

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,) CASE NO. 10356
EDDY COUNTY, NEW MEXICO.)

APPLICATION OF ARCO OIL AND GAS)
COMPANY FOR AN ORDER CONCERNING) CASE NO. 10369
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.)
-----)

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

COPY

I N D E X

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

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A P P E A R A N C E S

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1 MR. MORROW: We'll call this hearing to order
2 in Docket Number 23-91. Call cases 10356 and
3 10369.

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

9 10369 is the application of Arco Oil and
10 Gas Company for an order concerning its Empire Abo
11 pressure maintenance project and the Oxy U.S.A.,
12 Citgo Empire Abo pressure maintenance project and to
13 amend the division order Number R-4808 Eddy County,
14 New Mexico.

15 MR. MORROW: Call for appearances.

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

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

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

1 to make a statement at the end.

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

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

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

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

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

1 constructed.

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

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

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

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

25 The original pressure maintenance project

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

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

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

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

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

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

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

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

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

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

20 Thank you, Mr. Examiner.

21 MR. MORROW: Thank you.

22 MR. CARR: May it please the Examiner, as
23 you're well aware of by now, back in the early
24 1970s, certain operators in the Empire Abo field
25 determined it was time to end the pressure

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 rights.

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

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

12 RICHARD E. FOPPIANO,
13 the Witness herein, being previously duly sworn, was
14 examined and testified as follows:

15 DIRECT EXAMINATION

16 BY MR. KELLAHIN:

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

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

22 Q. And where do you reside?

23 A. Midland, Texas.

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

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

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

14 A. Yes, I have.

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

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

1 have done in the past.

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

9 A. Yes, I have.

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

13 MR. MORROW: We accept his qualifications.

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

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

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

1 A. Yes, I believe I have.

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

6 A. Yes, I have.

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

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

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

18 A. Yes, I have.

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

1 A. Yes.

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

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

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

8 A. Yes, we have.

9 Q. And what is your conclusion?

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

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

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

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

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

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

11 A. Yes, I do.

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

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

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

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

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

24 A. Yes, I have.

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

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

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

10 A. Yes, I did.

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

15 A. Yes, it is.

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

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

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

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

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

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

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

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

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

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

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

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

15 A. Correct.

16 Q. Let's turn now to the summary following
17 Exhibit Number 3. Let me ask you to start back in
18 1957 with the discovery of the pool, and using this
19 display, give us your understanding of the
20 chronology and history of the development between
21 Arco and Citgo in developing the Empire Abo unit,
22 and particularly how it affects the current case
23 before the examiner today.

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

1 initially developed on 40-acre acre spacing under a
2 depth bracket allowable of 142 barrels a day with a
3 2000-1 GOR limit, and in early '73 there,
4 specifically in June '73, I think has been
5 previously mentioned, Arco sought and received
6 approval for the Empire Abo unit, and there a year
7 later they started injection into that unit. Oxy
8 was, as I mentioned, was offered an opportunity to
9 participate but because we were not treated fairly
10 under the participation formula, we declined and
11 decided to set up our own pressure maintenance
12 project, and so in 1974 we went to the OCD and
13 sought and received approval for our Citgo Empire
14 Abo unit and our rules, and we started injection
15 about a year later thereto, and so we --

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

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

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

23 A. Correct.

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

1 A. Correct.

2 Q. Okay. They're injecting in March of '74.

3 When then did Citgo commence gas injection in their
4 pressure maintenance project?

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

7 Q. How many injection wells were you using?

8 A. One.

9 Q. And historically have you used more than
10 one?

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

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

15 A. Well, Arco went to the OCD on numerous
16 occasions and received amendments to their original
17 set of pool rules, the most notable of which
18 occurred in April of 1984 when they requested that
19 their voidage limit be removed in favor of a
20 65-MCF-a-day limit on gas production. I think at the
21 time --

22 Q. 65 million MCF?

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

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

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

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

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

13 THE WITNESS: I'm sorry.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

9 For the Arco Empire unit the pool allowable
10 was the lesser number. I think there is 30,000
11 barrels a day somewhere around in there, or the
12 56,000 reservoir voidage figure, whichever was
13 less. They bumped up against the reservoir voidage
14 limitation I think in '83, which is what I recall
15 from the testimony. We, however, have been limited
16 by that ever since.

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

20 A. Yes.

21 Q. When did that occur?

22 A. It occurred in April of 1984.

23 Q. What happened?

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

1 their production. They showed evidence that
2 increasing the gas production in the pool would have
3 the effect of increasing oil recoveries and NGO
4 recoveries, and that just was the most efficient
5 thing in terms of conservation standpoint was to
6 eliminate the voidage requirement -- voidage
7 limit -- and just go on just a
8 65-million-cubic-feet-a-day cap. In other words, let
9 them produce as much oil as they can produce, but
10 not more than
11 65 million cubic feet of gas per day of production.

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

14 A. Yes, there was.

15 Q. And what was that?

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

20 Q. Why would that occur?

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

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

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

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

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

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

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

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

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

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

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

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

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

11 A. There was.

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

13 A. In April of 1984.

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

17 A. No.

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

21 A. No, there are not.

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

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

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

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

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

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

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

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

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

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

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

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

14 A. Yes, it does.

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

19 A. Yes, I have.

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

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

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

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

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

1 injected less than that, they debited the gas bank.

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

5 A. I believe they did, yes.

6 Q. Okay. Gas bank maximums the next entry?

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

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

21 A. Yes.

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

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

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

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

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

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

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

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

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

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

7 A. Yes, it was.

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

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

19 So that's why when our pressure maintenance
20 project commenced, we could never take advantage of
21 the 852 barrels of oil a day -- part of our
22 limitation -- because our gas/oil ratio was over
23 2000-1, so we started gas injection, and actually
24 our well just continued on a pretty steady decline
25 there, and you can see it. It is pretty consistent,

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

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

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

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

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

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

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

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

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

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

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

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

1 Unit.

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

6 A. Yes, I have.

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

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

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

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

8 A. Yes.

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

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

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

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

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

1 absolute pressure?

2 A. Correct.

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

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

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

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

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

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

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

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

1 order?

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

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

9 A. Okay. For example, the first pressure that
10 was measured on well Number 109 shows a test depth
11 of 5,410 feet. This indicates that the pressure at
12 5,410 feet was 1,302 pounds -- and that's shown in
13 the second column, pressure test depth -- and then
14 as they go down, they're measuring the pressure at
15 various points, so the pressure differential right
16 there at that test depth tells you the gradient of
17 the fluid that existed at that pressure -- I mean --
18 at that test depth, and that's the gradient that you
19 use to extrapolate from the measured test depth to
20 the datum of 2,264.

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

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

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

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

8 A. Yes, I have.

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

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

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

24 A. Yes.

25 Q. There aren't any producing wells for which

1 pressure has not been provided?

2 A. We only have six producing wells.

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

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

25 Q. Okay. Without going through it in great

1 detail, give us a summary of an example month.

2 You've taken the month of October of 1986; the first
3 part of the information shows "given." What does
4 "given" mean?

5 A. Okay. These are example calculations.
6 These are actually what we calculated for October
7 1986 for this hearing. The given values are the
8 known measured values that are the input values to
9 the voidage equation. The first one is oil
10 production for that month. It was 652 -- 651
11 barrels, and that is in the voidage equation denoted
12 (Q_o). The second given is gas production, another
13 measured quantity. 85,289 MCF of gas was produced
14 that month, and that's used in the voidage equation
15 as (G_p).

16 Gas injection is another measured
17 quantity. 69,131 MCF that month was injected of the
18 85,000 that we produced, and that (G_i) is the
19 variable that describes that.

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

1 be 68,603 reservoir barrels.

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

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

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

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

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

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

1 A. Okay. The last pressure measurement that
2 we had for the purposes of these example
3 calculations was recorded on October of 1985, so we
4 look at -- we can start with well 109. October of
5 '85 the corrected pressure for the datum was 988,
6 and we can go down to the next well, 110. October
7 '85 pressure was 900, and we can keep doing this
8 for the other four wells, and we just averaged those
9 measurements out and correct them for absolute, and
10 that should work out to 900 psi.

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

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

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

24 A. That's correct.

25 Q. Have you corrected that calculation so that

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

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

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

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

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

20 A. Okay.

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

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

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

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

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

25 Q. Have you correctly applied the cap to the

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

3 A. I believe so, yes.

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

7 A. Yes, I do.

8 Q. Let me ask you why Oxy did not seek to have
9 the pressure maintenance order removed from the
10 project when you stopped gas injection in May of
11 1988?

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

1 that we were producing against this very large gas
2 bank.

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

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

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

20 A. Correct.

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

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

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

25 (Recess at 9:30 a.m.)

