BEFORE THE
OIL CONSERVATION COMMISSION
Roswell, New Mexico
April 16, 1958

IN THE MATTER OF:

CASE NO. 1420

TRANSCRIPT OF PROCEEDINGS

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691

NEW MEXICO OIL CONSERVATION COMMISSION

Elks Club

Roswell, NEW MEXICO

REGISTER

HEARING DATE April 16, 1958 TIME: 9:00 a.m.

NAME:	REPRESENTING:	LOCATION:
H C Bratton	Humble Oil & R Co	Roswell
W. J. Brown	Permian Basin P.L.'s	Hobbs
D. C. Capps	Amerada Pet Corp	Monument
Homer Derby	Continental Oil	Ft Worth Tex
D. R. Currens	Pan American Pet. Corp.	Roswell, N.M.
Myron B Messner	The British American Oil Prod Co	Dallas.
Paul S. Johnston	Gackle Oil Co.	Hobbs
Jay Harwell	Jess Harwell	Hobbs.
J R Cheatham	Harvey Dow & Hinkle	Roswell
M. E. Dehlinger	Forest Oil Corp.	Midland Tex.
Joe M. Waniel Jr.	Cabot Carbon Co	Pampa, Texas
T. L. Stall	Cabot	Midland, Tex
A. B. Cockburn	Cabot	" "
Walter G. Hern	Cabot	Pampa, Texas.
H. L. Johnston	Conoco	Ft. Worth, Texas
L. L. Adams	✓	Roswell, N.M.
James E Lowe	Amerada	Tulsa Okla
N Drake	✓	Durango Colo,

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NAME:	REPRESENTING:	LOCATION:
J. W. Clark	Shell Oil Co.	Roswell.
[illegible]	✓	✓
Frank D. Dardale	Sinclair Crude Oil Co.	Tulsa
Robert A. Burns	Malco Refineries, Inc	Roswell, N. Mex.
Tom McCain	Sinclair Crude oil	Roswell
[illegible]	Gulf Oil	—
C. W. Dashin	Gulf Oil	—
F. E. Curtis Jr.	Gulf Oil Corp	Roswell
A D Salsbury	Featherstone, Corp	"
H. N. Sweeney	✓	"
E B Todhunter	Hanson Oil CO	"
Bill Bradley	El Paso Nat. Gas Prod.	El Paso
Joe M. McNutt	✓ ✓ ✓ ✓	✓
R. E. CARAWAY	STANDARD OIL CO OF TEXAS	HOUSTON
Bill McComb	Malco	Roswell.
E F Whitehurst	Malco	Roswell.
W J Loyd	Malco	artesia
R L Higgins	Malco	"
V. W. [illegible]	Phillips Pet. Co.	Bartlesville Okla
N B Hamilton	" "	Midland

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NAME:	REPRESENTING:	LOCATION:
W A Kleine	Permian Oil Co	Midland
John Mills	The Texas Co	✓
K T. Kenny	Gulf Oil	Midland
J. G Costes	" "	Houston
W. Shellshear	" "	Roswell
J. E. Damewood	Indiana Oil Purch Co	Midland
H. E Schuerman	Shell Oil Co	Los Angeles
W. E Owen	Shell	Roswell
Ted Bilberry	State Land Office	Santa Fe
Booth Kellough	Gulf	Denver
A. M. Bell	Gulf	Denver
Geo. Hemphill	Moran	Hobbs,
Dick Booker	Cities Service	Midland
C. N. Berry	✓	Bartlesville
A C Blackburn	Blackburn Stark trustee	Hobbs
W. E. Harrington	Malco	Roswell
Lew Hanks, Jr	Pan Am Petr Corp.	Ft. Worth
C. L. Kelley	" "	Roswell
J. W. Brown	" "	Eunice

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NAME:	REPRESENTING:	LOCATION:
John W. Higgins	The Ohio Oil Co.	Roswell, N.M.
J. G. Stanley	Benson-Montin-Greer	Farmington, N. M.
R. L. Houghton	Shell Oil Co.	Midland
J. W. Balch Jr.	El Paso Natural Gas	Jal
L. M. Hall	" " Products	El Paso
K. M. Mosley	New Mex. Dist. Geol.	Ros.
D. J. Sharp	Pan American Pet.	Ros.
Jim Burley	Pan Am Pet	Ros
C. Perkins	Shell Oil	Roswell
Hugh Pickett	John Trigg	Roswell
J. L. Graham	Standard of Texas	Houston
B. Anderson	Malco	Roswell
O. R. Hall	Elliott-Hall	Roswell
Joan Killam	Killam & Fox	Santa Fe
Robert E. Fox	" "	" "
John M. Kelly	Independent	Roswell

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NAME:	REPRESENTING:	LOCATION:
Harry R. Dippel	Continental Oil Co	Fort Worth
Kenneth D. McGehee	John M. Kelly	Hobbs
D. Wilson	Intex Oil Co	Roswell
Foster Morrell	Independent	Roswell
Clarence Babcock	Pan. Am.	Roswell
David Dunn	Union Oil of Calif.	Roswell
E. P. Kerr	Northern Nat Gas	Midland
P. T. McGrath	U.S.G.S.	Farmington
Carl Traywick	U.S.G.S	Roswell
A. P. Kleeman	U.S.G.S.	Roswell
B. J. Smith	Pan American	Roswell
A K Bryant	Pan American	Roswell
Geo Bucher	Pan Am.	Roswell
Ross L Malone	Clark etal	Roswell
D. E. A. JOHNSON	TEXAS NATIONAL PET.	FARMINGTON

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NAME:	REPRESENTING:	LOCATION:
J. J. Hampton	Great Western Drlg	Midland
S. H. Snoddy	"	"
Robert R. Garlow	Cont'l Oil	Roswell
Robert Leonard	Leonard Oil Co	" "
W. Edwin Hudson	Hudson & Hudson Inc	Fort Worth
W. P. Tomlinson	Atlantic	Roswell
R. F. Baker	Atlantic	Roswell
Cecil V. Chapman	Atlantic	Roswell
O. C. McBryde, Jr.	Amerada	Midland
N. C. Hill	Amerada	Hobbs
M. T. Smith	Shell	Midland
M. C. Bamm	Shell	Farmington N.M.
Fred Brown	McWood Corp	Abilene Texas
J. K. Moore	Shell Oil Co.	Houston Tex.
D. M. Shields	Murray Mid-Continent	Tulsa Okla.
R. M. Weir	Gulf Oil Corp	Denver, Colo.
W. D. Mathews	" "	Durango Colo.

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NAME:	REPRESENTING:	LOCATION:
R. M. Moran	Mobil Oil & Exlg.	Hobbs, N. Mex.
N. J. Payne	Continental Oil Co	Ponca City, Okla.
Sam F. Weir	Carter Gas Co. Inc.	Midland, Texas
B. L. Denton	Magnolia Pet Co	"
E. J. FISCHER	OCC	Hobbs,
K. L. McPherson	M & Ward Corp	Midland
Roy Johnson	Bruce Burnap Inc	Odessa
W. J. Rogers	Sinclair Oil & Gas Co	Midland
Haydon A. Webb	" "	"
E W NESTOR	SHELL OIL COMPANY	—
E H Griffin	Amerada	
F. Normen Woodruff	E.P.N.G.	El Paso
John W. Stewart	Gulf	Denver
[illegible]		Roswell
[illegible]		Roswell
R. L. Evans	Pan American	Roswell
K. C. Wadsell	Pan American	Roswell

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NAME:	REPRESENTING:	LOCATION:
Floyd Lafferty	Pan. Am.	Roswell
D. L. Hamilton	" "	"
F. V. Vinklarek	Std Oil Co of Texas	Midland, Tex.
G.E. George	" " " "	"
R L McGlannan	" "	Houston
E. I. Wolfe	U.S.G.S.	Roswell
[illegible]	U.S.G.S.	✓
R. F. Montgomery	OCC	Hobbs
B. R. Farris	Std oil Co of Texas	Midland
T. J. Leighner Jr.	" " " " "	Houston
Paul Eaton	Hervey Dow + Hinkle	Roswell
Bob Gladdone	" "	"
Keith L Brown	Carlkins Oil Co.	Okla. City
A. F. Holland	"	"
Frank Gray	"	Farmington
T. W. Moxey	N.M.O.+G.	Roswell.
Bob Matthews	Humble	Roswell
John Holzer	Sinclair	Roswell
W.F. Overreaux	Shell	Roswell

