boundary?

A I couldn't consider it as such.

Q Certainly the Navajo 7-"E" well is?

A It is, very definitely.

Q Regardless of what rule might be adopted, would you want to transfer any allowable to the Navajo 7-"E" prior to obtaining response?

A No, we would not.

MR. BRATTON: I believe that's all.

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

(Witness excused.)



MR. UTZ: Do you have any further witnesses?

MR. BRATTON: No, sir.

MR. UTZ: Any statements in this case? Mr. Buell.

MR. BUELL: Guy Buell, may it please the Examiner, Pan American Petroleum Corporation, as an interest owner in the Northwest Cha Cha Unit, has worked extremely closely with the El Paso Natural Gas Products Company and the Humble Oil & Refining Company in the formation of this unit and the designing of the pressure maintenance program. As such an interest owner we wholeheartedly concur in the recommendations of Humble here today.

Also Pan American is an operator North of the San Juan River immediately North of the Northern boundary of the Northwest Cha Cha Unit. As an operator in that area, as is Southwest Production Company, we have critically evaluated the pressure maintenance program and the rules proposed by Humble. It is our firm and sincere conclusion that the only effect on our properties North of the river by this program proposed and these rules proposed will be an **additional** effect on those properties North of the river.

Actually Pan American is concerned over Southwest, maybe opposition isn't the correct word, but certainly their reluctance at this time to see injection wells in the Northern portion of the Northwest Cha Cha Unit. Actually Pan American feels that it is

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absolutely necessary in order to protect our properties North of the river to immediately convert wells to injection service in the Northern portion of the Northwest Cha Cha Unit. We feel that it is mandatory to protect our interests North of the river.

MR. UTZ: Any other statements?

MR. VERITY: Relying upon the Applicant's witness's statement that he and the Applicant were assured that this water flood could not damage any leases offsetting the project area, Southwest Production Company has no objection to the granting of the application.

MR. UTZ: Any other statements?

MR. MASON: John Mason with the El Paso Natural Gas Products Company. We also concur in this application of Humble since we also are an interest owner in the project area. There has been no evidence introduced here today to indicate that there would be any damage to offsetting properties, that to the contrary there will be certain precautions that should be taken to protect the project area itself, and it has been indicated that these measures will be undertaken as the need arises.

If anything, as far as the offset operators is concerned, as Mr. Buell has indicated, they will perhaps benefit from this program. In view of those matters and in view of the urgency which Mr. Kelley has clearly indicated, as far as the conditions

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now existing in the river, the high gas-oil ratios and the rapid decline in pressure, we feel that it is urgent that approval be gained as soon as possible so that injection can begin, so that these conditions can be arrested. We heartily concur in the request that has been made in this application and urge that the Commission grant this approval as soon as possible.

MR. UTZ: Mr. Buell.

MR. BUELL: Guy Buell, may it please the examiner, it might be proper for this record to briefly comment on the other conservation efforts that are going on in the Cha Cha-Gallup Pool. As the examiner probably knows, Pan American has an application on the first Examiner Hearing in January for a lease flood in the Southeast portion of Cha Cha. I would like to state for the record that last week an operators' meeting, as well as an Engineering Subcommittee meeting was held with regard to unitization efforts in the Southeast portion of Cha Cha, and the people who are dealing directly with that effort are extremely optimistic and are hopeful within the immediate future that we will see in conjunction with this Northwest Cha Cha Unit a Southeast Cha Cha Unit, which will, in effect, subject about 90 or 95% of the Cha Cha-Gallup Oil Pool to unitize pressure maintenance operation.

MR. UTZ: Thank you, Mr. Buell.

MR. BRATTON: Mr. Examiner, I would just like to make one

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statement. Every month all of those present here, and many others, come up here charging up as white knights of conservation, and sometimes the Commission views that favorably and sometimes with a somewhat skeptical attitude. I want to say in all sincerity that I believe this is an urgent conservation project. I believe we have tried to demonstrate to our absolute utmost we aren't going to violate anybody's correlative rights, those across the boundary, and certainly we have to protect those inside the boundary.

This is a sincerely and urgently needed project, and I would hope that the Commission would act favorably on it without any delay, because as the witness pointed out, we have to work just as fast as we can through all agencies to try to get water in the ground just as soon as possible. Thank you.

MR. UTZ: Any other statements? The case will be taken under advisement and the hearing is adjourned.

(Whereupon, the hearing was adjourned.)

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