STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

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

CASE NO. 10369

APPLICATION OF ARCO OIL & GAS COMPANY
FOR AN ORDER CONCERNING ITS EMPIRE-ABO
PRESSURE MAINTENANCE PROJECT AND
THE OXY U.S.A., INC. CITGO EMPIRE-ABO
PRESSURE MAINTENANCE PROJECT AND TO
AMEND DIVISION ORDER NO. R-4808,
EDDY COUNTY, NEW MEXICO.

RECEIVED
AUG 19 1991
OIL CONSERVATION DIVISION

PRE-HEARING STATEMENT

This Pre-hearing Statement is submitted by William F. Carr, as required by the Oil Conservation Division.

APPEARANCES OF PARTIES

APPLICANT

ARCO Oil & Gas Company
c/o Gary Smallwood
Post Office Box 1610
Midland, Texas 79702

name, address, phone and
contact person

ATTORNEY

William F. Carr
Campbell, Carr, Berge & Sheridan, P.A.
Post Office Box 2208
Santa Fe, New Mexico 87504
(505) 988-4421

OPPOSITION OR OTHER PARTY

_____
_____
_____

name, address, phone and
contact person

ATTORNEY

_____
_____
_____
_____

STATEMENT OF CASE

APPLICANT

ARCO Oil and Gas Company, applicant in the above-captioned cause seeks an order shutting in the Citgo Empire-Abo Unit until Citgo's current overproduction has been made up and also seeks a restriction on future allowable to the Citgo Unit to assure that it is not produced at a rate which will damage the Arco Empire-Abo Unit. ARCO opposes the relief proposed by Citgo in companion Case No. 10356 on the grounds that what OXY proposes violates the Orders governing operation of the Citgo Unit and will damage ARCO's pressure maintenance project in the Empire Abo Unit.

OPPOSITION OR OTHER PARTY

(Please make a concise statement of the basis for opposing this application or otherwise state the position of the party filing this statement.)

PROPOSED EVIDENCE

APPLICANT

WITNESSES (Name and expertise)	EST. TIME	EXHIBITS
Gary Smallwood, Petroleum Engineer	1 Hour	Approximately 25

OPPOSITION

WITNESSES (Name and expertise)	EST. TIME	EXHIBITS

PROCEDURAL MATTERS

Signature

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

CASE NO. 10356

APPLICATION OF OXY USA Inc. for an order affecting Citgo Empire-Abo Pressure Maintenance Project, Eddy County, New Mexico

COMPANION CASE NO. 10369

APPLICATION OF ARCO Oil & Gas Company for an order affecting Citgo Empire-Abo Pressure Maintenance Project, Eddy County, New Mexico

PRE-HEARING STATEMENT

This pre-hearing statement is submitted by OXY USA Inc. as required by the Oil Conservation Division.

APPEARANCE OF PARTIES

APPLICANT	ATTORNEY
OXY USA, Inc. ATTN: Rick Foppiano	W. Thomas Kellahin KELLAHIN, KELLAHIN & AUBREY P.O. Box 2265 Santa Fe, NM 87504 (505) 982-4285

OPPOSITION OR OTHER PARTY	ATTORNEY
ARCO Oil & Gas Company	William F. Carr, Esq. Campbell & Black P.O. Box 2208 Santa Fe, NM 87504 (505) 988-4421

STATEMENT OF CASE

APPLICANT

OXY USA Inc. seeks a review of its Citgo Empire-Abo Unit and a determination that its unit is currently underproduced; the rescission of its Pressure Maintenance Order R-4549 effective as of May 1, 1998; the adoption of statewide oil prorationing for its unit including special provisions for assignment of allowables and carrying forward of underproduction. OXY USA Inc. is opposed to the relief proposed by ARCO Oil & Gas Company is companion Case No. 10369 on the grounds that ARCO Oil & Gas Company's proposition violates OXY USA Inc.'s correlative rights.

OPPOSITION OR OTHER PARTY

PROPOSED EVIDENCE

APPLICANT

WITNESSES	EST. TIME	EXHIBITS
Richard Foppiano Petroleum Engineer	1-2 Hours	Estimated Approximately 20 Exhibits
Scott Gengler Petroleum Engineer	1-2 Hours	

OPPOSITION

WITNESSES	EST. TIME	EXHIBITS

SEE OPPOSITION FILING

PROCEDURAL MATTERS

None applicable at this time.

KELLAHIN, KELLAHIN & AUBREY

By: _____
W. Thomas Kellahin
P.O. Box 2265
Santa Fe, New Mexico 87504
(505) 982-4285

phst820.009

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

APPLICATION OF OXY USA INC., FOR A QUARTER AFFECTING ITS CITGO ABO PRESSURE MAINTENANCE PROJECT, EDDY COUNTY, NEW MEXICO.	)	CASE NO. 10356
APPLICATION OF ARCO OIL AND GAS COMPANY FOR AN ORDER CONCERNING ITS EMPIRE ABO PRESSURE MAINTENANCE PROJECT AND THE OXY USA CITGO EMPIRE ABO PRESSURE MAINTENANCE PROJECT AND TO AMEND THE DIVISION ORDER NUMBER R-4808, EDDY COUNTY, NEW MEXICO.	)	CASE NO. 10369

REPORTER'S TRANSCRIPT OF PROCEEDINGS
EXAMINER HEARING

BEFORE: Jim Morrow, Hearing Examiner
August 23, 1991
8:15 a.m.
Santa Fe, New Mexico

This matter came for hearing before the Oil Conservation Division on August 23, 1991, at 8:15 a.m. at the State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Linda Bumkens, CCR, Certified Court Reporter No. 3008, in and for the County of Bernalillo, State of New Mexico.

FOR: OIL CONSERVATION DIVISION

BY: LINDA BUMKENS CCR
Certified Court Reporter
CCR NO. 3008

ORIGINAL

I N D E X

August 23, 1991
Examiner Hearing
CASE NO. 10356 & 10369

E X H I B I T S

A P P E A R A N C E S

FOR THE DIVISION: ROBERT G. STOVALL, ESQ.
General counsel
Oil Conservation Commission
310 Old Santa Fe Trail
Santa Fe, New Mexico
87501

FOR ARCO OIL
AND GAS COMPANY: CAMPBELL, CARR, BERG &
SHERIDAN P.A.
BY: MR. WILLIAM F. CARR, ESQ.
110 North Guadalupe
Santa Fe, New Mexico

FOR OXY USA INC.: KELLAHIN, KELLAHIN & AUBREY
BY: MR. W. THOMAS KELLAHIN, ESQ
117 North Guadalupe
Santa Fe, New Mexico
87501

FOR AMOCO
PRODUCTION COMPANY: MR. DAN CURRENS, ESQ.
501 Westlake Park Boulevard
Houston, Texas
77253-3092

MR. MORROW: We'll call this hearing to order in Docket Number 23-91. Call cases 10356 and 10369.

MR. STOVALL: 10356 is the application of Oxy U.S.A., Inc., for a quarter affecting its Citgo Abo Pressure Maintenance project and affecting Arco Oil and Gas Company Empire Abo Project, Eddy County, New Mexico.

10369 is the application of Arco Oil and Gas Company for an order concerning its Empire Abo pressure maintenance project and the Oxy U.S.A., Citgo Empire Abo pressure maintenance project and to amend the division order Number R-4808 Eddy County, New Mexico.

MR. MORROW: Call for appearances.

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin & Aubrey appearing on behalf of Oxy U.S.A., Inc.

MR. CARR: May it please the examiner, my name is William F. Carr with the Santa Fe law firm Campbell, Carr, Berge & Sheridan. I represent Arco Oil and Gas Company, and I have one witness.

MR. CURRENS: Mr. Examiner, Dan Currens, attorney for Amoco Production Company. We'll not be an active participant in this case, but we do plan

to make a statement at the end.

MR. MORROW: Will the witnesses please stand and be sworn at this time?

(At which time Richard E. Foppiano and Gary Brooks Smallwood were sworn.)

MR. MORROW: Mr. Kellahin, whenever you're ready.

MR. KELLAHIN: Mr. Examiner, I appear today on behalf of Oxy U.S.A., Inc., with regards to their operation in the Empire Abo pool and their pressure maintenance project. We have had a number of informal meetings before the commission to discuss Oxy's operation in this project, and in order to fully appreciate the extent and nature of the problem, we're going to present to you this morning Mr. Rick Foppiano who, as a petroleum engineer for Oxy, has made an extensive investigation and study of the Oxy operations within their project.

As part of that study, he and I have gone back to the inception of the units for both Arco and for Oxy so that through his testimony he can show you the basis of his interpretation of the orders, the chronology, and the major components of the regulatory framework in which the various pressure maintenance orders and their modifications have been

constructed.

He will tell you that there's a general theme of conservation intertwined with what he has in rather complicated engineering calculations premised on a reservoir voidage concept. All of which is tied back to reservoir pressure.

As a layman, and I don't pretend to tell you about the engineering calculations, but I can tell you that it appears to me that the entire regulatory scheme that we're presenting to you today, and the end result of all the calculations, is predicated on reservoir pressure.

We've had informal meetings before the division that have involved Mr. Smallwood on behalf of his company and Mr. Foppiano on behalf of his, but this dispute does not involve either gentleman personally, and, in fact, the dispute between the two companies dates back to 1972 when both these gentlemen were still in junior high.

My dad was involved in the first hearings on behalf of Oxy. Clarence Hinkle represented Arco way back in 1972, '74. The basic dispute that still continues is the question of reservoir voidage and gas reserves for each of the two projects.

The original pressure maintenance project

envisioned by Arco involved an analysis of the Empire Abo reservoir. The suggestion was that Arco unit should extend to the Oxy acreage. We can contend it did not. We were left out of the unit and continued on to the present date.

Mr. Foppiano will relate to you the chronology of the events that led up to the present. Mr. Carr and I have exchanged data and information between each other, and attempted to analyze each party's calculations. Our effort today is not to take you through each and every detail involved in this project, but to attempt to focus your attention directly on the areas that remain in dispute so that you can resolve them for us.

You may recall that in one of the earlier meetings Arco's allegation against Oxy was that we were some million reservoir barrels overproduced according to their interpretation of our rules in their calculations. Mr. Foppiano and I are here today to inclusively demonstrate to you that those allegations are unfounded and wrong.

We have with his assistance and the assistance of the Oxy engineers extensively reexamined all the data that goes into the calculation. We have made the corrections where

necessary to fix past errors in the calculations, and the net result is that after the entire calculations from inception to the current date are redone in a consistent manner, with the same engineers doing all the calculations to make sure that they were accurate, we were substantially underproduced.

We are here to demonstrate to you that it is Oxy and not Arco that has been harmed by the pressure maintenance orders. The scheme and the regulatory allowances for allowables under our orders have demonstrated that we are substantially overinjected and correspondingly underproduced.

We are here to demonstrate to you that there is no correlative rights violation of Arco's interest, and there is no harm occurring to their project. We'll demonstrate to you that the substantial inequity that currently exists has been to the detriment of Oxy, and that we are seeking the relief set forth in the application.

Briefly, the pressure maintenance order that continues to apply to the Oxy project is outdated, antiquated and needs to be replaced. Our proposal for replacing the pressure maintenance orders will give us an opportunity to produce

additional reserves underlying our tract, and to help restore some equity between Oxy and Arco if our relief is granted.

Mr. Foppiano is going to take you through his understanding of the interpretations of the orders, the application of the calculation in the orders; go through the information that he selected in terms of his reservoir parameters. He will talk to you about how he has determined the reservoir pressures; he's going to give you a sample calculation of how he specifically goes through a particular month in looking at the formula. He then is going to give you his own spread sheet that shows you the entire calculation, and we'll talk about some of the differences as we think they exist between Mr. Smallwood's interpretation and that of Mr. Foppiano's so that you can clearly focus on what we think is the difference, and why we think we are right and they are wrong.

Thank you, Mr. Examiner.

MR. MORROW: Thank you.

MR. CARR: May it please the Examiner, as you're well aware of by now, back in the early 1970s, certain operators in the Empire Abo field determined it was time to end the pressure

maintenance operation and under Arco's lead in 1973, the entire Abo unit was formed.

Now, Cities at that time had an opportunity to join in that and they had a right not to, and they elected not to participate in the unit. Instead they took a breach which was at the top of the structure and after the Empire Abo unit was formed, came to this commission and obtained approval for their own pressure maintenance project.

So basically what we had in the Empire Abo field is two units: one, the Arco unit, 84 times larger than the Citgo unit, and several other one-well windows.

One thing that it is important to keep in mind as we go forward through this hearing, is that although there are two pressure maintenance projects, and although the commission has attempted to regulate this so there is some sort of equity between the two units, the project has never been and were never presented as being the same.

The fundamental difference in the projects is that in the beginning Cities planned to sell gas from the unit and Arco has always been required to reinject all residue gas, so there's a fundamental difference. And when you're called upon to evaluate

the various testimony, it is important to keep that in mind.

Both cases came before the division. Orders were entered, and the orders were based, as Mr. Kellahin pointed out, on reservoir voidage and setting allowables based on voidage of the reservoir. These orders also contained very definite procedures to be followed in computing the allowables, but they recognized that the plans were different, and that one party would reinject while the other sold gas. And the orders were based on traditional conservation principles; the prevention of waste and the protection of correlative rights and also the prevention of damage to offsetting properties by operation of either of the parties.

We will call Mr. Smallwood, a reservoir engineer, who will present evidence that will show that contrary to Oxy's allegation that they have been harmed, they will show that the plan in place after the hearings in the early '70s, has simply not worked, and although it is based -- and they were based and premised on reservoir voidage -- today we can see, that the Citgo unit has voided their reservoir 3.3 times faster than the Arco unit, yet they contend they've been harmed.

The plan was designed to protect correlative rights, and we will show you that today they have recovered 180 percent of the original gas in place and yet they contend they have been harmed.

The plan was designed to prevent damage to this reservoir, and yet, material balance information shows that there has been a migration or drainage into their unit of 7.1 BCF, and yet they contend they've been harmed.

And I'm not coming before you today to suggest that the problem is just a failure of the order to properly come to grips with the problem. We believe that the orders simply haven't been followed. We concur with Mr. Kellahin that the issue really boils down to the pressures that were utilized in computing the allowables, and we believe that when you look at the evidence, you're going to see that year in and year out, incorrect pressure calculations were used and the result of this was that there were larger allowables for the Citgo unit, and that is the reason there has been the drainage, that's the reason we're here today with this problem.

Oxy comes before you and from their application they're going to ask that they no longer

be treated as a pressure maintenance project because they're not injecting anything and operating as a pressure maintenance operation project, and they're going to ask that each of the wells in their unit receive an oil allowable -- a depth-bracket allowable -- and that they be able to accumulate these and produce them on a unit basis of any well in the unit.

What they're in essence asking you to do is to increase their producing rate. Increase the rate by more than two times. The present rate has resulted in this tremendous reservoir voidage covering almost two times the original gas in place and migration is over 7 BCF of gas, and yet, they're going to ask you to double that rate and they're also going to, and there is no dispute, but they have been not been reinjecting gas, and yet they're going to ask you step outside the orders and also find them instead of overproduced, underproduced; give them -- and that's all it can be because there is no other basis for it -- a large volume of gas. And give them extra time to make it up, and we submit that when the evidence is in that this isn't supported by the evidence and, in fact, violates the provision to prevent waste and protect correlative

rights.

We will, at the end of our testimony, ask you to enforce the order of the commission. To tell them that they're overproduced and they have to shut in until they're back in balance, and then to look at producing rates and establish a producing rate for their unit which will mean that they are not continuing to drain reservoirs from the Arco-operated Empire Abo field.

MR. KELLAHIN: At this time, Mr. Examiner, I'd like to call Mr. Rick Foppiano.

RICHARD E. FOPPIANO,

the Witness herein, being previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Foppiano, will you please state your name and occupation?

A. My name is Richard E. Fappiano. The last name is F-o-p-p-i-a-n-o, and my occupation is an engineer for Oxy U.S.A. in Midland, Texas.

Q. And where do you reside?

A. Midland, Texas.

Q. Would you summarize for us your educational background and employment experience?

A. Yes. I received a bachelor of science in civil engineering in 1977 from the Georgia Institute of Technology in Atlanta, and I went to work as a petroleum engineer for HaliBurton services. I worked for three years for them, and then I resigned that position and went to work for Cities, now Oxy, in 1981 and had worked for them in various assignments as an engineer up to the present day.

Q. Has it been your recent responsibility on behalf of your company to examine the Citgo Empire units operations to make yourself familiar with the orders involved in not only your unit, but the Arco-operated unit that adjoins you to the south?

A. Yes, I have.

Q. Describe for us the information in a general way that you have examined to make yourself current and familiar on all the aspects of this particular case that you felt necessary to understand and comprehend.

A. Well, I've examined the two orders that are applicable to each project, I've examined the that are applicable to the other operators in the pool, I've examined all the regulatory hearings that have occurred since inception of the unit, and have investigated in our own files, you know, what we

have done in the past.

Q. Okay. Based upon that review, have you satisfied yourself that you have sufficient information and have made necessary calculations and investigations as an engineer to come to conclusions about Cities' and Oxy's compliance with the pressure maintenance order in the reservoir voidage calculations and placement within that order?

A. Yes, I have.

MR. KELLAHIN: At this time, Mr. Examiner, we tendered Mr. Foppiano as an expert petroleum engineer.

MR. MORROW: We accept his qualifications.

Q. (By Mr. Kellahin) Having made yourself familiar with the various provisions of your order as well as the Arco order, and having come to conclusions and an understanding about those orders, what then did you do to reexamine Oxy's and Cities' prior application of their operations to those order provisions?

A. I guess I don't understand the question; I'm sorry.

Q. In looking at the orders, have you satisfied yourself that you understand how those orders are supposed to function?

A. Yes, I believe I have.

Q. Having obtained that understanding, did you go back and review what Cities and Oxy have done in operation for their project pursuant to those orders?

A. Yes, I have.

Q. Okay. Have you independently made, with the assistance of other Oxy engineers, recalculations of all the allowables to your project and integrated those with the production from the unit?

A. Yes. We've gone back to day one and recalculated everything and have calculations to present here today.

Q. Okay. Having completed that study and made -- recalculated the production in terms of the allowables allowed under those orders, have you come to certain conclusions?

A. Yes, I have.

Q. In prior informal meetings before the division examiner, one of the allegations that Arco has made against your company is that you were substantially overproduced in terms of your allowable as it now exists currently for the project. You recognize that as one of the allegations?

A. Yes.

Q. What is your conclusion in response to that allegation?

A. That's wrong. We're underproduced.

Q. Have you made a determination as to whether or not Citgo's operations through Oxy have harmed Arco and their unit in any way?

A. Yes, we have.

Q. And what is your conclusion?

A. They have not harmed Arco in any way. If anything, Oxy's been harmed.

Q. At this point, and we'll examine the details later, summarize for us your major conclusions of your study in so far as this case is concerned.

A. Well, the major conclusions that I have made are -- and I break them down into two -- are really what the status of our unit is at this point in terms of under and overproduction. I looked at the status of our unit when we ceased the reinjection of gas in early '88, and I have determined that the unit was underproduced at that time, contrary to Arco's allegation that it was overproduced by a million barrels or some wild number, and then since that time I conclude that

since we've ceased reinjection to January 1 of 1991, I've concluded that we are underproduced.

We have produced less than our allowable that was assigned just in that period of time alone. So my conclusion is that we are underproduced, we have not produced in violation of our rules, and we have not harmed Arco.

Q. Okay. You also have recommendations to the Examiner as to what relief Oxy is requesting in this case?

A. Yes, I do.

Q. Summarize for us the basic elements of the relief that you're requesting.

A. What I'm requesting is a recognition by the OCD that the pressure maintenance rules are, as Tom has mentioned, outdated and antiquated. They don't -- the reservoir voidage concept, which we are the only operator in the entire pool under a reservoir voidage concept at the present time, is obviously not applicable to our unit anymore.

We are not injecting gas. At the present date we don't plan to inject gas, and so we are, in terms of an injection operation, we are not -- we don't see that happening anymore, and so we would ask that the order that applies and contemplates

this reinjection of gas be rescinded, that it be rescinded effective when we cease the reinjection of gas, which is May 1 of 1988, and that the OCD put us under the same pool rules that the other operators in the pool are under or in the same producing mode that we are currently in, and that's the state wide rules, that each well be eligible for 142 barrels a day, a casing head gas limit of 284 MCF a day, and that since this is a retroactive request, we ask that the OCD recognize that giving us this allowable and then not doing anything else, just allows the rules to cancel us right back out, so we're not being given any opportunity to produce that increased allowable, so we would ask that the OCD recognize that and allow us to carry forward and reinstate all the allowable that accrues after the date the order is rescinded, and that we be given two years in which to produce this new allowable.

Q. As part of your study, have you prepared an exhibit book to demonstrate the various reasons and conclusions that you've reached pursuant to your study?

A. Yes, I have.

Q. Let me ask you to turn to the exhibit book.

MR. KELLAHIN: Mr. Examiner, the exhibit book is prepared so that each exhibit is intended to come after the tab number, and we'll simply refer to Exhibit 1 in the exhibit book, and that will be the document or display following the tab and subsequently through the book.

Q. (By Mr. Kellahin) Did you personally prepare and supervise the preparation of the Oxy exhibit book, Mr. Foppiano?

A. Yes, I did.

Q. And have you satisfied and are you willing to testify to the best of your knowledge, information and belief the information contained in that exhibit book is true and correct?

A. Yes, it is.

Q. Let's turn to the Exhibit 1. Let me have you identify and describe that exhibit for us.

A. This is a plat of the entire Empire Abo pool in Eddy County, New Mexico. It shows the various operators in the pool and the two pressure maintenance projects that have been discussed. Arco is the operator of the Empire Abo unit, which is uncolored on this exhibit, and Oxy's the operator of the Citgo Empire Abo unit which is highlighted in yellow there.

The two pressure maintenance projects each operate under their own set of rules, and the other operators in the pool -- I guess there's about five other operators in the pool -- and at least as many wells -- they operate under state wide rules, which is 142 barrels a day, 284 MCF of gas per day of gasoline for each well on a 40-acre unit.

Q. Approximately how many wells are within the Arco Empire Abo unit?

A. I don't know exactly. Several hundred, I'm sure.

Q. How many wells do you have in your unit?

A. We have six producing wells and one temporarily abandoned injection well.

Q. Let's turn to look specifically at the configuration of your unit and the offsetting well locations. If you'll turn to Exhibit No. 2, identify and describe that display for us.

A. This is just more detail of the Citgo Empire Abo unit. The hashed marks there show the outline of the unit. As you can see, as I mentioned previously, we have one temporary abandoned gas injection well. That's that GI-11 with the triangle around it. We have six producing well, four of which are temporarily abandoned at this time.

Q. What is the status of the producing wells within the unit?

A. The producing wells under the present set of rules applicable to our unit, we can produce our allowable with two wells in 15 days, so there hasn't been much need to produce the other four wells, so they've basically just been shut in for period of -- long period of time because they were not necessary for production. We could make our full allowable with two wells in 15 days.

Q. When we look at the display and see the producing wells, Number 5 and Number 13, are those the two producing wells from which you produce your allowable?

A. Correct.

Q. Let's turn now to the summary following Exhibit Number 3. Let me ask you to start back in 1957 with the discovery of the pool, and using this display, give us your understanding of the chronology and history of the development between Arco and Citgo in developing the Empire Abo unit, and particularly how it affects the current case before the examiner today.

A. Well, starting in the beginning, the pool was discovered there in November 1957 and was

initially developed on 40-acre acre spacing under a depth bracket allowable of 142 barrels a day with a 2000-1 GOR limit, and in early '73 there, specifically in June '73, I think has been previously mentioned, Arco sought and received approval for the Empire Abo unit, and there a year later they started injection into that unit. Oxy was, as I mentioned, was offered an opportunity to participate but because we were not treated fairly under the participation formula, we declined and decided to set up our own pressure maintenance project, and so in 1974 we went to the OCD and sought and received approval for our Citgo Empire Abo unit and our rules, and we started injection about a year later thereto, and so we --

Q. At this point, go back to March of '74. That's the approximate date of approval of the Arco unit pressure maintenance project?

A. March of '74 was when they started gas injection into their unit.

Q. Okay. That's a gas injection date start for their unit --

A. Correct.

Q. -- as opposed to the date approving the orders?

A. Correct.

Q. Okay. They're injecting in March of '74. When then did Citgo commence gas injection in their pressure maintenance project?

A. We commenced it in June of 1975 about a year after our rules were adopted.

Q. How many injection wells were you using?

A. One.

Q. And historically have you used more than one?

A. No. We have only used that one well.

Q. All right. What's the next major component of the chronology after Citgo, or Cities Service, began injection in '75?

A. Well, Arco went to the OCD on numerous occasions and received amendments to their original set of pool rules, the most notable of which occurred in April of 1984 when they requested that their voidage limit be removed in favor of a 65-MCF-a-day limit on gas production. I think at the time --

Q. 65 million MCF?

A. Excuse me: 65 million MCF a day. The justification I believe at the time was that they were starting to have to curtail their production.

In other words, they were bumping up against their limit under their orders, so they went to the OCD and got it changed in favor of the 65 million a day, which was the capacity of their plant to process the gas.

MR. STOVALL: Let me just make sure we've got the right number in the record. Is it 65 million cubic feet, or 65 million thousand cubic feet?

THE WITNESS: 65 million cubic feet of gas per day.

MR. STOVALL: Okay. Because we said 65 million MCF and that would be a different number.

THE WITNESS: I'm sorry.

A. Also in 1984 when they got the voidage limit removed, they also amended Rule 4 which had the gas bank language in it for credit for overinjection and underinjection and those kinds of things. They eliminated that language.

Oxy, however, has never sought any amendment to their orders. We're still under the original version that was adopted in 1974. We did however, cease the injection of gas in March of 1988 because it was just completely uneconomical to continue injecting gas, and that's basically where we are today.

We ceased reinjection -- when we ceased reinjection -- we did not have an outlet for the gas, we were not selling gas at that time, we had to go look for a market, and we spent a year looking for a market and finally found one, and during that time our unit was all but shut in. We were flaring gas just to hold the unit together and, when we did find a market we commenced production, and that's basically where we are today.

Q. (By Mr. Kellahin) Before we leave this display, let me have you go back and summarize for us your understanding of the regulatory concepts and framework that was in place for both the project pressure maintenance starting back in 1972 with that production volume, the reservoir voidage calculated from that volume, and what you understand to be the equities or inequities in the original regulatory scheme.

A. Well, starting in -- actually it was, I think, in '73 when Arco sought approval of the pressure maintenance rules applicable to the Empire Abo unit. Their application was for a project allowable once they achieved a certain level of injection. That allowable would be equal to the voidage that occurred in the project area in the

calendar year of 1972, And so when Oxy came along a year later and asked for their pool rules -- in fact, we asked for something a lot bigger than that and we didn't get it. That hearing was opposed by Arco, I believe, but at any rate, Arco showed up and said, "We think that's to excessive," so they asked for some similar set of rules, some consistency between these rules, and so the OCD approved a voidage limit for Oxy equal to the voidage in the project area of Citgo Empire Abo unit in 1972.

So it's clear to me that there is a consistency between those two sets of rules because they were both based on the same thing, the voidage that occurred from the project areas in the calendar year 1972.

Q. When you reduce that to a reservoir voidage numbers in barrels, what is it for the Citgo unit and what is it for the Arco unit?

A. Well, the Arco unit went through a few revisions because they had a -- a tract came in later on after the rules were adopted, so they got it enlarged because the project area was enlarged, but basically for comparison's sake, we're talking about 56,912 reservoir barrels per day for the Arco Empire Abo unit and we're talking about 2,213

reservoir barrels per day for the Citgo Empire unit Abo units.

Q. In calculating the reservoir voidage, are the calculations and the methodology that are set forth in the Arco order consistent with the formula and methodology set forth in the Citgo orders?

A. Are you talking about as of today, or --

Q. No, no. As of the inception back in 1974 when your project starts.

A. The formula, I believe, and the table of fluid properties was actually taken from the Arco orders when the Citgo orders were adopted, so the two formulas were, I think, for all intents and purposes, identical.

Q. The next major revision with regards to either order in terms of placing the allowable on some other component other than reservoir voidage, did that ever occur?