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

7 A. Okay. This is a tabulation of the monthly
8 voidage and gas bank balance since the commencement
9 of the injection in the Citgo Empire Abo Unit. It
10 uses the same methodology as described in the
11 example calculations in the previous exhibit, and
12 what that is, it starts with a known measured number
13 in the first four columns, that being the reservoir
14 pressures, gas production, injection, and the oil
15 production and from those known values you calculate
16 everything else in the table (B_o), (R_s), and (B_g)
17 values, and that's per attachment A -- or attachment
18 B, I believe, one of the attachments to our order
19 that has a table of fluid properties in it based on
20 these reservoir pressures, and that's taken directly
21 from that table, and then the (R_{pn}) is a calculated
22 net producing gas-oil ratio which is also based on
23 the formula in our formula, excuse me, in our field
24 rules, and that's just the producing gas-oil ratio
25 reduced from the amount of gas injection that you

1 have.

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

4 A. Correct.

5 Q. What's that?

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

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

16 A. Correct.

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

19 A. Correct, for that month.

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

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

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

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

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

12 Q. The next column after that one?

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

1 Q. And the final column on the right there?

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

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

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

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

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

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

25 A. That was the date that was approved by the

1 OCD for the commencement of the calculation.

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

6 A. Well, looking at two columns, cumulative
7 over and under, and then the adjusted gas bank, you
8 can see that when we ceased re-injection in March of
9 1988, that's probably the second-to-last page of
10 this massive spread sheet, you can go over to the
11 column of cume over and under and see that we had
12 produced almost one million barrels less than what
13 we are were allowed to produce by our order.

14 MR. MORROW: What column is that, again?

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

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

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

22 Q. Reservoir barrels?

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

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

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

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

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

23 A. It's no longer meaningful.

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

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

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

6 Q. And why is that?

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

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

13 MR. KELLAHIN: Certainly.

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

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

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

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

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

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

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

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

16 A. Well, after March of '88, as I mentioned,
17 we basically shut the unit in except for flaring
18 some small volumes of gas, and you can see in the
19 table after March '88, the gas production volumes go
20 way -- voidage accumulates as indicated in the
21 cumulative over and under column; gets up to as high
22 as 1.7 million reservoir barrels, and then in early
23 '89, as I've testified to earlier, we've got a gas
24 market, started selling gas, so we start depleting a
25 little bit of this gas bank -- this cumulative over

1 and under volume -- and we end up in
2 December 1990 at a point that still is more
3 underproduced than what we are when we ceased
4 re-injection. In fact, we've added almost another
5 100,000 reservoir barrels of oil to the status of
6 the unit as of January 1, 1991.

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

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

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

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

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

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

9 A. I believe it can, yes.

10 Q. Why?

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

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

1 opportunities to produce as they do.

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

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

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

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

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

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

12 We believe the effective date of that
13 should be May 1 of 1988. We would ask the OCD to
14 assign us an allowable under the state wide rules of
15 142 barrels a day and 284 MCF a day for each capable
16 well beginning in May of 1988, and since to assign
17 us that allowable and to let the state wide rules
18 operate to cancel it each month because we can't
19 change our production over the last two years, that
20 would be equitable.

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

25 We're also asking that in order to operate

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

9 We're also asking that if the OCD decides
10 that the carry forward is not allowed under Order
11 4808 --

12 MR. MORROW: If what's not allowed?

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

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

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

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

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

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

1 interest owner?

2 A. I believe so, yes.

3 Q. And why is that?

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

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

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

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

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

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

12 A. Yes. Five at least.

13 Q. Under state wide pool rule limitations?

14 A. Yes.

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

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

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

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

25 (Oxy USA, Inc. Exhibits 1 through

1 13 were admitted in evidence.)

2 CROSS-EXAMINATION

3 BY MR. CARR:

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

9 A. Yes, sir.

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

14 A. Yes, sir.

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

18 A. No. Arco did too.

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

24 A. I don't know what they considered.

25 Q. Did anyone ever have an approved pressure

1 maintenance application --

2 A. Not that I am aware of.

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

5 A. That's my understanding, yes.

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

10 A. No, I believe the rules allow one well per
11 40 acres.

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

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

15 Q. Yes.

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

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

22 A. That's correct.

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

25 A. As of today we believe all the wells are

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

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

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

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

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

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

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

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

25 A. That's correct.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6 A. I am not aware, no.

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

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

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

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

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

1 correlative rights of Oxy?

2 A. No, I'm not.

3 Q. Or causing waste at this time?

4 A. No.

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

8 A. Yes, it was pretty easy to make.

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

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

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

19 A. That's my belief, yes.

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

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

1 our unit onto Arco's unit, yes.

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

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

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

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

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

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

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

23 A. Which pressures are we talking about?

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

1 A. Yes.

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

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

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

7 A. Measured gradient, yes.

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

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

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

22 A. From month to month.

23 Q. Yes.

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

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

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

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

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

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

10 A. As to overproduction.

11 Q. Yes.

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

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

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

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

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

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

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

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

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

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

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

18 A. That's how it reads.

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

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

25 Q. And if I understood your testimony,

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

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

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

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

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

1 A. We're talking about our records.

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

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

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

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

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

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

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

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

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

6 A. Uh-huh.

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

12 A. A slight increase, yes.

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

16 A. Well, we see an increase there in '89 to
17 '90 when we started back producing.

18 Q. Of about how many barrels?

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

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

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

1 curtailing our production tremendously.

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

7 A. This is correct.

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

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

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

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

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

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

3 A. To determine the gradient?

4 Q. Yes.

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

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

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

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

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

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

1 gradient is.

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

5 Q. That's fine with me.

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

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

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

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

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

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

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

1 those two depths divided by the difference in those
2 depths.

3 Q. Okay.

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

7 Q. Yes.

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

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

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

1 be meaningful too, so you balance those two
2 requirements?

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

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

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

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

12 Q. Okay.

13 A. To calculate the datum pressure point
14 2,264.

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

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

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

25 A. I do believe the pressures are probably in

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

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

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

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

12 A. That is correct.

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

16 A. I don't know.

17 Q. Okay.

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

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

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

3 A. Correct.

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

8 A. That is correct.

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

12 A. Previously used when?

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

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

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

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

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

25 A. Correct.

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

4 A. Actually March of 1988, yes.

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

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

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

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

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

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

1 maintain a gas bank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

20 Q. I bet you will.

21 MR. MORROW: Is that a no?

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

1 credits; is that right?

2 A. That's correct.

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

6 A. That's not right.

7 Q. Okay. What does that show?

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

11 Q. Okay.

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

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

17 MR. MORROW: All right.

18 MR. CARR: That's all we have.

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

21 REDIRECT EXAMINATION

22 BY MR. KELLAHIN:

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

1 it was no longer economic to continue to inject
2 gas.

3 A. That's correct.

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

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

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

13 A. Correct.

14 MR. KELLAHIN: I have nothing else.

15 EXAMINATION

16 BY MR. MORROW:

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

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

1 them on.

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

4 A. Yes. We tested those four in excess of the
5 284 MCF a day and as high -- as close to a million
6 cubic feet of gas per day.

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

9 A. That's correct.

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

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

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

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

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

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

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

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

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

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

4 Q. Produced oil and gas?

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

9 Q. That's your allowable voidage?

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

14 Q. Okay. All right.

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

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

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

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

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

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

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

1 had no choice but to curtail our production.

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

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

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

11 A. I would hope so.

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

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

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

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

10 MR. KELLAHIN: Except for the pressure.

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

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

19 Q. Well number 109?

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

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

1 noticed you use October of '85 for your October of
2 '86 calculations. Are there any requirements in
3 the rules that say you measured every year, or every
4 six months, or five years, or just measure it?

5 A. Mr. Examiner, there's no requirement in
6 Order 4808 to run reservoir pressures at all. It
7 just says that you have to determine the reservoir
8 pressure in order to do the calculations. It
9 doesn't -- it does say that that datum that you use,
10 the pressure has to be 2,264, but it doesn't say
11 that you have to run the pressure datum, you just
12 have to use a pressure corrected to that datum for
13 the calculations, but there is no requirement in
14 4808 for any frequency or number of tests, or which
15 wells to run them on, or that sort of thing.

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

20 A. Are you looking at the adjusted gas bank?

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

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

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

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

4 A. The first one. You see we've calculated
5 72,229 MCF. As I mentioned, the way that is
6 calculated is, we plugged the limit of 2,213 into
7 the voidage calculations and back calculate what the
8 injection should be so that that voidage is made
9 equal to 2,213, and that calculation yielded 72,229
10 MCF for that month. That then is compared to the
11 column -- to the volume -- under column gas
12 injection. So, for example, the month of June '75
13 you see we injected 74 million, we were supposed to
14 inject 72 million to keep our production 2,213. The
15 difference between those two numbers is 48,048 MCF
16 debit, which means that we underinjected by
17 48 million that month.