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NAME:	REPRESENTING:	LOCATION:
Foster	Phillips	
John Runyan	OCC	Hobbs.
M L Armstrong	OCC	Artesia
Phil D Helmig	Malco Ref	Roswell
A. F. Holland	Carlton oil Co.	Oklahoma City
V. R. Loar	Sunray Mid-Continent	Tulsa, Okla.
A. R. Kendrick	OCC	Aztec
H. R. Smith	Roswell Daily Record	Roswell.
Nancy Royal	NM Statehouse Reporting Service	Santa Fe

BEFORE THE
OIL CONSERVATION COMMISSION
Roswell, New Mexico
April 16, 1958

IN THE MATTER OF:

CASE NO. 1420 Application of Caulkins Oil Company to amend the Special Pool Rules for the South Blanco-Tocito Oil Pool. Applicant, in the above-styled cause, seeks an order amending the Special Pool rules in the South Blanco-Tocito Oil Pool in Rio Arriba County, New Mexico to provide for the transfer of allowables within its water injection project in said pool and to provide credit against gas-oil ratio limitations for water injected under said program.

BEFORE:

Mr. A. L. Porter
Mr. Murray Morgan
Honorable Edwin L. Mechem

TRANSCRIPT OF PROCEEDINGS

MR. PORTER: The hearing will come to order, please. The Commission will consider at this time Case 1420.

MR. PAYNE: Application of Caulkins Oil Company to amend the Special Pool Rules for the Sputh Blanco-Tocito Oil Pool.

MR. KELLAHIN: If the Commission please, Jason Kellahin of Kellahin & Fox representing the applicant, Caulkins Oil Company. I would also like to enter the appearance of Mr. Robert Fox and Keith Brown. Mr. Brown is from Oklahoma. We will have two witnesses in this case, Mr. Frank Gray and Art Holland.

MR. PORTER: Will the witnesses stand to be sworn?

(Witnesses sworn)

MR. KELLAHIN: We will call as our first witness Frank Gray.

FRANK GRAY

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Frank O. Gray.

Q By whom are you employed, Mr. Gray?

A Caulkins Oil Company.

Q What is your position?

A I am field superintendent in charge of operations in New Mexico.

Q And in connection with your position as field superintendent, do you have anything to do with the South Blanco-Tocito Oil Pool?

A Yes, I supervise all of the operations that are carried on there.

Q Now, Mr. Gray, what experiences have you had in the oil business?

A I've been in various phases of the oil business for the past thirty-four years, and producing operations, counting engineer-

ing.

Q During that period, where did you work?

A The first year -- the first six years of my experience in the oil business was with the Continental Oil Company in Oklahoma. The next seventeen years with Anderson-Pritchard Oil Corporation in Oklahoma, Texas, and New Mexico. Twelve years of that time was in southeastern New Mexico. The next four years I was a partner in a contract drilling company. The past seven years, since 1951, I have been employed by Caulkins Oil Company.

Q And during that time it was in the area involved in this application?

A Yes, that's right.

Q Now, what are your duties as field superintendent?

A It is my duty to supervise the complete operation, including drilling, producing, measurements, and disposition of the oil and gas to the pipeline companies.

MR. KELLAHIN: Are the witness' qualifications acceptable?

MR. PORTER: They are.

Q Now, in connection with your work for the Caulkins Oil Company, have you made a study of prorationing as it is presently operating in the South Blanco-Tocito Oil Pool?

A Yes, sir.

Q Now, referring to what has been marked as Exhibit No. 1, what does that show, Mr. Gray?

A It shows the comparison of the oil and gas production by

months on the Caulkins properties, and it is over a period of three months before and three months after proration was started in that field.

Q Is that information based on tests and records kept by you in the ordinary course of business?

A Yes.

Q Now, I notice from the Exhibit, Mr. Gray, that the production of gas in December of 1957 was extremely high and yet the Exhibit shows no increase in the gas-oil ratios. How do you explain that?

A During the month of December, the proration order permitted the selective production of oil, that is, we were permitted to produce the oil from the well that would produce it most efficiently from the standpoint of gas-oil ratio.

Q Then, in achieving that, are you saying that you produced your oil from the wells with the lower gas-oil ratio insofar as possible?

A Yes, sir.

Q Now, in January, wherein the production of oil was at its -- your daily production was at its lowest, the gas-oil ratio was higher. How do you explain that?

A During the month of January, the proration order required that each well produce its allowable, or that the allowable for each well be taken from that particular well regardless of its gas production. The limiting gas-oil ratio was not in effect during the

months of January and February included in this report.

Q Now, as a matter of fact, there has never been any limiting gas-oil ratio in effect in this pool until the 1st of April, is that correct?

A Unless I am confused on the original order, there has not been any limiting gas-oil ratio until the 1st of April.

Q Now, your explanation of higher gas-oil ratio for the month of January -- would the same explanation be given as to February?

A Yes, sir.

Q Now, with the institution of a limiting gas-oil ratio on April the 1st, will that operate to reduce the gas-oil ratio to the pool as a whole?

A Yes, sir, that will have a very good effect on the gas-oil ratio for the entire pool.

Q But does it in itself solve the problem of controlling the gas-oil ratios in the pool?

A The limiting gas-oil ratio will reduce the production of gas in the field, but in no way will it improve the inefficient producers if they have high gas-oil ratio at one rate of production. That similar ratio to some extent will apply most anywhere.

Q Now, referring to what has been marked as Exhibit No. 2, would you state what that shows?

A Exhibit No. 2 shows the disposition of the gas production during the six month period; three months before proration, and three

months after in the Caulkins properties in this South Blanco Pool.

Q Now, according to the figures which you have set out on Exhibit No. 2 under the heading "MCF Gas Wasted," what does that mean?

A That is the amount of gas that we were not able to either sell or use.

Q Now, during the three months, December, January and February, it shows a decided increase in this amount of gas. What accounts for that situation?

A During the month of December we had an allowable substantially higher than in January or February. The order setting out the allowed rate of production for the field came out, I believe, it was issued on December the 6th, and prior to that time we had been operating at a lower rate of production, and we stepped the rate of production up the remainder of the month in order to sell the amount of oil that we were entitled to sell, but in so doing, the amount of gas produced per day was increased considerably and we were not able to sell the same percentage as we had in the previous months.

Q Well now, you have facilities to take care of the gas that you had been producing prior to that, do you not?

A We have facilities for taking care of about all the gas we produce, except there will be peak loads that may at times cause some gas to be vented, and there are other times when conditions beyond our control make it necessary to shut the compressor down. Our equipment is designed to operate at a maximum pressure of 300

pounds. If the line pressure on the purer exceeds that, it shuts us down, and there have been occasions when that has happened.

Q Now, was this compressor installed by Caulkins Oil Company or its predecessor?

A Yes, sir, that's right.

Q Has Caulkins Oil Company made every effort to sell the gas produced along with the oil on this pool?

A Yes, we have made every effort to sell as much as we can.

Q Now, has the institution of proration created any special problems in connection with this operation?

A The unlimited, or rather the lack of a lending gas-oil ratio during the months of January and February made it necessary for us to produce some high gas-oil ratio wells in order to operate them and keep freezing and flooding of the separators at a minimum. We have found it best to operate them at a high rate of flow, and one well in particular, our No. 123 in Section 7, 26, 6, has a ratio high enough that it by itself, at the most efficient rate we can flow it, it will more than load the system. We have to take care of it. We can handle on up to three and a half, four million feet of gas. The compressor itself will handle about one and a half million, and we use roughly one quarter million for fuel, but the system is so designed that if the suction pressure on the compressor exceeds 20 or 21, 22 pounds, we get into an overloaded condition on the compressor engine, so we are limited by those conditions on the amount of gas we can pass through our plant, and for

that reason we have had to shut wells in while we produced the high gas-oil ratio wells. There are three wells actually that are bad offenders.