A. Are you talking about early on where there was --

Q. Let me ask you again. Do the orders as originally issued have allowables that are established based upon this reservoir voidage calculation that takes you back to the 1972 oil production rate?

A. As originally established -- well, let me further describe the allowable limitations. The allowable limitations for each unit were based on the voidage for the calendar year '72 on the pool allowable in terms of 142 barrels a day times the number of wells in that project, whichever was less. For the Citgo Abo Empire unit we started out with the 2,213 which was less.

For the Arco Empire unit the pool allowable was the lesser number. I think there is 30,000 barrels a day somewhere around in there, or the 56,000 reservoir voidage figure, whichever was less. They bumped up against the reservoir voidage limitation I think in '83, which is what I recall from the testimony. We, however, have been limited by that ever since.

Q. In reviewing the records, did Arco ever change the method by which their allowable was calculated?

A. Yes.

Q. When did that occur?

A. It occurred in April of 1984.

Q. What happened?

A. They petitioned the OCD to have their voidage limit removed because it was curtailment of

their production. They showed evidence that increasing the gas production in the pool would have the effect of increasing oil recoveries and NGO recoveries, and that just was the most efficient thing in terms of conservation standpoint was to eliminate the voidage requirement -- voidage limit -- and just go on just a 65-million-cubic-feet-a-day cap. In other words, let them produce as much oil as they can produce, but not more than 65 million cubic feet of gas per day of production.

Q. Was there a reservoir engineering predicate for that request?

A. Yes, there was.

Q. And what was that?

A. As I mentioned, it was based on a study that they had done that showed increasing gas production in the pool would have the effect of increasing the oil recovery and the recovery of NGO.

Q. Why would that occur?

A. Well, I think that, as they mentioned, would occur because the dominant mechanism at this point is the gravity drainage. In other words, I think early on we had gas cap expansion and gravity drainage, but as the years go by and we get into the

latter stages of completion in this unit, I mean, this pool, the gravity drainage mechanism becomes more and more dominant and at that point you can begin to increase withdrawals from the gas cap or, if you will, of this pool without adversely affecting the oil recovery.

Q. Arco then in '84 has removed from its allowable the reservoir voidage concept and tied the allowable into this extraction-plant-capacity-based allowable?

A. Correct. They basically asked for a capacity allowable in 1984 and it was approved.

Q. How is that any different from what you're seeking to accomplish today?

A. Well, they -- we're not seeking a capacity allowable, or I'd like to have a capacity allowable, but we're seeking to have the voidage limit removed because it's no longer applicable. We're certainly curtailing, which is one of their justifications, and we believe that the analysis that they performed and the justification they used in 1984 is applicable to the request that we're making today. In fact, I recall the testimony of Arco saying that it was applicable to our unit.

Q. Let's turn now to the orders themselves,

Mr. Foppiano. Let me direct your attention to Exhibit Number 4. Identify for the record what is contained behind tab four.

A. This is a copy of an Order No. 4549 version G. The latest version available to the pool rules applicable to the Empire Abo unit operated by Arco, and as I mentioned, it was originally adopted in '73, and it is the rule that -- it is the rule that established the special rules and regulations applicable to their unit in the Empire Abo pool. And I'd like to point out just one of two things.

If you'll turn a couple of pages over to Rule 3, this is the change that was made in 1984. Rule 3 states, "That the maximum daily project allowable shall be an amount of oil which will result in a monthly average associated gas production of no more than 65 MMCF per day."

Also I'd like to mention that their rule also provides that allowables assigned -- and this is Rule 5 at the top of the next page -- that their "allowable assigned in their unit shall result in production of casinghead gas averaging not than 65 MMCF per day, provided however, that on a cumulative basis, the unit operator may carry forward gas overproduction of 325 MMCF."

And one last thing I'd like to mention other than the mention of extraneous gas bank in this order, which is an accounting procedure that requires them to keep track of extraneous gas, which is really outside gas that is brought in and stored in the unit and used during peak demand period. There is no mention of any gas bank, no specific mention of any gas bank in these rules.

Q. Early on in the Arco orders there was mention of a gas bank, was there not?

A. There was.

Q. And when was that taken out of the order?

A. In April of 1984.

Q. In reviewing the Arco order, do you find any rules dealing with the opportunity to carry forward underproduction under their rules?

A. No.

Q. In addition to Rule 3 and Rule 5, are there any other rules to which you would like to address specific comment at this time?

A. No, there are not.

Q. Let's turn now to Exhibit 5. Would you identify and describe that exhibit?

A. Exhibit 5 is a copy of Order No. 4808, which are the special rules and regulations

applicable to the Citgo Empire Abo. Unit, as I mentioned before, this order is the same one that was adopted in June of 1974, and has not been changed since.

I'd like to point out a few things in our order. If you'll turn to the page -- to the second page of the rules, our Rule 3, and this can be contrasted with the Arco Empire Abo unit rules, our Rule 3 states that "the maximum daily project allowable shall be an amount of oil which will result in a reservoir voidage no greater than the average daily reservoir voidage for the project area for the calender year 1972, which is 2,213 reservoir barrels, or 852 barrels of oil per day whichever is less."

As I mentioned, we've been under -- we've bumped the 2,213 limit and have ever since the start of the unit. Rule 8 on down at the bottom of the page states that "all calculations of reservoir voidage shall be in accordance with a formula set out in attachment A and the table of fluid properties in attachment B."

And also I'd like to mention that if you'll turn to the page -- at the top of page their Rule 9, the gas bank -- this identifies and describes what

the gas bank is for our project, and it says it shall be established for the project and allow credit to be added to it when we overinject, and debits to be made from it when we underinject, and it describes the provisions that are applicable to the gas bank, how it is calculated and everything else.

One last thing like to point out on these rules, if you'll flip back to the previous page, in the findings. Findings 6, 7 and 8 at the top of the page, I think this very clearly describes the intent and what the OCD was trying to do at the time.

Finding Number 6 that the Citgo Empire Abo unit embraces land immediately adjacent to the Arco Empire Abo unit; that area is under pressure maintenance by injection of gas, and at that the injection of gas in the Citgo Empire Abo Unit is in the interest of the efficient operation of the pool as a whole, and secondly, that production permitted the Atlantic Richfield the Arco Empire Abo Unit is limited to reservoir voidage equal to or less than the average reservoir voidage for the project -- for the project area in the calendar year '72, and the reason why our reservoir voidage limit is in our rules, as I've clearly described in Finding 8, that

evidence indicates that the portion of the Empire Abo pool underlying the Citgo Abo Unit area will be more efficiently produced by operating under a reservoir voidage formula similar to that used by the Arco project.

So I think the intent is pretty clear here that what the OCD tried to do was to allow the operation of the two different units, but to allow what -- but to limit each so that there was consistent pressure depletion of the pool.

Q. In looking at the reservoir voidage formula itself, does that formula in calculation incorporate a relationship based upon pressure?

A. Yes, it does.

Q. Directing your attention now to Exhibit Number 6, Mr. Foppiano, have you summarized the major components for comparison between the two rules for the two projects?

A. Yes, I have.

Q. Take us through what you understand as the major components in so far as they affect the current case before the Examiner.

A. Okay. This is a comparison of the pool rules as they existed when Oxy then Cities Service's pool rules were adopted in 1974, and I think -- not

to belabor the point -- but I think it shows again what the OCD was intending to do in setting up the pool rules for the Oxy units. The allowable for the Citgo Empire Abo unit, as I mentioned, is 2,213 reservoir barrels per day, and that's based on the actual voidage in the project area in 1972.

The Arco rules were based on very similar things, just a higher reservoir barrel limit. Each set of rules provided for the gas bank. Ours provided for a gas bank where credits were accumulated when volume -- when we injected more than we were required to inject. Our rules define this required injection volume to be the reservoir voidage balance gas. It's actually based on our production for that month.

The reservoir voidage balance gas is a volume of gas that must be injected based on that production to keep our allowable -- to keep our production within the 2,213 limit, so when we injected more than that in volume, we have credit in our gas bank, and Arco has similar language and their standard was 95 percent of the available residue at the tailgate of the plan. When they injected a volume in excess of that, they accumulated credits in the gas bank, and when they

injected less than that, they debited the gas bank.

Q. Under the operation of their gas banking procedure under their unit, did they ever inject so that they had a credit in the bank?

A. I believe they did, yes.

Q. Okay. Gas bank maximums the next entry?

A. Yes. In accordance with the gas bank, each set of rules sets a maximum that -- actually a cap on the amount of credit that could be accumulated in these gas banks. Ours was the average of the total -- the total -- the average of the total monthly reservoir voidage balance gas volumes for the previous three months, and theirs was the average of the total monthly gas volumes injected for the previous three months, so there's another similarity in trying to establish a maximum of these gas banks.

Q. Have you gone back and replotted the performance of the wells in your unit and tracked the oil and the gas recoveries?

A. Yes.

Q. Let me direct your attention to Exhibit Number 7. Before we talk about the specific conclusions you can reach from the display, explain to us how it was prepared.

A. Well, this is measured data. This is the graph of the oil that was produced within -- from the wells within the Citgo Empire Abo Unit, and the oil is in green there, and it is the oil production each month just divided by the calender days in that month.

The red shows the gas production rate which was the monthly gas production divided by the calender days in that month, and that was total for all the wells on the Citgo Empire Abo Unit, and shown in blue is the gas injection, which is the volume of gas injected divided by the number of days in that month, so put it on a daily basis, so these are the three known measured quantities from the wells within the Citgo Empire Abo Unit, and it shows -- just a couple things I'd look to highlight on here.

As I mentioned before, we commenced gas injection in mid 1975. You can see the blue line start to shoot up there, and we rocked along there for a while and started having problems there in late '86. We actually shut our natural gas and liquids plant down because it was just no longer economical to continue stripping the liquids out of the gas.

The gas was fairly lean, and the costs of operating the plant were in excess of the benefit the we could derive by getting the liquids out of the gas, so we shut the plant down and tried to inject the wet gas, and the -- that caused a lot of problems.

You can see a lot of the fluctuation that occurs, and then we had so many large problems with the compressors which, incidentally, was a real major problem because with no way to sell gas, when we had problems with the compressor, we had to shut our production down because we had no place else to go with the gas, so you can see the production dropped dramatically there in 1987, and we were trying to inject this wet gas, and then in early '88 we just gave up trying to inject wet gas, shut the compressor down.

The cost of repairing the compressor and trying to keep the thing on line was just excessive, so we did gas injection in early '88 and you can see the blue line just goes south there, and the red line is showing small volumes of gas production. That's because we were flaring.

There again, we had no way to sell gas, and so we flared to hold the unit together. It took us a

year to find a market for this gas, which we finally did, and in early '89 we got a market with Phillips and commenced the sale of gas from the Citgo Empire Abo Unit.

Q. Was your flaring of gas approved by the division?

A. Yes, it was.

Q. Compare for us the oil rates during gas re-injection and then when gas re-injection stopped.

A. Well, the -- I'll start even earlier than that. You can see the oil rates were dropping fairly dramatically there in the early '70s, and the reason for this was because our gas/oil ratio was increasing on our project, so we could not, even though we had the capability of producing the allowable, we were bumping up against the gas limit of 2000-1 in the early '70s there.

So that's why when our pressure maintenance project commenced, we could never take advantage of the 852 barrels of oil a day -- part of our limitation -- because our gas/oil ratio was over 2000-1, so we started gas injection, and actually our well just continued on a pretty steady decline there, and you can see it. It is pretty consistent,

and it got down for the entire unit there, you can see, late '87 less than -- almost less than ten barrels of oil a day total unit oil production.

So it's fairly obvious that we had -- we were drying up pretty quickly, but then after we did shut down and we started gas sales, our liquid production increased dramatically, and this is one of the reasons why we feel that granting of our application which will increase -- allow us to increase -- our gas production -- that's why we're here -- will allow us to recover additional liquids underneath our unit.

Q. Let's turn to the topic of the calculation of the allowable and the gas bank and the various components pursuant to your pressure maintenance order. Give us a general overview of what you did as an engineer to begin to understand the pieces by which we had reported our production to the oil conservation division, the exchange of information, and then what you ultimately decided to do in order to properly and adequately reconstruct what Citgo and what Oxy have done pursuant to that order.

A. Well, we -- in the early part of this year as a result of letters from Arco -- began examining the status of our unit. They made some allegations

that we were overproduced. So we started looking at it -- and this is just projected back to early '70s, and quite frankly, they moved the files around quite often, and so our files were not complete on what we had in terms of what we filed, what pressures we had filed, whatever, so when the allegation was made that we were a million barrels overproduced, I quite frankly was quite shocked, and we just decided to go back and start at square one.

We started with measured data, and we ignored what was filed by previous people, and in trying to explain it, we just did -- we're going to start from square one with the raw measured data and recalculate all the voidage that was produced from our understanding of when we started injection, which we did that, and that's the calculations I have here today, and that's what I base my conclusion on that we are underproduced.

As a complete and total review of the whole project from the standpoint of just looking at the measured data and not from looking at files that -- we had million files from people that are no longer around had made -- we just started with measured data and worked from there.

Q. Does the order require -- let me ask you;

what does the order require in terms of determining the pressure that is used in the calculation? What kind of pressure is that?

A. Well, the order doesn't have a requirement in there for how to determine the pressure, but the order does require that whoever is doing the calculations know what the reservoir pressure is, so the reservoir pressure is measured periodically on our unit and once the reservoir pressure is measured, then that describes the fluid properties that are used in the calculations, but it's up to the operator to decide how to measure his pressure.

Q. Is the calculation premised under the assumption that you're using the reservoir pressure measured for the Citgo Empire Unit?

A. Oh, I think so. To use any other pressure would -- is just -- wouldn't -- you wouldn't come up with the right answer. When you're talking about a voidage, you're talking about looking at production on a reservoir basis and you would have to use the pressure that is consistent with the volumes that you're talking about, which is the pressure in the Citgo Empire Abo Unit since we're looking at the production for the Citgo Empire Abo Unit and trying to calculate the voidage of the Citgo Empire Abo

Unit.

Q. Have you prepared a display that tabulates all the pressure information that you have gathered from which then you have used that pressure in your subsequent calculations?

A. Yes, I have.

Q. Let's turn to Exhibit 8, Mr. Foppiano. Identify and describe what you have included in the book behind tab number 8.

A. Well, as I mentioned before, we've measured pressure frequently on the wells in the Citgo Empire Abo Unit. This is a summary of the actual pressure measurements that were taken for each well all the way back to 1976. This data is straight off the bottomhole pressure measurement graph, that are provided to us by the company measuring the pressure, and to start with in column one, the test depth is the depth that the pressure was measured at, and the pressure at the test depth is what pressure is, the actual bottom they measured that pressure at, then the gradient is what the gradient was, whatever the fluid was at that point, and these three numbers are used to calculate the pressure at the datum of 2,264. Our voidage calculations require a reservoir pressure of 22 -- calculated at

a datum of 2,264 to be able to determine what reservoir properties -- can fluid properties -- are used in the voidage calculations.

Q. All right. Let's take a moment and talk about the datum. If you'll flip back to Exhibit Number 5 and look at the Citgo order, and go to the last page of the Citgo order?

A. Yes.

Q. When we look at the table of parameters here, and you look at the calculations here, the order requires a datum of 2264?

A. Yes. The order requires that you know the reservoir average pressure at a datum of 2264 pounds per square inch absolute.

Q. In examining some of the C-124s that City Service and Oxy had filed on this project, what did you find to be the datum utilized for that report?

A. Well, sometimes it was 2400, sometimes it was 2100. I don't think there was a clear indication as to what the proper datum to use to file a C-124 was at, but regardless of what the C-124s were filed at, in order to do these calculations, the pressure had to be corrected to a datum of 2364.

Q. In addition, you're supposed to use an

absolute pressure?

A. Correct.

Q. And how do you make the adjustment from a gauge pressure to an absolute pressure?

A. You have to take the pressures that are measured, since these are gauge pressures, and add in the pressure base of 15.025 to get pounds per square inch absolute.

Q. And the order provides for the adjustment of the pressure at 15.025 psi?

A. Correct. Up there at the top you can see "pressure base equals 15.025 pounds per square inch absolute."

Q. So when we turn back to the Exhibit A --

MR. MORROW: Before you turn back, where is that datum set out in the rules? I haven't found it yet.

THE WITNESS: Well, the datum -- thank you.

Q. (By Mr. Kellahin) Order requiring datum of minus 2264, so when we flip back over to the well pressure information behind Exhibit 8 and look at the second to the last column from the right and it says "pressure datum minus 2264," that is the pressure at that datum point so that you can subsequently calculate it in compliance with the

order?

A. Correct. In order to determine what your reservoir pressure is.

Q. Okay. When you have a pressure depth test, for example, take the 109 well and start with any of the entries that you want, describe for us how you as an engineer then get to the proper datum pressure.

A. Okay. For example, the first pressure that was measured on well Number 109 shows a test depth of 5,410 feet. This indicates that the pressure at 5,410 feet was 1,302 pounds -- and that's shown in the second column, pressure test depth -- and then as they go down, they're measuring the pressure at various points, so the pressure differential right there at that test depth tells you the gradient of the fluid that existed at that pressure -- I mean -- at that test depth, and that's the gradient that you use to extrapolate from the measured test depth to the datum of 2,264.

Q. Aren't there different types of gradients to use in order to adjust the pressure to the proper datum?

A. It's based on what you measure -- the gradient that you measure. You can have a heavy

gradient from salt water, which is almost .5 psi per foot, and then you can have a real light gradient which is all gas. It could be very small, a tenth of a psi of a foot or less.

Q. Have you properly applied the correct gradient to make the adjustment in pressure to the proper depth of the datum?

A. Yes, I have.

Q. What is the purpose of the last column on the right? What does that show?

A. That just identifies when that well -- when the pressure was measured in that well, what the producing status of that well was. He denotes that it was a producing well. He denotes that it is temporarily abandoned, and for purposes of that designation, producing was -- if the well produced any volume at all during that year we considered it a producing well. If it did not produce any volume at all during that year, we considered it temporarily abandoned for the purposes of that designation.

Q. Have you supplied the pressure on all six of the producing wells within the unit?

A. Yes.

Q. There aren't any producing wells for which

pressure has not been provided?

A. We only have six producing wells.

Q. Having done that, Mr. Foppiano, then what did you do?

A. Well, then we had the values, the known measured values, that we could begin the voidage calculations with, and so we performed the voidage calculations, and this exhibit -- this next exhibit, Exhibit 9, describes in detail exactly how the calculations are done, and I can go through this, but I'll mention at this point that based on conversations that Oxy had with Arco in recent weeks where we've exchanged data, I believe that the controversy lies in where we're coming up with different numbers in these calculations, lies primarily in what pressure is used to calculate the reservoir fluid parameters and, of course, the voidage from that point on, and those type of things, so talking about how to calculate the reservoir voidage balance gas and the bank and all this other kind of stuff, I -- unless I hear something new today -- it is my understanding there is no controversy between the two companies as to that methodology.

Q. Okay. Without going through it in great

detail, give us a summary of an example month. You've taken the month of October of 1986; the first part of the information shows "given." What does "given" mean?

A. Okay. These are example calculations. These are actually what we calculated for October 1986 for this hearing. The given values are the known measured values that are the input values to the voidage equation. The first one is oil production for that month. It was 652 -- 651 barrels, and that is in the voidage equation denoted (Qo). The second given is gas production, another measured quantity. 85,289 MCF of gas was produced that month, and that's used in the voidage equation as (Gp).

Gas injection is another measured quantity. 69,131 MCF that month was injected of the 85,000 that we produced, and that (Gi) is the variable that describes that.

From the gas production and oil production we calculate a producing gas-oil ratio, which is (Rp) and that month it calculated 131.012 MCF per barrel, and then our allowable reservoir voidage for that month, which was our 2,213 limit times the number of days in that month, that calculated out to

be 68,603 reservoir barrels.

And the other given that we use in the calculations is, of course, the reservoir pressure, and that month it worked out to 949 psi, and we get that pressure from looking at the six wells that -- we measured pressure on all six wells that month -- or for that period of time -- and averaged them, and that's where we came up with the 949 psi.

MR. KELLAHIN: There's a typo, Mr. Examiner, and it's my error, I was supposed to change it, Calculation 1. It says 854 psi. That's incorrect. It should be the 949 which is the average reservoir pressure used in a given, so I don't want that to confuse anybody.

MR. MORROW: Where is that now? In the given part up there?

MR. KELLAHIN: That given pressure; the 949 is correct. There's a typo down here where it says 854. That should be 949.

A. And those reservoir fluid parameters (Bo) and (Rs) and (Bg) are the correct values determined for 949 psi.

Q. (By Mr. Kellahin) Let's take Exhibit Number 8 and show us how you get the average reservoir pressure -- the 949?

A. Okay. The last pressure measurement that we had for the purposes of these example calculations was recorded on October of 1985, so we look at -- we can start with well 109. October of '85 the corrected pressure for the datum was 988, and we can go down to the next well, 110. October '85 pressure was 900, and we can keep doing this for the other four wells, and we just averaged those measurements out and correct them for absolute, and that should work out to 900 psi.

Q. And that's the methodology used in each of the months then of calculating the spread sheet for the allowable purposes?

A. That's correct. Except for the first year of voidage calculations, which we didn't have pressure measurements to use, so we used what was published in the New Mexico Engineering Committee books.

Q. In going through a reexamination of the other calculations that Cities and Oxy had done in the project, Arco had raised the question that it appeared to them Oxy was using the wrong value for the (Bg)?

A. That's correct.

Q. Have you corrected that calculation so that

both you and Arco now agree that that is correctly calculated?

A. I think so. The error was in a computer program. We had these calculations set up on a computer program and where it was supposed to take the reservoir pressure and go in and determine the fluid properties, that calculation was flawed so we kept using a (Bg) for a different pressure long after we should have used a different (Bg), so the calculations were in error and we agreed with Arco and we corrected them.

Q. When we look at the methodology applied then in the calculations, is it your understanding that both you and Mr. Smallwood have used the same methodology?

A. That's correct. I can go through these examples if you want to or --

Q. Well, let's turn, I think, to a topic, and that's the how to handle the gas bank.

A. Okay.

Q. Describe for us the mechanics of the gas bank and then take us through an example.

A. Well, after you calculate the voidage, and then you calculate based on your production how much you're supposed to inject that month to keep your

production at 2,213, then you calculate whether you have overinjected or underinjected. It's simply the difference between what you actually injected in this reservoir voidage balance gas number. Once you make that comparison that you've either overinjected or underinjected, then if you've overinjected, you add a credit to the gas bank. If you underinject you take a volume away from the gas bank, but then the gas bank itself has a maximum limitation on it that's equal to the average injection requirement for the past three months, so our gas bank maximum can't be any larger than that on a running basis.

Q. Let's talk about what Cities and Oxy had done prior to your recalculations in terms of running or applying a cap to the gas bank. What was done?

A. I believe that there was no cap applied to the gas bank. When our production increased far before the 2,213 limitation in '89 when we had a gas market, we did so thinking we had a gas bank that was considerably larger than what we actually had because we were not correctly applying the maximum limitation to the gas bank, and so it was a mistake take on our part and we acknowledge.

Q. Have you correctly applied the cap to the

gas bank in the current calculations that you're presenting to the Examiner?

A. I believe so, yes.

Q. And by correcting the (Bg) and correcting the gas cap calculations you still come up in an underproduced status at the end of the calculation?

A. Yes, I do.

Q. Let me ask you why Oxy did not seek to have the pressure maintenance order removed from the project when you stopped gas injection in May of 1988?

A. Well, there wasn't much need to do something about it because that was not our problem at the time. We couldn't sell the gas, we had no gas sales outlet at that time when we ceased reinjection. So our first order of business was to go find some method with which we could produce our unit, and the only way we could do it was to market the gas, so we spent a year looking for a gas market and finally found one, and started gas sales to Phillips in early 1989. And when we -- when we started, that we started overproducing because at that time, like I say, we thought we had a gas bank -- a very large gas bank at that time -- and we thought when we were overproducing our allowable,

that we were producing against this very large gas bank.

Q. To complete the discussion, let's take you down to Number 8. "It says Adjusted Gas Bank." Quickly summarize for us the correct way to calculate the gas bank.

A. In Rule 9 of Order 4804, the maximum that the gas bank can be is the average of the prior three months reservoir voidage balance gas volume, not including the current month. So calculating it there for October of 1986, we look at the reservoir voidage balance gas volume calculated for July '86, August '86, September '86, sum them up, divide them by three, and that's the maximum that our gas bank can be carried forward into October of 1986.

Q. And is it that methodology that you've applied in the spread sheet calculations that we're going to discuss on Exhibit 10?

A. Correct.

Q. All right. Let's turn to Exhibit 10.

MR. MORROW: Would this be a good time to break?

MR. KELLAHIN: Yes, sir, it sure would.

(Recess at 9:30 a.m.)

Q. (By Mr. Kellahin) Mr. Foppiano, let me ask you to direct your attention to Exhibit 10. Before we talk about the calculations themselves and the spread sheet, let's start with the column on the far left and have you go from left to right and tell us how the spread sheet's been organized.

A. Okay. This is a tabulation of the monthly voidage and gas bank balance since the commencment of the injection in the Citgo Empire Abo Unit. It uses the same methodology as described in the example calculations in the previous exhibit, and what that is, it starts with a known measured number in the first four columns, that being the reservoir pressures, gas production, injection, and the oil production and from those known values you calculate everything else in the table (Bo), (Rs), and (Bg) values, and that's per attachment A -- or attachment B, I believe, one of the attachments to our order that has a table of fluid properties in it based on these reservoir pressures, and that's taken directly from that table, and then the (Rpn) is a calculated net producing gas-oil ratio which is also based on the formula in our formula, excuse me, in our field rules, and that's just the producing gas-oil ratio reduced from the amount of gas injection that you

have.

Q. After the (Bg) column, the next column is reservoir voidage?

A. Correct.

Q. What's that?

A. After you've determined these values (Rpn) (Bo), (Ro), (Rs), (Bg) then you plug those into the voidage equation in Order Number 4808 and you calculate reservoir voidage, and as we know with all that is, is the surface volumes on a reservoir-volume basis instead of a surface-volume basis.

Q. The calculation and the actual values will give you the actual voidage in reservoir barrels in that column?

A. Correct.

Q. And so this represents on a monthly basis, the voidage in the reservoir?

A. Correct, for that month.

Q. All right. What do you compare that to?

A. You compare that to your limit, which in this case as I've mentioned, we've started of being limited by the 2,213-reservoir-barrels per day aspect of our rules, so we come compare that to our monthly voidage allowable of 2,213 times the number

of days in the month, and that's that column "monthly voidage allowable." So we compared that to our allowable and determine a cumulative over and under status of our project.

Q. When we get to the cume over and under column, what is displayed there by a negative?

A. Negative, to be consistent with New Mexico -- the way they do it -- we're using a negative to denote overproduction, so when the values are negative there it means that the unit is in an overproduced situation.

Q. The next column after that one?

A. The next column, in order to calculate the gas bank, you have to calculate the reservoir voidage balance gas and there, again, without getting into the intricacies of that calculating, all that really is is, based on the production values in the prior columns, how much of that gas production do you have to re-inject to keep your production at 2,213? And so you calculate that injection requirement, and that's shown under reservoir voidage balance gas, and then that injection requirement is compared to the volume that you actually injected to determine whether you over or underinjected that month.

Q. And the final column on the right there?

A. The final column is a cumulative of the over and underinjection column. The unadjusted gas bank is just a running cumulative of the plusses and minuses of over and under injection column, and then since the gas bank does have a limit on it, we apply -- compare the unadjusted gas bank to the calculated limit each month to determine what the adjusted gas bank balance is, and that's shown in the last column.

Q. Do you have an opinion, Mr. Foppiano, as to whether this spread sheet shown on Exhibit 10 is in full compliance with the provisions of the pressure maintenance Order R-4808. Is it?

A. It is my opinion that it is in full compliance with Order Number 4804.

Q. Starting back at the first column, the first line of that column says June 1975. Why have you started this spread sheet with that particular month?

A. That is the date we commenced injection into the Citgo Empire Abo Unit.

Q. Why use that date as the start date for the spread sheet as opposed to some other date?

A. That was the date that was approved by the

OCD for the commencement of the calculation.

Q. Take us through the summary then, of the spread sheet and tell us the significant points as we move through the producing years and through the various calculations.