18 Q. Okay.

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

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

3 In reviewing the first report that was
4 filed, the pressure used for those calculations of
5 the voidage and the gas bank was something like
6 1,380 pounds. The pressure we used was 1,181.
7 Because that was so long ago, we really had
8 difficulty figuring out where that pressure came
9 from in terms of backing it up with measured
10 numbers, so what we did for this first 1975, because
11 we took the most conservative approach we could take
12 to it, the only published data available for
13 pressure on any wells in the Citgo Empire Unit, is
14 the New Mexico Engineering Reports -- Engineering
15 Committee Reports, and that shows the pressure for
16 one well over here, this 1,281.

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

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

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

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

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

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

25 A. According to what was filed originally, we

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

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

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

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

1 well basis.

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

8 Q. Let's see, last page?

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

11 Q. Or above Oxy?

12 A. It's right above Oxy.

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

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

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

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

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

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

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

9 Q. Yeah.

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

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

19 A. Yes, sir.

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

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

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

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

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

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

2 Q. I guess I can see that after February of
3 '88 where you dropped below 2,213, but between
4 2,905 and 1,207 there in the reservoir voidage
5 column?

6 A. Yes, sir.

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

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

12 Q. Okay.

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

15 Q. Oh, okay.

16 A. -- approximately 97 reservoir barrels a
17 day.

18 Q. Okay.

19 A. Those are all on a monthly basis.

20 Q. That's all I have.

21 EXAMINATION

22 BY MR. STOVALL:

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

1 A. How can you?

2 Q. Yeah. It's a retroactive change.

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

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

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

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

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

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

8 Q. I guess if you didn't need a rule change in
9 '88, why do you need a rule change now that goes
10 back to '88?

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

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

18 MR. MORROW: Well, I thought of one.

19 FURTHER EXAMINATION

20 BY MR. MORROW:

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

23 A. Right now?

24 Q. How much allowable will that be?

25 A. I can calculate it for you exactly. I

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

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

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

15 Q. All right.

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

18 MR. KELLAHIN: No, sir.

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

20 MR. CARR: No, sir.

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

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

25 MR. MORROW: How much time you all want to

1 take?

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

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

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

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

11 GARY BROOKS SMALLWOOD,
12 the Witness herein, being previously duly sworn, was
13 examined and testified as follows:

14 DIRECT EXAMINATION

15 BY MR. CARR:

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

18 A. Gary Brooks Smallwood.

19 Q. Mr. Smallwood, where do you reside?

20 A. Midland, Texas.

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

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

25 Q. And have you previously testified before

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

4 A. Yes, I have.

5 Q. What's your current responsibilities with
6 Arco?

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

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

12 A. Yes, I am.

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

16 A. Yes, I am.

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

20 A. Yes, I have.

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

23 A. Yes.

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

1 MR. MORROW: Yes.

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

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

8 Q. And what else do you seek?

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

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

14 A. Yes.

15 Q. Do you basically concur in that
16 presentation?

17 A. Basically.

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

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

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

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

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

14 Q. And what conclusion do you reach from this?

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

17 Q. Are your calculations shown later in your
18 presentation?

19 A. Yes, they are.

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

23 A. Yes.

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

1 from Exhibit Number 1.

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

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

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

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

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

1 Number 4549. It shows that the Arco allowable was
2 changed in 1984, but we'll address that in a minute,
3 that that change occurred because we demonstrated
4 that by going to a surface allowable that we would
5 be able to increase natural gas liquid recoveries by
6 3.3 million barrels of NGO by going to that surface
7 allowable, and that we received that surface
8 allowable contingent on re-injecting all available
9 residue gas.

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

12 A. Yes, they have.

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

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

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

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

24 Q. And then the black line is the --

25 A. 65 million a day allowable.

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

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

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

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

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

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

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

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

13 MR. MORROW: Page what?

14 THE WITNESS: Page ten.

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

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

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

1 is that right?

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

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

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

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

17 A. Yes, I believe we are.

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

21 THE WITNESS: Yes, sir.

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

25 THE WITNESS: Yes, sir.

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

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

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

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

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

17 A. Yes, I have.

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

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

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

1 A. Yes.

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

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

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

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

24 Q. And then line 12?

25 A. Line 12, these are the pressures that the

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

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

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

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

12 A. Yes, it has.

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

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

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

20 A. Yes.

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

25 A. These are from the operators monthly

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

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

12 A. Well, they're much greater.

13 Q. Is that a consistent pattern?

14 A. Yes, it is.

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

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

21 Q. Would it result in higher allowables?

22 A. Yes.

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

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

3 A. Yes.

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

6 A. Yes, I was.

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

9 A. Yes, I do.

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

14 A. Yes.

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

19 A. That's right.

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

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

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

1 A. From the operator.

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

6 A. Yes.

7 Q. If you would look down to the column dated
8 10-22-80, would you go over and -- what is the
9 gradient that was reported by Oxy in this exhibit?

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

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

14 A. Yes, I have.

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

17 A. .1 psi per foot.

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

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

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

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

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

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

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

10 A. Uh-huh. The other pressure I use is the
11 pressure that they report on the C1-24 at a datum of
12 1,191 which also shows -- the 1,191 -- and that
13 datum that is shown up in the upper right-hand
14 corner, the C1-24, is minus 2,400 feet.

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

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

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

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

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

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

3 A. Just doing it to make sure. Yes.

4 Q. Okay.

5 MR. MORROW: Where did you get the elevation?

6 THE WITNESS: Form C1-24.

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

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

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

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

14 Q. Divided by 390?

15 A. Uh-huh.

16 Q. And what do you get?

17 A. About .1 psi per foot.

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

20 A. Yes.

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

23 A. Yes, I have.

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

1 A. Yes.

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

5 A. A gradient of 0.7.

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

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

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

13 A. Yes.

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

16 A. Yes.

17 Q. And what does that come out to be?

18 A. .27. Almost four times as much.

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

22 A. Point two seven.

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

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

3 Q. That's from Exhibit 8?

4 A. Right.

5 Q. And you got?

6 A. An average of .07 psi per foot.

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

8 A. Yes.

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

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

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

16 A. It's going to make them different.

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

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

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

1 determine these gradients?

2 A. No.

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

7 A. Yes.

8 Q. And that would also be --

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

10 MR. CARR: Yes, sir, I am.

11 MR. MORROW: On what page?

12 MR. CARR: On page 12.

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

16 A. That's right.

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

19 A. They do when they calculate their
20 allowables.

21 Q. If we go through those numbers we have for
22 1977, the number of 1,321. Do you see that?

23 A. Yes.

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

25 A. Yes.

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

3 A. No, not at all.

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

6 A. Quite often.

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

10 A. Yes, we sure do.

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

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

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

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

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

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

8 A. Yes, I have.

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

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

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

16 A. Yes.

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

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

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

24 A. Yes, it is.

25 Q. Okay. Page 18 in your exhibit book is

1 what?

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

5 Q. Now, in utilizing this Attachment B on page
6 18 of our exhibit, how is this utilized?

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

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

15 A. Yes.

16 Q. And calculate allowable?

17 A. Yes.

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

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

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

25 A. That means you calculate the wrong voidage.

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

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

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

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

1 voidage minus the allowable, overproduction shows as
2 positive.

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

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

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

10 A. It's the first tip. You must also consider
11 the status of the gas bank before you automatically
12 come up these over and underages.

13 Q. Okay. And could you just state -- we've
14 discussed the gas bank -- what it is that you
15 understand this gas bank to be?

16 A. The gas was intended to allow the unit to
17 maintain allowable production during times of
18 injection, compressor shutdowns and similar
19 problems.

20 Q. And on page 21 of your exhibit, is there a
21 definition of the gas bank?

22 A. Yes. And that's what I just read.

23 Q. Okay. Are you aware of anything in OCD
24 rules or orders that would permit accumulation of an
25 allowable to the Citgo Unit other than the provision

1 of that bank?

2 A. No.

3 Q. Let's go then to page 22 and I'd ask you if
4 you would point out what you believe to be the
5 relevant portions of Order R 4808 as it relates to
6 the gas bank?

7 A. Well, Rule 7 is the rule that defines as
8 termed reservoir voidage balance gas and that's
9 basically a baseline. Once you determined how much
10 that is, if you inject above or below that amount,
11 then you get accredited or debited to the gas bank.
12 Rule 9A indicates that the volume of gas injected in
13 a project in any month of the excess of the
14 reservoir voidage gas shall be credited to the gas
15 bank and carried cumulatively forward, but the
16 important thing I think is -- or one of the most
17 important things -- is Rule 9E.

18 " When there are insufficient credits
19 accrued to the gas bank to bring actual injection
20 plus applied credits up to the reservoir voidage
21 balance gas requirement during any given production
22 month, production for that month shall be reduced to
23 an amount commensurate with the average daily
24 reservoir voidage set forth in Rule 3. Production
25 beyond this amount shall be considered

1 overproduction and shall be compensated for by
2 underproduction during the following month."