Q Now, in the event you were allowed to transfer the allowable from those wells to wells with the lower gas-oil ratio, would that solve that problem?

A I think that would very nearly cure the trouble.

Q With the result that gas produced would be to a much larger extent saved and marketed, is that correct?

A Yes, I think we could get back, at least to -- we could cut the waste of it down, at least to what it was back in September, October and November.

Q Now, referring to what has been marked as Exhibit No. 3, Mr. Gray, what does that design to show?

A The Exhibit No. 3 shows the comparison of reservoir space voided per barrel of stock tank oil produced during this six month period.

Q What is the basis for your filing of the daily average reservoir voidage?

A The daily average reservoir voidage expressed in barrels is the space occupied by the oil produced at reservoir conditions, the gas produced at reservoir conditions, and the water produced, the sum of the three.

Q What are the basis for the other figures shown on this Exhibit?

A The daily water injection in barrels is the amount of water that we inject daily. The daily average water injection of 1306 barrels is the net amount we injected.

Q That would be the amount of water injected less the amount produced?

A No, the amount produced is included in the daily average reservoir voidage. The daily water is the total amount of water we inject per day.

Q What is this figure, the net daily average reservoir voidage?

A That is the difference between the water injected and the reservoir voidage.

Q Now, how do you arrive at the last figure, the last column of figures, the barrels of voidage per --

A That is column 4, the daily average oil production in barrels divided into the net daily average reservoir voidage, and it shows the number of barrels and the space voided per barrel of stock tank oil produced.

Q That column shows a decided increase in the barrels of space voidage per barrels of oil produced for the last two months. How do you account for that?

A That's due to gas production in excess of that produced during the months of September, October and November.

Q Is that as a result of the present system which requires you to produce your oil from each individual well?

A Yes, it is. However, the ratio will be improved a great deal during the month of April when we have a limiting gas-oil ratio, but it is not as low as it could be if we were permitted to operate on taking our oil from the most efficient producer from the group.

Q Based on your experience in this field, do you feel that is an efficient operation, to void 4.39 barrels of space per barrel of oil produced?

A No, I don't think it is an efficient rate because we have demonstrated that it can be done with less space, less space voidage.

Q Now, referring to what has been marked as Exhibit No. 4, Mr. Gray, what is that designed to show?

A Exhibit 4 is an application of the principal of allowable transfers and water injection credit to the April, 1958 allowables authorized for the Caulkins property in the South Blanco-Tocito Oil Pool.

Q Now, is that Exhibit based upon the proposals made in the proposals attached to the application in this case?

A Yes, that shows the estimated results that can be obtained by producing the oil from the most efficient producers.

Q And what effect would those rules then have under the proposed rules -- under the operations, I should say?

A The gas-oil ratio for all of the wells that are operated by Caulkins, which includes wells that would not participate in any allowable transfers and those that would. There are two wells that

will not participate in the transfer of allowables.

Q That is two Caulkins wells you are talking about?

A Two Caulkins wells. The gas-oil ratio estimated to produce 687 barrels, as will be required during the month of April, is 2300. If we were permitted to take the oil from the well that would produce it most efficiently and reduce the take from inefficient wells to an amount that would give us just control and knowledge of any change that might be taking place in them, the gas-oil ratio would be 1854 approximately.

Q In other words, the proposals would allow you to produce the same amount of oil and yet reduce your gas-oil ratios for the pool, is that correct?

A In working this out, this credit for gas-oil ratio as we have recommended, the credit for water injected -- excuse me, as we have recommended, it would have the effect of permitting us to take the allowable for a penalized well, and by having credit for water injected, correct the allowable to top allowable if the well were capable of making it, and in working it out, we would, by receiving credit for the water injected, we would restore the top allowable wells to a top allowable of 842 barrels which would be produced with approximately the same amount of gas as 687. The penalized allowable could be produced. With the gas allowable, we estimate we could produce 687 barrels under the present rules or 1,580,000 cubic feet. To produce 842 barrels from the most efficient wells would require 1,560,700 cubic feet, approximately the

same amount of gas for 150 barrels or so.

Q Would you consider that a more efficient use of the energy available in the reservoir --

A Yes.

Q -- under the present rules?

A Yes, very definitely.

Q Now, based upon your testimony and the Exhibits 1 through 4, can the situation you outlined be avoided by the selective production of wells in the pool?

A I think that the selective production of the wells, that is, favoring the more efficient producers, would conserve reservoir energy and would help him minimize any surface waste of gas.

Q Would it result in greater ultimate recovery of oil from the pool?

A Yes, I think it would.

Q Do you have anything else you wish to add, Mr. Gray?

A No, that's all I have.

MR. KELLAHIN: At this time we would like to offer in evidence Exhibits 1 through 4 inclusive.

MR. PORTER: Without objection, they will be admitted.

MR. KELLAHIN: That is all.

MR. PORTER: Anyone have a question of Mr. Gray? Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Gray, I note that the most gas that was produced in any of the six months as indicated on Exhibit No. 1 was during the month of December, is that correct?

A That's correct.

Q And at that time produced the most oil than any of the six months, is that correct?

A Yes, sir. The December production averaged 908 barrels a day.

Q The highest GOR -- Now, these GOR's that are shown here on Exhibit 1 are produced GOR's, is that correct?

A Yes.

Q The highest GOR is during the month of January, is it not?

A Yes, sir.

Q And that was during the month of your lowest production?

A Yes, sir.

Q Do you think that with increased allowables and the designation of so much oil to each unit without the assignment of allowables from one well to the other will cause you to have high GOR's such as you had during the month of January? Is this -- in other words, are these high GOR's responsible, are they the result of the low rate of production that you had during January?

A No, sir. I think not. During the month of December we were permitted to take the oil from the wells that would produce efficiently. During the months of January and February we were not,

we had to take the allowable from each well regardless of the gas production.

Q Well, how did you do it in September, October, November and December?

A Selectively. We were favoring the most efficient wells.

Q Well, with the imposition of the 2,000 to 1 gas-oil ratio that went into effect April the 1st, do you think you will get the high GOR that you have on this Exhibit?

A No, we would not. The limiting gas-oil ratio will reduce the pool's total gas-oil ratio, but it will not in any way improve the efficiency of the wells that are inclined to produce a lot of gas.

Q Well, Mr. Gray, is this not true at any pool where you have some structures with wells located high in the structure that produce a lot of gas, if you could transfer the allowable to those wells down the structure and shut the wells on the top end, that you could reduce the GOR on the pool?

A Yes, that's correct.

Q Is this a common practice ordinarily?

A Ordinarily, the ownership of the property will not permit a transfer of allowables except on a unit basis, and I am not as familiar as I should be with some of the larger pressure maintenance operations around over the country, but I believe it is where it has been unitized and where it is not a cooperative deal, they favor the producers.

Q Aside from a measure maintenance project, is it a common practice to transfer the allowable from the wells on top of the structure to the well down the structure?

A It is not common practice, because in nonunitized or in -- where the ownership is diversified, it can't very well be done, but that is not the situation we have here.

Q Mr. Gray, do you have an opinion as to whether this pool has an MER, or a most efficient rate of production, has a desirable rate of production which you would like not to see exceeded or not met?

A We have no actual figures on it. We have not attempted to work it out, but I do think that it would be between 850 and 1000 barrels a day.

Q This pool is on 80-acre spacing, right?

A Yes.

Q And it does have the depth factor, does it not?

A Yes.

Q Do you know what the depth factor --

A The combination depth factor is 2.77.

Q With the allowable that the Commission has established for May, 1958, what will the allowable be for the acreage in this pool?

A I believe it figures 138 barrels per day. 139 barrels.

Q How many wells do you have in this project, Mr. Gray, that can produce without being penalized on account of the 2,000 to

1 GOR limit?

A There are three wells in the group that would not be penalized. I believe that's right.

Q On Exhibit 4 there is an estimated gas-oil ratio. What is the estimated gas-oil ratio based on?

A Those figures are based on the latest information available on the wells. Part of it was taken from the report from the month before of gas production, part of it is recent tests.