A. Well, looking at two columns, cumulative over and under, and then the adjusted gas bank, you can see that when we ceased re-injection in March of 1988, that's probably the second-to-last page of this massive spread sheet, you can go over to the column of cume over and under and see that we had produced almost one million barrels less than what we are were allowed to produce by our order.

MR. MORROW: What column is that, again?

THE WITNESS: This would be -- look at the March '88 line in the column cumulative over and under. It should show a number of 929267.

Q. (By Mr. Kellahin) That represents what?

A. That represents the status of the unit when we ceased re-injection, and it indicates that the unit was underproduced by almost a million barrels.

Q. Reservoir barrels?

A. Reservoir barrels, correct. And also at that time, since when we ceased re-injection of gas, the status of the gas bank becomes somewhat murky

because it's really based on overinjection, underinjection, and when you're not injecting at all, the basis of the gas bank really becomes kind of shaky. The gas bank balance drops to zero when we ceased re-injection at that time, and we don't maintain it after that because, like I say, to continue it after that when we're not injecting is --

Q. Well, the calculation itself presumes gas injection inherently involved in the spread sheet; does it not?

A. Correct. The gas bank calculation is a bank you use when -- you add to it when you overinject and you take away from it when you underinject so when you're not injecting anything at all, you're producing less than your 2,213 reservoir barrels, the calculation begins to go haywire there, and not only that, the maximum limitation operates to bring the balance to zero anyway, so we choose not to continue it past that point.

Q. Well, it's no longer meaningful after that point?

A. It's no longer meaningful.

Q. All right. What is your recommendation to the Examiner about what to do with the approximately

million reservoir barrels that are underproduced at the time gas injection ceases?

A. Well, I think that it should be carried forward past that point, and we be given an opportunity to produce that.

Q. And why is that?

A. Well, that represents a volume that we didn't produce and -- one reason or another -- and we would like a second opportunity to do so if our allowables are increased.

MR. MORROW: Would you all repeat that last question and answer?

MR. KELLAHIN: Certainly.

Q. (By Mr. Kellahin) The spread sheet shows that as of the end of gas injection, you have a credit or an underproduction volume in reservoir barrels of 929,267. What relief are you asking the Examiner with regards to that underproduction?

A. Well, I'm asking that underproduction -- we be allowed to carry it forward and use it in the future.

Q. And what are your reasons for requesting that opportunity?

A. My reason is that to do so gives us the opportunity to -- better opportunity to produce the

reserves under our tract, and also to take advantage of the allowable that we would be assigned in the future if our relief is granted.

Q. Why shouldn't that volume simply be cancelled because you've ceased gas injection?

A. Well, it represents an amount of our allowable that we haven't used, and under the interpretation that Arco makes in their rules, they interpret that they're allowed to carry forth from month to month and year to year, and so forth, the amount of allowable that they don't use from month to month, so we think it is consistent to allow us to do the same thing.

Q. After March of '88, what is shown in the calculation?

A. Well, after March of '88, as I mentioned, we basically shut the unit in except for flaring some small volumes of gas, and you can see in the table after March '88, the gas production volumes go way -- voidage accumulates as indicated in the cumulative over and under column; gets up to as high as 1.7 million reservoir barrels, and then in early '89, as I've testified to earlier, we've got a gas market, started selling gas, so we start depleting a little bit of this gas bank -- this cumulative over

and under volume -- and we end up in December 1990 at a point that still is more underproduced than what we are when we ceased re-injection. In fact, we've added almost another 100,000 reservoir barrels of oil to the status of the unit as of January 1, 1991.

Q. As you continue this spread sheet after March of 1988, you're continuing to debit and credit the cume over and under column?

A. Yes. You start out crediting it because you're not producing your 2,213, and then we get a gas market, we start debiting it, and it brings it to a balance of pretty close to a million barrels underproduced January 1, 1991.

Q. What is your recommendation to the Examiner for the underproduction accumulated, or accrued, after gas injection ceases to the current time?

A. Well, it is my recommendation that we be allowed to carry forward this underage. There again, it is consistent with the interpretation that Arco has made under their rules. It's not specifically spelled out in either rules, and I think to say that Citgo Empire Abo Unit cannot carry forward and the Arco Unit can is inequitable and is not a consistent interpretation of both rules.

As I've mentioned, it is specifically spelled out, so we think that since that's what the OCD was trying to do early on was to maintain these two units under some consistent rules, it is consistent to allow us to carry it forward to the present day and produce it and use it.

Q. Can that requested relief be granted without harming Arco in their unit?

A. I believe it can, yes.

Q. Why?

A. Well, the information that I've seen shows that during the operation of the unit we took our produced gas and injected it, and we measured bottomhole pressures periodically. We've seen the pressures offsetting our unit, and we've compared the pressures, and what the evidence indicates to me it that there's a pressure differential between the two units, and that it's in favor of Arco.

Oxy's pressure in their unit is higher than Arco's and has been that way under these rules, so I don't believe that allowing us to increase our gas production is going to adversely affect Arco because of this pressure difference, and, in fact, I think it will allow us to be on an even keel with the other producers in the field and enjoy the same

opportunities to produce as they do.

Q. In terms of management of the Citgo Unit pursuant to the pressure maintenance rules, has the injection and production been such that Citgo and Cities Service and Oxy over the life of this project, some 17 years, has consistently overinjected their gas and underproduced their hydrocarbons?

A. That's what the evidence indicates to me, yes. And there again, that's based on the pressure differential -- the pressure maintenance -- in our unit and wells offsetting our unit.

Q. Let's turn now, Mr. Foppiano, to Exhibit Number 11. Would you identify and describe that exhibit?

A. Exhibit 11 is just a nice color plot of the column in the prior exhibit of over and underinjection. What it basically shows are -- the volumes in red are when we are debiting the gas bank for that month. In other words, we're underinjecting, and shown in blue are the months and the volumes where we're crediting the gas bank, and I think it pretty well shows for most of the life of the project, we were adding volumes to the gas bank instead of taking it away.

Q. Okay. I'll have you turn to Exhibit 12. Summarize for us, Mr. Foppiano, the relief that you're requesting from the examiner for your company.

A. We're asking that the OCD rescind Order Number 4808 and put us under state wide rules the same as the other five operators in the pool, and to do it at the same time where we were in the same producing mode as the other operators in the pool, which is when we ceased re-injection and just started producing our wells.

We believe the effective date of that should be May 1 of 1988. We would ask the OCD to assign us an allowable under the state wide rules of 142 barrels a day and 284 MCF a day for each capable well beginning in May of 1988, and since to assign us that allowable and to let the state wide rules operate to cancel it each month because we can't change our production over the last two years, that would be equitable.

We're asking the OCD to reinstate all the underage that accumulates as a result of that action to the present day and give us an opportunity to produce that extra allowable -- give us two years.

We're also asking that in order to operate

our unit in the most efficient manner, we're asking the OCD tc allow us to combine the different spacing units that would be created as a result of rescinding Order 4808, and basically keep our unit intact and operate it as a unit and allow a unit allowable as opposed to a well-by-well allowable, so that we can produce the allowable from the wells in the most efficient manner.

We're also asking that if the OCD decides that the carry forward is not allowed under Order 4808 --

MR. MORROW: If what's not allowed?

THE WITNESS: The carry forward of underage is not allowed under our order, and since that puts us in an overproduced situation, that we ask for an exception to that ruling. The reason why we ask for that exception is because we didn't have a gas market for our wells for a year. We had to go find one. These wells were capable of producing, so to cancel our allowable during that period of time, I think is to deny us a reasonable opportunity to produce.

The state wide gas rules provide for this exact remedy. When you lose your gas market, or you don't have a gas market, but your wells are capable

of production, they provide for this very same thing, that underage can be carried forward from month to month from the time when you do have the opportunity to produce your wells, so we're asking for that relief if the OCD decides that carry forward is not allowed underneath these rules. So we're asking for an exception to that, and if that is granted, that puts us in an underproduced situation again.

Q. What's the information contained behind Exhibit 13, Mr. Foppiano?

A. Well, Exhibit 13 is just a copy of the proration schedule as applicable to the Empire Abo pool, and I put it in really for information purposes. It identifies, particularly on the second page, the other operators in the pool, and just shows that there are other operators in the pool. They operate from one end of the pool to the other right in the middle of the Arco Unit, and they have been enjoying state wide allowable since day one, and all we're asking for is to be treated on the same basis as they are.

Q. In your opinion, Mr. Foppiano, can the relief Oxy requests be granted without causing waste and without violating the correlative rights of any

interest owner?

A. I believe so, yes.

Q. And why is that?

A. Well, as I mentioned before, I think it's not going to violate Arco's correlative rights, and it's not going to cause waste.

Before I get into the waste issue, it's not going to violate their correlative rights because our evidence indicates that our order has caused a pressure differential from the Oxy Unit to the offsetting acreage -- offsetting wells -- so we don't think that Arco is going to be harmed by our increase in gas production.

In fact, our testimony in 1984 indicated that increasing gas production in the pool has the effect of increasing the recoveries of oil and NGO liquids in the pool. So we also think that the granting of the application is the equitable thing to do. We're, quite frankly, we're almost at the end of what could be considered to be a pressure maintenance project and we've got to do something here.

This 2,213-reservoir-barrel limitation is a severe limitation on our production here, and we, you know, it's going to be very difficult for us to

continue, and that translates into something like I want to say, 700 MCF a day or something like that, for entire unit, so we just want the same opportunities as the rest of the people in the pool have to produce under the same conditions; the same allowable as they have. We think that's equitable. We think if -- You're going to have to put us someplace, and that's where we think is the best place to put us at this point.

Q. Are there any other operators operating under those types of limitations?

A. Yes. Five at least.

Q. Under state wide pool rule limitations?

A. Yes.

Q. Are there any other operators besides Oxy operating under the curtailments that you are required to abide by in your unit?

A. We're the only other operator in the pool operating under a voidage limitation.

MR. KELLAHIN: That concludes my examination of Mr. Foppiano. We move the introduction of his Exhibits 1 through 13.

MR. MORROW: 1 through 13 are admitted into the record.

(Oxy USA, Inc. Exhibits 1 through

13 were admitted in evidence.)

CROSS-EXAMINATION

BY MR. CARR:

Q. Mr. Foppiano, let's go to the -- we just went through your exhibits. I'd like to direct your attention to the righthand tab one. This shows the units in the pool and the other windows in this -- in the two units; is that correct?

A. Yes, sir.

Q. You indicated just a minute ago that you were the only other operator under a reservoir voidage sort of a limitation in terms of your ability to produce; is that correct?

A. Yes, sir.

Q. You're the only other operator, are you not, that ever had a pressure maintenance effort as well; isn't that correct?

A. No. Arco did too.

Q. But, I mean, other than that, these other windows that I'm talking about here -- Durham, Sidney Lanier, Marbob, Bridge, Phillips -- no one else ever considered pressure maintenance except you and Arco?

A. I don't know what they considered.

Q. Did anyone ever have an approved pressure

maintenance application --

A. Not that I am aware of.

Q. --- other than the two of you? I mean, Cities and Arco in the pool?

A. That's my understanding, yes.

Q. And the windows, the other windows, and I mean when I say that, I'm excluding the two units, are any of those units developed with more than one well in each one?

A. No, I believe the rules allow one well per 40 acres.

Q. And they're all just 40-acre wells?

A. No. Windows within the confines of the Arco Empire Abo Unit?

Q. Yes.

A. Yes, I believe that's correct, but outside there we see that there's three 40-acre units grouped together.

Q. If we go to your Exhibit Number 2, I believe you testified that you could produce your full gas allowable from two wells; is that correct?

A. That's correct.

Q. How many of the wells in this pool are capable of producing?

A. As of today we believe all the wells are

capable of producing. We haven't tested the gas injection well, but we have tested the -- all six of the wells -- producing wells -- and they range a million a day to, you know, wherever.

Q. And have you -- do you have any idea of what kind of oil rate you're getting on those wells?

A. I think it's small. You know, we're talking about five, ten, twenty barrels a day per well. It varies from well to well.

Q. When you're asking that the commission place these wells under the state wide oil allowable scheme, are you talking about six wells, or are you talking about seven including the injector?

A. I'm talking about six wells. We may come in later on and ask for an exception for that one well, but that's not subject to the application.

MR. MORROW: Six Producing wells; is that right?

THE WITNESS: Correct. We're asking for six wells. Six 40-acre units, but we combine them back into the unit.

Q. (By Mr. Carr) Okay. If we go to your Exhibit Number 3, this is your history of the Empire Abo pool?

A. That's correct.

Q. Is it correct that from the very first unitized operations in the Citgo Empire Abo Unit, that there were plans to actually sell gas from that pool?

A. We were selling gas from that pool before we instituted pressure maintenance operations.

Q. And it was always your intention to sell some gas from the pool?

A. No, it was not. It was our intention once we commenced gas injection was to maintain the project in a pressure maintenance mode, which was the injection of all available gas. Except during emergency conditions when we had no other place to go with the gas, we would sell it, but that was only under emergency conditions, and I think it reflects the fact that we only had one well injecting, so if you have problems with that one well, then your only other alternative is to shut the whole unit in.

Q. Did you, in fact, sell gas during most months or not, during the pressure maintenance operation?

A. I believe we sold gas early on, but then when we were able to achieve the injection volumes, injection of 100 percent of the gas, which was our intent, that we did sell, and we didn't sell any

more gas, and eventually our gas connection was severed because it wasn't even used anymore.

Q. In fact, Arco has been required to re-inject its residue gas; has it not?

A. That's my understanding. They asked for that in one of their earlier revisions as a caveat to an allowable increase and they asked for quote-unquote requirement that they re-inject all produced gas, and the OCD approved that request.

Q. Was it my understanding of your testimony that the reservoir voidage limitation in the Citgo Order of 2,213 reservoir barrels has been a constant problem in restriction on that unit?

A. Yes. We bumped up against that right early on.

Q. And when you said "bumped up against it," what do you mean?

A. Well, I mean, if that was the operating limit. The rules require, and it was set up the same way for the Arco Empire Abo Unit, that you receive the lesser of -- like in our case -- 852 barrels of oil per day, or reservoir voidage for the calendar year 1972. The 852 is just six wells times 142 barrels a day, so the pool allowable, or the reservoir voidage limit, whichever was less, and in

our situation the reservoir voidage limit was the lesser of those two numbers from the inception of the project.

Q. Are you aware of any effort by Cities or Oxy to ever change that limit?

A. I am not aware, no.

Q. Okay. As I understood your testimony, I thought there was some concern about the Arco gas bank; is that right?

A. Well, concern from the standpoint that I think it gives rise to an interpretation that Arco is making under their rules that I think for the OCD to be consistent, they should take that into account in interpreting our rules and whether or not we can carry forward underage. I think clearly the OCD wanted a consistent treatment of both units, and if Arco is making the interpretation that they can carry forward underage, I think the same interpretation can be made by Oxy.

Q. And that's your understanding that those are Arco's interpretations?

A. That is my understanding based on evidence supplied by Arco.

Q. Are you suggesting that the presence of that gas bank is at this time impairing the

correlative rights of Oxy?

A. No, I'm not.

Q. Or causing waste at this time?

A. No.

Q. Okay. When you actually ceased gas injection back in 1988, that was a decision that you made for economic reasons; isn't that right?

A. Yes, it was pretty easy to make.

Q. You just weren't making a profit, so you shut the thing in at that time and started looking for a market?

A. Started looking for a market, that's correct.

Q. I thought you testified that -- correct me if I'm wrong -- that one of the objectives, as you understood it, for the two orders approving these two pressure maintenance projects, was to maintain a consistent pressure depletion of the pool?

A. That's my belief, yes.

Q. And I understand your testimony to be that you believe, in fact, there has been a -- that there are higher pressures in the Citgo Unit which caused gas to, in fact, migrate away from it?

A. I believe that the situation exists because of these higher pressures of gas that migrate off of

our unit onto Arco's unit, yes.

Q. And how did you establish the pressure for the Citgo Unit?

A. Based on the pressure measurements here and in Exhibit 8.

Q. And were they just measured pressures, or was there any calculations or computation? How did you get your pressure number? What did you use to make that particular -- reach that conclusion?

A. Well, we corrected the pressures to the same datum, 2,264, as we've done on Exhibit 8. We took those measurements from the wells based on the datum provided by Arco about a month ago, and then recently on the C-124s.

Q. So you'd have taken the measured pressures and then converted those to the midpoint in the reservoir, the 2,264 reporting datum; is that right?

A. We did for ours. Yes. Arco, I believe, reported theirs on the C-124 and F2,264.

Q. Okay. So we're comparing them at reservoir pressures, and you made this conversion from the measured pressure to that datum?

A. Which pressures are we talking about?

Q. As I understand, you took measurements in the Citgo Unit?

A. Yes.

Q. And that you then converted those to the reporting pressure of a minus 2,264?

A. Correct. As we've done in Exhibit 8.

Q. And you've used your gradient to get to that point?

A. Measured gradient, yes.

Q. Now, I look at Order R-4808, the order approving the Citgo Unit, and we look at Rule 9 in that order, that's the rule behind tab five, and we look at 9E, that provision provides that overproduction is to be made up during the following month; is that not right?

A. Well, I believe the requirement is that if you don't have enough credits in the gas bank, then it does say that production for that month shall not be reduced.

Q. Other than the gas bank, are you aware of anything that would permit the operator of the Citgo Empire Unit to carry forward underproduction -- I'm sorry -- overproduction -- underproduction?

A. From month to month.

Q. Yes.

A. Well, I believe Rule 3 assigns us an allowable, and I think Rule 3 can be interpreted to

allow unused allowable to be carried forward from month to month. It does not specifically prohibit, and it is not specifically allowed. It just says you would have this allowable for the 2,213 barrels of oil per day, the number of days in that month, but it doesn't say, "If you don't use it, it's cancelled," and what we have done in our calculation, if we looked at 2,213 times the number of days and the month since 1976, and that's how we're calculating the cumulative over and under status of our unit, that shows it to be underproduced.

Q. And that would permit you to carry forward underproduction even in excess of the allowable plus the gas bank credit?

A. Well, I don't think that the cumulative over and under calculation is that applicable when you have the gas bank. I think the gas bank is the more limiting factor. In fact, the gas bank -- the unadjusted gas bank and the cumulative over and under calculations are the exact same thing. The only difference is one is on a reservoir-barrel basis and the other is on an MCF basis, so the adjusted gas bank, because it provides for a limitation, is actually a more restrictive carry

forward of underage, but when you get into the situation where you're not injecting anymore, and the gas bank, you know -- it doesn't make sense to carry the gas bank, then I think you can have a carry forward of underage situation.

Q. Okay. That is total production. Is it your testimony that you don't have to make that up during the following month? You can carry that forward on a cumulative basis month by month?

A. As to overproduction.

Q. Yes.

A. If you have sufficient credits in your bank, I think Rule 9 provides, yes.

Q. And if you don't have sufficient credits in the gas bank, may you carry more overproduction forward than the amount of allowable plus the credits?

A. Well, if you don't make it up, I think you should carry it forward, yes, to make it up in later months, but you're making it up eventually.

Q. But my question is, are you aware of anything in the rules that permit you to carry it forward? I understand what you're thinking should be done, but I'm asking you if you're aware of anything in the rules or the statutes that permits

you to carry and accumulate this thing forward in this fashion?

A. Well, the gas bank can go positive or negative, so, you know, an overproduced gas bank situation is a carry forward of overproduction.

Q. Do you know of anything other than that gas bank that lets you carry forward overproduction?

A. No, other than what I've mentioned here --

MR. MORROW: I might inject there as long as you had overproduction, we'd insist it being kept on the books until it was made up.

THE WITNESS: And that's how we've treated it in the calculations. We've carried it until it was made up.

Q. (By Mr. Carr) But the rules would provide that be made up in the following month unless there were credits in the gas bank?

A. That's how it reads.

Q. Okay. We go to the information behind tab 7. This is the graph that show actual measured information on the wells in the Citgo Empire Abo Unit; is that correct?

A. Yes, that is correct, measured oil production, gas production and gas injection.

Q. And if I understood your testimony,

Mr. Foppiano, what you've done from this point forward is instead of going back and trying to figure out what was actually reported to the commission and the division, you've gone forward and tried to apply the rule to the actual measured information?

A. That's correct. It was just too much of an exercise to try and figure out what we had done in the past. Those people weren't around anymore to explain why they did whatever it was they did, and so I just started with the raw data from day one to take a fresh look at the whole thing to see if we were overproduced or underproduced, and that's based on these measured numbers here shown on the graph, the measured pressures, and that's how we get the voidage calculation.

Q. Okay. And if we look at these measured -- is this measured information the same information that would have been reported on the C-124s?

A. I had not cross-checked against it. This is what is in our records that we have for the production of the unit, but I have not cross-checked to show how that compares.

Q. When we talk about your records, what are we talking about?

A. We're talking about our records.

Q. I mean, are they different than the State C1-24, say, for measured pressures?

A. Well, of course. We measured the pressures. The C1-24s are calculated pressure.

Q. And doesn't the C1-24 also show the measured pressure at the datum point?

A. It may. I don't know. I haven't reviewed the C1-24s because I had raw measured pressure data, and I just started with that.

Q. And, so, if we're looking at C1-24 data that's been reported to the state, might it be those reported pressures are different than what you've been working from?

A. No. I would think that the actual measured pressures, if they're shown on the C1-24 should be the same as what we've done, but I have not reviewed every C1-24 to check that, and like I say, that was done way before my time. I just started with the actual pressure measurements.

Q. I just want to be sure there's no suggestion here that we might be looking at the reported data and your data, that there is no reason to suspect that would be different in any significant way?

A. There may be errors. I don't know. I haven't checked to see if there are.

Q. When we look at the graph behind Exhibit Number 7, what we've got is we've got production rates report; correct?

A. Uh-huh.

Q. And I believe you indicated that if your relief you're seeking was granted, that you would not only be able to increase the gas that you were producing, but would expect an increase in the oil production as well?

A. A slight increase, yes.

Q. And this graph, in fact, shows that even at a higher gas rate, we don't see a very substantial increase in the production of oil, do we?

A. Well, we see an increase there in '89 to '90 when we started back producing.

Q. Of about how many barrels?

A. Oh, anywhere from 30 barrels a day plus. Let's see: 25 barrels a day plus. As high as that.

Q. And then it declined back down to -- if you were to plot this back to about -- down to where the normal decline would have been anyway; is that right?

A. Oh, yes, it declines because we're

curtailing our production tremendously.

Q. Now, Mr. Foppiano, if we go to the material behind tab 8 in this exhibit, and what you have here, if I understand it, is the pressure that you've used for calculating voidage in the Citgo Unit?

A. This is correct.

Q. Okay. And what you have done is developed a gradient well by well to adjust from measured, or reported pressures, to the pressure as required by the OCD at midpoint in the reservoir, minus 2,264?

A. Well, let me correct you. It's not required. There's no requirement that we report pressure to 2,264. The requirement in our rules is that fluid properties be determined with the reservoir pressure of 2,264.

Q. And that's what you're determining reservoir voidage?

A. Correct. But in answer to your question about the gradient, the gradient is a measured number on the bottomhole pressure test based on fluid that is in the hole at the measured test depth.

Q. What do you do? Do you take the pressure at the measured datum and then take that as just a

ratio to the pressure at the reporting datum? Is that how you make this?

A. To determine the gradient?

Q. Yes.

A. No -- well, let me see --

MR. KELLAHIN: For the record, Mr. Examiner, to respond to Mr. Carr's question: Mr. Foppiano has been handed a bottomhole pressure survey report, and he's examining that report. I'm not sure which well he's looking at, but I'll hand you another copy of a bottomhole pressure survey report. Do you have another we can share? They're different wells, but the procedure is the same.

A. So I don't spin my wheels, Mr. Carr, the gradient is calculated on these pressure reports. Do you want me to --

Q. (By Mr. Carr) I just would like to see how you do it.

A. Okay. Well, I don't do it. Whoever measures the pressure in the field does it, but I'll verify the calculation.

Q. I understand. I would just like to know how you take this information. I'm not particularly concerned about any particular number; I just want to see the method you use to determine what a

gradient is.

A. Before I answer your question, I want to verify the calculation so I can give you the correct answer; is that all right?

Q. That's fine with me.

A. Okay. I'm prepared to answer your question.

Q. I'll see if I can understand it.

A. Are we looking at the same copy of the pressure measurement?

Q. No. I don't believe so. I'm looking at a bottomhole pressure survey report for the well Number 9 dated 10-91.

A. Okay. I'll just have to give you the method.

Q. That's all I'm really trying to get here.

A. At a certain depth as close to the bottom of the hole, there -- on the one I'm looking at, there's about 5,000 feet. They measure the pressure, and then they go down as far as they can and they measure the pressure at 5,590 -- or -- excuse me. They measure the pressure at the bottom even lower than where they measured the first pressure I was talking about. The gradient is the difference in pressures, pressure measurements at

those two depths divided by the difference in those depths.

Q. Okay.

A. And what it represents is the gradient of the fluid in the hole at the bottom of the hole. Does that answer your question?

Q. Yes.

MR. STOVALL: Let me just ask one question so I understand what you're talking about. How does he pick that first depth that they measured the pressure that you're talking about? There's no specific method for doing that. They just get somewhere so they have a depth differential; is that --

THE WITNESS: I think the intent is to get down, as far down, as possible, and then they have two points as far in the hole as possible that you can measure the gradient of the fluid that are sufficiently far enough apart. The one I'm looking at is 500 feet apart, but it's 500 feet at the bottom of the hole. They measure the pressure at those two depths and that's what tells them what the gradient is.

MR. STOVALL: You need to be deep enough to be meaningful, and you have to be far enough apart to

be meaningful too, so you balance those two requirements?

THE WITNESS: I'd agree with that, yes.

MR. STOVALL: I'm sure Mr. Carr understood all that, but I thought I'd better clear it up.

Q. (By Mr. Carr) When I look at the bottomhole pressure survey report, do you have one of these for each well for each year, is that how you would do it?

A. Yes. And those numbers are summarized on Exhibit 8 --

Q. Okay.

A. To calculate the datum pressure point 2,264.

Q. And if we came up with a very different gradient, then I would suspect we would have very different voidage calculations?

A. If you used a different gradient to correct the pressure of the measured depth to a sum datum, you would come up with a different pressure at the datum of 2,264 which would give you a different voidage.

Q. Okay. And that may be the core of your dispute; do you think that's fair?

A. I do believe the pressures are probably in

dispute, but ours are measured, they're on all your wells, so I don't see how you can get much better than that.

Q. Now, Mr. Foppiano, let's look at the information behind tab 10. You started in June of '75 because that's when you started to inject; right?

A. We started the calculations in June of '75, yes. We injected the first month in June of '75.

Q. And you had produced prior to that time; had you not?

A. That is correct.

Q. Do you know if you were over or under in terms of your calculation at the time in June of 1975?

A. I don't know.

Q. Okay.

A. But I will say that we started it because that was consistent with the filing we made in June '75 where we filed our first pressure maintenance operators report. We showed the commencement of the gas bank calculations that was filed and approved by the OCD, and with a start date the June '75.

Q. Okay. Now, if we go across the columns

here, we've got some measured information. That's the information in the first four columns?

A. Correct.

Q. Then we have various factors that are really factors that are utilized in the -- or are to be utilized -- in the OCD formula that was prescribed for the unit; isn't that right?

A. That is correct.

Q. And you have corrected the (Bg) factor now because the one that was previously used was in error?

A. Previously used when?

Q. Well, I think you testified that you had corrected the (Bg); did you not?

A. Yes. We made -- on the original filings that were made on our voidage, we were using an incorrect (Bg) on recent filings, and that is corrected in these calculations.

Q. Okay. And then the reservoir voidage figure in the column is what you have calculated?

A. Based on the review of all the measured pressures in the measured volumes that we have.

Q. And the conversion of those pressures to the right datum?

A. Correct.

Q. And then we get all the way over to May of 1988; correct, and that's when you ceased injection?

A. Actually March of 1988, yes.

Q. I'm sorry; that's right. And at that time running your calculation, you come out with about a million barrels of underproduction?

A. On a cumulative basis compared to our allowable, yes.

Q. And at that time you had a zero figure in the gas bank?

A. That's correct. Actually the gas bank began to get weird up here around mid 1987 because the reservoir voidage balance gas calculation went negative and said basically, "Not only do you not have a requirement to inject gas, but you need to produce more gas," so we had negative gas injection requirement and that threw the gas bank calculations all haywire. So we made it zero, but that's conservative because actually it should be more negative than that.