3 Q. Now this addresses how -- this is how
4 Order R-4808 covers overproduction?

5 A. Yes.

6 Q. Is there anything in this order which
7 addresses the carrying forward of underproduction?

8 A. With the gas bank?

9 Q. Either way. Does the gas bank address
10 that?

11 A. The gas bank is a method for carrying
12 forward underproduction.

13 Q. And how does that work?

14 A. "When you have produced less than 2,213
15 reservoir barrels per day, you will calculate an
16 amount of reservoir voidage balance gas that is less
17 than what you re-injected." So the difference
18 between those two will be the amount that you credit
19 to the gas bank and then you can use it at a later
20 date.

21 Q. Now, other than the gas banking provisions
22 in this order, are you aware of anything that
23 permits the carrying forward of underproduction to
24 be made up at a later day?

25 A. Oh, no.

1 Q. Okay. Have you calculated the gas bank
2 status in the Citgo Unit in terms of the over and
3 under status?

4 A. Yes, I have.

5 Q. And is that calculation what is set forth
6 on page 24 of this exhibit?

7 A. It's not shown on page 24 because it came
8 out to be negative.

9 Q. Okay. Well, let's go to 24, and explain to
10 me what 24 shows.

11 A. Because the gas bank was negative for all
12 the years, we basically went back and cumed up the
13 overage and underage from the previous exhibits and
14 show a cumulative of overage status.

15 Q. Okay. And that is set forth on page 24 in
16 what column?

17 A. In Column G. In my first set of columns A,
18 B, C, D, E and F have been previously shown, I
19 believe it was on page -- on page 19. And once we
20 investigated the status of the gas bank and found
21 that it was negative all these years, then it became
22 obvious that there was no method for them to produce
23 above 2,213 for all this time.

24 Q. Now, in Column G we have numbers that show
25 the over/under status in terms of reservoir barrels

1 by year, correct?

2 A. Yes.

3 Q. And this is carried forward on a cumulative
4 basis; correct?

5 A. Yes, it is.

6 Q. And in getting these numbers you actually
7 looked at, what, annual numbers? Or did you review
8 it on a month-by-month basis?

9 A. I reviewed it on a month-by-month basis.

10 Q. Now, this cumulative column, is that
11 consistent with the provisions of Order R 4808?

12 A. No. You're required to shut in and to make
13 up overproduction in the following month.

14 Q. So in essence what we should have had in
15 here are a bunch of zeros; isn't that right?

16 A. That's right.

17 Q. Now, when you get down to the last several
18 lines in that column, in the line from 1987, that's
19 line 14, you have a zero?

20 A. Uh-huh.

21 Q. Could you just from that point on explain
22 why you have those two zeros and then the numbers
23 that follow?

24 A. The 1987 was when the unit was -- the
25 gas -- the unit came into balance in 1987.

1 Q. That was during the period of time when
2 there wasn't a market for the gas?

3 A. That was shortly before that. I believe
4 that was during the period of time when they were
5 re-injecting all their wet gas and not stripping
6 down.

7 Q. All right. Then we have a zero for the next
8 year. Why do we have a zero there?

9 A. Because that was when they were not
10 injecting gas and selling gas and had no -- no gas
11 bank.

12 Q. Were you carrying forward or accumulating
13 allowable for them during that year?

14 A. No.

15 Q. And then we go to 1989. What is the basis
16 of that number?

17 A. That's simply from Column F. That's the
18 amount of overproduction based -- compared to the
19 2,213 reservoir barrels per day allowable.

20 Q. And that continued in 1990 which gives you
21 the 650,000 reservoir barrels; is that right?

22 A. Yes, yes.

23 Q. Is that what your calculations show to be
24 the overproduced status of the Citgo Unit?

25 A. 3-19-90 it does, yes.

1 Q. And has it continued into 1991?

2 A. Yes, we think it has.

3 Q. And this is based on the calculations of
4 allowables from the OCD Order R 4808?

5 A. Yes.

6 Q. And the pressures that you got from the
7 C1-24s?

8 A. Yes, it is.

9 Q. And the gradients that you obtained in the
10 method you explained to Mr. Morrow?

11 A. Yes, it is.

12 Q. All right. Mr. Smallwood, your conclusions
13 are set out on pages 25 and 26. Let's go to page 27,
14 and could you identify this for the Examiner?

15 MR. MORROW: What number did you say?

16 MR. CARR: Page 27.

17 A. Page 27 is a tabulation of production and
18 injection for their unit for the life of the wells
19 on that unit. The first column is oil produced per
20 year. That's Column A. Column B is accumulation of
21 the oil produced. Column C is gas production per
22 year. Column D is cumulative gas produced. Column
23 E is gas injection per year, and Column F is
24 cumulative gas injection.

25 What I want to show on this page is that

1 the cumulative gas produced has been 21.2 BCF at the
2 end of 1990, which is shown in bold at the bottom of
3 Column D, and also shown at the bottom of the page,
4 and the cumulative gas injected is 10.6 BCF, and
5 that difference between those two numbers is
6 coincidentally 10.6 BCF, and that is the amount of
7 gas that has been recovered or consumed from this
8 unit.

9 Q. With these numbers, have you been able to
10 calculate the percentage of the original gas in
11 place under the Citgo Unit that has been produced
12 through 1990?

13 A. I have calculated the original gas in place
14 and the percent recovery of that gas in place.

15 Q. And is --

16 A. That's shown on the next page, page 28.

17 Q. All right. Let's go to page 28, and I
18 think you ought to review for Mr. Morrow the source
19 of the information that you used in this calculation
20 and what it shows.

21 A. We've used two major reservoir studies.
22 One of them is a 1968 joint engineering committee
23 study that was performed by the joint group that
24 worked up these proposals out here for the Arco
25 Unit, participated in by all parties that wanted to

1 participate and had an interest in the field, and
2 the other one is the October '70 Arco field
3 management study, both of them having very similar
4 information and data in them.

5 Column one is from those studies. Column
6 two, three, and four are from those studies and are
7 also in the PVT attachments, I believe, to the two
8 orders to calculate reservoir voidage within the
9 initial formation of volume factors for oil and gas
10 and solution gas ratios is what I'm referring to
11 there.

12 MR. MORROW: What page are you on?

13 MR. CARR: We're on page 28.

14 Q. (By Mr. Carr) Mr. Smallwood, the items in
15 Columns 3 through 5 are from the attachment to OCD
16 order 4808. That's attachment B, two through four?

17 A. Two through four.

18 Q. Two through four.

19 A. Yes.

20 Q. All right. What's the source of the figure
21 on line five, the original oil in place number?

22 A. That's in the October '70 Arco field
23 management report.

24 Q. Okay. Then item six is what?

25 A. It shows the original gas in place is equal

1 to the free gas in place plus the gas that was in
2 solution.

3 Q. All right. Now, in 7 -- line 7 -- you show
4 how you compute the free gas; is that correct?

5 A. Yes.

6 Q. And what did you get?

7 A. 316 million cubic feet. In line 8 I showed
8 how to compute the solution gas, and I got 5.56 BCF.

9 Q. And so you simply add those two?

10 A. Yes, to come up to original gas in place as
11 shown in line 9 of 5.878 BCF.

12 Q. And you compare to that, what, the volumes
13 that you show on the preceding page?

14 A. Yes. The 10.6 BCF of produced gas and the
15 original gas in place of 5.878 BCF indicates that
16 the percent recovery has been 180 percent of the
17 original gas in place.

18 Q. And what does this actually mean to Arco as
19 the operator of the offsetting unit?

20 A. We computed a material balance on the Citgo
21 Empire Abo Unit to calculate that.

22 Q. And that's what your material has forth on
23 page 29?

24 A. Yes, it is.

25 Q. Okay. Let's go to that, and I'd ask you to

1 review that for Mr. Morrow.

2 A. This is a solution to the generalized
3 material balance calculation from Mudcraft and
4 Hawkins textbook, and we basically saw the
5 calculated gas influx for the generalized balance
6 equation. Column F shows the accumulation of the
7 gas that has influxed into the Citgo Unit, and in
8 1990 -- at the end of 1990 -- it is 7.1 BCF that has
9 migrated to the Citgo Unit.

10 Q. And this was just a standard engineering
11 calculation?

12 A. Yes.

13 Q. And you drew it from Mudcraft and Hawkins?

14 A. Yes.

15 Q. And this is the volume that is based on
16 your calculations and the data that you've used, has
17 actually moved from the Arco Empire Abo Unit into
18 the Citgo Unit?

19 A. That's right.

20 Q. Now, Mr. Foppiano testified about the
21 pressure differential between the two units. You
22 were present for that, were you not?

23 A. Yes, I was.

24 Q. Have you also taken a look at the pressures
25 that exist between these units?

1 A. I have.

2 Q. And is that -- I think I ought to ask you
3 to refer to the graphs on pages 31 through 36 and
4 just explain how you understand the pressure
5 differential to be.