Q Mr. Gray, I count six wells here which have GOR of less than 2,000.

A The first well, No. 109, is a marginal well. Its capacity is 27 barrels. No. 132, this increase in allowable will make a marginal well out of it. Its capacity is 97 barrels a day. This 185 well will be a top allowable well, also 127 and 129. 207 is a penalty well; 182 is a marginal well; 179 is a penalty well; 177 is a penalty well; 132 is a marginal well with a 97 barrel capacity; 129 is a top well; 127 top well, and 109 a marginal well.

Q Have you made an estimate of how much you can produce with an allowable of 135 barrels and GOR of 2,000 to 1?

A No, sir, I have not.

Q You may be able to achieve the desired rate of production?

A I think we will be permitted to produce approximately the 842 barrels from the total wells in the group that this selective production would entitle us to, if we received credit for water injected and were permitted to do the transferring. But to

increase the production will also increase the production of high gas-oil ratio wells. The penalty applies, I believe, on the gas limit, which is set by multiplying the top permissible gas-oil ratio by the allowable of the top unit in the field, which would be 2,000 times 139 barrels. The penalty for the wells is figured on that basis, by dividing the actual gas-oil ratio into the maximum permissible gas production, which would increase the allowable of the inefficient wells.

Q Mr. Gray, on your Exhibit No. 2, I believe that in the month of December more gas was produced than any other months, is that correct?

A Yes, that is right.

Q And this was during a period when you were taking the oil from the desired wells?

A Yes, that is correct, with one qualification. During the month of December we were producing this No. 179 well continuously, even though it did have a high gas-oil ratio and the reason for that was to obtain information for control of the operation. We had started the injection of water into the No. 85 and No. 87 wells, then discontinued it, and we were testing No. 179 at a rather high rate in order to determine what effect it would have on it to help us trace the movement of water in the reservoir.

Q You weren't observing any GOR limitation during December?

A During the month of December?

Q Yes.

A No, I believe the order permitted us to produce the oil from whatever wells we saw fit.

Q Which order was that?

A The one that was issued December the 6th.

MR. NUTTER: I believe that's all.

MR. PORTER: Anyone else have a question of Mr. Gray?

MR. COOLEY: Yes, sir.

QUESTIONS BY MR. COOLEY:

Q Mr. Gray, you stated one of the objects for transferring allowables ordinarily was a diversity of ownership between wells on high structures and those wells which would make high gas-oil ratios. Can you tell me what the royalty ownership is in the various leases in this project?

A No, sir, I can't tell you who they are or what their respective interests are.

Q Can you tell me whether they are common?

A I believe they are common to this extent. There has been an agreement worked out among the royalty owners that makes this thing work.

Q They are all Government leases, and the overriding royalties are adequately protected?

A Yes, sir. This thing has been in operation now for three or four years, and there has been -- apparently everyone is well satisfied with the operation of the thing as far as their respective interests are concerned, and the management of the accounting for

crude production -- I mean the production of crude and gas.

Q Would you elaborate, please, on your observations -- the prediction that if your proposal is adopted, that greater ultimate recovery will be obtained?

A One of the problems that we've encountered in conducting this operation was channeling, and we think that it was partially due to too high a rate of injection. We would prefer to keep the rate of injection as low as possible to partly or at least minimize that condition, and in order to maintain pressures or control a decline, the rate of injection has got to be either equal to or at least in proportion to the withdrawal, or space voidage. That is one --

Q Will the rate of injection differ whether we adopt the proposed plan or remain on the existing well by well plan?

A The space voidage per barrel produced will be less if we produce less gas to get it, and the amount of water that we need to inject to take the place of the oil and gas that has been withdrawn would be less also.

Q Did you have another reason you were going to --

A No, that's about as far as I want to go on it.

MR. COOLEY: That's all. Thank you very much.

MR. PORTER: Mr. Utz, do you have a question?

MR. UTZ: Yes, I did.

QUESTIONS BY MR. UTZ:

Q Mr. Gray, referring to your Exhibit No. 2 under the

column entitled "MCF Gas Wasted," does that mean that gas was vented to the air?

A Yes, sir.

Q What was your explanation as to the necessity of venting that gas?

A We were unable to either use it or compress it and sell it to El Paso Natural Gas Company.

Q Due to the lack of compressor facilities?

A It was, for the moment, yes. We simply didn't have the capacity to do it, and then there were some shutdowns of the compressor beyond our control that occurs almost every month.

Q What is the maximum pressure that you can transfer gas on your pressure system?

A The rated capacity is 250, and they gave us a safety factor that permitted us to go up to 300 pounds, but we have an automatic device that shuts it down when the compressor reaches 300 pounds; to go beyond that would not be a safe working pressure.

Q Could you two-stage the gas and sell all your gas?

A It is possible that we might, but it would be a little difficult to justify the cost of doing it on the amount of gas we are handling at the present time. The line pressure is supposed to remain at, oh, I believe, approximately 250 pounds. There are conditions that arise that even the gas company has a little control over in the way of freezing and one thing or another that causes those line pressures to go up, and when that occurs, with the equip-

ment we have, all we can do is shut down the compressor. There have been times when we were even able to shut in wells to avoid wasting any gas that we had a market for, but when those things occur at night, there is little you can do about it except to take care of it in the morning when operation are resumed for the day. During the months of September, October and November we were able to use or sell an average of 18 percent, and 18 percent of the total gas we sold that month would hardly be justification for installation of more equipment. Now later, if more wells are drilled and it is necessary to handle more gas, it might be possible to do that.

Q Do you have any idea how much it would cost to increase your compression facilities to be able to produce that gas in the line?

A Well, no, I don't. I wouldn't hazard a guess on it without investigating it more carefully.

Q Now, referring to your Exhibit No. 4, Mr. Gray, I believe that is an example of how you would like to operate this field, is it not?

A Yes, sir.

Q Under your column entitled "Estimated Daily Gas Production," the total is 1,946,000. How much of that gas do you think you could sell?

A I think that the average would be approximately the same as it was during the months of September, October and November. We might even do better than that.

Q Approximately 88 percent of it then?

A Yes.

Q Further down the column, the total for the wells not participating in the pressure maintenance unit, there is a total of over a million and a half cubic feet, what happens to that gas?

A It is put through the same system and through the same compressor. I am not sure that we are together on the volume there. The maximum permissible gas production from each well would be approximately 194,000 feet apiece. The 1,580,000 represents the total produced by all of the wells, those participating and those not participating.

Q Are there any wells producing from the South Blanco-Tocita Oil Pool which do not put their gas into your gathering system?

A We have only the wells that we operate connected to the compressor.

Q Are Texas Natural wells connected to your system?

A No.

Q What happens to the gas from those wells, do you happen to know?

A As far as I know, it is flared.

Q Would Caulkins Oil Company object to a no-flare order in this pool?

A Inasmuch as we are compressing most of the gas that we produce, I think that a no-flare order would have little effect as

far as we are concerned because we are disposing of most of the gas now, selling it or using it.

Q What you are saying is that a no-flare order would affect the Texas Natural wells more than it would you?

A Yes, sir.

MR. UTZ: That's all I have.

MR. PORTER: Anyone else have a question of Mr. Gray?

MR. KELLAHIN: If the cross examination is through, I have a couple of more questions.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Gray, you testified in response to a question, I believe, by Mr. Nutter, that the MER, or the most efficient rate of production for this pool you would guess would be eight hundred to a thousand barrels per day, is that your testimony?

A It would be a guess.

Q Would that be based on the wells presently producing in the pool?

A That is correct.

Q In the event additional wells were drilled, you would revise that figure?

A Of necessity, we would, yes.

Q Now, if you do not receive credit for water injected and the transfer of allowables as requested, would you be able to increase that figure without increasing the GOR to the pool, the thousand

barrels per day under the present system?

A No, I believe the gas-oil ratio of 2300 actually would increase, it would of necessity increase. If we take more oil from the inefficient wells, we must handle more gas to get it, so that the gas-oil ratio would increase and we would not be able to handle substantially more than we have set up here. That is about the capacity of the compressor, if you are asking about the marketing of gas.