Q. So there was no-- and no gas bank shown after March of '88?

A. Yes. But for the reasons I just mentioned. It just goes haywire if you try to

maintain a gas bank.

Q. And what you're really, as you've stated, requesting is for a second opportunity to produce what you carry as overproduction after the March '88 point in time when you ceased injection?

MR. KELLAHIN: I believe you misspoke, I think you said "overproduction."

MR. CARR: Yes, and I meant "overproduction."

Q. (By Mr. Carr) Now, if we go for the last page of this exhibit and the last number on the last column, December 1990, that shows about a million barrels of -- this is what? A cumulative underproduction?

A. Total cumulative underproduction since the start of gas injection.

Q. And this is the volume you're requesting the OCD permit you now to make up?

A. Yes. We'd like to have it carried forward.

Q. And you'd be carrying that forward, I think like you said Arco was carrying forward in underproduction?

A. Yes. We've been given information that Arco maintains a gas bank, and that gas bank is the exact same gas calculation as we've made on here, cumulative over and under.

Q. At this point in time Arco is not in the position to produce anything in their bank; isn't that right?

A. Oh, I differ there, Mr. Carr. Arco's allowable is 65 million a day. They have on occasion produced in excess of it, and when they do, they debit gas bank.

Q. And have you looked at the -- do you have any idea what the balance in the bank is right now?

A. I believe it's 8 and a half BCF of allowable.

Q. And would you think that at some time in the future you would be supportive of an effort by Arco to support -- to produce 8 BCF of gas out of the reservoir under special rules if they'll let them take it?

A. Well, I would say that when Arco comes to the OCD and asks for special relief, we'll evaluate it at that time and make our decision.

Q. I bet you will.

MR. MORROW: Is that a no?

Q. (By Mr. Carr) If I look at the material behind tab 11, if we look at the line, you've got credits shown in blue, and from 1986 on we have a number of lines which show -- designed to indicate

credits; is that right?

A. That's correct.

Q. That basically shows the underproduction that you now would like to have permission or authority to produce; is that right or not?

A. That's not right.

Q. Okay. What does that show?

A. There again, this is a well -- let me take that back. If you cumed all these volumes, then, yes, that is the same volume.

Q. Okay.

A. But this is on a reservoir-barrel basis. Excuse me. It is not on a reservoir-barrel basis. If you cumed all these volumes, that should be the same as the cume over.

MR. CARR: May we have just a second, please?

MR. MORROW: All right.

MR. CARR: That's all we have.

MR. KELLAHIN: Just one point of clarification, Mr. Examiner.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q. I had misheard your answer, Mr. Foppiano. Mr. Carr was asking you a question about the ceasing of injection and my recollection is the answer was,

it was no longer economic to continue to inject gas.

A. That's correct.

Q. Was the project or the unit as a whole, uneconomic?

A. No, it was not. Well, let me take that back. Under those conditions the project was uneconomic because of the high cost of maintaining the gas compressor.

Q. And once gas compression ceased, continuation of the project without gas injection was economic?

A. Correct.

MR. KELLAHIN: I have nothing else.

EXAMINATION

BY MR. MORROW:

Q. Okay. All right. Mr. Foppiano, I believe you said all of the six producing wells are capable of production; is that correct?

A. We are -- yes. We've tested four and we are working on the other two. They've been temporarily abandoned for a long period of time, but we believe they would show -- we will -- all six wells will be able to be produced at the present time, but right now we tested four just by turning

them on.

Q. Would each of those make the gas limit or not?

A. Yes. We tested those four in excess of the 284 MCF a day and as high -- as close to a million cubic feet of gas per day.

Q. But each of the four you tested will produce more?

A. That's correct.

Q. The statement you made about the reservoir voidage rules being based on '72 voidage, do you know if the wells in each unit, or in each unit was essentially producing at the allowable during '72, or what was the basis of that being equitable at that time if that was not the case?

A. Arco originally asked for that in their first hearing. They asked for a project allowable based on a voidage in the calendar year '72. I can only presume that they thought that was a good enough project allowable for them, and then when we came along with our rules quite frankly we asked for something a lot larger than that and the OCD -- and Arco opposed it. They wanted something set on the same basis as their allowable, so the OCD decided to set ours on the same basis which is that calendar

year production 1972, but as to whether one unit was overproduced and the other unit was not, I really don't know, Mr. Examiner.

Q. Would you became satisfied with that after the OCD decided on it and apparently have stated it's been acceptable to you since that time; is that correct?

A. Well, we -- yeah. We went ahead and started gas injection. I will point out -- you can see that our oil production didn't just jump up when we started gas injection and stay on an incline; unlike Arco's which was able to be increased dramatically. They were able to take advantage of the other part of the rule, which was the pool allowable instead of the reservoir voidage all the way up until '83. Because of our structural position -- our high gas-oil ratios -- we never could take advantage of the pool allowable part of our voidage, so it did not represent the -- what we were asking for and the type of incentive to get the pressure maintenance that we wanted, but I can only presume it was enough of a benefit to us to go ahead and start the project because we did, but as you can see, we've been way low, 852 barrels a day, ever since.

Q. Okay. On Exhibit 6, if you turn to that, tell me again how this reservoir voidage balance gas volume operates?

A. Okay. Both rules as they existed in the early '70s were based on, you know, having a gas bank in there that allowed you to credit -- add credit to this gas bank and take them away depending on how you injected, and that injection volume is compared to some standard set by the OCD in each rule. Our rule was this volume called "reservoir voidage balance gas."

Arco's rule was the 95 percent of all available -- of what was available to be injected. The reservoir voidage balance gas concept of ours is basically based on the amount of gas you produce, how much of that do you need to re-inject to keep your production within the allowable limit. That's the standard and it's a calculated number in our voidage equation, and I might add, I don't think there's any dispute between Oxy and Arco on how to calculate that, but that's the standard --

Q. Let me ask you this; is it the produced gas minus the injected gas, minus the allowable converted to reservoir conditions? Would that get you there? If it would, I understand it.

A. I don't -- I don't think so. Let me tell you how we calculate it. We take the voidage equation that says based on all these --

Q. Produced oil and gas?

A. Produced oil and gas -- this is what your voidage is. Then we go back to the voidage equation once we calculated voidage, and we plug in 2,213 as the voidage, and back calculate how much --

Q. That's your allowable voidage?

A. Allowable voidage. Back calculate how much MCF of gas injected -- would there have been injected to get you to the 2,213, so that's what we kind of back into that number.

Q. Okay. All right.

A. I admit it's complicated. It took me a while too -- it's actually described in our rule.

Q. I think I understand. I was going to ask you again -- let's see -- about -- turn to Exhibit 7, if you would, and the records you have graphed here indicate that you did a pretty good job of getting that wet gas back in the ground in 1987, and you indicated you had some difficulties. Would you describe those again to tell us how you were able to do that good without troubles?

A. You know, it's just more difficult to

inject the wet gas than the dry gas because of the fact that you have the liquids present in the gas stream, and you're taking them from one pressure to another pressure and liquids and dropping out and these kinds of things, so as far as operating compressors, it just makes it -- it's an operationally more difficult problem injecting wet gas and keeping compressors running.

As I understand, we had two compressors and when -- and one was constantly going down, and the other couldn't handle all the volume, so when we couldn't handle all the volume, we had no choice but to curtail our production, and that's why you see production fluctuating mostly to the down side, because we just had no choice to curtail our production, and it was just mainly due to operational problems on the compressors.

Q. So you're getting it all back in the ground, but you were having to curtail production in order to be able to match production, I guess, obviously?

A. Since we had no place else to go with the gas, we couldn't produce it and then just inject what we wanted to. We had to inject everything we produced so when we couldn't inject everything, we

had no choice but to curtail our production.

Q. Do you know how much -- on this Exhibit 7 -- how much extra oil you've produced as a result of pressure maintenance? How much of what's shown here is your production record?

A. No, sir, I have not. I have not made that calculation.

Q. Are these -- is what's shown on this graph, does that equal what you reported to OCD on C1-15s as to injection and production?

A. I would hope so.

Q. I didn't go back to your records for this. That was only for your pressure you were talking about?

A. No, we went back to our records on this, and our records are the same records that are supposed to be used to prepare the C1-15s. I just -- coincidentally, in reviewing the first pressure maintenance operators report that we did file, the gas production volume that we used in the calculations, gas injection volumes, the oil production volumes, all match identically.

Q. Okay. Are you -- it's your -- you feel like you and Arco are in agreement at least on the production volumes -- or Arco's?

A. For the most part we were provided a spread sheet last week which, for the first time, showed us monthly -- the monthly numbers they were using for their voidage -- for that voidage calculation of our unit, and we compared those with our numbers and there were some minor differences. It looked to be typographical errors, but for the most part, I think we do we agree on the basic numbers -- the measured numbers -- used in the calculation.

MR. KELLAHIN: Except for the pressure.

Q. (By Mr. Morrow) Okay. The well numbers that you use with your bottomhole pressures have some extra numbers on the front compared to the map. I assume the numbers to the right would indicate the actual well number; is that right?

A. Yes, sir. I apologize for that. We actually -- the first number like in the case of well 109.

Q. Well number 109?

A. Actually well number 9 we do it by tract. It's actually Tract 1, Well Number 9, so that's the reason why internally we have a little different designation.

Q. Do the rules set out any time when the pressure would have to be measured, or just say -- I

noticed you use October of '85 for your October of '86 calculations. Are there any requirements in the rules that say you measured every year, or every six months, or five years, or just measure it?

A. Mr. Examiner, there's no requirement in Order 4808 to run reservoir pressures at all. It just says that you have to determine the reservoir pressure in order to do the calculations. It doesn't -- it does say that that datum that you use, the pressure has to be 2,264, but it doesn't say that you have to run the pressure datum, you just have to use a pressure corrected to that datum for the calculations, but there is no requirement in 4808 for any frequency or number of tests, or which wells to run them on, or that sort of thing.

Q. I was going to ask you if Oxy had a positive gas bank at all times during the ten years or so of injection, but I see that you did not on your Exhibit 10.

A. Are you looking at the adjusted gas bank?

Q. Yeah. What does the -- go through the last four columns there and give me a more -- try again on explaining those differences so I can know them.

A. The first column again, there is reservoir voidage balance gas that is -- for example, that

first month -- actually it might be better to use the fourth month down.

Q. Let's go ahead and use the first one.

A. The first one. You see we've calculated 72,229 MCF. As I mentioned, the way that is calculated is, we plugged the limit of 2,213 into the voidage calculations and back calculate what the injection should be so that that voidage is made equal to 2,213, and that calculation yielded 72,229 MCF for that month. That then is compared to the column -- to the volume -- under column gas injection. So, for example, the month of June '75 you see we injected 74 million, we were supposed to inject 72 million to keep our production 2,213. The difference between those two numbers is 48,048 MCF debit, which means that we underinjected by 48 million that month.

Q. Okay.

A. And that what we started the gas bank with, and because the adjusted gas bank is based on the sum of the prior three months, we don't show a volume over there until we've had four months of available data, and you can see that's how we came up with 135. I might add, Mr. Morrow, I agree with you that these calculations show our gas bank in an

overproduced position of quite a bit for a long period of time.

In reviewing the first report that was filed, the pressure used for those calculations of the voidage and the gas bank was something like 1,380 pounds. The pressure we used was 1,181. Because that was so long ago, we really had difficulty figuring out where that pressure came from in terms of backing it up with measured numbers, so what we did for this first 1975, because we took the most conservative approach we could take to it, the only published data available for pressure on any wells in the Citgo Empire Unit, is the New Mexico Engineering Reports -- Engineering Committee Reports, and that shows the pressure for one well over here, this 1,281.

That's substantially lower than what was used in the original filing, and by the order of a couple hundred pounds. A few pounds difference in this pressure makes a significant difference in the voidage volume, so the lower pressure you use, the bigger the voidage that you calculate, and we have used a lower pressure than what was used on the initial report.

And, like I say, we did that to take the

most conservative view possible, but that throws our gas bank balance negative for a long period of time, and so to use these numbers to reflect back on how we operated back then, they operated under different information and different measured values and it was just so long ago we could not find backup for that information, so we didn't use it, but that's clearly, you know, had different numbers as far as reservoir pressure back then, and that's what gave them a smaller voidage and a more positive gas bank balance.

Q. Okay. Let's see your cumulative over and under. It's stayed negative for the first year -- actually -- I guess you're overproduced until 1984; is that correct?

A. Well, for the purposes of this review, yes, it shows an overproduced situation, but there again, I harken back to the pressure that was used -- that we used in our calculations compared to the pressure used on the first report.

Q. You're saying according to those pressures you didn't know you were that much overproduced, or you didn't know you were continually overproduced; is that correct?

A. According to what was filed originally, we

were not overproduced. This shows us to be a lot more overproduced now than what was filed in 1975.

Q. How does your -- let's see -- I guess the first time you show that you're cumulatively underproduced is in 1984, September of 84. And at that time you still have a -- you still have an unadjusted gas bank which is negative. How does that happen? Are those -- I guess they pretty well synchronized up to then, but when you have an overproduced status or a negative or unadjusted gas balance?

A. Yes, sir. Really I think the only difference at that time between the two numbers is because the maximum hasn't operated yet. It's a maximum on the amount of credits you can carry forward. There is no maximum to the amount of debits or how much overproduction you carry forward. All of that has to be carried forward, but the only difference between the cume over and under and the gas bank calculations is the (Bg) converting it from a reservoir basis to the surface basis.

Q. Okay. I understand. When you answered Mr. Carr's question about the three wells on the 120 acres outside the units, do you know if they produce on a well basis or on a lease basis? I assume a

well basis.

A. I believe it's a well basis. I think we can even refer to those -- let's see -- those are the Sidney Lanier wells. Those can be referred to on Exhibit 13, second-to-the-last page of the proration schedule. You see three Sidney Lanier wells?

Q. Let's see, last page?

A. Yes, sir. It's the bottom of the middle column there. Gas/oil proration.

Q. Or above Oxy?

A. It's right above Oxy.

Q. Right above Oxy. Okay. On Exhibit 11 I need for you to tell me a little bit more about that.

A. Well, there again, Exhibit 11 is just a plot of the column in Exhibit 10 over and underinjected.

Q. So those first three months you underinjected by the amount shown; is that right?

A. Yes. Based on these calculations that we're showing here, it works out to be underinjected -- that we underinjected injected so we had a debit, and that monthly debit, say, for the first -- you can see June of '75, the monthly debit

was 48,179, that should correspond to that first red line on Exhibit 11.

Q. Okay. And you indicated that if you cumed those you come out to what you're asking for, and I guess that's what you've done in your table in Exhibit 10; is that correct?

A. Well, if you just straight cumed them, which is the unadjusted gas bank?

Q. Yeah.

A. The only difference between the unadjusted gas bank and the cume over and under is one is on a reservoir basis and the other is on a surface barrel basis, so you would come up with the same number. As of the -- in the early part of 1988, you should come up with the same number as the cume over and under column.

Q. Okay. On Exhibit 10 then, on the next-to-last page?

A. Yes, sir.

Q. Tell me about the zeros in the reservoir voidage -- reservoir voidage balance gas.

A. Okay. It was -- originally we set up on our spread sheet as I mentioned, the way we calculate the reservoir balance gas is, it's based on the gas you produced, the oil you produced, and the unknown

is the gas injected. The voidage is equal to 2,213, so you take the calculations that are described in Exhibit - Here it is. Exhibit 6, you can see the two equations -- reservoir voidage equations -- we just plug all those numbers in there, the 2,213 for the reservoir voidage and the gas produced -- actually produced -- the gas injected or -- excuse me -- not gas injected; that's the variable, and we plug in the oil that was produced that month, and then we have the fluid parameters based on the reservoir pressure for that month, and we calculate how much gas should be injected that month to keep the voidage of 2,213.

What happens here is, if you look over at the reservoir voidage column for those months where we're showing zeros, it shows a volume very low compared to the 2,213 limit, and the equation starts to just bomb there really.

It calculates -- if you go through the calculation for the month of September 1987, you get a negative reservoir voidage balance gas volume, and I guess to think of it conceptually the equation tells us, "Hey, you haven't even produced enough to get to 2,213," so I can't tell -- you actually have to inject a negative amount which means -- I guess

-- we have to take more out just to get the 2,213.

Q. I guess I can see that after February of '88 where you dropped below 2,213, but between 2,905 and 1,207 there in the reservoir voidage column?

A. Yes, sir.

Q. It seems like you voided -- if I'm looking at that correctly -- you voided it more than your allowable?

A. No, sir. That's a monthly number, so 2,905 is saying September '87.

Q. Okay.

A. That's a monthly number and that would work out to --

Q. Oh, okay.

A. -- approximately 97 reservoir barrels a day.

Q. Okay.

A. Those are all on a monthly basis.

Q. That's all I have.

EXAMINATION

BY MR. STOVALL:

Q. One really simple question. How can we change rules under which you will operate after May 1988?

A. How can you?

Q. Yeah. It's a retroactive change.

A. Well, you can do anything. You're the OCD.

Q. On the other hand, we don't have to do anything. What's the basis -- in other words, why didn't Oxy ask for it back in '88?

A. We didn't need it in early '88. Had we gotten new rules or whatever, it didn't matter. We couldn't produce our unit in 1988. To do so would just be to operate uneconomically, which is not a prudent operator, and so we just had no way to produce our unit until we found a market for the gas.

So we spent a year looking for it, and when we finally found it, quite frankly, we thought we had a gas bank that had accumulated to produce again and since we found a market, we started overproducing our allowable, and there again, that was why we didn't think we needed some kind of a relief, but now that we've looked at the situation, and I, quite frankly, said some of it was prompted by Arco questioning some of the things we were doing and we took a fresh look at it.

It's obvious that we can't continue under the present rules that we've got right now except in

a heavily, heavily curtailed situation, and that's not fair to us because we're not injecting gas anymore, and that basically penalizes us for pressure -- having a pressure maintenance project. All we want to do is enjoy the same allowable as the rest of the guys in the pool who are doing the same thing we're doing.

Q. I guess if you didn't need a rule change in '88, why do you need a rule change now that goes back to '88?

A. Because that reflects the change in our operation essentially from going to pressure maintenance operation to going to the same type of operation that the other operators in the pool are.

Q. I have a little problem with the retrospective rule change. I don't have any further questions.

MR. MORROW: Well, I thought of one.

FURTHER EXAMINATION

BY MR. MORROW:

Q. What does the 22 -- what does the 2,213, what does that equate to in MCF per day?

A. Right now?

Q. How much allowable will that be?

A. I can calculate it for you exactly. I

calculate it about a month ago, but I recall it somewhere in the order of 700 MCF a day based on current reservoir pressures, gas-oil ratios, and those kinds of thing. It's an extremely low volume.

Q. The equivalent to about three wells or less than three wells?

A. Yeah, less than three, and if we maintain reservoir voidage concept, then what we end up with a lower and lower allowable, and if we maintain a reservoir voidage allowable before future years, and then all that really does to us is give us a decrease in allowable in a field where everybody else has got either a set surface allowable -- where everybody else does have a set surface allowable.

Q. All right.

MR. MORROW: Mr. Kellahin, you got anything further?

MR. KELLAHIN: No, sir.

MR. MORROW: How about you, Mr. Carr?

MR. CARR: No, sir.

MR. MORROW: Thank you, sir. You may be excused.

MR. KELLAHIN: That concludes our direct presentation, Mr. Examiner.

MR. MORROW: How much time you all want to

take?

MR. CARR: Well, I think our direct presentation is about in length the same as Mr. Foppiano's. For about an hour or so.

MR. MORROW: Would you all want -- I guess it's too early to go to lunch; isn't it?

MR. KELLAHIN: I had just soon start with Gary's presentation. If we take a five-minute break and get a drink of water or something.

(Recess taken at 11:15 a.m.)

GARY BROOKS SMALLWOOD,

the Witness herein, being previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your full name for the record, please?

A. Gary Brooks Smallwood.

Q. Mr. Smallwood, where do you reside?

A. Midland, Texas.

Q. By whom are you employed and in what capacity?

A. I'm employed by Arco Oil and Gas as a reservoir engineer.

Q. And have you previously testified before

this division and had your credentials as a reservoir engineer accepted and made a matter of record?

A. Yes, I have.

Q. What's your current responsibilities with Arco?

A. I'm the reservoir engineer that works the Arco Empire Abo Unit.

Q. Are you familiar with the applications filed in each of these consolidated cases by Arco and by Oxy?

A. Yes, I am.

Q. And are you familiar with the operations of Arco in the Empire Abo Unit and the Citgo operations and the Oxy's operations in their unit?

A. Yes, I am.

Q. Have you reviewed the orders pursuant to which pressure maintenance projects have been conducted in each of these units?

A. Yes, I have.

Q. And have you made a study of the current productions practices?

A. Yes.

MR. CARR: Are the witness's qualifications acceptable?

MR. MORROW: Yes.

Q. (By Mr. Carr) Mr. Smallwood, could you briefly state what Arco seeks by appearing in these cases?

A. We seek an order requiring Oxy to make up current overproduction and to fully comply with Order R-4808.

Q. And what else do you seek?

A. We're asking that future orders limit Oxy's future production to prevent Oxy from damaging continued operations in the Empire Abo Unit.

Q. You heard the background presentation presented this morning by Mr. Foppiano?

A. Yes.

Q. Do you basically concur in that presentation?

A. Basically.

Q. Let's go directly then to your exhibits, and I would like to have you refer to --

MR. CARR: Our Exhibits are contained, Mr. Morrow, in one book. That is Exhibit 1. We have numbered the pages, and so we will work through it in that fashion.

Q. (By Mr. Carr) So, Mr. Smallwood, if you would go to the exhibit set forth on page one of

this exhibit, could you identify that and review it for the examiner?

A. This is a comparison of the voidage rates of the units. The red line shows that Citgo's Unit voidage rate, and the blue line shows the Arco voidage rate -- the Arco Unit voidage rate -- both units have been divided by the poor volume size to make them comparable to each other and make them work on a comparison situation. The lines include oil, gas and water production less a gas injection credit, all converted to reservoir volumetric barrels by the order that Mr. Foppiano described earlier -- the rules that you described earlier.

Q. And what conclusion do you reach from this?

A. That the Citgo Unit has drained their reservoir 3.3 times faster than the Arco Unit.

Q. Are your calculations shown later in your presentation?

A. Yes, they are.

Q. And then page two of Exhibit Number 1 basically states the conclusions that you've just stated?

A. Yes.

Q. Okay. Let's go to page three of this exhibit, and explain what this is and how it differ

from Exhibit Number 1.

A. This shows how the Citgo Unit has overproduced its allowable because now I've superimposed their allowable line of the 2,213 reservoir volumetric barrels per day that you heard from Order R-4804 on this curve, and it's shown there as the black line. It shows that they've been overproduced from the very beginning of their unit when the unit was formed in June of 1974. It shows that they did not make up any overproduction until basically when they were shut in for a gas contract market in 1988. You can see the large dip below the black line where the red curve takes a large dip below the black line.

Q. And how allow does this performance by Oxy, based on your calculations, compare with the way Arco has produced its unit?

A. Arco has remained within its allowable for the life of this unit.

Q. Let's move to what is marked as Arco Exhibit Number -- page six in Exhibit Number 1, and I'd ask you now to review that.

A. This is now has the Arco allowable superimposed on it, and it also is shown in black from the orders and rules that apply under Order

Number 4549. It shows that the Arco allowable was changed in 1984, but we'll address that in a minute, that that change occurred because we demonstrated that by going to a surface allowable that we would be able to increase natural gas liquid recoveries by 3.3 million barrels of NGO by going to that surface allowable, and that we received that surface allowable contingent on re-injecting all available residue gas.

Q. And those conclusions are set out on what has been marked as page seven to Exhibit Number 1?

A. Yes, they have.

Q. And, Mr. Smallwood, there's a graph on page eight. What is that graph designed to show?

A. Just that we were remaining within our allowable from the time we went to a surface allowable contingent upon re-injection of all available residue gas. That 65 million cubic feet per day allowable. We've produced below that rate.

Q. And the red line on this exhibit indicates, what, the production rate?

A. The production of wet gas from the Arco Unit.

Q. And then the black line is the --

A. 65 million a day allowable.

Q. Okay. Let's go now to what has been marked as Exhibit Number 9.

A. Exhibit Number 9 shows why Arco is concerned about the Oxy voidage rate. This is a contour map on the top of the reef, and their tracts are shown in the yellow area, and some of the other windows are shown in green, and then everything that's not shaded basically, is the Arco-operated Empire Abo Unit. The contour indicates that their roof -- or their unit is located very near the crest of the reef. If you were to follow this shade here that's shaded yellow down the page, you could see a front, or what we're calling a front elevation, it shows the top of the reef and the base of the reef. And you could see that once again there, that it's almost at the very top of the reef, not quite at the top of the reef.

Q. How much of this reef is actually productive formation? The 200 feet indicated here?

A. Well, this front -- this west to east front elevation actually indicates the total -- the very top of the reef and the very base of the reef, and there's some drape in this reservoir, so where their unit is located, it's not as thick as depicted on this west/east front elevation.

Q. Could you just briefly state what is Oxy's concern about the way you understand -- or Arco's concern about what you understand to be the way Oxy is operating their unit?

A. The fact that they have overproduced their allowable and caused drainage to migrate and cause a pressure sink in their reservoir, and since they're located at the top of the structure, gas is going to migrate up to their leases.

Q. How do you understand the allowable for this Citgo Unit to be calculated?

A. I think I've shown that on page ten.

MR. MORROW: Page what?

THE WITNESS: Page ten.

Q. (By Mr. Carr) What is this material on page ten?

A. Basically it says that what we've seen before, that Rule 3 from their Order R-4808 sets the allowable at 2,213 reservoir barrels per day, and that it goes on and says under Rule 8 that you would use attachment A and Attachment B of this order to do these calculations with.

Q. And there's really no dispute with you and Oxy as to what is required in terms of the actual calculation to be used to determine the allowable;

is that right?

A. In our data exchange before this meeting, we agreed with that.

MR. MORROW: Can you repeat that answer, please?

THE WITNESS: When we exchanged data before this meeting, we appeared to be calculating -- using these equations the same way. Let me explain a little bit more for Mr. Morrow. They have given us a new tabulation on a new spread sheet where they've applied different numbers, and I haven't been able to really check all those. Before we met we were using the same calculations.

Q. And the same method is being employed, is it not, Mr. Smallwood? The input factors may change, but you're using the same basic approach?

A. Yes, I believe we are.

MR. MORROW: You're in agreement on the approach. You don't agree on the pressure every time?

THE WITNESS: Yes, sir.

MR. MORROW: But the basic data and the way you do it, you're all in agreement on; is that correct?

THE WITNESS: Yes, sir.

Q. (By Mr. Carr) Now what do you have to know about the Citgo Unit to use the OCD's prescribed formula and calculate an allowable for that unit?

A. You have to know the pressures, and you have to know oil production and gas production and gas injection, but the pressures are the things that we're cuming on right now.

Q. So the pressures are the -- in your opinion, what is the key area of dispute between Arco and Oxy in making the computations of allowable for the Citgo Unit?

A. It looks like it's the way they've reported the pressures -- or calculated the pressures -- at the reservoir midpoint minus 2,264 feet.

Q. Now, have you calculated the reservoir pressures for the Citgo Unit?

A. Yes, I have.

Q. And in doing that, what was the source of the information you utilized in making these calculations?

A. Their form C1-24s, and when they were not available we used the New Mexico Statistical Reports.

Q. So this was the base information that you used?

A. Yes.

Q. All right. Let's look at the tables on pages 12 through 14 of Exhibit Number 1, and I would ask you to explain to Mr. Morrow what these tables are designed to show.

A. These tables show the pressures from their form C1-24s and from their statistical reports. The first row represents the year and what the pressures were reported. The second row represents the datum at which they reported on the form C1-24s. Rows three through eight are the actual wells and the actual pressures reported on each of those actual wells, and they're in the Citgo Unit.

Row 9 is the aeromatic average of those pressures for each year. Row 10 is a porosity foot weighted average for each of those pressures that were reported. We assign a porosity foot factor for each wellbore and weighted the pressures accordingly to come up with a weighted average reservoir pressure for the unit.