6 A. Page 31 is a map that shows a location of
7 the wells in both of the units that are near the
8 Citgo Empire Abo Unit, and it shows when the wells
9 were shut in, and I might just point out, the Arco
10 Well G17, which is located by the column of letters
11 on the left-hand side of the page, you see the G, H,
12 I, J, K, and then the numbers as you go across the
13 page by the wells. So the G17 is located up in this
14 corner of the map right here. That well was shut in
15 in 1975 as was the well beside it in '75. The well
16 south of it was shut in in '76 and '78 many of
17 the -- well H12 on the other side of the Citgo Unit
18 was shut in, and H12 was shut in in 1975. These
19 wells were shut in the Arco Empire Abo Unit to
20 conserve reservoir energy and produce low down
21 structure. At the same time, if you look at the
22 shut-dates dates on the Citgo Empire Abo Unit, you
23 can see that most of those wells are on there in
24 those times. Their first well was shut in in 1975
25 -- excuse me -- 1979 when they shut in the Number

1 14 and the Number 4, and then no more wells were
2 shut in until '83, so they had wells on -- producing
3 all this time while the Arco Unit had wells that
4 were shut in and trying to maintain reservoir
5 pressure for the rest of the unit.

6 Q. All right. Now, let's, as background, go to
7 the graphs, and I'd ask you just to explain what the
8 following graphs are intended to show.

9 A. These are a series of plots that compare
10 pressures from wells that are in each of the two
11 units; pressures that were measured on the form
12 C1-24s. You can see the Arco curve is always shown
13 in red and the Citgo well is always shown in black,
14 and in most cases, the general trend has been that
15 the Arco pressure is greater than the Citgo Unit
16 well pressure.

17 Q. All right. Well, let's go to the graph on
18 page 37 of this exhibit, and I'd ask you to review
19 and explain those.

20 A. Page 37 are the pressures shown again. The
21 pressures from the allowable request letters, or the
22 letters that were used to calculate allowables, are
23 shown in red again.

24 Q. And we've had that curve before on several
25 graphs?

1 A. Yes, we have, and the pressures that are
2 shown in black are from the Citgo Unit form C1-24 as
3 we've had that pressure -- that curve -- shown
4 before, and this time we've reported the pressures
5 from the Arco Unit on the Arco form C1-24s and
6 they're shown in blue, and you can see that since
7 the time of 1982 the Arco Unit has had higher
8 pressures than the pressures reported on the C1-24s
9 from the Oxy forms.

10 Q. And what does this -- what would this
11 cause?

12 A. This would cause drainage from the Arco
13 Unit to the Citgo Unit.

14 Q. Now, let's take a look at the graph that's
15 set forth on page 38 of this exhibit.

16 A. This is a plot of pressure versus
17 cumulative voidage for poor volume, and it shows,
18 once again, that the Citgo Unit is being drained
19 faster than the Arco Unit. I picked an arbitrary
20 pressure there of slightly greater than 900 pounds
21 to describe this one. You can see the red arrow
22 that's coming across from the Y axis there, and it
23 intersects the Arco Unit curve shown in black at a
24 time that occurred in 1987, and the voidage at that
25 time for poor volume was slightly under 500

1 reservoir volumetric barrels per 1,000 volumetric
2 barrels. While at the same time --

3 Q. So in the Arco Unit when we got to this
4 pressure of a little over 900 pounds, there had been
5 voidage of slightly less than what? 500 what?

6 A. Reservoir barrels per poor volume reservoir
7 barrels.

8 Q. Now, compare to the curve that reflects the
9 Citgo Unit.

10 A. You can see that that occurred after 1984
11 but before 1985, so they reached that reservoir
12 pressure more than two years before the Arco Unit
13 did, and that occurred because they had already
14 voided almost three times as much more, as you can
15 see, down on the axis where the arrow points down to
16 between 12 and 1500.

17 Q. So we if can see this 3.3 times voidage
18 ratio by just noting where the arrow comes down from
19 where the Arco Unit hit that 900-plus pound pressure
20 and compared to when the Citgo Unit hit that
21 pressure?

22 A. Yes, that's right.

23 Q. All right. Now, Mr. Smallwood, let's go to
24 your graph on page 39 and I'd ask you to explain
25 what that is.

1 A. This shows the gas-oil ratios versus time
2 for the two units, and it shows when gas injection
3 started in each of the units. The Citgo Unit is
4 shown in red, and the Arco Unit is shown in black.
5 You can see that the Citgo Unit has been very
6 inefficient just by looking at the gas-oil ratio.

7 Q. Okay. Anything else on that one?

8 A. That's it.

9 Q. All right. Let's move to the graph on
10 page 40.

11 A. This is a plot of the gas-oil ratio for the
12 two units versus the cumulative voidage per poor
13 volume, and you can see that the gas-oil ratio for
14 the Citgo Unit is shown in red and that it's much
15 higher, and one reason being because it's been
16 voided so much more than the Arco Unit has
17 relatively.

18 Q. Okay. Would you identify for Mr. Morrow
19 the information contained on page 41 of Arco
20 Exhibit 1?

21 A. This is a summary of the comparison of the
22 two units. We show the original in place for each
23 of the two units. You show the oil fill poor volume
24 that's in place for each of the two units, and the
25 hydrocarbon poor volume, and then we calculate the

1 gas recovery for the two units to date, and the
2 Citgo Unit has recovered 180 percent of its original
3 gas in place, and the Arco Unit only 36 percent of
4 its original gas in place. The oil recovery is
5 shown in line six, and the Citgo Unit has recovered
6 72 percent of its original oil in place while the
7 Arco Unit has recovered only 56 percent of its
8 original oil in place.

9 Q. Okay. At the time the Arco Empire Abo Unit
10 was being proposed, were projections made as to how
11 this unit was expected to perform?

12 A. Yes, sir, it was.

13 Q. And would you refer to page 42 and identify
14 and review that for Mr. Morrow?

15 A. This is a graph of the predicted production
16 rates, as predicted by the reservoir simulator
17 versus the actual production rates.

18 Q. And what does this show?

19 A. This shows that the simulator did an
20 outstanding job of predicting and forecasting the
21 rates of the unit.

22 Q. Now, Mr. Smallwood, let me ask you, does
23 this tell you anything about the estimates that you
24 originally had concerning original oil in place and
25 original gas in place?

1 A. It tells us that the estimates that were in
2 the Arco study of 1970 must be right.

3 Q. And what does Arco recommend be done to
4 correct the situation in the Empire Abo pool?

5 A. Our recommendations are shown on page 43.
6 We recommend shutting in the Citgo Unit until all
7 overproduction is made up because the Arco Unit is
8 84 times larger than the Citgo Unit. We recommend
9 allowable for the Citgo Unit of 1/84th of the
10 estimated Arco voidage of 18.8 million reservoir
11 barrels per year, or 613 reservoir volumetric
12 barrels per day.

13 Q. Now, at the current rate, I believe
14 Mr. Foppiano said was something in the neighborhood
15 of 700 barrels a day? This is less than what they
16 are currently able to produce?

17 A. This is less than what they are currently
18 able to produce. Their allowable right now is 2213.
19 He estimated that their current gas production rate
20 at the surface is at about 700 MCF per day.

21 Q. By converting gas rates and confusing those
22 with reservoir barrels?

23 A. Yes.

24 Q. Which I've done all week and all month. Do
25 you recommend that any other changes be made in

1 Order 4808?

2 A. Other than adjusting the allowable from
3 2,213 to 613 reservoir volumetric barrels per day,
4 no, we do not.

5 Q. Do you -- you have been present to and
6 familiar with what Oxy is proposing to be done in
7 this unit?

8 A. Yes, I have.

9 Q. Based on your study of the reservoir, do
10 you have an opinion on whether or not Oxy is, in
11 fact, overproduced?

12 A. Yes. I believe they're overproduced.

13 Q. And when they assert that they are
14 underproduced, do you have an opinion as to what is
15 the source of this difference between Arco and Oxy
16 as to the overproduced and underproduced status?

17 A. Well, early on it's the pressure
18 information, but later on it's the -- their
19 willingness to carry forward underage when there is
20 no mechanism in the order for that to occur.

21 Q. If they were underproduced, do you believe
22 it would be appropriate now to permit them to have a
23 special allowable exception to now recover
24 underproduction?

25 A. No.

1 Q. Do you agree that it would be appropriate
2 to simply place the wells in the Arco Unit under
3 state wide oil allowables?

4 A. No.

5 Q. And why not?

6 A. Because we're recovering oil in a pressure
7 maintenance project, and this is an ongoing, viable
8 project.

9 Q. If their requested allowable rate was
10 granted, what impact would that have on the Arco
11 Unit?

12 A. It would cause more damage.

13 Q. In terms of reservoir voidage, what would
14 you expect to see?

15 A. If the rates that they requested were
16 granted, they would be more than twice the rates
17 they're at now, and that would make their voidage at
18 almost 6.6 times as fast as the Arco Unit is.

19 Q. If their requested relief is granted, what
20 would that do to their ability to recover gas from
21 the unit?

22 A. It would impair the Empire Abo Unit owners'
23 correlative rights.

24 Q. And why is that?

25 A. Because it would be draining reserves from

1 the Arco Unit.