Q Now, you, of course, have no assurance that the allowable on this pool will continue at the level set for May?

A I don't.

Q In response to some questions by Mr. Utz, I would like to clarify some points there. Are the compressor facilities adequate to take care of the gas if the proposed rules are adopted, in your opinion?

A With the present number of wells and producing them selectively, we can take care of, I'd say 85, 86 percent of the gas. We would not be able to handle a hundred percent of it for the reasons I have given before. There are a number of things that will cause the compressor to be shut down.

Q Well, in a pool of this type, is it normal to have peak production periods of oil?

A There will be times when your flow of gas will be higher than it is at other times.

Q Well, is that because of the changes in the producing

rates that you have to operate that?

A Usually that is caused by the producing rate and also the efficiency of the well that happens to be producing at the time.

Q And does that also contribute to the situation where you cannot handle the gas one hundred percent?

A Frequently there will be gas flared. When we first open the well up, particularly if it has been shut in for a few days, there will be a gas head on it that will be more than the compressor can handle for a short time.

Q Now, you have a two-stage compressor there, do you not?

A Yes.

Q In other words, if additional compressor facilities were needed, it would be a three-stage compressor to raise the pressures?

A Well, I believe I would prefer to leave that to an equipment expert, the equipment that would suit the job we have to do there.

Q There has never been a no-flare order in this pool, has there?

A No.

Q And Caulkins Oil Company or its predecessor voluntarily installed this compressor equipment to save the gas?

A Yes, sir.

MR. KELLAHIN: That is all.

MR. PORTER: Anyone else have a question?

RECROSS EXAMINATION

BY MR. UTZ:

Q Mr. Gray, could Caulkins Oil Company handle any additional amount of gas?

A No, sir, not with the present proration, not with the present allowables. During the month of February we had a pretty efficient run on that compressor. It was operating, I believe, 96 percent of the time, but due to changes in loading and one thing and another in operating our own wells, that seems to be about the maximum amount of gas we are able to handle, a million two hundred feet a day on the average, which we sold El Paso during the month of February.

Q Then you would not be in a position to handle the gas from the Texas Natural wells?

A No, sir.

MR. UTZ: That is all.

QUESTIONS BY MR. NUTTER:

Q Mr. Gray, the two months on your Exhibit No. 1, in which the GOR was more than a couple of thousand, were January and February, right?

A Will you repeat the question, please?

Q I said the two months on your Exhibit No. 1 in which the GOR was more than a couple of thousand were January and February of '58, is that correct?

A Well, the average for September, October and November would be about 2600.

Q But the average for January and February would be 4200?

A Yes, that's approximately correct.

Q Do you happen to know offhand what the allowable rates of production authorized by the Commission for the San Juan Basin for those two months were?

A Offhand, I don't.

Q Assuming that the allowable is in the average of 10, 13 barrels, that would be an allowable comparable to what we have at the present time, would it not?

A Yes, sir.

Q Is it your opinion that this high gas-oil ratio resulted more from the inability to have Caulkins Oil Company produce the oil from the wells from which they desired to produce it, or from the very low allowables that were in that pool at that time?

A I think it is due almost entirely to the suspending or relaxing of the limiting gas-oil ratio, and the requirement of -- I mean the rule that required that each individual well produce its allowable. As an illustration, during the month of December, we started with Well No. 109, the gas-oil ratio was 924, with the production of 662 barrels; the month of February 914, with 409 barrels.

Q In other words, the gas production has remained virtually constant while the oil production went down?

A The gas-oil ratio did not change appreciably even though there was a difference in production from the well. That is a pumping well, and there are fluctuations from month to month in the

total amount of oil we take from it, which is influenced by trouble and what not that we have with the pump equipment, but I would like to go on with Well No. 123. During the month of December we produced 39 barrels from the well, during the month of February, we produced a thousand and seven barrels. The gas-oil ratio of the well in December was 4231, gas-oil ratio in February was 1927. Now, most of the other wells in the group had lower gas-oil ratios during the months of February than they did during the month of December. Does that answer your question?

MR. NUTTER: I believe so, thank you.

MR. PORTER: Any further questions of Mr. Gray? The witness may be excused.

(Witness excused)

MR. KELLAHIN: Call Mr. Holland as our next witness.

ART HOLLAND

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q State your name, please, sir.

A A. F. Holland.

Q By whom are you employed, Mr. Holland?

A I am employed by Caulkins Oil Company.

Q In what position?

A I am in charge of their production department.

Q You have previously testified before this Commission as an expert engineer and had your qualifications accepted, have you not?

A Yes, sir, I have.

MR. KELLAHIN: Are the witness' qualifications acceptable?

MR. PORTER: Yes, sir, they are.

Q Mr. Holland, are you familiar with the operations of Caulkins Oil Company in the South Blanco-Tocito Oil Pool?

A Yes, I have followed the operation of that field for approximately six years.

Q Now, the water injection program now under way in that pool was commenced in October of 1954 by order of this Commission, was it not?

A That is correct.

Q Do you have any present opinion as to the effectiveness of this program?

A The program has been in operation approximately four and a half years. Our analysis of the field is that there are approximately 18,000,000 barrels of oil in place in the reservoir under natural production.

MR. NUTTER: Is that at the present time?

A Present developed limits. We include 18,000,000 barrels of oil under natural production, which means we estimate that oil recovery would amount to approximately 4,000,000 barrels. With the

water injection project we believe that oil recovery will be increased and that ultimate recoveries from the field will range in values of 6 to 7 million barrels. We think that we can secure an additional two or three million barrels by this water injection project. Also, the reservoir is believed to have initially contained approximately 25 billion cubic feet of gas. That includes the gas in solution with the oil and the gas in the gas cap. The gas cap limits have not been defined, so our estimates of that gas necessarily are subject to interpretation.

Q Have you had any problems in connection with the operation of this water injection program?

A We've had our share of problems which I think are inherent in an operation of this type. We, at one time, injected rather large quantities of water in some poor type sand condition wells and we have channeling in the reservoir in another area of the reservoir where we used a wetter injection well. We have injected approximately 2 million barrels of water. We think that the oil displacement efficiency is good.

Q Now, referring to what has been marked as Exhibit No. 5, Mr. Holland, will you state what that is?

A Exhibit No. 5 shows the South Blanco-Tocito Pool area. On the map, the area is divided into two segments for proration purposes. One area, delineated in blue, is an area determined to not be associated with the water injection project. It was designated in that manner because the other operator in the pool is not

injecting water or gas. The area also includes the offset wells to that property, which are operated by Caulkins Oil Company. The area delineated in yellow is an area that we determine to be associated with the water injection project and for which we ask that we be allowed to produce oil from wells having the lowest gas-oil ratio, plus not being penalized for wells in that area that do have ratios exceeding the two thousand to one limit.

Q By not being penalized, do you mean receive credit for water injected?

A That is correct. Our reasoning is that by replacing the energy in the reservoir, we should not be penalized with the limiting gas-oil ratio for this area.

Q For what reason have you included the properties of -- or setting the Texas Natural properties in the nonparticipating area, Mr. Holland?

A We propose that they be prorated in accordance with the existing state-wide plan. The other areas I've previously mentioned, we propose that we be allowed to transfer oil from wells of high ratio to wells of low ratios and also not be penalized. We don't think this is a new plan, we copied the plan from other projects, it's not new.

Q Well, would the Caulkins property included in the nonparticipating area proper, affect the buffer zone between your zone and the zone of the Texas Natural?

A We believe it would.

Q Would it, in effect, protect the correlative rights of Texas Natural?

A Yes, that is correct. And it is along the lines the way other operators have handled similar problems in other areas where the offset wells are prorated in the same manner.

Q Now, Mr. Holland, are you familiar with the royalty interest ownership in the property shown on Exhibit 5?

A Yes, sir, I am. I am familiar with the royalty interest underlying the Caulkins Oil Company leases. It is common throughout the area of the Tocito production.

Q And would the adoption of the rules as proposed by Caulkins Oil Company create any problems in connection with royalties or overriding royalties?

A Since the ownership is common, it would not.