Row 11 is the porosity foot weighted average pressure moved to the datum of minus 2,264 feet as required by Order 4808.

Q. And then line 12?

A. Line 12, these are the pressures that the

operator used when they reported monthly to the commission to calculate allowables and to calculate voidage.

Q. All right. Now, Mr. Smallwood, why did you include a column -- the column, or line ten, the porosity foot weighted average?

A. Because this is a more thorough method of calculating a weighted average for the -- average pressure for the reservoir.

Q. Had this approach been used in previous studies concerning the Empire Abo Unit?

A. Yes, it has.

Q. Now, when you actually calculated a reservoir pressure at a datum of minus 2,264, how did you derive a gradient?

A. I used the gradients that were off of their form C1-24s.

Q. And using that, that is how you actually came up with these particular pressures?

A. Yes.

Q. Now, if we look at the bottom line, these are the pressures that were reported annually, what is the source of the data in that bottom line on this exhibit?

A. These are from the operators monthly

letters to the commission. Each month they're required to report a pressure project maintenance report, and to report voidage, and report their allowable status, and they have to calculate their allowable. And as you've seen, we have to use pressures to calculate allowable, and they report those pressures when they report to those calculated allowables.

Q. How do the reported pressures on the allowable letters compare with the pressures that were reported on the C1-24s?

A. Well, they're much greater.

Q. Is that a consistent pattern?

A. Yes, it is.

Q. And if the pressures used to calculate allowable, or reservoir voidage are higher than the actual measured pressures, what does this actually do to the allowable?

A. It allows you to produce more than you're entitled to by the order.

Q. Would it result in higher allowables?

A. Yes.

Q. And if a different pressure gradient is used and a higher pressure results, will this make your calculations -- and different pressures

result - will this make your calculations different from the ones presented by Oxy?

A. Yes.

Q. You were here for the presentation of -- testimony -- by Mr. Foppiano, were you not?

A. Yes, I was.

Q. I'd like to ask, do you have a copy of his exhibit with you?

A. Yes, I do.

Q. I'd like to go to the Exhibit Number 8 in the Oxy booklet. Mr. Smallwood, did you hear Mr. Foppiano explain how you would take data and actually compute a gradient?

A. Yes.

Q. If I understood that, it was basically, you took the difference in the measured pressures and divided that by the difference in the depths; is that how you understood it?

A. That's right.

Q. Let me hand you what I have marked as Arco Exhibit Number A and ask you if you could identify that, please?

A. That's the C1-24 for the Citgo Empire Abo Unit for -- dated 1-29-80.

Q. And where did you obtain this C1-24?

A. From the operator.

Q. Now, if we would look at the first table behind Exhibit Number 8, that is a table for the Citgo Empire Abo Unit Well Number 109. Do you see that?

A. Yes.

Q. If you would look down to the column dated 10-22-80, would you go over and -- what is the gradient that was reported by Oxy in this exhibit?

A. In the column 10-22-80 you'll see they use a gradient of .374 psi per foot.

Q. From the C1-24 filed by Oxy have you computed a gradient?

A. Yes, I have.

Q. And what sort -- what gradient do you get utilizing the information on the C1-24?

A. .1 psi per foot.

Q. Could you just explain to the Examiner how you get that .1?

A. By taking the pressure measured at the two depths and taking a difference in calculating them, and I might walk you through, Mr. Morrow, through the firm C1-24 to do that.

Q. If you would. What are the two pressures that were measured?

A. The two pressures are the pressure that is reported as the observed pressure of 1,150 on the form C1-24.

Q. That's the last number before we get --

A. And the observed pressure is measured at a test depth of 5,600 feet, also reported on the form C1-24.

Q. All right. Now, what is the other pressure that you used? The first pressure is 1,150?

A. Uh-huh. The other pressure I use is the pressure that they report on the C1-24 at a datum of 1,191 which also shows -- the 1,191 -- and that datum that is shown up in the upper right-hand corner, the C1-24, is minus 2,400 feet.

Q. All right. Now the first thing Mr. Foppiano said we should look to is the difference in the measured pressures. What do you get?

A. Well, subtract 1,150 from the 1,191 and you get 41 pounds.

Q. Now, when we then divide this by the differences in depths, what do you get for the differences in the depth here?

A. You have to take the 5,600 at test depth minus the 3,610, which is the elevation, and you get

1,990. Subtract that from 2,400, the datum depth.

Q. You get 2,010, don't you?

A. Just doing it to make sure. Yes.

Q. Okay.

MR. MORROW: Where did you get the elevation?

THE WITNESS: Form C1-24.

Q. (By Mr. Carr) And what difference do you get in the depth of these reported measurements?

A. 22 and minus 2,400 is 390 feet.

Q. Okay. And then what do you do with that number?

A. You divide the difference in the pressure readings by that number, which is 41 pounds.

Q. Divided by 390?

A. Uh-huh.

Q. And what do you get?

A. About .1 psi per foot.

Q. And so is that how you would compute the gradient for these wells?

A. Yes.

Q. Have you computed the gradient for all of the wells shown on this particular C1-24?

A. Yes, I have.

Q. And when you do that, have you been able to average those numbers?

A. Yes.

Q. And what average do you get from the gradient -- using your method -- that you would compute from this data?

A. A gradient of 0.7.

Q. So what was the average gradient that you would get?

A. The average gradient for the numbers of the C1-24 is 0.7 psi per foot.

Q. Now, Exhibit Number 8 in the Oxy material also had a reported gradient for each of these wells for October of 1980, do they not?

A. Yes.

Q. And have you been able to average the gradients that they report?

A. Yes.

Q. And what does that come out to be?

A. .27. Almost four times as much.

Q. And so, Mr. Smallwood, when you use the data reported by Cities on their C1-24, what kind of a -- you get what average gradient?

A. Point two seven.

Q. And when you use the material that they have used and reported in their exhibit, what sort of gradient did they get?

A. Excuse me. The one I used. They got an average of .27 psi per foot.

Q. That's from Exhibit 8?

A. Right.

Q. And you got?

A. An average of .07 psi per foot.

Q. And that's from the C1-24?

A. Yes.

Q. And what is the approximate difference with those forms?

A. It's almost a factor or multiple of four.

Q. Now, if Oxy is using four times the gradient that you are in converting measured pressures to the minus 2,400 depth, what is that going to do to the calculating on both sides?

A. It's going to make them different.

Q. And in doing that, what we've got here is your information based on the C1-24 and bottomhole pressure information being the basis for the Oxy calculations?

A. I'm not sure that I understand what their basis is.

Q. Do you have anything available to you or are you aware of anything that you would look to other than the reported information to try and

determine these gradients?

A. No.

Q. If we look at the exhibits on pages 12 through 13 of Exhibit Number 1, line 12 shows the report used to calculate allowable; isn't that right?

A. Yes.

Q. And that would also be --

MR. MORROW: You're back in your book now?

MR. CARR: Yes, sir, I am.

MR. MORROW: On what page?

MR. CARR: On page 12.

Q. (By Mr. Carr) The bottom line shows pressure reported by the operator in the allowable letters?

A. That's right.

Q. Would that pressure on that line also be used to calculate reservoir voidage?

A. They do when they calculate their allowables.

Q. If we go through those numbers we have for 1977, the number of 1,321. Do you see that?

A. Yes.

Q. And then we have for 1988 the same number?

A. Yes.

Q. Is it typical for these numbers to be the same year after year?

A. No, not at all.

Q. In fact, they repeat each other more than once, do they not?

A. Quite often.

Q. In fact, for calculation of allowable in voidage, we have five years where the same pressure is utilized in mid-1988; do we not?

A. Yes, we sure do.

Q. All right. Let's go to page 15 of Arco's exhibit, and I'd ask you to simply identify that and review it for Mr. Morrow.

A. Well, this is line 11 and line 12 from the previous exhibit. It shows the pressures that they use in their allowable requests and their allowable calculations in the first column for each year, and it shows pressures that are off their form C1-24s in the statistical reports in the second column. It indicates that they used a higher pressure in 14 of the 15 years than what was indicated by the statistical data.

Q. Let's move to page 16 in your exhibit?

A. This is a plot of the same data. It's just a graphical depiction of it, and you can see the red

line is the curve they calculated allowables from, and it's much higher than the line that's from the statistical reports and C1-24s, and you can also see how the pressures remain constant for years at a time, which is an almost impossible situation.

Q. Have you recalculated Oxy's prior allowable based on the formula set forth in Order R-4808?

A. Yes, I have.

Q. And in doing this, what pressures did you use?

A. I used the pressures from the statistical report and form C1-24s that are shown on the black line.

Q. And then have you also adjusted these as to a datum of a minus 2,264?

A. Yes.

Q. Let's go to page 17, and I would ask you just to identify that.

A. That's the voidage equation from the Order R 4808 to calculate the reservoir voidage with a credit for gas injection included.

Q. And this is just the attachment to the order?

A. Yes, it is.

Q. Okay. Page 18 in your exhibit book is

what?

A. This is the attachment to the order of the PBT properties that are to be used in that calculation in that equation one.

Q. Now, in utilizing this Attachment B on page 18 of our exhibit, how is this utilized?

A. Well, you measure the pressures like we've all discussed and you report them, or compute them, at the reservoir midpoint of 2264, and then you enter the table and select the appropriate (Bo), (Bg), and (Rs), and apply them to the equation that was shown on the previous page.

Q. And in doing that you can calculate reservoir voidage?

A. Yes.

Q. And calculate allowable?

A. Yes.

Q. If you use the wrong pressure because you converted it incorrectly, what would that do to this table and calculations?

A. Well, you use their own -- you come up with the wrong (Bg) and wrong PBT factors.

Q. And what does that mean in terms of reservoir voidage calculations?

A. That means you calculate the wrong voidage.

Q. If you're using too high a pressure, what would that do to the calculation of reservoir voidage?

A. It would calculate -- it would allow you to produce at a higher allowable than intended by the owner.

Q. Okay. Let's go to page 19. Could you explain to Mr. Morrow what this shows?

A. This is the -- I'll go through this by columns. First column is the year and then gas production is shown on Column A, gas injection under Column B, oil production under Column C, and then Column D is the actual yearly voidage as calculated by the equation that we just referred to. Column E is the yearly allowable which is 2,213 reservoir volumetric barrels per day times the number of days in the year, and you might note that their order was in effect as of June 1974, so their first year -- their 1974 -- shows a smaller allowable in Column E to reflect the number of days that were in that year from the time it was sited in June of '74, and that leap years are included as you go down through Column E. The difference is shown on Column F, which is a yearly voidage minus the yearly allowable, and that means because I've taken the

voidage minus the allowable, overproduction shows as positive.

Q. And what does this tell you in terms of the status of the Citgo Unit?

A. Well, it shows you that it's produced above the 2,213 allowable.

Q. Now, is this intended to be a computation of the cumulative over-or-underproduced status of this?

A. It's the first tip. You must also consider the status of the gas bank before you automatically cume up these over and underages.

Q. Okay. And could you just state -- we've discussed the gas bank -- what it is that you understand this gas bank to be?

A. The gas was intended to allow the unit to maintain allowable production during times of injection, compressor shutdowns and similar problems.

Q. And on page 21 of your exhibit, is there a definition of the gas bank?

A. Yes. And that's what I just read.

Q. Okay. Are you aware of anything in OCD rules or orders that would permit accumulation of an allowable to the Citgo Unit other than the provision

of that bank?

A. No.

Q. Let's go then to page 22 and I'd ask you if you would point out what you believe to be the relevant portions of Order R 4808 as it relates to the gas bank?

A. Well, Rule 7 is the rule that defines as termed reservoir voidage balance gas and that's basically a baseline. Once you determined how much that is, if you inject above or below that amount, then you get accredited or debited to the gas bank. Rule 9A indicates that the volume of gas injected in a project in any month of the excess of the reservoir voidage gas shall be credited to the gas bank and carried cumulatively forward, but the important thing I think is -- or one of the most important things -- is Rule 9E.

" When there are insufficient credits accrued to the gas bank to bring actual injection plus applied credits up to the reservoir voidage balance gas requirement during any given production month, production for that month shall be reduced to an amount commensurate with the average daily reservoir voidage set forth in Rule 3. Production beyond this amount shall be considered

overproduction and shall be compensated for by underproduction during the following month."

Q. Now this addresses how -- this is how Order R-4808 covers overproduction?

A. Yes.

Q. Is there anything in this order which addresses the carrying forward of underproduction?

A. With the gas bank?

Q. Either way. Does the gas bank address that?

A. The gas bank is a method for carrying forward underproduction.

Q. And how does that work?

A. "When you have produced less than 2,213 reservoir barrels per day, you will calculate an amount of reservoir voidage balance gas that is less than what you re-injected." So the difference between those two will be the amount that you credit to the gas bank and then you can use it at a later date.

Q. Now, other than the gas banking provisions in this order, are you aware of anything that permits the carrying forward of underproduction to be made up at a later day?

A. Oh, no.

Q. Okay. Have you calculated the gas bank status in the Citgo Unit in terms of the over and under status?

A. Yes, I have.

Q. And is that calculation what is set forth on page 24 of this exhibit?

A. It's not shown on page 24 because it came out to be negative.

Q. Okay. Well, let's go to 24, and explain to me what 24 shows.

A. Because the gas bank was negative for all the years, we basically went back and cumed up the overage and underage from the previous exhibits and show a cumulative of overage status.

Q. Okay. And that is set forth on page 24 in what column?

A. In Column G. In my first set of columns A, B, C, D, E and F have been previously shown, I believe it was on page -- on page 19. And once we investigated the status of the gas bank and found that it was negative all these years, then it became obvious that there was no method for them to produce above 2,213 for all this time.

Q. Now, in Column G we have numbers that show the over/under status in terms of reservoir barrels

by year, correct?

A. Yes.

Q. And this is carried forward on a cumulative basis; correct?

A. Yes, it is.

Q. And in getting these numbers you actually looked at, what, annual numbers? Or did you review it on a month-by-month basis?

A. I reviewed it on a month-by-month basis.

Q. Now, this cumulative column, is that consistent with the provisions of Order R 4808?

A. No. You're required to shut in and to make up overproduction in the following month.

Q. So in essence what we should have had in here are a bunch of zeros; isn't that right?

A. That's right.

Q. Now, when you get down to the last several lines in that column, in the line from 1987, that's line 14, you have a zero?

A. Uh-huh.

Q. Could you just from that point on explain why you have those two zeros and then the numbers that follow?

A. The 1987 was when the unit was -- the gas -- the unit came into balance in 1987.

Q. That was during the period of time when there wasn't a market for the gas?

A. That was shortly before that. I believe that was during the period of time when they were re-injecting all their wet gas and not stripping down.

Q. All right. Then we have a zero for the next year. Why do we have a zero there?

A. Because that was when they were not injecting gas and selling gas and had no -- no gas bank.

Q. Were you carrying forward or accumulating allowable for them during that year?

A. No.

Q. And then we go to 1989. What is the basis of that number?

A. That's simply from Column F. That's the amount of overproduction based -- compared to the 2,213 reservoir barrels per day allowable.

Q. And that continued in 1990 which gives you the 650,000 reservoir barrels; is that right?

A. Yes, yes.

Q. Is that what your calculations show to be the overproduced status of the Citgo Unit?

A. 3-19-90 it does, yes.

Q. And has it continued into 1991?

A. Yes, we think it has.

Q. And this is based on the calculations of allowables from the OCD Order R 4808?

A. Yes.

Q. And the pressures that you got from the C1-24s?

A. Yes, it is.

Q. And the gradients that you obtained in the method you explained to Mr. Morrow?

A. Yes, it is.

Q. All right. Mr. Smallwood, your conclusions are set out on pages 25 and 26. Let's go to page 27, and could you identify this for the Examiner?

MR. MORROW: What number did you say?

MR. CARR: Page 27.

A. Page 27 is a tabulation of production and injection for their unit for the life of the wells on that unit. The first column is oil produced per year. That's Column A. Column B is accumulation of the oil produced. Column C is gas production per year. Column D is cumulative gas produced. Column E is gas injection per year, and Column F is cumulative gas injection.

What I want to show on this page is that

the cumulative gas produced has been 21.2 BCF at the end of 1990, which is shown in bold at the bottom of Column D, and also shown at the bottom of the page, and the cumulative gas injected is 10.6 BCF, and that difference between those two numbers is coincidentally 10.6 BCF, and that is the amount of gas that has been recovered or consumed from this unit.

Q. With these numbers, have you been able to calculate the percentage of the original gas in place under the Citgo Unit that has been produced through 1990?

A. I have calculated the original gas in place and the percent recovery of that gas in place.

Q. And is --

A. That's shown on the next page, page 28.

Q. All right. Let's go to page 28, and I think you ought to review for Mr. Morrow the source of the information that you used in this calculation and what it shows.

A. We've used two major reservoir studies. One of them is a 1968 joint engineering committee study that was performed by the joint group that worked up these proposals out here for the Arco Unit, participated in by all parties that wanted to

participate and had an interest in the field, and the other one is the October '70 Arco field management study, both of them having very similar information and data in them.

Column one is from those studies. Column two, three, and four are from those studies and are also in the PVT attachments, I believe, to the two orders to calculate reservoir voidage within the initial formation of volume factors for oil and gas and solution gas ratios is what I'm referring to there.

MR. MORROW: What page are you on?

MR. CARR: We're on page 28.

Q. (By Mr. Carr) Mr. Smallwood, the items in Columns 3 through 5 are from the attachment to OCD order 4808. That's attachment B, two through four?

A. Two through four.

Q. Two through four.

A. Yes.

Q. All right. What's the source of the figure on line five, the original oil in place number?

A. That's in the October '70 Arco field management report.

Q. Okay. Then item six is what?

A. It shows the original gas in place is equal

to the free gas in place plus the gas that was in solution.

Q. All right. Now, in 7 -- line 7 -- you show how you compute the free gas; is that correct?

A. Yes.

Q. And what did you get?

A. 316 million cubic feet. In line 8 I showed how to compute the solution gas, and I got 5.56 BCF.

Q. And so you simply add those two?

A. Yes, to come up to original gas in place as shown in line 9 of 5.878 BCF.

Q. And you compare to that, what, the volumes that you show on the preceding page?

A. Yes. The 10.6 BCF of produced gas and the original gas in place of 5.878 BCF indicates that the percent recovery has been 180 percent of the original gas in place.

Q. And what does this actually mean to Arco as the operator of the offsetting unit?

A. We computed a material balance on the Citgo Empire Abo Unit to calculate that.

Q. And that's what your material has forth on page 29?

A. Yes, it is.

Q. Okay. Let's go to that, and I'd ask you to

review that for Mr. Morrow.

A. This is a solution to the generalized material balance calculation from Mudcraft and Hawkins textbook, and we basically saw the calculated gas influx for the generalized balance equation. Column F shows the accumulation of the gas that has influxed into the Citgo Unit, and in 1990 -- at the end of 1990 -- it is 7.1 BCF that has migrated to the Citgo Unit.

Q. And this was just a standard engineering calculation?

A. Yes.

Q. And you drew it from Mudcraft and Hawkins?

A. Yes.

Q. And this is the volume that is based on your calculations and the data that you've used, has actually moved from the Arco Empire Abo Unit into the Citgo Unit?

A. That's right.

Q. Now, Mr. Foppiano testified about the pressure differential between the two units. You were present for that, were you not?

A. Yes, I was.

Q. Have you also taken a look at the pressures that exist between these units?

A. I have.

Q. And is that -- I think I ought to ask you to refer to the graphs on pages 31 through 36 and just explain how you understand the pressure differential to be.

A. Page 31 is a map that shows a location of the wells in both of the units that are near the Citgo Empire Abo Unit, and it shows when the wells were shut in, and I might just point out, the Arco Well G17, which is located by the column of letters on the left-hand side of the page, you see the G, H, I, J, K, and then the numbers as you go across the page by the wells. So the G17 is located up in this corner of the map right here. That well was shut in in 1975 as was the well beside it in '75. The well south of it was shut in in '76 and '78 many of the -- well H12 on the other side of the Citgo Unit was shut in, and H12 was shut in in 1975. These wells were shut in the Arco Empire Abo Unit to conserve reservoir energy and produce low down structure. At the same time, if you look at the shut-dates dates on the Citgo Empire Abo Unit, you can see that most of those wells are on there in those times. Their first well was shut in in 1975 -- excuse me -- 1979 when they shut in the Number

14 and the Number 4, and then no more wells were shut in until '83, so they had wells on -- producing all this time while the Arco Unit had wells that were shut in and trying to maintain reservoir pressure for the rest of the unit.

Q. All right. Now, let's, as background, go to the graphs, and I'd ask you just to explain what the following graphs are intended to show.

A. These are a series of plots that compare pressures from wells that are in each of the two units; pressures that were measured on the form C1-24s. You can see the Arco curve is always shown in red and the Citgo well is always shown in black, and in most cases, the general trend has been that the Arco pressure is greater than the Citgo Unit well pressure.

Q. All right. Well, let's go to the graph on page 37 of this exhibit, and I'd ask you to review and explain those.

A. Page 37 are the pressures shown again. The pressures from the allowable request letters, or the letters that were used to calculate allowables, are shown in red again.

Q. And we've had that curve before on several graphs?

A. Yes, we have, and the pressures that are shown in black are from the Citgo Unit form C1-24 as we've had that pressure -- that curve -- shown before, and this time we've reported the pressures from the Arco Unit on the Arco form C1-24s and they're shown in blue, and you can see that since the time of 1982 the Arco Unit has had higher pressures than the pressures reported on the C1-24s from the Oxy forms.

Q. And what does this -- what would this cause?

A. This would cause drainage from the Arco Unit to the Citgo Unit.

Q. Now, let's take a look at the graph that's set forth on page 38 of this exhibit.

A. This is a plot of pressure versus cumulative voidage for poor volume, and it shows, once again, that the Citgo Unit is being drained faster than the Arco Unit. I picked an arbitrary pressure there of slightly greater than 900 pounds to describe this one. You can see the red arrow that's coming across from the Y axis there, and it intersects the Arco Unit curve shown in black at a time that occurred in 1987, and the voidage at that time for poor volume was slightly under 500

reservoir volumetric barrels per 1,000 volumetric barrels. While at the same time --

Q. So in the Arco Unit when we got to this pressure of a little over 900 pounds, there had been voidage of slightly less than what? 500 what?

A. Reservoir barrels per poor volume reservoir barrels.

Q. Now, compare to the curve that reflects the Citgo Unit.

A. You can see that that occurred after 1984 but before 1985, so they reached that reservoir pressure more than two years before the Arco Unit did, and that occurred because they had already voided almost three times as much more, as you can see, down on the axis where the arrow points down to between 12 and 1500.

Q. So we if can see this 3.3 times voidage ratio by just noting where the arrow comes down from where the Arco Unit hit that 900-plus pound pressure and compared to when the Citgo Unit hit that pressure?

A. Yes, that's right.

Q. All right. Now, Mr. Smallwood, let's go to your graph on page 39 and I'd ask you to explain what that is.

A. This shows the gas-oil ratios versus time for the two units, and it shows when gas injection started in each of the units. The Citgo Unit is shown in red, and the Arco Unit is shown in black. You can see that the Citgo Unit has been very inefficient just by looking at the gas-oil ratio.

Q. Okay. Anything else on that one?

A. That's it.

Q. All right. Let's move to the graph on page 40.

A. This is a plot of the gas-oil ratio for the two units versus the cumulative voidage per poor volume, and you can see that the gas-oil ratio for the Citgo Unit is shown in red and that it's much higher, and one reason being because it's been voided so much more than the Arco Unit has relatively.

Q. Okay. Would you identify for Mr. Morrow the information contained on page 41 of Arco Exhibit 1?

A. This is a summary of the comparison of the two units. We show the original in place for each of the two units. You show the oil fill poor volume that's in place for each of the two units, and the hydrocarbon poor volume, and then we calculate the

gas recovery for the two units to date, and the Citgo Unit has recovered 180 percent of its original gas in place, and the Arco Unit only 36 percent of its original gas in place. The oil recovery is shown in line six, and the Citgo Unit has recovered 72 percent of its original oil in place while the Arco Unit has recovered only 56 percent of its original oil in place.

Q. Okay. At the time the Arco Empire Abo Unit was being proposed, were projections made as to how this unit was expected to perform?

A. Yes, sir, it was.

Q. And would you refer to page 42 and identify and review that for Mr. Morrow?

A. This is a graph of the predicted production rates, as predicted by the reservoir simulator versus the actual production rates.

Q. And what does this show?

A. This shows that the simulator did an outstanding job of predicting and forecasting the rates of the unit.

Q. Now, Mr. Smallwood, let me ask you, does this tell you anything about the estimates that you originally had concerning original oil in place and original gas in place?

A. It tells us that the estimates that were in the Arco study of 1970 must be right.

Q. And what does Arco recommend be done to correct the situation in the Empire Abo pool?

A. Our recommendations are shown on page 43. We recommend shutting in the Citgo Unit until all overproduction is made up because the Arco Unit is 84 times larger than the Citgo Unit. We recommend allowable for the Citgo Unit of 1/84th of the estimated Arco voidage of 18.8 million reservoir barrels per year, or 613 reservoir volumetric barrels per day.

Q. Now, at the current rate, I believe Mr. Foppiano said was something in the neighborhood of 700 barrels a day? This is less than what they are currently able to produce?

A. This is less than what they are currently able to produce. Their allowable right now is 2213. He estimated that their current gas production rate at the surface is at about 700 MCF per day.

Q. By converting gas rates and confusing those with reservoir barrels?

A. Yes.

Q. Which I've done all week and all month. Do you recommend that any other changes be made in

Order 4808?

A. Other than adjusting the allowable from 2,213 to 613 reservoir volumetric barrels per day, no, we do not.

Q. Do you -- you have been present to and familiar with what Oxy is proposing to be done in this unit?

A. Yes, I have.

Q. Based on your study of the reservoir, do you have an opinion on whether or not Oxy is, in fact, overproduced?

A. Yes. I believe they're overproduced.

Q. And when they assert that they are underproduced, do you have an opinion as to what is the source of this difference between Arco and Oxy as to the overproduced and underproduced status?

A. Well, early on it's the pressure information, but later on it's the -- their willingness to carry forward underage when there is no mechanism in the order for that to occur.

Q. If they were underproduced, do you believe it would be appropriate now to permit them to have a special allowable exception to now recover underproduction?

A. No.

Q. Do you agree that it would be appropriate to simply place the wells in the Arco Unit under state wide oil allowables?

A. No.

Q. And why not?

A. Because we're recovering oil in a pressure maintenance project, and this is an ongoing, viable project.

Q. If their requested allowable rate was granted, what impact would that have on the Arco Unit?

A. It would cause more damage.

Q. In terms of reservoir voidage, what would you expect to see?

A. If the rates that they requested were granted, they would be more than twice the rates they're at now, and that would make their voidage at almost 6.6 times as fast as the Arco Unit is.

Q. If their requested relief is granted, what would that do to their ability to recover gas from the unit?

A. It would impair the Empire Abo Unit owners' correlative rights.

Q. And why is that?

A. Because it would be draining reserves from

the Arco Unit.

Q. Would that, in your opinion, have an adverse affect on your operation?

A. Yes.

Q. Does the production of this gas from the reservoir have any impact on the pressure maintenance project other than just the volumes that are lost?

A. Yes, it reduces the pressure in ultimate recovery of the reservoir.

Q. In terms of the Arco gas bank that's been raised here a couple of times, Mr. Smallwood, what are the benefits to Arco at this time of the gas bank?

A. Well, we're recycling gas at a slightly higher rate than the 65 million cubic feet per day today for some of the first time in the life of our unit. We're at about 70 million cubic feet a day, and because of that extra 5 million cubic feet a day of production, which is all reinjected back into the ground, we're making about 50 barrels of oil per day more than we would for the unit.

Q. When we get to what we call "blow down" of the unit, how will the gas bank factor into production at that time?

A. The gas bank is contingent upon re-injection of available residue gas.

Q. What about those volumes when we get to "blowdown"? How will that -- is that an important factor to Arco at that time?