2 Q. Would that, in your opinion, have an
3 adverse affect on your operation?

4 A. Yes.

5 Q. Does the production of this gas from the
6 reservoir have any impact on the pressure
7 maintenance project other than just the volumes that
8 are lost?

9 A. Yes, it reduces the pressure in ultimate
10 recovery of the reservoir.

11 Q. In terms of the Arco gas bank that's been
12 raised here a couple of times, Mr. Smallwood, what
13 are the benefits to Arco at this time of the gas
14 bank?

15 A. Well, we're recycling gas at a slightly
16 higher rate than the 65 million cubic feet per day
17 today for some of the first time in the life of our
18 unit. We're at about 70 million cubic feet a day,
19 and because of that extra 5 million cubic feet a day
20 of production, which is all reinjected back into the
21 ground, we're making about 50 barrels of oil per day
22 more than we would for the unit.

23 Q. When we get to what we call "blow down" of
24 the unit, how will the gas bank factor into
25 production at that time?

1 A. The gas bank is contingent upon
2 re-injection of available residue gas.

3 Q. What about those volumes when we get to
4 "blowdown"? How will that -- is that an important
5 factor to Arco at that time?

6 A. No, not that we agree on.

7 Q. What would your production be restricted to
8 when you start selling gas?

9 A. We think it will still be at same 65
10 million a day based on the capacity of the two
11 plants that receive the gas.

12 Q. Do you have anything further to add to your
13 testimony?

14 A. I think that's enough.

15 Q. Were exhibits -- was Exhibit 1 prepared by
16 you?

17 A. Yes, it was.

18 Q. And Exhibit -- Arco Exhibit A is just a
19 copy of a form C1-24 that was supplied by Oxy?

20 A. Yes.

21 MR. CARR: At this time, Mr. Morrow, we would
22 move the admission of Arco Exhibit 1 and Exhibit A.

23 MR. MORROW Exhibit 1 and Exhibit A are
24 admitted.

25 (Arco Exhibits 1 and A were

1 admitted in evidence.)

2 MR. CARR: And that concludes my direct
3 examination of Mr. Smallwood. One other thing, we
4 have copies of the basic studies, which I think
5 everybody has used here, the early ones.

6 MR. KELLAHIN: The '70s study?

7 MR. CARR: Right.

8 MR. KELLAHIN: We haven't used it. We don't
9 like it.

10 MR. CARR: We have used it. I would like to
11 offer -- I would like to offer two studies;
12 correct?

13 THE WITNESS: Yes, sir.

14 MR. CARR: As Arco Exhibits 2 and 3. These
15 are the studies that we had utilized in preparing
16 these calculations.

17 MR. MORROW: We'll be glad to accept those,
18 and if you'll go through and explain them. I'll be
19 happy to do that if you'd like, right after lunch.

20 MR. MORROW: I don't need them for my private
21 study. If you'd like to have them explained and
22 tell me what's in them, I'll be glad to accept
23 them.

24 MR. CARR: You don't want every page
25 explained, do you, Mr. Morrow?

1 MR. MORROW: Well, I want to know what we're
2 getting.

3 MR. CARR: Okay. We'll take a few minutes
4 after lunch when we get back and tell you what they
5 are and how we used them.

6 MR. MORROW: How much more time do you think
7 we have before the end of the day to spend on this?

8 MR. KELLAHIN: I need to regroup during the
9 lunch break. I don't know what we're getting into
10 in the 1970 engineering studies.

11 MR. CARR: You know, we may decide not to
12 offer those. The purpose was simply to have all the
13 data before you and we thought it would not
14 create --

15 MR. MORROW: Well, it must have been submitted
16 in the original record.

17 MR. KELLAHIN: That's right. It was
18 submitted -- the '68 study was.

19 MR. CARR: It was already submitted, and we're
20 not attempting to throw in pages and pages except
21 for the data that we used.

22 MR. KELLAHIN: Maybe we should hold this and
23 talk about it among ourselves.

24 MR. MORROW: We'll be glad to take it, but we
25 don't just want volumes and volumes coming in the

1 record unless we know what we're getting.

2 MR. CARR: Okay. And we may decide at that
3 point not to put that in.

4 MR. KELLAHIN: I suppose the easiest way to go
5 about this, I need to ask Mr. Smallwood some
6 questions about his methodology and some of the
7 choices he's made in selecting his parameters, but I
8 suspect I'll call a rebuttal witness to comment on
9 his calculations as the most expeditious way to put
10 forward our comments, so I think we can handle it in
11 that fashion, but I would expect it would take
12 another couple of hours after lunch by the time
13 everybody gets through asking questions. I think
14 there's a couple of hours more to do.

15 MR. STOVALL: It depends on whether you decide
16 to go through this or not.

17 (Recess taken for lunch at 12:30 p.m.)

18 MR. MORROW: Already it's 1:45 and Bob said he
19 would be a little late, so if everybody is ready,
20 we'll go ahead and start up again.

21 MR. CARR: If it please the Examiner, that
22 concludes our direct examination of Mr. Smallwood.

23 MR. MORROW: Thank you, sir. Go ahead,
24 Mr. Kellahin.

25 CROSS-EXAMINATION

1 BY MR. KELLAHIN:

2 Q. Thank you Mr. Examiner. Mr. Smallwood,
3 you've given us a substantial number of exhibits
4 this morning to support your contentions concerning
5 this case, and in my own layman's way, I would like
6 to see if I couldn't summarize your conclusions and
7 your exhibits to see if I can understand where the
8 focus is of your work in those conclusions.

9 Am I correct in perceiving that your
10 conclusions and your exhibits are predicated on two
11 basic engineering components, one of which is
12 determining reservoir pressure, and the second one
13 is determining the oil in place underlying the Citgo
14 Empire Abo Unit?

15 A. Yes, sir.

16 Q. The conclusions you have made about
17 drainage where you contend that Oxy's operations are
18 draining Arco are going to be predicated on
19 reservoir pressure and the reliability of
20 oil-in-place calculation; is that not true?

21 A. Yes, sir.

22 Q. Okay. In addition, the argument you've
23 expressed about the rate at which Oxy is voiding the
24 reservoir and the fact that you contend based upon
25 your study that they are voiding the reservoir at

1 3.3 times Arco's voidage rate is also predicated
2 upon reservoir pressure and the oil-in-place
3 calculations; would that be true?

4 A. It's predicated upon the oil-in-place
5 calculations, and to some extent, the pressure.

6 Q. Let's turn to page 28, if you will,
7 please. You've summarized on page 28 the components
8 that have gone into this material balance volumetric
9 calculation. Am I correct in remembering that item
10 number five, the oil-in-place number for the Citgo
11 Empire Abo Unit is not something that you have
12 independently derived based upon your own analysis,
13 but rather have taken from the 1970 -- the
14 October 2, 1970, engineering study report?

15 A. Yes. It came from the October '70 study,
16 and was also used by the operator of the Citgo Unit
17 for their presentation and request for their
18 pressure maintenance project in 1974.

19 Q. Okay. Can you summarize for us without
20 going into all the details, the October 2, 1970,
21 study, the general methodology that was applied in
22 selecting the parameters by which you get the
23 oil-in-place calculation in that study?

24 A. Yeah. There was an extensive engineering
25 committee evaluation of all the logs and all the

1 cores in the field, and a great assimilation of
2 data, I believe, something like 75,000 feet of well
3 logs were reviewed, more than 3,000 feet of cored
4 wells were reviewed, porosities versus
5 permeabilities were correlated between logs, and
6 cores and flow capacity charts were generated, and
7 porosity and permeability cutoffs were selected, and
8 net feet were assigned to each well in the field,
9 and a volumetric calculation on each tract in the
10 field was done.

11 Q. Then you've taken that conclusion and
12 utilized it then in determining the Item 9 on here,
13 which is the gas recovered plus the remaining gas to
14 be recovered to get us the 5.878 BCF; is that what
15 that represents?

16 A. Yeah. You take data from the study to
17 calculate Item 9. The study reports the numbers
18 that are shown in Item 7 and in Item 5 also, which
19 were used to calculate Item 9.

20 Q. The parameters selected for the 1970 study
21 calculation were dealing with the interval within
22 the unit described as the gross Abo reef interval,
23 and within that interval then, the calculations were
24 made and the parameters were selected?

25 A. Yes, that's right.

1 Q. For the Citgo Empire Abo Unit, do you
2 recall what was estimated based upon that study to
3 be the original gas in place for the Citgo Unit? Is
4 that going to be Item Number 5 on this tabulation?

5 A. The original gas in place or the
6 original --

7 Q. I'm sorry. The original oil in place.

8 A. Item Number 5 is the answer to the original
9 oil in place that was in that study.

10 Q. Okay. The original gas in place is what
11 amount? Is that shown on this spread sheet?

12 A. Yes. Item 9 is computed by adding the free
13 gas initially to the solution gas.

14 Q. Okay. So when I want to determine the
15 original hydrocarbons in place within the Citgo
16 tract, I can look at Items 5 and 9 on this sheet?