Q Now, referring to what has been marked as Exhibit No. 6, would you state what that shows?

A Exhibit No. 6 is a graphical representation of the producing values of the South Blanco-Tocito reservoir since inception. It shows the bottom hole pressure record, the daily oil and gas production record, and the gas-oil ratio record. The significant things that we believe are in the record, are that it shows that 18 different reservoir pressure surveys have been conducted to saturize the operation of this field. Since water injection was commenced over the approximate four and a half year period reservoir pressure has dropped an estimated 182 pounds. We think that

that definitely shows an arresting of the bottom hole pressure decline for this type of field. Another item that has already been brought out by Exhibits is the increase in gas-oil ratios during the past several months' period. As is shown by the dotted line on the graph, there has been a rather large increase, which was occasioned by not being allowed to selectively produce the wells. We hardly are in favor of proration, but this was an emergency situation and it did increase the gas-oil ratio appreciably.

Q Now, do you consider a pressure drop and bottom hole pressure drop of 182 pounds in four years a significant drop?

A Not for this type of reservoir. We have additional data that will show the change before water injection and after water injection.

Q Now, referring to what has been marked as Exhibit No.7, will you tell us what that is designed to show?

A This Exhibit is a summarization of the oil, gas, water, and bottom hole pressure information for the pool. Since inception, the field has produced approximately 2,300,000 barrels of oil. The bottom hole pressure declined before commencement of water injection and there was one pound drop for each 3,165 barrels of oil produced. Since injecting water, there has been a one pound drop for 9,004 barrels of oil produced, which means that there has been a decrease in the bottom hole pressure decline three times the value before commencement of water injection. That means that energy has been conserved which can be used to produce additional

ultimate oil recovery. The gas-oil ratio of the field has remained practically constant in the past six and a half years that the field has been in operation. The overall gas-oil ratio was 140 cubic feet per barrel. With this type of field, under normal operations, due to depletion, those ratios increased by rather large amounts. By taking into consideration the replacing of energy in the reservoir, since commencement of water injection, one barrel of water has replaced approximately 680 cubic feet of gas. Deducting the amount of gas determined by using an equivalent value, the producing gas-oil ratio, since commencement of water injection, is four hundred and thirty-three cubic feet per barrel. That would be the low solution gas-oil ratios. Since commencement of the water injection operation, for each four barrels of oil, gas, and water removed from the reservoir, three barrels of water have replaced it,which means that there has been a material decrease in the amount of space and energy removed from the reservoir.

Q Well, this tabulation shows the producing gas-oil ratio giving credit for water injection. Approximately what total figure would that represent, water injection as against cubic feet of gas?

A To do the same thing, maintain the same level of pressure, it would have required the injection of an excess of 2 billion cubic feet of gas. I would like to point out one other thing, and that is that since water injection has started, the property, the Caulkins Oil Company leases have produced a million six thousand barrels of oil, with a 182 pound pressure drop. To achieve the

recoveries that we have predicted from the field, using the higher value of 7,000,000 barrels, it would require approximately three times, an additional three times this amount of oil. Projecting the pressure decline on the same basis, it would mean that we would recover the predicted ultimate recovery with an additional 600 pound pressure drop, which means the ultimate oil recovery would be achieved with approximately 1200 pounds of reservoir pressure still remaining, so allowing the pressure analysis, the ultimate recoveries predicted are very reasonable. Another item is the analysis of the gas production. From Caulkins Oil Company's leases, 3,860,000 cubic feet of gas have been produced. The gas production from the Texas Natural Rincon wells is not known, but we estimate it will be at least another billion cubic feet. That would mean to date that 5 billion cubic feet of gas have been used for the production of oil from this reservoir. There was an estimated 25 billion cubic feet of gas initially, leaving an additional 20 billion cubic feet of gas available in the reservoir to recover the predicted ultimate recoveries. Since five billion feet has allowed the recovering of approximately 2,350,000 barrels, which represents about one-third of the predicted recoveries, projecting that same ratio, it would mean that 10 billion additional cubic feet of gas would be necessary to achieve the oil recoveries predicted, and using the gas in the manner that we have, we know that there is an excess of that available.

Q Now, this Exhibit shows that you are not operating a

complete pressure maintenance project. There has been some decline in pressures, has there not?

A Yes, sir, that is correct. One of the principal reasons for such a decline is that on the western edge of the pool there is a gas cap, and we have, to some degree, limited our injection to prevent moving oil up into the gas cap and being forever lost.

Q Now, if the Commission allows the flexibility of operations as proposed in the rules submitted in connection with this application, will your reservoir management be more efficient, in your opinion?

A We think so, and I would like to introduce Exhibit No. 7, which is a plat of the latest gas-oil ratio information available. These ratios that are shown, that is, most of the ratios, were taken from oil and gas measured during the month of March, and include a total month's production for two wells. Tests were available during the month of April, which were essentially the same as the March figures, but since they were later figures, I have used them. Now, what they show -- what this Exhibit shows is that the high gas-oil ratio wells are principally high on structure, or close to the gas cap. The higher portions of the field are to the south and to the west; the lower portions of the field are to the north and to the east. For an example, our well T-123 is one of the higher wells on structure in the field. It has a ratio in excess of 13,000 cubic feet per barrel. A well low on structure would be, for example, our well T-129. It had a ratio of 731 cubic

feet per barrel, another well, T-179, although it is in the center of the field, is a high well structurally. The ratio is 9,000 cubic feet per day. Now, what we propose to do with this transfer of allowable plan is take the oil, for example, that would be assigned to well T-179 and transfer it to a well lower on structure, for example, T-129 and produce oil more efficiently.

MR. PORTER: I believe your discussion had to do with Exhibit No. 8. You referred to it as Exhibit No. 7.

A That is correct. I would like to change that for the record. Thank you.

Q Would that resutl, then, in your opinion, in more efficient use of the reservoir energy available?

A I believe so. The lower the value of the producing gas-oil ratio, the greater and value of the ultimate oil recovery we think we can arrive.

Q And would it, in fact, have a greater ultimate recovery from the pool?

A We think so. The more energy we can conserve in bringing oil to the surface, the greater should be our ultimate oil recovery.

Q Have you completed your discussion of Exhibit No. 8, Mr. Holland?

A Yes, I think that's all.

Q Now, referring to what has been marked as Exhibit No.9, will you state what that is designed to show?

A Exhibit No. 9 is a representation of one of the 18 different bottom hole pressure surveys that have been conducted in the field. This survey was taken during the first part of this month. It shows in detail the well pressures, the average of time, which was 1798 pounds per square inch, and supports our contention that there has been a drop of 182 pounds since inception of the water injection project.

Q Referring to what has been marked Exhibit No. 10, will you state what that is?

A Exhibit No. 10 is a graphical record of the manner in which water was injected into the field. At one time rather high injection rates were used, and at that time, we had the channeling that I mentioned, in which we spent approximately six months to a year in tracing water movement through the reservoir to find out what the trouble was and found that one area. The area where we are now injecting water, the program is operating efficiently. It also shows that there have not been great increases in the amount of water produced from the field. At the present time, the water production averages three to four hundred barrels per day. It shows that of the three and a half million barrels of water that have been injected, approximately three million barrels of that had stayed in the ground, so that means it is displacing oil in the reservoir.

Q And that doesn't indicate that there has been any cycling of water in this operation, does it?

A No, sir, it doesn't. There will be, in water injection projects, there will be water produced, and from our records, we think that the injection is efficient and is recovering additional quantities of oil.

Q Now, referring to what has been marked as Exhibit No. 11, will you state what that is?

A Exhibit No. 11 is a graphical chart showing the reservoir voidage. That is, the barrels of combined oil and water removed; the amount of space replaced by water injection, and the difference between the two. It shows also why reservoir pressure is not being entirely maintained. There is a difference between the gross reservoir voidage and the water injected during the past six months. This difference has averaged about fifteen to eighteen hundred barrels of water per day. During the month of March, which is not shown on this chart because corrected production figures were not available at the time they were prepared, the difference will amount to about 800 barrels per day during the month of April. Under the present pipeline proration plan of 420 barrels from the field, water injection should exceed reservoir voidage. We should have, in excess of water injected, about 700 barrels per day. It shows a restoration of reservoir energy.