A. No, not that we agree on.

Q. What would your production be restricted to when you start selling gas?

A. We think it will still be at same 65 million a day based on the capacity of the two plants that receive the gas.

Q. Do you have anything further to add to your testimony?

A. I think that's enough.

Q. Were exhibits -- was Exhibit 1 prepared by you?

A. Yes, it was.

Q. And Exhibit -- Arco Exhibit A is just a copy of a form C1-24 that was supplied by Oxy?

A. Yes.

MR. CARR: At this time, Mr. Morrow, we would move the admission of Arco Exhibit 1 and Exhibit A.

MR. MORROW Exhibit 1 and Exhibit A are admitted.

(Arco Exhibits 1 and A were

admitted in evidence.)

MR. CARR: And that concludes my direct examination of Mr. Smallwood. One other thing, we have copies of the basic studies, which I think everybody has used here, the early ones.

MR. KELLAHIN: The '70s study?

MR. CARR: Right.

MR. KELLAHIN: We haven't used it. We don't like it.

MR. CARR: We have used it. I would like to offer -- I would like to offer two studies; correct?

THE WITNESS: Yes, sir.

MR. CARR: As Arco Exhibits 2 and 3. These are the studies that we had utilized in preparing these calculations.

MR. MORROW: We'll be glad to accept those, and if you'll go through and explain them. I'll be happy to do that if you'd like, right after lunch.

MR. MORROW: I don't need them for my private study. If you'd like to have them explained and tell me what's in them, I'll be glad to accept them.

MR. CARR: You don't want every page explained, do you, Mr. Morrow?

MR. MORROW: Well, I want to know what we're getting.

MR. CARR: Okay. We'll take a few minutes after lunch when we get back and tell you what they are and how we used them.

MR. MORROW: How much more time do you think we have before the end of the day to spend on this?

MR. KELLAHIN: I need to regroup during the lunch break. I don't know what we're getting into in the 1970 engineering studies.

MR. CARR: You know, we may decide not to offer those. The purpose was simply to have all the data before you and we thought it would not create --

MR. MORROW: Well, it must have been submitted in the original record.

MR. KELLAHIN: That's right. It was submitted -- the '68 study was.

MR. CARR: It was already submitted, and we're not attempting to throw in pages and pages except for the data that we used.

MR. KELLAHIN: Maybe we should hold this and talk about it among ourselves.

MR. MORROW: We'll be glad to take it, but we don't just want volumes and volumes coming in the

record unless we know what we're getting.

MR. CARR: Okay. And we may decide at that point not to put that in.

MR. KELLAHIN: I suppose the easiest way to go about this, I need to ask Mr. Smallwood some questions about his methodology and some of the choices he's made in selecting his parameters, but I suspect I'll call a rebuttal witness to comment on his calculations as the most expeditious way to put forward our comments, so I think we can handle it in that fashion, but I would expect it would take another couple of hours after lunch by the time everybody gets through asking questions. I think there's a couple of hours more to do.

MR. STOVALL: It depends on whether you decide to go through this or not.

(Recess taken for lunch at 12:30 p.m.)

MR. MORROW: Already it's 1:45 and Bob said he would be a little late, so if everybody is ready, we'll go ahead and start up again.

MR. CARR: If it please the Examiner, that concludes our direct examination of Mr. Smallwood.

MR. MORROW: Thank you, sir. Go ahead, Mr. Kellahin.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Thank you Mr. Examiner. Mr. Smallwood, you've given us a substantial number of exhibits this morning to support your contentions concerning this case, and in my own layman's way, I would like to see if I couldn't summarize your conclusions and your exhibits to see if I can understand where the focus is of your work in those conclusions.

Am I correct in perceiving that your conclusions and your exhibits are predicated on two basic engineering components, one of which is determining reservoir pressure, and the second one is determining the oil in place underlying the Citgo Empire Abo Unit?

A. Yes, sir.

Q. The conclusions you have made about drainage where you contend that Oxy's operations are draining Arco are going to be predicated on reservoir pressure and the reliability of oil-in-place calculation; is that not true?

A. Yes, sir.

Q. Okay. In addition, the argument you've expressed about the rate at which Oxy is voiding the reservoir and the fact that you contend based upon your study that they are voiding the reservoir at

3.3 times Arco's voidage rate is also predicated upon reservoir pressure and the oil-in-place calculations; would that be true?

A. It's predicated upon the oil-in-place calculations, and to some extent, the pressure.

Q. Let's turn to page 28, if you will, please. You've summarized on page 28 the components that have gone into this material balance volumetric calculation. Am I correct in remembering that item number five, the oil-in-place number for the Citgo Empire Abo Unit is not something that you have independently derived based upon your own analysis, but rather have taken from the 1970 -- the October 2, 1970, engineering study report?

A. Yes. It came from the October '70 study, and was also used by the operator of the Citgo Unit for their presentation and request for their pressure maintenance project in 1974.

Q. Okay. Can you summarize for us without going into all the details, the October 2, 1970, study, the general methodology that was applied in selecting the parameters by which you get the oil-in-place calculation in that study?

A. Yeah. There was an extensive engineering committee evaluation of all the logs and all the

cores in the field, and a great assimilation of data, I believe, something like 75,000 feet of well logs were reviewed, more than 3,000 feet of cored wells were reviewed, porosities versus permeabilities were correlated between logs, and cores and flow capacity charts were generated, and porosity and permeability cutoffs were selected, and net feet were assigned to each well in the field, and a volumetric calculation on each tract in the field was done.

Q. Then you've taken that conclusion and utilized it then in determining the Item 9 on here, which is the gas recovered plus the remaining gas to be recovered to get us the 5.878 BCF; is that what that represents?

A. Yeah. You take data from the study to calculate Item 9. The study reports the numbers that are shown in Item 7 and in Item 5 also, which were used to calculate Item 9.

Q. The parameters selected for the 1970 study calculation were dealing with the interval within the unit described as the gross Abo reef interval, and within that interval then, the calculations were made and the parameters were selected?

A. Yes, that's right.

Q. For the Citgo Empire Abo Unit, do you recall what was estimated based upon that study to be the original gas in place for the Citgo Unit? Is that going to be Item Number 5 on this tabulation?

A. The original gas in place or the original --

Q. I'm sorry. The original oil in place.

A. Item Number 5 is the answer to the original oil in place that was in that study.

Q. Okay. The original gas in place is what amount? Is that shown on this spread sheet?

A. Yes. Item 9 is computed by adding the free gas initially to the solution gas.

Q. Okay. So when I want to determine the original hydrocarbons in place within the Citgo tract, I can look at Items 5 and 9 on this sheet?

A. Yes.

Q. Okay. When we examine -- or you examine as a petroleum engineer -- the question of pressures in the reservoir, you've shown us a number of displays in which, utilizing the information on the C1-24s it gives you a certain projection of pressures within the Citgo Unit. It's in various forms in here, and you may have to help me find one that demonstrates the pressure, but if -- I think one is found on

page 37 if you'll turn to that form.

When we look on page 37 and see the red line that is stairstepped in a decline, that represents your selection of pressure from the C1-24s filed by Oxy?

A. No. The red line comes from the allowable request calculations that were made each month by the operator of the unit.

Q. That allowable calculation will be influenced by the pressure utilized in the calculation?

A. Yes.

Q. For illustration purposes then, can I use that to describe that it appears for a number of years the same reservoir pressure is being utilized for that project to make the allowable calculation?

A. That's right.

Q. As a petroleum engineer, wouldn't you conclude that that is absolutely wrong? That, in fact --

A. Definitely. That's what I've been saying.

Q. It can't be that, can it?

A. No, sir.

Q. When you use the pressures on the C1-24s to make the comparison, when we're not using --

A. I might qualify that a little better.

Q. Yes, sir.

A. There's a way it can be that way. If you look at my material balance calculation on the solution on page 29, if the pressures are that high and that constant, then the only way that can happen is that much more gas is in place than the Citgo Unit.

Q. Well, that's a possibility, that's not a likely probability; is it?

A. For it to be constant pressures like that?

Q. Yes sir.

A. Not likely.

Q. As a petroleum engineer trying to use your best judgment and to accurately determine what is happening between the two projects, wouldn't you do what Mr. Foppiano did, and that is to go to the bottomhole pressure surveys for the individual wells so that you have the raw pressure information to work with in order to assure yourself that your calculations were as accurate as possible?

A. I did what I could. I took the form C1-24s and assumed that the data was right on the form C1-24s.

Q. Okay. When we turn to Exhibit 38, this

calculation has a component of poor volume in it that is again pulled back from the 1970 engineering report; doesn't it?

A. Yes, sir.

Q. What I want to focus on, though, is the pressure portion of the information that goes into the display. Tell me again on page 38 what pressure information you're utilizing to plot the information for the Citgo Unit?

A. The pressure from the form C1-24s at the reservoir data minus 2264.

Q. Okay. When we look at the black line, the pressure information by which you have plotted the black line for the Abo Unit is derived how?

A. We make use of our form C1-24s. We make an isobar map of the Empire Abo Unit each year from those pressures, and then we select a pressure for each well in our unit, and then we poor volume weight them for the entire unit so that we get a very accurate average reservoir pressure for the entire unit.

Q. How many wells are you selecting pressures from to come up to the study?

A. We have a key-well pressure report that we've reported every year since the beginning of the

unit, and it's about 38 wells. It varies plus or minus a few. We've tried to make it some of the same wells throughout the time of the life of the unit.

Q. Do you know whether or not that tabulation -- well, I'm sorry. Take me another step. You take those sample well pressures and then you average them?

A. We make an isobaric map, and from that map we take the pressure -- a pressure on every well in our unit -- and then we average them on a poor-volume-wet basis for the unit.

Q. Would that averaging include wells that are producing wells?

A. Yes.

Q. And would it include wells that are temporarily abandoned?

A. Yes.

Q. And does it include injection wells?

A. I don't believe it does.

Q. Do you know whether or not it includes the M6 Well, the injector M6?

A. I don't know. We make our -- we make -- most of our pressures are measured in a lot of the wells that have been shut in and remain shut in, and

then we make our map from that data -- our isobaric map from that data.

Q. If the pressure information utilized by Arco by which you have plotted some of these displays includes an injection well, that would give you a higher reservoir pressure within your unit; would it not?

A. Yes, it would.

Q. And if you have a higher reservoir pressure, you would correspondingly have a smaller reservoir voidage, would you not, in the calculation?

A. In what calculation?

Q. The allowable calculation.

A. For the Arco Unit?

Q. Yes, sir.

A. If you have a higher pressure you would calculate a lower voidage.

Q. Okay. Tell me something about the reservoir as it now exists. Initially on the dried mechanism in the reservoir, was generally recognized to be a combination of gravity drainage and gas cap expansion, if you will; is that not true?

A. Yes. And also there's some solution gas drive.

Q. Okay. And that by 1984 the dominant drive mechanism in the reservoir became gravity drainage; did it not?

A. Yes, sir.

Q. Have you made an independent study of your own about the magnitude of gravity drainage and its gravity on the productivity of the wells in the unit -- your Arco Unit?

A. No.

Q. Are you able to estimate as an engineer whether or not the ceasing of injection by Oxy into their pressure maintenance project has any type of impact on the productivity of your wells to the south?

A. Simply the ceasing of injection?

Q. Yes, sir.

A. We're not going to address the voidage in?

Q. Not just yet.

A. I haven't made a determination because I couldn't see how that would have a great effect.

Q. With the dominant drive mechanism in the reservoir being gravity drainage, those producing wells in your unit that are down structure are going to obtain the maximum benefit of gravity drainage; are they not?

A. Yes, sir.

Q. Correspondingly, what happens in the reservoir is if the gas withdrawal rates are increased in the gas cap, how can that have any effect on the producing oil wells, if the primary drive mechanism is gravity drainage?

A. Because the pressure has an effect on the rate of production, and as the pressure is depleted the production rate drops, and the ultimate reserves won't be the same for one way versus the other one. It would be less when the pressure is depleted.

Q. Let's turn to the spread sheet, and you may have to help me find it. It's the one that shows the annual calculations that you have made on the Citgo allowable that show the over and underproduction. Is that page 24?

A. Yes, sir.

Q. Okay. Do you have the month-by-month spread sheets that help you prepare the annual summaries that show -- are shown on Exhibit 24?

A. Yes, I do.

Q. Okay. Would you take a moment and get out a set of those, please? Do you have extra copies of those, Mr. Smallwood?

A. Sure do.

MR. MORROW: Page what was that now?

MR. KELLAHIN: I'm looking at 24, Mr. Examiner.

Let me take a moment, Mr. Examiner, and mark this as an exhibit, so that we might introduce it. I'm going to mark this, Mr. Examiner, as Oxy Exhibit Number 14.

Q. (By Mr. Kellahin) Let me have you take Exhibit Number 14, Mr. Smallwood, and let's compare it to Mr. Foppiano's Exhibit Number 10. Do you have a copy of his exhibit book? I'd like to take a moment and look at the spread sheets and then let me see if they have been organized in the same fashion so that each of the columns on Mr. Foppiano's spread sheet corresponds to the column that you have on yours.

A. Would you say that again? I'm sorry.

Q. Sure. When we look at column one on Mr. Foppiano's, he's got the date. The next one is reservoir pressure. Have you organized your spread sheets in Exhibit 14 in the same order of columns?

A. Mine's a little bit different order, but it has some of the same things here. Column A in 9 is the number of days in the months. Column B in 9 is the reservoir pressure. Column C in 9 is the year.

Column D in 9 is the month of the year, and then E, F and G are gas production, gas injection and oil production.

Q. All right. Let's start at H then.

A. Okay.

Q. When we look at H, is that the actual reservoir voidage in reservoir barrels that Mr. Foppiano shows on his spread sheet as reservoir voidage? His is the tenth column over from the left.

A. I'm not real sure what he shows. Mine is the actual reservoir volumetric barrels per day as calculated by the reservoir voidage claimed.

Q. Take the calculation with the pressure. You've got the gas, the oil production, and this is the actual voidage on a daily basis?

A. Yes, in Column H.

Q. Okay. What happens then to complete the calculation as we continue over from left to right?

A. Column I on this spread sheet is a calculation of the reservoir voidage balance gas, which is the amount of gas that's required to be injected to maintain the voidage at 2,213 reservoir barrels per day, which uses the actual gas production shown on Column E and the actual oil

production shown in Column G, and you set the voidage equation equal to 2,213 voidage barrels, then you solve the amount of gas that's needed to be injected to maintain it at 2,213, and that is called reservoir voidage balance gas as shown in Column I.

Q. When I looked at Mr. Foppiano's spread sheet, and it is the third column over from the right, which he's captioned "Over and underinjection," which shows the status on a monthly basis under his calculation for the Citgo Unit, what is the corresponding column letter number in your spread sheet to that column of Mr. Foppiano's?

A. Which column is his again?

Q. The third over from the right. It says "Over and underinjection" -- negative being an under -- so he's got an underproduced situation at the end of June of '75 of a negative 48,000-plus reservoir barrels.

A. I have a little trouble comparing the numbers because he starts in June of '75 which is not when their order became effective. Mine starts in June of '74 when the order was effective. I don't know why he wouldn't go back and calculate reservoir voidage back to the time the order was signed, except that obviously they were not injecting gas

and their voidage was real high then.

Q. I'm sorry. I've confused you because I've misread this. I was looking at the underinjection column, and what I'm really looking for is the cume over and under column, which is five over from the right, if you please. I'm sorry.

MR. MORROW: What's the alphabetic letter for that, Tom?

MR. KELLAHIN: Well, I'm not sure my alphabet goes that high. It's the twelfth one from the left.

A. Which table are you looking at?

Q. (By Mr. Kellahin) I'm looking at Mr. Foppiano's table. I'm on Mr. Foppiano's table and I count 12 columns over from the left, cume over and under. That is his status at the end of any particular month in terms of reservoir barrels. He's either over or underproduced on that spread sheet; right? Are you with me?

A. Yes.

Q. What's a similar column in your spread sheet that gives me your calculation?

A. I'm not sure that that's shown in this spread sheet.

Q. Okay.

A. Let's see. But it may be. It's not.

Q. You don't have a column that does that?

A. That's right.

Q. Okay. We can't do it off your spread sheet on a monthly basis? We have to go back to page 24 and see it simply on its annual basis?

A. Oh, no. You can do it off the spread sheet on a monthly basis. The voidage is calculated in Column L on my spread sheet for the month. That's the actual voidage, and the allowable is 2,213 times the number of days shown over in Column A for the month, and subtract the two.

Q. What's the basis that you have for starting your spread sheet in -- what is that? You started it in what? In September of '74 rather than in June '75 which was the date of first gas injection?

A. The order was signed on June 11, 1974. The order was effective June 11, 1974. The unit was on a reservoir voidage basis from that time forward.

Q. Is there anything in the order that tells you, you commenced the calculation of the allowable as of the date of the order?

A. No.

Q. Assuming your pressures are correct, and everything else in this spread sheet is correct, if you do nothing else than start your calculation with

the June 5th injection date and move the spread sheet back a year, what's the net result?

A. I don't know. I'd have to study that for a while.

Q. Okay. You don't know if whether on the date injection stops in May of 1988, whether or not using all your other assumptions, you're in an over or underproduced situation on the Citgo Unit?

A. You'll have to repeat that one. I'm sorry.

Q. Yes, sir. I take it you haven't taken your spread sheet and seen what would happen if you move the start date for your calculation from the September '74 date back to June of '75 to see what will happen in terms of over and underproduction status in May of 1988?

A. No, I haven't, but I can say that -- as I testified on direct -- that we show that that unit balanced out in 1987. That wouldn't change.

Q. When we look at page 24 and look at the summaries here, is there anything on here to support the contention that Oxy is approximately a million reservoir barrels overproduced?

A. No, and we told Oxy before we met that when we got their pressures on their C1-24s that that was going to change, and it did change, and now they're

overproduced by as much as 549,000 reservoir barrels in 1983 instead of nearly a million in 1986 like we had said before.

Q. Okay. The first calculation you had done was based upon what pressures?

A. Pressures from the statistical reports.

Q. Thereafter then you substituted the C1-24 pressures and you came up with a different volume for the overproduction?

A. Yes.

Q. When you took the C1-24s, describe again for me the methodology you used in converting that information to the proper datum.

A. Okay. The Form C1-24s report an observed pressure at a test depth, and the elevation is shown on the C1-24, so you can take the test depth, subtract the elevation and come up with a subsea depth that the observed pressure was measured at.

Q. How will you know the elevation is shown on the C1-24?

A. It's on them.

Q. Do you know if that's a surface elevation or something else?

A. It's the elevation -- you can subtract the two and come up with a subsea depth, and then the

pressure is also shown at the datum as reported on the form. The datum on some of the forms is minus 2400. On some of them it's minus 2100, so you basically have two pressures at two depths, and you can take the differences and divide them and calculate the gradient that was used by the operator to report the pressure at the datum of either minus 2400 or minus 2100.

Q. This C1-24 reports pressures -- gauge pressures; does it not?

A. Yes.

Q. And didn't you adjust the gauge pressures to the absolute?

A. No, I used gauge pressures.

Q. The Oxy order, when you look at the attachment to their order, requires that the reservoir average pressure at this datum point be an absolute pressure?

A. Yes, sir.

Q. So, to your calculations in your spread sheet we're going to have to add 15 pounds of pressure, are we not?

A. That's right, But I also did it on the Arco Unit and that makes the two comparable.

Q. But it will also cause you to calculate the

incorrect allowable for the Citgo Unit?

A. Somewhat, yes, sir.

Q. Okay. Think I understand your methodology. When we get down to row 13 on page 24 and you look at the last Column G, and we get the over and under status in reservoir barrels -- the 528716 -- what did you do after that?

A. Well, in 1987 the unit reached a zero status.

Q. How come?

A. And it would have accumulated more except that the gas bank was still in a negative status, and they were still making up a negative gas bank status during 1987. Had they continued gas injection in 1988, the gas bank would have gone positive and they would have been accumulating underproduction, but they didn't. They didn't have a gas bank, so there was no way for them to accumulate that.

Q. So you've made the decision -- when we look at Row 14 for '87, the actual voidage is 133,000, the allowable would have been 807,000, so they have a credit, if you will, in terms of underproduced allowable?

A. You're on Row 13 or Row 14?

Q. Fourteen. For year '87 in Row 14, they could have voided the reservoir at 807,000 reservoir barrels. That was the allowable; right? Am I reading that correctly?

A. Say that last part again.

Q. Sure. Look at Column E.

A. Yes.

Q. You've got 807,000?

A. Right.

Q. That's in reservoir barrels what the allowable equates to on a yearly basis?

A. That's right.

Q. The column before that, D, shows they actually voided only 133,000 reservoir barrels?

A. That's right.

Q. So at the end of the year they've got a credit of 674,000.

A. They would have had.

Q. Why didn't they get it?

A. Except they had accumulated a negative gas bank for all these previous years, and they were still working their own.

Q. So because -- well, gas injection doesn't stop until May of '88; right?

A. Well, and that's right, and had it not

stopped they would have gone ahead and accumulated a break-even position in their gas bank, and they would have been accumulating underage.

Q. Well, where in the rules for Oxy do you cancel the underproduction?

A. There is no method for accumulating -- the method for accumulating underproduction is through the gas bank system.

Q. Okay. So even though at the end of '87 they're underproduced by some 674,000 reservoir barrels, that is not carried forward into 1988?

A. Well, that's not quite right. In '87 they were underproduced by 674,000 reservoir barrels, that brought the 528,000 cumulative from the previous year in Column G down to zero, but then the difference didn't accumulate because they still had a negative gas bank, and the method for accumulating underage is through the gas bank system.

Q. Without that interpretation of working off the gas bank, all of this overproduction in Column G would have been worked off, if you will, in years '87 through '90 by the underproduced allowable?

A. I'm a little bit lost on that one. I show it worked off in '87. You want to say it again or explain it to me a little more?

Q. Sure. When we look at line 13 we have an overproduced 528,000 reservoir barrels at the end of that year.

A. Yes.

Q. And in the next row in that same column it's zero.

A. Yes.

Q. Okay. But if you had carried over from Column F to G the underproduced allowable, you would have had a credit in Column G and it would now be underproduced rather than overproduced, but you zeroed it out based upon your interpretation of the working of the gas bank?

A. Right.

Q. Okay. And so that's the basis for your position that Oxy cannot accumulate and carry forward the underproduction?

A. I'm not -- when?

Q. Well, Mr. Foppiano, in his calculations, shows he's underproduced, but if the Examiner disregards that and determines that he's overproduced based upon your calculation, the recommendation is to have the project shut in, okay?

A. Yes.

Q. If Mr. Foppiano's position is adopted by

the Examiner, he has an underproduced situation. Are you contending that if his position is adopted, that he cannot carry forward his underproduced allowable?

A. Yes. The order, as it's written, provides for that mechanism by the gas bank. If he wants to inject gas, then it's in place to do that.

Q. Okay. If that's your position, isn't that position inconsistent with starting the debit against the unit for that year prior to gas injection in your spread sheet?

A. Prior to gas injection ceasing; is that what you meant?

Q. Sure. You started your spread sheet with --

A. No, because in '87 there was still a negative bank being accumulated because the reservoir voidage balance -- the calculation of reservoir voidage balance gas was higher than the amount of gas injected in '87.

Q. I'm not sure I made myself clear. Prior to gas injection in '74 -- your calculation starts in September of 74; gas injection starts in June of '75, okay?

A. Okay.

Q. You're charging a debit in the gas bank prior to the time gas injection takes place?

A. I think that's correct, yeah.

Q. Well, why are you doing that?

A. Well, that's the way the order is written.

Q. I don't want to belabor the point with you, Mr. Smallwood, but if you're debiting the gas bank account prior to gas injection, why don't you credit it after gas injection ceases?

A. Because there's a cap of three months.

Q. Okay. If you calculate the three-month cap, you haven't put that in column G, have you? You've zeroed it out?

A. That's right.

Q. What happens if you change that and put the three-month cap in there?

A. Well, I show the gas bank as negative all this time. A negative gas bank cannot exist because Rule 9 of the order says "You will shut in and make overproduction up the following month." It's not entitled by the order to have a negative gas bank.

Q. How does Arco handle the overproduction under its order? There's a rule that deals with that; isn't there? Let me see if I can find it. Sure, Rule 5.

MR. MORROW: What page is that on?

MR. KELLAHIN: If you look at Mr. Foppiano's books, it's behind tab four, and it would be the last page of the order that's behind tab four, and it's in the first column. It's the first paragraph.

A. I'm sorry. I haven't found that yet. Which amendment are we looking at?

Q. (By Mr. Kellahin) I'm looking at the current status of your order under tab four. Do you have tab four?

A. Yes, sir.

Q. To the Empire Abo Unit it says, "The allowables assigned shall result in production of casinghead gas averaging no more than 65 million cubic feet of gas per day for the month, provided, however, that on a cumulative basis the unit operator may carry gas overproduction of 325 million cubic feet of gas." Is that what you're doing?

A. No. We're accumulating more gas than that, and we're doing it by authority from the commission, and I have a letter that I'll enter as an exhibit that says it's okay for us to do this.

Q. Okay. Let's do that.

A. I might add, there's a very big difference

between a unit that accumulates --

Q. I've gone ahead and marked your response to my question, Mr. Smallwood, as Exhibit 15 for the record. Do you want to paraphrase or tell me what this is supposed to do?

A. Well, we approached the commission in, I think, 1987, and asked for authority to accumulate our gas bank the way we've been reporting it, and this is the waiver that says we have the authority to do so.

Q. Okay. I'm curious again, and not to belabor it any further, Mr. Smallwood, but give me your position on starting the allowable calculations for the Oxy project with this September date in 1974 as opposed to the month in which first gas injections take place.

A. Well, as I understand it, that's the way the order is written.

Q. Did you review any commission records or files with regards to the Citgo Empire Abo Unit?

A. I've just -- can I back up a minute?

Q. Yes, sir.

A. I started with June. That's when the order was signed.

Q. Did you? Maybe I misunderstand the display.

You started in June of '74 and I said September. It's June of '74 is the start date; right?

A. Yes, sir.

Q. Okay. Did you review any of the commission files and records concerning the implementation of the calculations for the Oxy project to determine whether or not the division and Oxy were utilizing the date of the order, or the date of first injection by which to report the allowables?

A. I looked at the project maintenance reports that we have on record.

Q. And what does that show you?

A. Well, it shows the Cities company filed their first report in 1975.

Q. Did you find any indication in any of your files that Arco had in 17 years ever objected to the start date by which the allowable calculations were being made?

A. No, I didn't, and -- I didn't.

Q. Okay. The order for Arco is dated April 25, 1973. Do you know whether or not Arco used that order date as the start date for its allowable calculations pursuant to the pressure maintenance order?

A. I think they did.

Q. When did Arco first file its first monthly operator's report on the pressure maintenance project, Mr. Smallwood?

A. I don't know.

Q. Thank you. Mr. Examiner.

FURTHER EXAMINATION

BY MR. CARR:

Q. I have just a couple of points. Mr. Smallwood, Mr. Kellahin asked you some questions about page 28 of Exhibit Number 1?

A. Yes.

Q. My question is, does pressure have any impact on how you get this number of 180 percent recovery of original gas in place?

A. No, it does not.

Q. Now, there was some discussion about, you know, higher pressures versus lower pressures being used in certain calculations and allowable letters. If higher pressures are used in allowable letters, what impact does the use of a higher pressure in these calculations have on voidage?

A. Well, when you use higher pressures, you calculate a voidage that is lower.

Q. And then what does that mean in terms of allowable?

A. It means you get to produce more than your allowable.

Q. And if you use higher pressures in, say, your material balance calculations where you determine influx into the reservoir, what would using higher pressure numbers mean in terms of the amount of influx?

A. It would calculate more gas influx into the Citgo Unit.

Q. Now, in doing your material balance calculations in determining the influx into the Citgo Unit, what pressures did you use?

A. The pressures from the form C1-24s or the lower pressures.

Q. And there were higher pressures used for the allowable calculations?

A. That's right.

Q. And they were from the allowable letters filed by Oxy?

A. Yes.

Q. That's all I have.

MR. MORROW: I have few questions of Mr. Smallwood.

EXAMINATION

BY MR. MORROW:

Q. When you made your calculations and corrected those pressures that you obtained from the report filed with the OCD, to what datum pressure did you correct those corrections?