17 A. Yes.

18 Q. Okay. When we examine -- or you examine as
19 a petroleum engineer -- the question of pressures in
20 the reservoir, you've shown us a number of displays
21 in which, utilizing the information on the C1-24s it
22 gives you a certain projection of pressures within
23 the Citgo Unit. It's in various forms in here, and
24 you may have to help me find one that demonstrates
25 the pressure, but if -- I think one is found on

1 page 37 if you'll turn to that form.

2 When we look on page 37 and see the red
3 line that is stairstepped in a decline, that
4 represents your selection of pressure from the
5 C1-24s filed by Oxy?

6 A. No. The red line comes from the allowable
7 request calculations that were made each month by
8 the operator of the unit.

9 Q. That allowable calculation will be
10 influenced by the pressure utilized in the
11 calculation?

12 A. Yes.

13 Q. For illustration purposes then, can I use
14 that to describe that it appears for a number of
15 years the same reservoir pressure is being utilized
16 for that project to make the allowable calculation?

17 A. That's right.

18 Q. As a petroleum engineer, wouldn't you
19 conclude that that is absolutely wrong? That, in
20 fact --

21 A. Definitely. That's what I've been saying.

22 Q. It can't be that, can it?

23 A. No, sir.

24 Q. When you use the pressures on the C1-24s to
25 make the comparison, when we're not using --

1 A. I might qualify that a little better.

2 Q. Yes, sir.

3 A. There's a way it can be that way. If you
4 look at my material balance calculation on the
5 solution on page 29, if the pressures are that high
6 and that constant, then the only way that can happen
7 is that much more gas is in place than the Citgo
8 Unit.

9 Q. Well, that's a possibility, that's not a
10 likely probability; is it?

11 A. For it to be constant pressures like that?

12 Q. Yes sir.

13 A. Not likely.

14 Q. As a petroleum engineer trying to use your
15 best judgment and to accurately determine what is
16 happening between the two projects, wouldn't you do
17 what Mr. Foppiano did, and that is to go to the
18 bottomhole pressure surveys for the individual wells
19 so that you have the raw pressure information to
20 work with in order to assure yourself that your
21 calculations were as accurate as possible?

22 A. I did what I could. I took the form C1-24s
23 and assumed that the data was right on the form
24 C1-24s.

25 Q. Okay. When we turn to Exhibit 38, this

1 calculation has a component of poor volume in it
2 that is again pulled back from the 1970 engineering
3 report; doesn't it?

4 A. Yes, sir.

5 Q. What I want to focus on, though, is the
6 pressure portion of the information that goes into
7 the display. Tell me again on page 38 what pressure
8 information you're utilizing to plot the information
9 for the Citgo Unit?

10 A. The pressure from the form C1-24s at the
11 reservoir data minus 2264.

12 Q. Okay. When we look at the black line, the
13 pressure information by which you have plotted the
14 black line for the Abo Unit is derived how?

15 A. We make use of our form C1-24s. We make an
16 isobar map of the Empire Abo Unit each year from
17 those pressures, and then we select a pressure for
18 each well in our unit, and then we poor volume
19 weight them for the entire unit so that we get a
20 very accurate average reservoir pressure for the
21 entire unit.

22 Q. How many wells are you selecting pressures
23 from to come up to the study?

24 A. We have a key-well pressure report that
25 we've reported every year since the beginning of the

1 unit, and it's about 38 wells. It varies plus or
2 minus a few. We've tried to make it some of the
3 same wells throughout the time of the life of the
4 unit.

5 Q. Do you know whether or not that
6 tabulation -- well, I'm sorry. Take me another
7 step. You take those sample well pressures and then
8 you average them?

9 A. We make an isobaric map, and from that map
10 we take the pressure -- a pressure on every well in
11 our unit -- and then we average them on a
12 poor-volume-wet basis for the unit.

13 Q. Would that averaging include wells that are
14 producing wells?

15 A. Yes.

16 Q. And would it include wells that are
17 temporarily abandoned?

18 A. Yes.

19 Q. And does it include injection wells?

20 A. I don't believe it does.

21 Q. Do you know whether or not it includes the
22 M6 Well, the injector M6?

23 A. I don't know. We make our -- we make --
24 most of our pressures are measured in a lot of the
25 wells that have been shut in and remain shut in, and

1 then we make our map from that data -- our isobaric
2 map from that data.

3 Q. If the pressure information utilized by
4 Arco by which you have plotted some of these
5 displays includes an injection well, that would give
6 you a higher reservoir pressure within your unit;
7 would it not?

8 A. Yes, it would.

9 Q. And if you have a higher reservoir
10 pressure, you would correspondingly have a smaller
11 reservoir voidage, would you not, in the
12 calculation?

13 A. In what calculation?

14 Q. The allowable calculation.

15 A. For the Arco Unit?

16 Q. Yes, sir.

17 A. If you have a higher pressure you would
18 calculate a lower voidage.

19 Q. Okay. Tell me something about the
20 reservoir as it now exists. Initially on the dried
21 mechanism in the reservoir, was generally recognized
22 to be a combination of gravity drainage and gas cap
23 expansion, if you will; is that not true?

24 A. Yes. And also there's some solution gas
25 drive.

1 Q. Okay. And that by 1984 the dominant drive
2 mechanism in the reservoir became gravity drainage;
3 did it not?

4 A. Yes, sir.

5 Q. Have you made an independent study of your
6 own about the magnitude of gravity drainage and its
7 gravity on the productivity of the wells in the unit
8 -- your Arco Unit?

9 A. No.

10 Q. Are you able to estimate as an engineer
11 whether or not the ceasing of injection by Oxy into
12 their pressure maintenance project has any type of
13 impact on the productivity of your wells to the
14 south?

15 A. Simply the ceasing of injection?

16 Q. Yes, sir.

17 A. We're not going to address the voidage in?

18 Q. Not just yet.

19 A. I haven't made a determination because I
20 couldn't see how that would have a great effect.

21 Q. With the dominant drive mechanism in the
22 reservoir being gravity drainage, those producing
23 wells in your unit that are down structure are going
24 to obtain the maximum benefit of gravity drainage;
25 are they not?

1 A. Yes, sir.

2 Q. Correspondingly, what happens in the
3 reservoir is if the gas withdrawal rates are
4 increased in the gas cap, how can that have any
5 effect on the producing oil wells, if the primary
6 drive mechanism is gravity drainage?

7 A. Because the pressure has an effect on the
8 rate of production, and as the pressure is depleted
9 the production rate drops, and the ultimate reserves
10 won't be the same for one way versus the other one.
11 It would be less when the pressure is depleted.

12 Q. Let's turn to the spread sheet, and you may
13 have to help me find it. It's the one that shows
14 the annual calculations that you have made on the
15 Citgo allowable that show the over and
16 underproduction. Is that page 24?

17 A. Yes, sir.

18 Q. Okay. Do you have the month-by-month
19 spread sheets that help you prepare the annual
20 summaries that show -- are shown on Exhibit 24?

21 A. Yes, I do.

22 Q. Okay. Would you take a moment and get out
23 a set of those, please? Do you have extra copies of
24 those, Mr. Smallwood?

25 A. Sure do.

1 MR. MORROW: Page what was that now?

2 MR. KELLAHIN: I'm looking at 24,

3 Mr. Examiner.

4 Let me take a moment, Mr. Examiner, and
5 mark this as an exhibit, so that we might introduce
6 it. I'm going to mark this, Mr. Examiner, as Oxy
7 Exhibit Number 14.

8 Q. (By Mr. Kellahin) Let me have you take
9 Exhibit Number 14, Mr. Smallwood, and let's compare
10 it to Mr. Foppiano's Exhibit Number 10. Do you have
11 a copy of his exhibit book? I'd like to take a
12 moment and look at the spread sheets and then let me
13 see if they have been organized in the same fashion
14 so that each of the columns on Mr. Foppiano's spread
15 sheet corresponds to the column that you have on
16 yours.

17 A. Would you say that again? I'm sorry.

18 Q. Sure. When we look at column one on
19 Mr. Foppiano's, he's got the date. The next one is
20 reservoir pressure. Have you organized your spread
21 sheets in Exhibit 14 in the same order of columns?

22 A. Mine's a little bit different order, but it
23 has some of the same things here. Column A in 9 is
24 the number of days in the months. Column B in 9 is
25 the reservoir pressure. Column C in 9 is the year.

1 Column D in 9 is the month of the year, and then E,
2 F and G are gas production, gas injection and oil
3 production.

4 Q. All right. Let's start at H then.

5 A. Okay.

6 Q. When we look at H, is that the actual
7 reservoir voidage in reservoir barrels that
8 Mr. Foppiano shows on his spread sheet as reservoir
9 voidage? His is the tenth column over from the
10 left.