Q Then, in your opinion, would you say that increased oil recovery will result as a result of this operation?

A Our analysis of it is that there will be two to three million barrels of additional oil recovered.

Q Now, referring to what has been marked as Exhibit No. 12, will you state what that shows?

A Exhibit No. 12 is a cumulative chart of this same reservoir picture. It shows that since commencement of water injection, that the net voidage, which means the amount of oil-gas and water, that was not replaced by water, has greatly declined over the life of the property. Gross voidage has exceeded six million barrels. During the period of water injection, the voidage amounted to 4,774,009 barrels. The water injected amounted to 3,438,513 barrels. The difference is 1,335,496 barrels. It shows that for each four barrels of combined oil-gas and water removed, that three barrels of water were replaced in the reservoir. Another item is that in replacing the space voided by oil-gas and water, the gas equivalent of the water injected amounted to 2,019,190 cubic feet, or represented approximately 75 percent of the gas produced. It means that a major portion of the reservoir energy and the pressure maintains is being maintained.

Q Mr. Holland, I am somewhat confused at this point. Do you have another exhibit?

A No, that's all.

Q Now, are you familiar with the proposed rules which were attached to the application in this case?

A Yes, sir, I am. They provide, No. 1, for the transfer of allowables that I've mentioned from wells of high gas-oil ratio to wells of low oil ratio. The proposed rulings provide that a

schedule will be prepared each month showing the Commission how this transfer is to be accomplished so that they can follow the programs. The rules also provide a means of translating the amount of water injected into a gas equivalent and applying that as a credit against wells of high gas-oil ratio. The transfer of the allowable, then, from these wells will also be shown on the schedule submitted to the Commission. The proposed rules also divide the area into two proposed areas for proration purposed. That is, one area will be prorated as presently employing state-wide proration rules, and the other would incorporate the features that we have mentioned.

Q In the event any other operator in the pool wishes to participate in the water injection program, would you have any objection to the same rules applying to the pool as a whole?

A We would not. We would feel it would be a credit for water injected. On a state-wide basis, it would be an attractive, economical promotional feature toward securing additional oil for the state.

Q Are the rules which Caulkins Oil Company proposed in this case in effect in other pools or pools similar thereto?

A For the State of New Mexico, one project in particular has a gas injection project, the Langley gas injection project, and it is my understanding that there was no penalty there, and the allowables were assigned on a unit basis and the oil and gas could be produced from any well in the pool at the discretion of the operator for the most efficient operations, and in other states,

there are quite a number of projects and most of them have the features we have outlined wherein they allow transfer of allowables for the most efficient operation of the unit, and No. 2, they allow credit either for injected water or gas against producing gas-oil ratios. As I say, it is not new, it is something we have copied.

Q Now, in your opinion, would the adoption of these rules result in a more efficient operation of this pool?

A I believe it will. First and foremost,it would allow us to produce at a lower gas-oil ratio. Another feature, it would allow us to, in some degree, control the movement of water through the reservoir by producing oil in different areas. We can somewhat control the pressure in the reservoir and control the movement of water. By doing all of those things, we should be able to recover additional amounts of oil from the pool.

Q It would then result in the prevention of waste as designed by the statutes?

A By the recovering of additional amounts of oil, waste would be prevented, yes.

Q And would correlative rights and operators and royalty owners be protected?

A We think so.

Q Do you have anything further you wish to comment on, Mr. Holland?

A I believe that's all.

MR. KELLAHIN: At this time we would like to offer in

evidence Exhibits No. 5 through 12 inclusive, and we would also like to offer as an exhibit in this case the proposed rules which were attached to the application filed by the applicant.

MR. PORTER: Without objection, they will be admitted. We will have a ten-minute recess.

(Recess)

MR. PORTER: The hearing will come to order, please. Mr. Holland, will you take the stand, please.

Does anyone have any questions of Mr. Holland?

MR. NUTTER: Yes, sir.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Holland, do I understand correctly that your proposition in this case is that you would -- you propose that Caulkins receive credit on the gas-oil ratio on the high GOR wells or on all of the wells? Receive credit for all of the wells or just on the high GOR?

A Just on the high GOR within the area we delineated at this particular time. There would be three wells with ratios in excess of 2000 to 1 to receive credit.

Q And the equivalent factor of some 680 cubic feet per barrel is the factor you have used?

A At the present time it would be about 645.

Q Now, after you received credit on the GOR's for the injected water and you chose to shut a well in, would you transfer

the unpenalized allowable for that well, after it had received its credit for the water injected, to the other wells?

A We would probably -- it would work like this. Take for instance, Well T-177. The well has a gas-oil ratio of 4300 cubic feet per barrel. Under the present gas-oil ratio limit, and under a 35 barrel per day basic unit allowable, the penalized allowable would be 45 barrels per day, because we are injecting water replacing reservoir energy. The allowable of that well would be assigned at 97 barrels of oil per day. We would obtain that by a formula which was presented in these proposed rules which applies the water given, a gas equivalent, allowing increase gas production. It would bring the allowable up to the 97 barrels per day, then we would like to take the major portion of that 97 barrels and produce it from a well having a lower gas-oil ratio. And, as I say, we have copied this plan. That is the way they have handled the problem in other water injections or gas injection areas.

Q How many barrels per day do you inject on the average at the present time?

A At the present time we are injecting 2300 barrels per day.

Q So in effect you would have 645 times 2300 as the credit that you would receive with the compressibility factor that you have in your application?

A We would deduct the injected water we are producing.

Q So you would have something in the range of 2000 barrels

of net injected water per day?

A Yes.

Q And --

A And at present we are injecting enough water so that it will raise the allowable of those three wells to top unit allowable.

Q Would you propose any sort of a maximum rate of production that any well could have?

A We have made no such recommendation. It has been done in other places. Those that we have seen range from double unit allowable up to 350 barrels per day. If a limit is placed here, we would like to have it placed around 300 barrels per day.

Q That would be slightly in excess of double the unit allowable at this time, would it not?

A Yes, it would be.

Q Rather than a flat limitation being placed on a well, would Caulkins be agreeable to a factor of say two times the normal unit allowable being assigned as the maximum any well could receive?

A As I understand it, we would be permitted to transfer up to two times the allowable. I think we could produce a little more efficiently if we had a higher limit, but if the Commission establishes that, that limit, why naturally we will produce our wells that way.

Q How many producing wells are in the area outlined in yellow on Exhibit 5?

A I believe there are nine. Nine.

Q How many of these wells do you feel are capable of producing much in excess of the present allowable?

A In excess of double the present unit allowable?

Q In excess of the present unit allowable.

A I believe six of the nine.

Q Mr. Holland, has Caulkins Oil Company ever given any consideration to reinjection of gas in this pool?

A Yes, sir, we have.

Q Do you think that would improve the ultimate recovery of the pool?

A Well, it could possibly to a small degree. Our observations of the field performance are that gas and gas alone is not a very efficient mechanism. Before the injection of water, some of the wells in the early part of their producing life had extreme increases in gas-oil ratios. In addition to that, we had some relative permeability measures made, and all of that data indicated that gas injection was very inefficient, so --

Q That was as a means of maintaining the pressure in the pool and not considering water pressure maintenance with the gas, is that true?

A It was considered separately and in conjunction with the water, yes, sir.

Q And injection of gas in either case didn't add materially to the ultimate recovery?

A We felt if we could do the job with water we were dupli-

cating effort. If we inject gas we would have to come back with water. We haven't been able to work out a cooperative plan all over the field and we think that we can do a better job with water than we can with gas.

Q I note, Mr. Holland, that under the best of conditions, as depicted on Mr. Gray's Exhibit 2, that a certain percentage of gas is wasted. I just wondered if there might not be a useful benefit obtained from that gas by injecting it into the gas cap rather than flaring it?

A We don't like to flare gas either, and I think that most of the gas flaring is during peak periods, during peak loads, and it's occasioned by the inherent producing characteristics of wells where you flow them at intervals and produce them that way to most efficiently get your oil. This type of gas production has those lows and those peaks. Essentially, we think that the gas that is vented represents those peaks.