A. Minus 2264 reservoir midpoint.

Q. The datum shown on the itself, what use did you make of that?

A. I used that to calculate the gradient that they used on their form.

Q. Okay. You subtracted the elevation from the reported depth and then used the difference in those two depths as --

A. Yes, sir.

Q. There's one place where you subtracted -- 3610 from 5600 and came up with 2010; is that how that is?

A. Yes, sir.

Q. I was off by 21. That was one calculation I was able to check.

A. That's what we said. We'd better do this again.

Q. Okay. I wanted to use those depths.

A. I used the 5600 depth and subtracted the 3610 and got 1990.

Q. Okay. But you did that this morning? That

was not a part of your original calculation?

A. Yes, it was. They provided me with the form C1-24s before this hearing, and I calculated all the gradients on all their forms that they gave me, and used it in all of my -- or all my pressure.

MR. STOVALL: And what he means you made the mathematical mistake this morning when you did it. Not in the course of making the calculation.

Q. (By Mr. Morrow) On page 19. Now, this -- down Column 14, this is the year you say that the overproduction had been -- had been balanced; is that correct?

A. Yes, sir.

Q. And it would have -- tell me again why they didn't -- weren't able to carry forward the difference in the oil production and the amount that they made up -- they actually came into a negative overproduction status?

A. It was a little bit of a quirk of the rule. They still had a negative gas bank status, and it didn't get worked off even though they -- in a sense I did include that underage, but it didn't work off the negative gas bank, so it didn't count.

Q. Okay. And so you didn't -- further didn't count the first three months of 1988; is that --

when they were continuing to inject and underproducing, but you didn't let them carry forward?

A. They didn't continue to inject long enough to make the gas bank go positive in 1988.

Q. Okay. On page -- no, I believe I got my questions answered there. On page 29, what's the significance of the red numbers?

A. That's the calculated total injection into the Citgo Unit 7.1 BCF.

Q. Why are some of them red down there in the column?

A. Well, another one is red because that's the -- the one in 1988, that's red, is there because it shows that the influx actually decreased from the year before during this time period, that they were on real low voidage rates because of various reasons, mainly because they didn't have a gas contract.

Q. In 1990 was it increased again -- or that changed every time it changed to red?

A. Yes, sir.

Q. How much difference do you think the use of absolute pressures instead of gauge pressures would make in your calculations?

A. Not very much.

Q. Ten percent?

A. A small amount. Maybe as much as ten percent.

Q. On page 38, to be sure I understand that block, these are average pressures for each unit; is that correct?

A. Yes.

Q. And cumulative poor volume you show with red arrows are comparative -- are those comparative poor volumes at a time when each reached the same pressure?

A. Yes.

Q. Only page 41, this shows -- three and four show the oil field poor volume and the hydrocarbon poor volume to be the same for both units, and I believe you'd shown some free gas --

A. Yes, sir.

Q. -- in another calculation.

A. I put a little note down here below. It's just a matter of the significant figures that are shown on this page. The free gas was so small compared to the total amount of original oil in place initially on this field, it just didn't show up when I added it in.

Q. How much would it be less than point one up there, say, where you show 7.15, how much would it change that?

A. Less than point one, yes.

Q. The letter introduced as Oxy Exhibit 15, do you have the application of the letter that's used to reply for that relief?

A. I have another letter but it wasn't -- it's not the application. I think I can find it and supply it to you.

Q. All right. Why don't you do that in case we're unable to find it in our files? That's all I have.

DIRECT EXAMINATION

BY MR. STOVALL:

Q. I've just got a real simple, dumb question. Is it true that the reason we've been here for the last six hours is because of in the course of calculations you've used C1-24 pressures to make all your exhibits and calculations, and Oxy has used a different pressure?

A. No, sir. And I think that is not a dumb question. There's more to it than just that.

Q. I mean, that leads to a lot of things. Isn't that probably the fundamental question, is

what pressure is used to determine reservoir voidage?

A. That's one part of it. That's how we think they became overproduced based on the allowable they had, but we're also saying that that allowable they were given is much too high, and that allowable, as defined, allows them to produce at nearly three times the rate at what we get to produce our unit.

Q. Yeah. But, I mean, okay. The allowable -- they have the allowable. You're not arguing that allowable -- that they -- you want to change that perspective?

A. We want that allowable changed in the future. That's too high an allowable.

Q. But really the factual background, which you spent a bulk of the time on, is that they used a different pressure number, a higher pressure number, which shows a lower voidage; is that correct?

A. Yes.

Q. And yours is based on C1-24 and calculated to the datum, and theirs is based -- if I think I heard Mr. Foppiano, on a bottomhole pressure test -- a monthly test; is that correct?

A. That is correct, and that's what the C1-24s are based on.

Q. I don't have any other questions.

MR. MORROW: We'll give you another chance.

MR. CARR: I did not need one.

MR. MORROW: Go ahead if you want to.

MR. CARR: I don't have any questions.

MR. MORROW: Thank you. All right. I guess if there's no more questions, then we'll excuse Mr. Smallwood.

THE WITNESS: Thank you, sir.

MR. CARR: That's concludes our direct case of Mr. Smallwood.

MR. KELLAHIN: Mr. Examiner, I'd like to call as a rebuttal witness, Mr. Scott Gengler will be need to be sworn as a witness. He was not sworn this morning.

(At which time, Scott Gengler was sworn.)

MR. MORROW: Before you start, Mr. Gengler, let me ask Bill and Tom a question. Is this -- dated Number 14, is that a monthly version of what was in Arco's packet as an annual presentation?

MR. KELLAHIN: That's my understanding, Mr. Examiner. And I haven't done so. We move the introduction of Exhibits 14 and 15 for the record.

MR. MORROW: 14 and 15 are admitted into the record.

(Oxy Exhibits 14 and 15 were admitted in evidence.)

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Gengler, for the record, will you please state your name and occupation?

A. My name is Scott Gengler, spelled G-e-n-g-l-e-r, and I'm a petroleum engineer with Oxy USA.

Q. Where do you reside, sir?

A. Midland, Texas.

Q. Summarize for us your educational background.

A. I have a bachelor of science degree in petroleum engineering from Texas A&M University.

Q. In what year?

A. 1979.

Q. Subsequent to graduation, summarize for us your employment experience as an engineer.

A. I have been employed, since I got out of college, with Cities Service which is now Oxy USA as a petroleum engineer.

Q. What is your primary function now?

A. I'm a petroleum engineer.

Q. Within your area of responsibility, what is

it that you do for what has been characterized as the Citgo Empire Abo Unit?

A. I'm an engineer that looks after the operation of the Citgo Empire Abo Unit.

Q. To prepare yourself for the hearing, describe for the Examiner the various engineering details that you have simulated in order to make a study of the facts surrounding this particular case. What did you do?

A. We met with Arco when they made their allegations of overproduction. We went back in and they had made an allegation that we were 385,000 reservoir barrels overproduced since re-injection had been ceased. We went back and found that the errors that Arco had found were indeed correct, that being in the (Bg) calculation. We corrected those, corrected our reports to the state, and then we filed those.

We then thought that was taken care of. Arco came back and made the allegation that we were then a million barrels overproduced prior to the injection. At that point in time, instead of trying to go back and find out what was done, and why it was done, because most of the people weren't there any longer to ask why they did it that way, a lot of

times after the initial computer program was set up, we had nontechnical people running the program, which was probably an error on our part, and we decided that we did not want to take anybody else's work, and especially have to come here to Santa Fe and testify on someone else's work. We decided that going back and doing our own calculations was the best method of being satisfied in our own mind that these calculations were indeed correct.

Q. We, meaning you and Mr. Foppiano?

A. Yes, sir.

Q. You've heard Mr. Smallwood's presentation today concerning Arco's position. Do you agree with his conclusions?

A. No, I don't.

Q. Let's deal with the various positions that he's taken and have you respond to them for me, Mr. Gengler. Have you made a study of and have you satisfied yourself as to the proper over and under status of your project?

A. Yes, I have.

Q. Have you satisfied yourself that you have used the best available, reliable, measured pressure information by which to make your calculations?

A. Yes, I have.

MR. KELLAHIN: Mr. Examiner, we tender Mr. Gengler as an expert petroleum engineer.

MR. MORROW: His qualifications as a petroleum engineer are accepted.

Q. (By Mr. Kellahin) As part of your study, have you examined the contention that the allowable calculations should be commenced with the date of the order June of '74 as opposed to the June '75 gas injection date? Have you examined that?

A. Yes, I have.

Q. And what have you concluded?

A. I concluded that in about August of 1975 we filed our initial pressure maintenance report with the State of New Mexico. We asked them to review this pressure maintenance report, asked them if that satisfied what they were wanting out of the order, and basically we were saying in our letter -- in our report -- that that's when we were starting our pressure maintenance project.

Q. Subsequent to that time, has there been any objection by either the Oil Conservation Division, Arco, or anyone else to utilizing the June 1974 start date for the allowable calculation?

A. Not that I am aware of.

Q. Even apart from any objection, is it fair

and reasonable to start the calculation with the month in which you have first gas injection?

A. Yes, it is.

Q. Why?

A. Well, as Mr. Smallwood testified, he said that, he believes that "the gas bank is not applicable after we've ceased injection." If the gas bank is not applicable after we ceased injection because we're no longer injecting, how can the gas bank be applicable before we start injection?

Q. Let me show you what is marked as Oxy Exhibit Number 16, Mr. Gengler. In making a search of the files in preparation for this case, did you find in the regular course of your search that Exhibit Number 16 was part of that file?

A. Yes, I did.

Q. Without reading it, summarize for us what components of it support your conclusion that the June '74 commencement date for the allowable calculations is the appropriate date at which to commence that calculation?

A. In the first paragraph we mention that this was our initial pressure maintenance project report, which indicates that we are commencing our project in June of 1975 with this report, which is for the

month of June of 1975. At the very end we also asked the Oil Conservation Division to review the report and to get back with us if they have any questions on the accuracy or the procedure used in filing this report.

Q. Let me have you turn to the last spread sheet attached to the letter. It's captioned "Gas Bank Statement." Summarize for us what's happening here.

A. From this statement, this is the initial month of the project, we show, using the pressures that were filed, that we have a gas bank debit of 31 million 470 MCF which we use as our initial start of our gas bank status.

Q. In making your investigation of pressures to utilize for the allowable calculation pursuant to your order, what did you do to simulate the pressure information and then determine in your own mind what was the best available way to approach determining an accurate reservoir pressure for the calculation?

A. First of all, we decided that we would go back and find our own pressure survey reports that were in our files, because the same people that were filing the monthly operator report for the most part, were filing the C1-24s. We didn't want to

rely on that data because it was done by somebody else. We wanted to satisfy ourselves that all of the data that we used in our calculations were our own data. We then took and extrapolated every one of the wells down to 2264 and averaged those at a datum of 2264 and added the 15 pounds pressure based to get us the psi.

Q. Do you have an opinion as to whether that is the best engineering method in order to determine a reliable reservoir pressure to utilize in the calculations for allowable purposes for this project?

A. It is the best method that I know of because you're going back to the raw data. You are not relying on someone else's work.

Q. Have you had an opportunity to examine Mr. Smallwood's spread sheet and his summary calculation concerning how he applies his interpretations to what should be the status of your project?

A. Yes, I've looked it over.

Q. Would you give us your comments and observations about whether you agree or disagree with these calculations?

A. I disagree with his calculations; number 1

being the start date. We clearly told the OCD and asked them to approve the start date of June in 1975. They had no objections to that, so I believe the official start date should be June of 1975. Other than that, the way that the calculations are made, I have no differences between how they did it and how we did it other than the pressures that they used.

Q. Let's assume that you utilized Mr. Smallwood's pressure, and the only thing you do in the calculation is recalculate the start date. Instead of using his start date of June '74, using everything else he used and back it down to June of '75 -- can you do that?

A. Yes, I can.

Q. Have you done it?

A. Yes, I have.

Q. What's the result?

A. The result is on a cumulative basis and March 1980 when injection was ceased, that we were underproduced 387,000 reservoir barrels.

Q. Let's talk about the contention that your underproduction cannot be carried forward. Arco contends that you cannot, after you cease injection, carry forward the underproduction. Do you agree

with that position?

A. No.

Q. Why not?

A. We feel like that -- we can carry forward the underproduction because the results in our order do not say that we can't, so therefore, you know, we really don't believe that it says that we can't do that.

Q. Okay. When you examined the relationship of the pressures between your project and the Arco project, were you able to come to any conclusions?

A. Yes, I was.

Q. Have you displayed your reservoir pressure conclusions in an exhibit?

A. Yes, I have.

Q. Before you discuss your conclusions, let me have you identify Exhibit 17, Mr. Gengler. Did you prepare this?

A. Yes, I did.

Q. Describe for us the information that you utilized in order to prepare this display.

A. I utilized the bottomhole pressure as calculated from our pressure survey report for all of the Citgo Empire Abo wells corrected to a 2264 datum.

Q. And that is displayed with the green line?
A. Yes, sir.
Q. How did you arrive at the Arco pressure line on the display?
A. They were given to us by Arco at a pressure datum of 2264.
Q. All right. What type of pressures were given to you?
A. I don't know if I understand your question.
Q. In what form were the pressures you received from Arco?
A. On a C1-24.
Q. For what wells?
A. They gave us C1-24s on all the wells that ran each particular year. We chose all the wells that had a common boundary with the Citgo Empire Abo Unit and averaged those wells.
Q. Once you take that pressure information and plot it, you've shown a green line for the pressure plot on the Oxy producing wells?
A. Yes, sir.
Q. And this is all six of your producing wells?
A. For most years, not every year, but most of them.

Q. Are you using the same bottomhole pressure survey information that Mr. Foppiano had in his exhibit book?

A. Yes, sir.

Q. And the Arco pressure, then, for its offsetting producing wells is shown in the red line?

A. Yes, sir.

Q. All right. What is the -- what is the bar graph that goes vertically in the orange shading? What is that?

A. That is the calculated reservoir voidage of the Citgo Empire Abo Unit as found in Mr. Foppiano's exhibit.

Q. Having plotted that, what does it show you as a petroleum engineer?

A. It shows me that throughout the history of our unit from just past injection, that our pressure was consistently higher than Arco's pressure. The rate of decline of the pressure is an average of all these wells, has been fairly constant between the two units. That tells me as petroleum engineer that one of two things is happening. Either both of us are withdrawing at the same rate, or that both -- or one of the two companies is withdrawing more than the other and is affecting the other company's

pressure.

Q. Were you able to determine which of those two alternatives was existing between those two projects?

A. Yes. If you look at 1987, 1988 pressure surveys, you notice that the end of 1987 our reservoir voidage was basically nothing. If you look at what our pressure did, you would assume that if we're not producing, not injecting, our pressure would stay basically the same and maybe drop a little bit, but what actually happened was that our pressure fell at a lot faster rate.

We feel like that this was caused by the fact that Arco was influencing us more than we were influencing them, especially since we had a higher pressure. And a classic example of drainage is taking hydrocarbons from a higher pressure to a lower pressure. It's also interesting to note that when our pressure dropped, it stayed fairly constant with Arco's pressure.

Q. Historically over the life of the two projects by plotting the pressure declines, are you satisfied that you're getting a reliable picture of the pressure relationship between the two projects with this data?

A. Yes, I do because if we're having some problems with pressure and it was a bad data point, you would have spikes in there, and for the most part, both units fall on a fairly straight line, which tells me that the pressure information is fairly reliable.

Q. If Mr. Smallwood is correct that Oxy is voiding the reservoir at 3.3 times the rate at which Arco is voiding the reservoir, what will you see happen on the pressure plot?

A. I would assume that if we are withdrawing three times as much as Arco would be, our pressure would be way lower than what the Arco pressure is. Contrastingly, we find that the pressure is higher using the correct pressure.

Q. What conclusions are you able to reach about the allowable being assigned to your project over the life of that project, and the rate at which the pressure is changed between you and Arco?

A. What I've surmised from it is that we look at this, and there was quite a few months where with our new calculations at the new pressures, we did exceed the 2213, and we are not disputing that thing. If our reservoir voidage limit of 2213 was too high, then you would expect if we're

overproducing, then our pressure would drop a whole lot more if that was too much of an allowable, and the fact that we stayed above Arco's pressure the entire time tends to tell me that the 2213 wasn't enough of an allowable to keep us on an equal basis with Arco.

Q. If Oxy's relief is granted by the Examiner, and we're allowed to return to the pool depth bracket allowable for our project, what do you forecast will happen in terms of the rate of reservoir voidage and pressure relationship?

A. As you can see, in 1989 and 1990, we had large volumes of reservoir voidage because we thought we were taking our gas bank down. At times we got over 4,000 reservoir barrels a day. Even though we were voiding the reservoir at that rate, our pressures really didn't differ that much from Arco's once we got pulled down to their pressure.

Q. And therefore, what are you able to forecast and conclude about the harm or potential harm that would occur to Arco if your application is approved?

A. We feel like that we will continue to have similar pressures on both sides of the boundary, and that granting our application for the state wide

rules would not harm Arco.

Q. Let me direct your attention to the topic of the 1972 October 2nd engineering study that was put together for the Arco Unit. Are you familiar with that reservoir engineering study?

A. I have looked at it, yes.

Q. A great part of Mr. Smallwood's calculations are predicated on the oil-in-place number that's derived from that study?

A. Yes, sir, it is.

Q. Have you made a determination of what the oil-in-place calculation is for that project under that study? What was the number that they utilized as their estimate of what would be recovered from the Citgo tracts ultimately? Do you recall?

A. I looked at that.

Q. Have you compared that forecast under that study with what has actually occurred in your unit?

A. Yes, I have.

Q. Showing you what is marked as Exhibit Number 18, identify and describe the exhibit, Mr. Gengler.

A. This is a table from Arco's study and the engineering study and notes that were taken from that of how they split up the remaining primary

reservoirs and secondary reservoirs underneath each tract. From that study in the committee report we found that the Citgo Empire Abo Unit, or the four leases that were assigned to that unit, had primary reserves of 609,954 barrels and secondary reserves of 320,981 barrels. This gives us total primary reserves, if you take into account the reserves produced prior to the 1,171 number that they came up with, of two-and-a-half-million barrels and 320,981 secondary barrels, or about 2.9 million barrels of secondary and primary reserves.

We then compared that to different dates, the first one being, of course, the start of when this study was taking place; also the start of injection by Arco, the start of injection by Oxy and current date. From this you can see that we have produced, according to Arco's numbers in that study, all our primary reserves and most of our secondary reserves before Arco even started injection, and by the time we had started injection on our own unit, we had produced -- according to their numbers -- all but 30,000 barrels of our secondary and primary reserves, and therefore, now, they're coming up with -- or we came up with -- 3.3 million barrels, which is two -- a little over 500,000 barrels more than

what Arco has said that we would recover under this secondary recovery project.

Q. Mr. Smallwood, on page 41 of his exhibit book, talks about the fact that based upon that 1970 engineering study, he says, "We have received 180 percent of the gas recovery."

A. Yes.

Q. And that we are voiding the reservoir at some -- what is it -- 3.3 times, if not more, than they were voiding the reservoir?

A. I believe that's what he stated.

Q. Have you examined to determine whether or not there is any reliability to that contention that Oxy is getting its additional reserves at the expense of the Arco Unit?

A. Can you state that question again?

Q. Yes, sir. He says that you have overproduced the volume of reserves that underlie your unit by a substantial magnitude.

A. Yes.

Q. And he says that it has to have come from the Arco Unit?

A. I believe that is what he is stating, yes.

Q. In addition to examining the recovery under the Oxy project in relation to the estimated

reserves for that project, have you also made an examination of the reserves that were projected and then recovered out of the Empire Abo project?

A. Yes, I have.

Q. Okay. Let me ask you to identify and describe Exhibit 19.

A. Exhibit 19 from that study was what the projected primary and secondary reserves were according to the study. We took this and added to that the reserves prior to 1-1-71 when these reserves were calculated, and came up with their estimate of 172 million barrels primary could be recovered from the Empire Abo Pool, and a little less than 28 million secondary barrels to be recovered for a total of 200 million barrel of reserves to be recovered both primary and secondary from the pool.

Q. That was the estimated forecast for recoveries? What has actually happened?

A. As of 1-1-91 the pool has recovered 218-and-half-million barrels of oil, which is 18 million barrels more than what they projected in this study.

Q. Do you, as an engineer, believe that it is reasonable to conclude that you are gaining reserves

from the Arco Unit?

A. No, I don't.

Q. Why not?

A. From these two exhibits right here, it shows that to me that they underestimated the reserves on out unit, and they underestimated the reserves in the pool.

Q. Do you have any opinion or conclusions as to why the 1970 engineering report underestimate the total reserves not only for the Empire Abo project, but for the Oxy Citgo Unit?

A. Yes, I do have.

Q. And what is that opinion?

A. My opinion is the same opinion that Oxy or Cities Service back then in 1971, '72, '73 -- it doesn't matter -- when this study was put together, and then when unitization of the Arco unit was put on, that we did not believe the acre-feet calculation for our unit, that it far underestimated what we believed was acre feet, and that it did not give a representative number for our unit, and therefore, at that time, our decision was made to withhold our leases from the unit.

Q. Okay. If Mr. Smallwood's predicate in terms of poor volume or acre feet is wrong, based

upon that study, then can you conclude as an engineer that his conclusions about the magnitude at which we are apparently draining him under his study are wrong?

A. Yes.

Q. Okay. In terms of relief requested by Oxy in this application, what is your opinion as to whether or not that is fair and reasonable?

A. I think it is fair and reasonable because we are just asking to be treated like any other operator who is not in a secondary or -- I should say pressure maintenance project -- and therefore, we feel like we should have the same type rules as they are. I don't think that it really -- our rules the way they are stated now apply to a project that we're not injecting any gas.

Q. When you look at the amount of underproduction that you've calculated for the Oxy Unit and translate that into oil at the surface and gas at the surface, what are we talking about? What's the magnitude of the underproduction in reservoir barrels when you bring that to the surface?

A. I don't guess I understand your question.

Q. If you take the reservoir barrels?

A. Uh-huh.

Q. We're approximately a million reservoir barrels underproduced?

A. Yes.

Q. And we apply that in terms of future production. What are we looking at?

A. If you apply it to gas production, you would just take the amount of reservoir barrels and use your (Bg) and calculate a surface production, and that would be the amount of surface MCF that we are required to be produced to make up that underproduction from reservoir barrels.

Q. Do you have an estimate of what that gas volume is?

A. No, I don't.

Q. In examining the start dates used for the various allowable calculations for the projects, Mr. Gengler, did you also look to see what Arco was using for a start date of their allowable calculations for that project?

A. No, I haven't.

Q. You haven't looked at that?

A. No.

Q. Okay. If we go to a state wide allowable for our project on our unit in terms of reservoir

voidage, I think you've described it on Exhibit Number 17, but what is the magnitude of the reservoir voidage if we go to a state wide allowable for our production?

A. It would be in the 4 to 5,000-reservoir-barrels a day range using the December 1991 oil production and the 284-MCF-a-day gas production per well, which is approximately 1.7 million, if you use all six wells.

Q. In looking at the recoveries on a per-well, or a per-tract basis for your unit, have you also examined the per-well and per-tract recoveries around your particular unit?

A. Yes, I have.

Q. What did you find when you compare those recoveries to the forecasted recoveries in the October 2, 1970, Arco engineering report?

A. That as of 1-1-91 that they were fairly close to what the estimates were, and that there was no large volumes of oil that were not recovered by any of those tracts as a whole.

Q. What does that tell you then as an engineer?

A. It tells me if they recovered most of the oil that was originally forecasted in that study,

that our additional oil didn't come from them, if their numbers are right in the study.

Q. Let me ask you a couple of concluding questions then about Mr. Smallwood's exhibit book. He draws some pressure comparisons in his book between some temporary, abandoned wells and some producing wells when he was trying to support his conclusion about the drainage impact.

A. Yes.

Q. I think it's on page 33, Mr. Gengler. If you'll turn to Mr. Smallwood's exhibit book.

A. This is one of the comparisons that he had compared to one of our wells, which is the 305, one of the two that have been producing ever since we started injection, and he's comparing that to a well that has been shut in since, I believe, according to his map, since 1983.

When you take your pressures the way that they have been done by both us and Arco, was shut in -- our producing wells -- for approximately 48 hours and measured the pressure at the end of that time. The one thing that that does not take into account is that if you ever look at a buildup curve, you really don't know how long it's going to take to actually get a stabilized reservoir pressure.

Therefore, we're not sure whether or not on a producing level, whether it be ours or Arco's, whether or not this is a stabilized pressure if we were still building at the end of 48 hours.

If you take a well that's been shut in for several years and measure the pressure, you can feel fairly confident that this is stabilized pressure and the maximum pressure that you can obtain, and using Mr. Smallwood's graph, it obviously looks to me like they're in a stabilized situation because their pressure has leveled off, and he's done this not only on this particular graph, but on other pressure graphs too.

I think looking at a producing well and TA'd well is kind of comparing an apple to an orange.

MR. MORROW: What page are you talking about now?

THE WITNESS: The ones that I remember, page 33, which is our 305, and page 34, which is our 213. He compares both of our producing wells to two of his temporary, abandoned wells: one being shut in in 1983 according to his exhibit, and the other one, the H17, has been exchanged since 1976. Again,

this was using his pressures that he got off the C1-24s, which are numbers from our pressure survey report, differ from what he got from the C1-24s. We did not calculate numbers from the C1-24s, so I don't know how accurate his numbers are, and, again, we didn't want to use anybody's work other than our own work so that we could feel fairly confident when we said that this was the pressure in this well.

Q. (By Mr. Kellahin) Let's turn back to page one of Mr. Smallwood's exhibit book. He's plotting Arco voidage rate versus Citgo's voidage rate, and it has a poor-volume component to the calculation --

A. Yes, sir.

Q. -- based upon the 1970 study?

A. Yes, sir.

Q. If he's wrong about the poor-volume calculation, what will happen to the relationship between the two curves?

A. It would obviously make a large difference if the poor volume is wrong.

Q. What's your estimate of the poor volume for your project and how this curve would be adjusted to more truly reflect the actual occurrences in the reservoir?

A. We do not believe that poor volume is as small as what Arco has stated, and therefore, the number that they calculate here, which we don't agree with, would be too high on the curve.

Q. If this poor volume is actually greater within your project, then that would shift the red-line curve farther down and closer to the Arco voidage rate curve?

A. Yes, and this is what we feel is also backed up by the point that our pressures indicate that we're higher pressure than theirs on their side of the boundary, and therefore this curve obviously was not -- has got to be wrong if our pressure is higher than theirs.

Q. When you look at page 3 of his exhibit book, recognizing what you know about the reservoir pressures and looking at the poor-volume component to this display, is the same observation about page three?

A. Yes.

Q. You make the same observations about page 3?

A. Yes. If the poor volume or pressure is wrong, this curve is obviously wrong.

Q. And is that true of all the other displays

or calculations that have this 1970 poor-volume component to it within the exhibit book?

A. Yes, it is.

Q. And you do not agree with the calculation of the poor volume used in that study, do you?

A. No, I don't. We haven't agreed with that from the very beginning, and we still don't agree with it.

Q. Have you, independent of the study, made an examination of what you anticipate to be the range of poor volume underneath your tract?

A. We have made a range. The geologists working underneath me have looked at it. They find that due to the old type logs and stuff, that -- and some other components -- that it's a real difficult number to come up with because all you have is a neutron porosity log to come up with the porosity, but we have come up with a range, and we haven't come up with a definite number, but we feel like that -- I've got that here -- but that range goes from anywhere on a low side of what Arco came up with to around 50,000-acre feet, all the way up to 250,000, depending on the method that you use to calculate your acre feet.

Q. Okay.

MR. KELLAHIN: That concludes my examination of Mr. Gengler. We move the introduction of Exhibits 16 through 18. We had a 19, I'm sorry.

MR. MORROW: We accept those. All right.

(Oxy Exhibits 16 through 19 admitted in evidence.)

(Recess taken)

CROSS-EXAMINATION

BY MR. CARR:

Q. All right. Mr. Gengler, if I understand your testimony, I understand that when you started trying to determine what the status of your unit was that instead of relying on the work of anybody else, you and Mr. Foppiano concluded to go back sort of to the beginning and come through it and use data that you yourself compiled and worked with throughout?

A. Yes, that's correct.

Q. And you stated that you didn't want to rely on the work of somebody else; in fact, you were concerned that there might be errors and problems with that work; isn't that right?

A. There might be. We didn't want to take any chances of there being errors that we weren't aware of.

Q. You stated that the pressure surveys that

you used varied from the C1-24?