Q I see. This is not a continual venting of gas every day of the month?

A No, sir.

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

QUESTIONS BY MR. UTZ:

Q Mr. Holland, when did you first discover channeling in this project?

A If my memory is right, about a year and a half ago.

Q It was about a year and a half ago that you ran into

this condition?

A The first step was taken in May of 1956; that would be nearly two years ago.

Q What was your percent of water production before this occurrence before channeling?

A Field total?

Q Yes.

Q I'd estimate around 50 percent. I don't believe we ever produced over five or six hundred barrels of water per day, maybe 50 or 60 percent.

Q 50?

A That figure is substantially lower now.

Q That was my next question. Do you know what it is now?

A During the month of February it was 43 percent.

Q Would you consider that a substantial decrease?

A Well, there has been no increase. I think one of our Exhibits shows this, the amount of our water production, and it's been a declining situation.

Q Your percent of water production is declining now?

A Yes.

MR. UTZ: That's all the questions I have.

MR. PORTER: Any further questions of Mr. Holland? If not, the witness may be excused.

(Witness excused)

MR. KELLAHIN: If the Commission please, that concludes

our case. I would, however, like to make a closing statement after other statements have been made, if any.

MR. PORTER: Anyone have any further testimony?

MR. **Boedler** , Mr. Porter, I am Bill **Boedler** , representing El Paso Natural Gas Product. El Paso Natural Gas Product Company is sole purchaser in the South Blanco-Tocito Oil Pool, in Rio Arriba County, New Mexico, and urges the Commission to adopt Caulkins Oil Company's application as submitted to the Commission. El Paso Natural Gas Company Products Company feels that special rules should be permitted to allow a unit allowable to this water injection project in order to prevent waste and protect correlative rights. Thank you.

MR. STANLEY: My name is S. J. Stanley. I represent Benson-Montin-Greer Drilling Corporation. We believe in the principal of secondary recovery or a pressure maintenance project such as this one in order to better utilize reservoir energy and prevent waste. Also, we believe that inasmuch as secondary recovery or pressure maintenance projects result in greater ultimate recovery of oil, the Commission should encourage the formation of these projects and credit for net water injected, as applied against high gas-oil ratio wells, is a minimum incentive that the Commission can grant to encourage secondary recovery or pressure maintenance projects. Caulkins' request for credit for net water injected as applied against high gas-oil ratio wells involves a very small additional allowable for such a project. We believe it would be

appropriate for the Commission to assign even greater allowables than this in order to provide more incentive to create pressure maintenance projects. From the evidence presented here today in this case, it has been shown that correlative rights will be protected and waste will be prevented and it is urged that the Commission grant the Caulkins Oil Company's request.

MR. PORTER: Anyone else have a statement?

MR. McGRATH: B. T. McGrath, U. S. Geological survey. All the wells in the South Blanco-Tocito Pool are on Federal land, and I agree with the testimony that was presented here that it will, if it is approved, will conserve gas and I am sure ultimately will recover more oil from the reservoir. I would like to urge the Commission that they approve the application of Caulkins Oil Company.

MR. KELLAHIN: If the Commission please, the presentation of this case has taken somewhat longer than we anticipated. However, I am not making an apoligy because, personally, I feel that this is rather an important case in the history of the Commission. We have here a company which has expended a great deal of money both in engineering and in facilities in order to achieve the greatest ultimate recovery of oil from a small pool here in New Mexico. The Commission, of course, is quite familiar with the hisotry of this project, having had various phases of the project before it in other cases.

The present situation is that we are faced with a new con-

dition which was brought about primarily by the institution of prorating in the South Blanco-Tocito Pool. Prior to that, our limit in the Pool was the market which was available. Now, we have submitted, and they are a part of the record now, proposed rules, and I believe they have been sufficiently covered that I will not make any comment on them.

As was pointed out, the evidence presented here does show that some gas is being flared. However, as Mr. Holland explained, that can be accounted for by the fact that there is excess gas production during peak periods of production, which is a normal situation in an oil pool of this type, and it is not a continuous flaring of gas. In addition to this, I would like to point out to the Commission that insofar as I know, there is not another oil pool in northwestern New Mexico where the operator has voluntarily installed facilities to gather, compress, and market the gas that is produced, and I certainly think this company has shown a proper attitude in the spirit of conservation in doing that in the South Blanco-Tocito Pool.

Now, the proposals which we are making here are not a new thing by any means. The Commission here in New Mexico has heretofore granted transfer of allowables in pressure maintenance projects or water injection projects. I would like to call attention to the Commission, to its Order R-1127 in Case 1381; Order No. R-1058 in Case 1300, involving the Pilot water flood project in the Grayburg-Jackson Pool, and one of the original orders of this type

was entered by the Commission in 1941 by Order No. 340 in which the transfer of allowables was allowed.

Now, as to the proposition of receiving credit for injected water, that is an established custom in other states, and certainly, we urge it as an incentive to an operator to properly manage his reservoir where he has a control such as available in this reservoir. That should be allowed. The state of Texas had the following Pools in which the transfer -- I mean the credit for water injected against net gas-oil ratio is allowed: the Salt Creek Field, Diamond Field, Fullerton Field, Merchant Field, and Fort Chadbourne Field. And we have available copies of the orders which were entered by the Texas Railroad Commission in those cases, if any of the Commission members or the staff would like to look at them. In the State of Oklahoma they have taken somewhat broader views, and in a project of this type, they have entered a blanket order which just automatically eliminates the requirement for the making of gas-oil ratio tests. I would conclude that that was done on the theory that any operator who is making an effort to maintain pressure and produce the greatest ultimate amount of oil from the reservoir was certainly not going to engage in any wasteful practices, and in their case No. 1768 Order No. 21301 entered by the Corporation Commission of the State of Oklahoma, projects of this type throughout the states are not required to take their gas-oil ratio tests.

Now, on the basis of the evidence which has been offered

here, I believe we have fairly shown that the greater ultimate recovery of oil from this reservoir will be achieved as a result of a pressure maintenance project which was instituted there with the approval of this Commission some six years ago. We are now faced with a situation where the effectiveness of this program, we feel, is being considerably lessened by the effect of prorating in that we are required under the present rule to produce our oil if we are to get our allowable from wells with high gas-oil ratios and we get no credit whatever for water injected, which is in effect replacing the reservoir energy, which by the statute of the State of New Mexico, we are entitled to use. In other words, we are conserving that which is already ours in this well. We should get credit for that, and we feel, as a proposition of good reservoir management, we should be allowed to produce it from the wells which are best able to produce it with least damage to the reservoir and achieve thereby the greatest ultimate recovery of oil on that basis, which will prevent waste as it is defined by the Statute of New Mexico. As has been shown, the correlative rights of other operators will not be prejudiced in any way. Texas Natural was fully aware of the application in the case. They appeared at the last hearing, and as far as I know, they have not appeared in this one. The chief royalty owner, being the U. S. Government, has made its statement in support of the application, so in the interest of conservation, we urge the Commission to adopt the rules as urged by Caulkins Oil Company. Thank you very much.

MR. PORTER: Anyone else anything?

MR. JOHNSON: David Johnson, Texas Natural Petroleum. Texas Natural Petroleum feels that Caulkins Oil Company can produce its lease more efficiently if allowed some flexibility in its operations. We realize that ultimate recovery would be higher if the pool could be produced at the lowest possible GOR. Therefore, we believe that the South Blanco-Tocito Pool will benefit by the Commission's approval of Caulkins' application.

MR. PORTER: Anyone else have a statement?

MR. KELLAHIN: I would like to point out to the Commission that the position taken by Texas Natural constitutes an agreement among all of the operators within this pool, there being only two.

MR. PORTER: And you don't object to support, even though it may be unexpected?

MR. KELLAHIN: No, sir.

MR. PORTER: The Commission will take the case under advisement.

C E R T I F I C A T E

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, J. A. TRUJILLO, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in stenotype and reduced to typewritten transcript under my personal supervision, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this 9th day of May, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
Notary Public

My commission expires:
October 5, 1960.