A. I do not know that. I did not compare them. They may have. From looking at Mr. Smallwood's work it looks like they have, but I have not compared them.

Q. And so you do not know if they would be different or not?

A. No.

Q. And so when -- in exchanging data with you we asked for C1-24s, you sent just the C1-24s and you were unaware that they might be different from the pressure information that you would use in preparing for this case?

A. That is correct.

Q. You were aware that (Bg) formulas had been erroneously calculated; isn't that right?

A. Yes, after Arco pointed it out in our later years, we found that the (Bg) was calculated wrong by the computer program, that there was an error in the programming of it.

Q. You were aware that you hadn't used the three-month limit in running your calculations; isn't that right?

A. After we got reviewing our unit after Arco's initial allegations, yes, we became aware of

that.

Q. And you just decided it would be wise to go to these bottomhole pressures instead of using the C1-24s that had been sent to the commission?

A. We felt like that it was wise to go to the raw data whether it be pressures or production or whatever.

Q. When you filed C1-24s for your company, you signed them, did you not?

A. I did a couple of times.

Q. What do you use to fill out the blanks on that form?

A. To be honest with you I do not fill the form out. Somebody underneath me does.

Q. Do you do any independent checking of that?

A. I didn't and I agree that I made a mistake by not doing that.

Q. You're aware that that is the data that is used by -- which is reported to the state, those pressures are the pressures that are carried in various kinds of reports and used by the state for various purposes?

A. They have not been carried by the state since the end of 1985, and that was told to me by the commission office both in Artesia and Hobbs.

Q. Did you ever have any involvement in filing allowable letters, or allowable requests for the commission for this unit?

A. I signed some of those. They were not prepared by me. Again, that was a policy that was ongoing when I took over this area. I continued it, and, again, I feel like that needs to be changed.

Q. Okay. But you didn't make an independent check?

A. No.

Q. Okay. If I understood your testimony, you said that really when you looked at the methods used by Mr. Smallwood, you did not have any real problems with the methods; there were just two particular points where we differ. One is the start date, and one was the pressures used; is that correct?

A. And also whether or not we can carry forward allowable.

Q. Now, in essence, Mr. Smallwood's calculations started about a year earlier than yours, did they not?

A. Approximately, yes.

Q. And when -- were you involved in the calculation of the cumulative over/underproduced status of the Citgo Unit?

A. That's found on Mr. Foppiano's exhibits?

Q. Yeah.

A. Yes, I was.

Q. And basically by starting a year earlier, we started with a negative value to begin with, didn't we?

A. According to Mr. Smallwood's exhibit, yes.

Q. And so when we got to the time you were first injecting, we already had you with a minus number or overproduced number?

A. Yes. You also had us with a debit in our gas bank, but you also say that once we ceased re-injection, we don't have a gas bank.

Q. I know. I'm only talking about 1974 now.

A. Okay. The gas bank you have an overproduced number in there and you say after injection you don't have a gas bank, so I don't think we have a gas bank before '75.

Q. I understand that, but if you'll just answer my question we'll get out of here.

A. Okay. I'm just trying to make myself clear.

Q. All I'm saying is that by the time your calculations start, we said you were already overproduced and that's a disagreement?

A. According to Mr. Smallwood's calculations.

Q. And when we start out saying that you're underproduced and you've cumulated all the way, that affects those calculations all the way through; doesn't it?

A. Yes, it does.

Q. Now, you presented, or sponsored, Oxy Exhibit Number 16, which is a letter from Cities Service to the Artesia office of the oil commission. If I understood your testimony, this is the letter where the commission said you shouldn't start calculating the bank -- shouldn't start the calculations until June of '75?

A. The commission didn't say anything in that letter.

Q. Okay. I just wanted to be sure. There's nothing in this letter that says that; is that right?

A. No. We asked the commission if they agreed with what we had done, and we didn't get a negative response from them.

Q. It just said if approved this will be a precedent and they never said no; right?

A. Right.

Q. It's sort of like being able to carry

forward underproduction: there's nothing that says you can't, right?

A. Well, if you ask them -- if you say that we're going to carry forward underproduction, if you don't agree with that let us know, and they say no or don't respond, then you assume that they don't have a problem with it.

Q. But it doesn't reference any particular time for starting a calculation; does it?

A. Well, it says our initial pressure maintenance report, which implies that that was the start date of our pressure maintenance project as June of 1975.

Q. Okay. Now, if we talk about this earlier start date, and as we carry through the cumulative numbers, we get to 1987, 1988, whenever it was that the Citgo Unit shut down for gas market, and during that period of time the unit zeroes out. Cumulate it anyway you will from any date you want to start with -- '74, '75 -- if you hit a zero point at that time, the ability to accumulate is only significant after that date if you are authorized to do that; isn't that right?

A. Yeah. I would agree with that, yeah.

Q. Okay. Now the difference on the pressures I

guess we've used, is you've used bottomhole pressure survey and we've used C1-24s you sent us?

A. Yes.

Q. And that's -- and therein lies the difference, and to that extent Mr. Stovall was right when he said that that was one of the primary issues?

MR. STOVALL: I catch on quick.

A. And that causes a lot of the calculations that we both made to be different.

Q. (By Mr. Carr) Okay. If I look at your Exhibit 17, that's the graph.

A. I've got it.

Q. Basically what you're trying to show here is that the pressures in the Oxy unit are higher than what Arco said they were; is that the purpose of this?

A. It also shows that our pressures are higher than the wells directly offsetting the Oxy Unit on the Arco Unit on a consistent basis from year to year.

Q. Now, the pressure -- the very last pressure point -- is the lowest point on the curve representing the Oxy Unit; correct?

A. That's correct.

Q. And that pressure is down following a period in which you show substantial voidage in the unit; isn't that right?

A. Yes, it is a small amount.

Q. Couldn't that voidage be, in fact, one of the reasons that pressure point is down where it is?

A. That's one interpretation, but that's not the interpretation that we made.

Q. You don't think that is?

A. No. We feel like that the pressure number in 1989 may not be representative, you know. It's hard to believe that we're making all that production and our pressure went up, so we went back and looked at our pressure survey and found that one of our wells that had a lot of paraffin in it we couldn't get as far down. It showed a liquid level and a grading of .465, which is salt water, and we tend to believe that that may be a bad pressure. We don't know that for a fact, but as an engineer you tend to have a doubt on that one, so if that is the case, then our pressure may be lower than that and we may be just in line there.

Q. And if the pressure is right it could be -- I could interpret that to be related to the voidage. That wouldn't be an unreasonable thing for

me to conclude, would it?

A. Well, the one thing you're also doing is you're comparing Arco's last pressure point which was run in October 1990, and Oxy's last pressure point was run in April of 1991. That's some six months in difference, and you can look at the curve. A year's difference makes quite a bit of difference in the pressure.

Q. I'm really just looking at the Oxy curve, and it just appears to me that it is down after a period in which you're reporting substantial voidage, and my question is just couldn't that voidage be one of the reasons that point is down?

A. One of the reasons. There could be others.

Q. Now, if we go to your Exhibit Number 18, I'm having a hard time understanding exactly what this is trying to show. If I read it right, and tell me if I'm wrong, it appears to me that we have total -- in the upper portion of Exhibit 18 -- it says "Total Reserves As Per Arco Study"?

A. Primary and secondary.

Q. And we have a total of approximately 2.9; is that million barrels? Is that what that number is?

A. Yes. That's the next line right down there

that summarizes with that. It's actually 2.882.

Q. All right. Then we go down to bottom figures running across that exhibit and we come over to 1-1-91, and under that we have 3,306,181 barrels; is that right?

A. That's right.

Q. And what does that show you?

A. It shows you one of two things. It either means that we produced a lot more than what was under our lease, or it also means that the numbers that were calculated for primary and secondary reserves were wrong. We feel that the latter one being the case because if you look at the numbers at 6-1-75 before we put any gas in the ground, we had produced supposedly what the state said we were going to make cumulative, primary and secondary reserves.

Q. So basically this could say the poor volume was larger?

A. We feel like it, yes.

Q. It also could be that there is some drainage to the unit?

A. If you just looked at this exhibit alone, yes, but you put it with pressure data, and I don't believe so.

Q. Okay. Let's go to the second one. I'm sorry. Exhibit 19. Does this exhibit attempt to do the same thing for the -- on a -- for the Empire Abo Unit? Does 19 do for the Empire Abo Unit what 18 shows?

A. Not the Empire Abo Unit, the Empire Abo Pool.

Q. Okay. So this is an entire pool number and basically what you're trying to show is the same sort of analysis, I guess it is, as you showed for the Citgo Unit in Exhibit 18?

A. Yes.

Q. Okay. What does this show you?

A. It shows you that what they have projected for primary and secondary reserves for the entire pool is less than what they actually recovered as of 1-1-91.

Q. And so what conclusion can you reach from that?

A. That not only our unit but possibly other leases that were calculated in that study, probably had some poor volume problems.

Q. Did you factor into these numbers at all, the fact that Arco drilled over 200 infield wells in this unit?

A. No. We were looking at the initial poor volumes. The one thing I'd like to say about that, though, is that you're saying you're draining 40 acres with a well, and you're adding additional reserves by drilling more wells in the 40-acre tract, plus the fact that this study assumed that initiation of the pressure maintenance project unitization will occur, I believe, in '71 and initiation injection in '72. I might be a year off, but in other words, what I'm trying to say is that the start of the project was later than what was expected and not all the tracts participated as what was expected.

Q. And you would agree with me that 200 well infield program would affect the recovery and increase it from the unit?

A. Some, yes.

Q. Now, if I understood your testimony, you testified that poor volume was measured in acre feet; is that what you said?

A. No.

Q. Okay.

A. I said that our acre feet ranged from one number to another.

Q. Okay. What was that range? 50,000 to

250,000?

A. That's what our geologists estimate depending on method that you use.

Q. If we had 250,000 acre feet, how many acres are there in this unit, do you know, that are productive in your unit?

A. Somewhere in the vicinity of 250, 300.

Q. And if there were, say, 250 acres, what would you have to have it terms of thickness and porosity to have 250,000-acre feet?

A. You would have to have quite a bit of footage.

Q. That's all.

MR. MORROW: Do you have any more questions?

MR. KELLAHIN: No, sir.

EXAMINATION

BY MR. MORROW:

Q. Were you operating under state wide rules between June '74 and June '75?

A. Yes, sir.

Q. You considered yourself to be under state wide rules since you hadn't started injection; is that what you believe?

A. That was our company's interpretation.

Q. What was the over/under status of the unit

when injection started?

A. Can you repeat that question?

Q. What was the status as to overproduction or underproduction of that unitized area when you began injection?

A. Our study started when injection started, so I don't know.

Q. Well, I mean, what -- you must have some record that shows whether you overproduced or underproduced at the time you started, don't you? I guess you don't?

A. We were -- the records that I remember, and I didn't do a thorough study on it, showed that we had an allowable and that they were producing that allowable, and I don't recollect ever seeing an overage or underage.

Q. So it's just your belief then that you were just about even; is that right?

A. As far as I know, but I did not do a thorough investigation of that.

Q. Do you have any engineering justification for an allowable equal to the state wide allowable 142 barrels, I think it is. Is that right, 142 barrels?

A. Uh-huh.

Q. That much voidage plus the 2001 to one, the 284? Had you done a study that showed that would be a good allowable?

A. The study that we did, we looked at what our pressures did when overproduced our unit, and we feel like that by overproducing the unit, you know, at one point over 4,000, that we really didn't change the pressure significantly, that we were fairly close to what Arco's pressure was and that by going under this allowable we would not have any drainage going on.

Q. Well, what would the allowable be in the event that the OCD adopted that allowable, or let's go back to state wide rules. It's six times 284.

A. If all six wells are capable of producing, yes.

Q. Would there be any amount in there -- any amount in addition to that 284 because of the oil voidage, or is it just 284 times six plus whatever oil you produce?

A. Yes, because none of our wells make that much oil, and the fact that we're well below that 142 barrels, the oil is pretty much negligible in the reservoir voidage calculation.

Q. So what you would produce would just be

back on the oil allowable? Produce whatever oil you can make plus a limit of 284?

A. Yes, sir.

Q. And let's see. How much does that come to on the surface? I guess about 1700?

A. Approximately 1.7 million, yes.

Q. And that equates to four to 5,000 barrels of reservoir voidage; is that what you answered Mr. Carr's question?

A. Yes, sir.

Q. And so that would be roughly twice what you have in the way of allowable now?

A. Yes.

Q. Okay. And I guess maybe seven times what Arco has recommended. How much did you say you were underproduced using Arco's pressure -- I believe you said you've calculated that, and I think you quoted a time, an underproduced time of March of '88?

A. Which is as cessation of injection. If you use the June '75 start date that we feel like is the start of our project, and use Mr. Smallwood's numbers, as far as pressure, at the time that we stopped injection we had a cumulative under/over of 387,000 reservoir barrels underproduced.

Q. 4-1-88?

A. Yes, sir.

Q. Would you please submit us a copy of those calculations?

A. I could not get them to print with my computer. They're on the computer.

Q. Well, you can send them in later?

A. Yes, sir.

Q. Let's see. Exhibit 17, and tell me again what those red lines and green line represents on this Exhibit 17, would you, please?

A. The green line is the average pressure taken on oil wells within Citgo Empire Abo Unit, measured at a datum 2264 from the pressure survey reports that had been measured for each one of those years. The red line is a measurement of all the wells offsetting the Citgo Empire Abo Unit that are in the Arco Unit that have been measured by Arco for each year, provided to us not only in a table by Arco, but also in their C1-24s at a datum of 2264.

Q. Okay. And your pressures are those that you've got the wrong data out of the files and recalculated; is that correct?

A. Exactly.

Q. And you think if the OCD should adopt, or authorize us to go back to state wide rules, that

that would cause any hydrocarbons to move from Arco's Unit to Citgo's?

A. No, I do not.

Q. When you said you didn't use anyone else's work, I'm sure you must have used bottomhole pressure measurement, there's no way you could avoid that?

A. Well, that was an outside firm's measurement that they took off the bottom.

Q. You meant you didn't use anybody else in Oxy's or Cities calculations as to what that data was?

A. No. That was our measured data. We did not use any calculated data by anybody else.

Q. How does your acre foot calculations -- how do those compare to Arco's calculations? I believe you've may have said that 50,000 was pretty close to theirs; is that right?

A. I believe theirs was in the range of 47 to 48,000. Right close to 50,000. I don't know the exact number right off the top of my head. I can look it up if it's important.

Q. Have you made calculations through April or May or June or whatever your most recent production is as to what your status would be in this unit

based on your calculations and Arco's -- and your calculations using Arco's pressure?

A. Not using Arco's pressure because we didn't have those until today.

Q. When you send that other stuff, would you go ahead and run it on down as far as you have --

A. Yes, sir.

Q. --- production information, and do it both ways supplement, and I request that you all do that also.

MR. KELLAHIN: I'm not sure I understand.

MR. MORROW: Just bring your calculations up to date through the most recent production. I believe they all end in December of '90. Do you have any questions?

MR. STOVALL: Yeah, just one.

DIRECT EXAMINATION

BY MR. STOVALL:

Q. If once a final order is issued in this case, is this going to resolve the Oxy/Arco dispute with respect to the operation of these units as well?

A. It's a loaded question.

Q. You may want to consult with counsel before you answer that.

A. I can't speak for Arco, so I can't answer that question.

Q. No further questions.

MR. MORROW: Tom, do you or Bill have any further questions of Mr. Gengler?

MR. KELLAHIN: No, sir.

MR. MORROW: Thank you, sir. You may be excused. I appreciate your testimony.

MR. KELLAHIN: We have nothing further on rebuttal, Mr. Examiner.

MR. CARR: I have one question and that is, Mr. Morrow, the calculations that you want prepared, we start ours back in the year before they start theirs. And do you want it just left that way?

MR. MORROW: Start it just like you did. Just bring them up to date.

MR. CARR: Okay. We can do that as soon as we can get data.

MR. KELLAHIN: We'll supply that next week.

MR. MORROW: The situation is where both of you have an application. Who gets to go first?

MR. CARR: I have to go first because Mr. Kellahin always wants to make me honest in the end.

MR. MORROW: Go ahead.

MR. CARR: May it please the Examiner, Mr. Stovall was almost right a few minutes ago. This case really does boil down to relatively simple questions. The answers are where it gets hard.

The questions are initially, does Oxy produce more or less than its allowable? And this question, as you can see, basically turns on what kind of pressure information we utilize. We've used one set of numbers, they've used another, and it depends on how we used these numbers in computing the gradient to convert them to the necessary datum.

The method isn't the issue. The issue is what figures have we used. At the very beginning -- before the very beginning of this particular hearing day, we've met with you repeatedly, and we agreed to exchange all information so that each side knew what the other was going to do, and pursuant to that we requested C1-24 forms on which Oxy would report to you and certify the various pressures that they had obtained on the well in their unit, and it was only today that we learned that they intended to use something else, and so perhaps the hearing hasn't been as meaningful as it could be, because although we thought we'd be before you arguing apples and

apples, we found out we were arguing apples and oranges, and so to that extent it may be my error for not requesting something different, but we had based our calculations on the information provided to you by Oxy over the years, the datum that has been used for the operation and monitoring of this particular pressure maintenance project.

But the question still stands before you, where do we stand in terms of reservoir voidage, and that's a call unfortunately we haven't been able to provide very much help on.

The second question that is before you is whether or not Oxy should be entitled to make up some underproduction. That question again, hinges on whether or not Oxy is over or underproduced, and you know that we believe that they were overproduced.

We believe they're overproduced because we believe the orders and rules of the commission mean something. We believe that just because something doesn't say you can't do something, it doesn't mean you can, and there's nothing in the order that would permit to, over a long period of time, cumulate overproduction outside the order, or cumulate underproduction outside the provision of the orders,

and there's nothing in the general statutes governing oil production that would permit this, and we think if we looked at the whole history of this unit, the time to start it is when the unit began, when they were under state wide rules, and when they were, in fact, at that time, overproduced.

But the interesting thing is, you know, we've talked a lot about the start date. We don't think that means a lot. They obviously do because when the unit was shut down in '87 and '88 out there, they admit there was no bank at that time, there was no pressure maintenance operation going forward.

We're aware of nothing that lets them have an allowable in the first place, let alone now be able to reinstate it. All we're looking at is really the overproduction that is approved since they started producing, and admittedly, we're not in a pressure maintenance mode.

The next question involves what should be done about the future producing rate. They have one proposal, we have another. I think there's some things in the record, however, Mr. Morrow, that can be of some assistance to you as you address this question. Probably there were three fairly simple

questions at the beginning. There are also three particular facts I think which you can look to in trying to determine how you're going to prevent waste of hydrocarbons in this field, and how you're going to protect correlative rights, and how you're going to prevent projects from damaging one another.

The first of the three critical bits of evidence is reservoir voidage, and we believe if you look at pressures that have been reported over the years, they have, in fact, voided the reservoir 3.3 times faster than the Arco Unit. Admittedly this takes you back into the question of pressure information and the problems there.

The second point is the material balance information where we had shown you that the material balance calculation, the 7.1 BCF of gas has migrated from the Arco Unit to the Citgo Empire Abo Unit.

There is one thing that I think is interesting in this regard. They used higher pressures in terms of calculating reservoir voidage, and by doing that the voidage was less and their allowable was higher, but if we take the higher pressures that they use and accept those, the material balance calculation will show that, in fact, more production migrated away from the Arco

Unit and into the Citgo Unit. That alone -- you can take those pressure numbers and on that score you can accept this, and I think when you do and you see that there's been that kind of migration over 7 BCF from us to them, it's hard to see why you should grant their request and go from about 700 MCF a day in terms of gas allowable to 1700 MCF a day. Because when you do that they're already had 7 plus BCF migrate, and by increasing production rate, it is logical that more will move in that direction.

I don't see how in view of that particular fact from the material balance gas calculation, it prevents waste or protects anyone's correlative rights -- ours and the other interest owners in the Arco Unit to turn around and say, "You didn't have any mechanism in place to accrue a bulk of underproduction since you shut in back in 1986. There's nothing that lets you do it. We're going to reinstate it and give you some extra time to make it up because the undisputed evidence in this case shows substantial migration from us to them."

The other factor that I think is virtually undisputed, and that is that we have watched them produce about 180 percent of the original gas in place under their unit. That's not a

pressure-dependent factor. If you look at the reserves, the original gas in place, and you look at what they've produced, and you work it out, and we believe that our numbers stand before you unassailed. We've shown you how when we modeled the reservoir recently we projected a performance based on our original gas-in-place numbers, and we've shown you how performance matches that initial model, and when you look at that, the conclusion has got to be, we had to be fairly close. Certainly there isn't an error that would suggest that maybe it's 185 percent, maybe it's 165 percent, but what it does say is they have received more than we had to begin with, and in view of that to give them an increased allowable or to void them an allowable bonus is like a pie in the face of preventing waste and protecting correlative rights.

The commission has tried to maintain equity in these units, and it's been -- and the commission's been stuck with this responsibility because these things were put together back in the day prior to the statutory unitization act when we could force all of these tracts together. But in trying to do it, you've tried to prevent waste, you've tried to protect correlative rights, and

you've tried to protect us, or any party, from damage from an offset, and the only way we believe you can do that is to grant our application, recognize that they are, under the rules, overproduced and they should be shut in until that's made up, and recognize that you, if you don't curtail their allowable, that they are going to be able to produce substantially more than they do now, that the migration and the influx from our unit to theirs will continue. We will be drained, our correlative rights will be impaired and at their higher producing rate, will reduce pressure and will damage the remaining life of our pressure maintenance project. For that reason we believe that if you out your statutory directive, you've got to grant the application of Arco and deny the application of Oxy.

MR. KELLAHIN: I always enjoy listening to my good friend, Mr. Carr. Interesting argument, fatally flawed. He has built his contentions as well as Mr. Smallwood's arguments on two basic building blocks that we have demonstrated unequivocally are wrong, the attached rate importance and merit to this October 2, 1970, reservoir study.

Mr. Gengler has demonstrated to you, both with Exhibits 18 and 19, that the projected reserves for the Citgo property were some 500,000 barrels less than what we've have actually produced. So what do you suspect? Either they have built a container that is the wrong size and shape, or we're taking it away from Arco.

Mr. Gengler does the next calculation. He says, "Well, if we're taking it from Arco, their total recoveries should have been substantially less than their projections." So he looks at that and he finds out that they're substantially overproduced from their original projections. What do you conclude? The container is too small. The engineering study on which this acre-foot calculation is predicated is wrong. We simply have a bigger reservoir underlying the Citgo project then they're willing to admit to us, and that argument dates back some 18 years and it continues today. They use it as a predicate by which to demonstrate that we are somehow gaining an advantage. Why don't we look and see what we really know?

As reservoir engineers, don't you want to really know what the reservoir pressure is and what is the best way to find that out? You look at

bottomhole pressure surveys that are reported by the independent operator that goes out and takes that information. And you build your blocks from there.

Regardless of all the hand waving about how we might have affected them, it is meaningless when you look at the reservoir pressures. The measured data demonstrates that the Citgo project over the life of that project is substantially higher pressure than the Arco project. If you have that as a basic, undisputable fact, then you can ignore the contention that we have somehow voided the reservoir at a far greater rate than they have. There's something wrong with that calculation. It doesn't fit the known data.

We apologize to you for errors and mistakes in the calculation of the allowable. We don't think it ought to be punitive against us for coming back in here and showing you what the calculation ought to be. We don't think we should have to sacrifice and forfeit as a punitive penalty the opportunity to produce this underproduction that we have accrued. Isn't it interesting that the only operator in this pool that is limited and curtailed by an allowable based upon reservoir voidage is Oxy?

Isn't it interesting that our major

opponent in the reservoir is coming and asking us to abide by this curtailment, this restrictive allowable? Is Arco -- and they removed voidage from their allowable calculation in 1984 because they contended that it could receive great oil production if that allowable was increased and based upon a capacity allowable for this gas extraction plant.

It's not a level playing field in this reservoir, Mr. Examiner. It never was. Arco constructed the rules of the game to benefit them. We are simply a small player in the pool, and we have been the victim of a regulatory framework with this allowable schedule that has been punitive, and we simply ask you the opportunity to have some small hope of receiving our equitable share of the remaining future production.

Mr. Carr wants to make a big point of the fact that we're not injecting gas any longer, but look at the first order in paragraph one of our order, paragraph number one. It defines for us what pressure maintenance is. It's the curtailment of our production and our gas injection. Why should we be arbitrarily penalized because we no longer inject gas? Why can't we now enjoy that underproduction that we've accrued because we have curtailed our

production over all those years, principally for the benefit of Arco.

The pressure information is not going to lie to you. The bottomhole pressure information is the building block by which you can decide the entire case. With that information you can ignore and disregard Arco's contention that they're getting drained, and they're at a disadvantage because the evidence proves otherwise. There are a couple of items for you to exercise your judgment about. One of those is the start date of the calculation. We think it's important. We've relied upon that start date for some 17 years without any dispute or argument from anyone.

It's interesting to note that when you take Mr. Smallwood's calculations and move it back from June of '74 to June of '75, instead of being overproduced we're underproduced. It's a significant point. In fairness we think that it ought to start with the gas injection. In addition, we would like to have the opportunity to produce the underproduction credit that we've accumulated.

Mr. Stovall raised with us a while ago whether or not it was good practice to make it retroactive. If you determine that it is not good

practice to make this retroactive, we would ask for a prospective opportunity to at least have a prospective opportunity to return to the state wide allowables that other operators not under pressure maintenance enjoy. Perhaps pressure maintenance was a mistake for us. It simply did not work to our benefit. We perhaps would have been better off if we'd have stayed out of that, but we attempted to conserve the dried mechanism in the reservoir for a period of time where it was useful, but by 1984 with Arco's own testimony -- and you may look at that transcript if you desire to do so -- it was based upon their proof that this was predominantly gravity drainage and there was no justification for them to stay on a voidage-based allowable, and there certainly is not one for us.

The order is antiquated and outdated. It is not useful for us, it serves no legitimate purpose, and we simply ask that you give us some sort of opportunity for equity and let us protect our fair share of our correlative rights. Thank you.

MR. MORROW: Mr. Currens.

MR. CURREN: Mr. Examiner, Amoco is working interest owner in the Empire Abo Field, and does recommend to you that you carefully study the rules

and presentations and make your decision in accordance with the rules that have been set forth concerning this unit. In the event that you make a determination that there is any underproduction that may have been accrued, however, Amoco would recommend that that underproduction not be granted to be produced at a future date.

Allowables aren't forever. This is not the case of a changing market such as you may have in market opportunities in a gas field. Certainly gas rules provide for a balancing of under and overage, and in the oil rules you really only have a balance of overage.

The reference that you have in state wide rules to underproduction has to do with circumstances such as pipeline proration and things of that nature that largely seem to be those things that are out of operator's control, so in the event that your determination should come up with the facts that underproduction has accumulated, then it would be Amoco's recommendation that that underproduction not be allowed in addition to whatever allowable system is appropriate. Thank you.

MR. MORROW: Anything further? This case will

be taken under advisement. That concludes our hearing for today.

(The foregoing hearing was concluded at the approximate hour of 4:15 p.m.)

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10356 & 10369 heard by me on 8/25/91

Michael E. Stogner, Chief Examiner
Oil Conservation Division

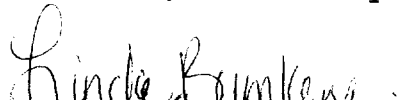
STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

REPORTER'S CERTIFICATE

BE IT KNOWN that the foregoing transcript of the proceedings were taken by me, that I was then and there a Certified Shorthand Reporter and Notary Public in and for the County of Bernalillo, State of New Mexico, and by virtue thereof, authorized to administer an oath; that the witness before testifying was duly sworn to testify to the whole truth and nothing but the truth; that the questions propounded by counsel and the answers of the witness thereto were taken down by me, and that the foregoing pages of typewritten matter contain a true and accurate transcript as requested by counsel of the proceedings and testimony had and adduced upon the taking of said deposition, all to the best of my skill and ability.

I FURTHER CERTIFY that I am not related to nor employed by any of the parties hereto, and have no interest in the outcome hereof.

DATED at Bernalillo, New Mexico, this day November 13, 1991.



My commission expires
April 24, 1994

LINDA BUMKENS
CCR No. 3008
Notary Public