11 A. I'm not real sure what he shows. Mine is
12 the actual reservoir volumetric barrels per day as
13 calculated by the reservoir voidage claimed.

14 Q. Take the calculation with the pressure.
15 You've got the gas, the oil production, and this is
16 the actual voidage on a daily basis?

17 A. Yes, in Column H.

18 Q. Okay. What happens then to complete the
19 calculation as we continue over from left to right?

20 A. Column I on this spread sheet is a
21 calculation of the reservoir voidage balance gas,
22 which is the amount of gas that's required to be
23 injected to maintain the voidage at 2,213 reservoir
24 barrels per day, which uses the actual gas
25 production shown on Column E and the actual oil

1 production shown in Column G, and you set the
2 voidage equation equal to 2,213 voidage barrels,
3 then you solve the amount of gas that's needed to be
4 injected to maintain it at 2,213, and that is called
5 reservoir voidage balance gas as shown in Column I.

6 Q. When I looked at Mr. Foppiano's spread
7 sheet, and it is the third column over from the
8 right, which he's captioned "Over and
9 underinjection," which shows the status on a monthly
10 basis under his calculation for the Citgo Unit, what
11 is the corresponding column letter number in your
12 spread sheet to that column of Mr. Foppiano's?

13 A. Which column is his again?

14 Q. The third over from the right. It says
15 "Over and underinjection" -- negative being an
16 under -- so he's got an underproduced situation at
17 the end of June of '75 of a negative 48,000-plus
18 reservoir barrels.

19 A. I have a little trouble comparing the
20 numbers because he starts in June of '75 which is
21 not when their order became effective. Mine starts
22 in June of '74 when the order was effective. I don't
23 know why he wouldn't go back and calculate reservoir
24 voidage back to the time the order was signed,
25 except that obviously they were not injecting gas

1 and their voidage was real high then.

2 Q. I'm sorry. I've confused you because I've
3 misread this. I was looking at the underinjection
4 column, and what I'm really looking for is the cume
5 over and under column, which is five over from the
6 right, if you please. I'm sorry.

7 MR. MORROW: What's the alphabetic letter for
8 that, Tom?

9 MR. KELLAHIN: Well, I'm not sure my alphabet
10 goes that high. It's the twelfth one from the left.

11 A. Which table are you looking at?

12 Q. (By Mr. Kellahin) I'm looking at
13 Mr. Foppiano's table. I'm on Mr. Foppiano's table
14 and I count 12 columns over from the left, cume over
15 and under. That is his status at the end of any
16 particular month in terms of reservoir barrels.
17 He's either over or underproduced on that spread
18 sheet; right? Are you with me?

19 A. Yes.

20 Q. What's a similar column in your spread
21 sheet that gives me your calculation?

22 A. I'm not sure that that's shown in this
23 spread sheet.

24 Q. Okay.

25 A. Let's see. But it may be. It's not.

1 Q. You don't have a column that does that?

2 A. That's right.

3 Q. Okay. We can't do it off your spread sheet
4 on a monthly basis? We have to go back to page 24
5 and see it simply on its annual basis?

6 A. Oh, no. You can do it off the spread sheet
7 on a monthly basis. The voidage is calculated in
8 Column L on my spread sheet for the month. That's
9 the actual voidage, and the allowable is 2,213 times
10 the number of days shown over in Column A for the
11 month, and subtract the two.

12 Q. What's the basis that you have for starting
13 your spread sheet in -- what is that? You started
14 it in what? In September of '74 rather than in June
15 '75 which was the date of first gas injection?

16 A. The order was signed on June 11, 1974. The
17 order was effective June 11, 1974. The unit was on a
18 reservoir voidage basis from that time forward.

19 Q. Is there anything in the order that tells
20 you, you commenced the calculation of the allowable
21 as of the date of the order?

22 A. No.

23 Q. Assuming your pressures are correct, and
24 everything else in this spread sheet is correct, if
25 you do nothing else than start your calculation with

1 the June 5th injection date and move the spread
2 sheet back a year, what's the net result?

3 A. I don't know. I'd have to study that for a
4 while.

5 Q. Okay. You don't know if whether on the
6 date injection stops in May of 1988, whether or not
7 using all your other assumptions, you're in an over
8 or underproduced situation on the Citgo Unit?

9 A. You'll have to repeat that one. I'm sorry.

10 Q. Yes, sir. I take it you haven't taken your
11 spread sheet and seen what would happen if you move
12 the start date for your calculation from the
13 September '74 date back to June of '75 to see what
14 will happen in terms of over and underproduction
15 status in May of 1988?

16 A. No, I haven't, but I can say that -- as I
17 testified on direct -- that we show that that unit
18 balanced out in 1987. That wouldn't change.

19 Q. When we look at page 24 and look at the
20 summaries here, is there anything on here to support
21 the contention that Oxy is approximately a million
22 reservoir barrels overproduced?

23 A. No, and we told Oxy before we met that when
24 we got their pressures on their C1-24s that that was
25 going to change, and it did change, and now they're

1 overproduced by as much as 549,000 reservoir barrels
2 in 1983 instead of nearly a million in 1986 like we
3 had said before.

4 Q. Okay. The first calculation you had done
5 was based upon what pressures?

6 A. Pressures from the statistical reports.

7 Q. Thereafter then you substituted the C1-24
8 pressures and you came up with a different volume
9 for the overproduction?

10 A. Yes.

11 Q. When you took the C1-24s, describe again
12 for me the methodology you used in converting that
13 information to the proper datum.

14 A. Okay. The Form C1-24s report an observed
15 pressure at a test depth, and the elevation is shown
16 on the C1-24, so you can take the test depth,
17 subtract the elevation and come up with a subsea
18 depth that the observed pressure was measured at.

19 Q. How will you know the elevation is shown on
20 the C1-24?

21 A. It's on them.

22 Q. Do you know if that's a surface elevation
23 or something else?

24 A. It's the elevation -- you can subtract the
25 two and come up with a subsea depth, and then the

1 pressure is also shown at the datum as reported on
2 the form. The datum on some of the forms is minus
3 2400. On some of them it's minus 2100, so you
4 basically have two pressures at two depths, and you
5 can take the differences and divide them and
6 calculate the gradient that was used by the operator
7 to report the pressure at the datum of either minus
8 2400 or minus 2100.

9 Q. This C1-24 reports pressures -- gauge
10 pressures; does it not?

11 A. Yes.

12 Q. And didn't you adjust the gauge pressures
13 to the absolute?

14 A. No, I used gauge pressures.

15 Q. The Oxy order, when you look at the
16 attachment to their order, requires that the
17 reservoir average pressure at this datum point be an
18 absolute pressure?

19 A. Yes, sir.

20 Q. So, to your calculations in your spread
21 sheet we're going to have to add 15 pounds of
22 pressure, are we not?

23 A. That's right, But I also did it on the Arco
24 Unit and that makes the two comparable.

25 Q. But it will also cause you to calculate the

1 incorrect allowable for the Citgo Unit?

2 A. Somewhat, yes, sir.

3 Q. Okay. Think I understand your
4 methodology. When we get down to row 13 on page 24
5 and you look at the last Column G, and we get the
6 over and under status in reservoir barrels -- the
7 528716 -- what did you do after that?

8 A. Well, in 1987 the unit reached a zero
9 status.

10 Q. How come?

11 A. And it would have accumulated more except
12 that the gas bank was still in a negative status,
13 and they were still making up a negative gas bank
14 status during 1987. Had they continued gas
15 injection in 1988, the gas bank would have gone
16 positive and they would have been accumulating
17 underproduction, but they didn't. They didn't have
18 a gas bank, so there was no way for them to
19 accumulate that.

20 Q. So you've made the decision -- when we look
21 at Row 14 for '87, the actual voidage is 133,000,
22 the allowable would have been 807,000, so they have
23 a credit, if you will, in terms of underproduced
24 allowable?

25 A. You're on Row 13 or Row 14?

1 Q. Fourteen. For year '87 in Row 14, they
2 could have voided the reservoir at 807,000 reservoir
3 barrels. That was the allowable; right? Am I
4 reading that correctly?

5 A. Say that last part again.

6 Q. Sure. Look at Column E.

7 A. Yes.

8 Q. You've got 807,000?

9 A. Right.

10 Q. That's in reservoir barrels what the
11 allowable equates to on a yearly basis?

12 A. That's right.

13 Q. The column before that, D, shows they
14 actually voided only 133,000 reservoir barrels?

15 A. That's right.

16 Q. So at the end of the year they've got a
17 credit of 674,000.

18 A. They would have had.

19 Q. Why didn't they get it?

20 A. Except they had accumulated a negative gas
21 bank for all these previous years, and they were
22 still working their own.

23 Q. So because -- well, gas injection doesn't
24 stop until May of '88; right?

25 A. Well, and that's right, and had it not

1 stopped they would have gone ahead and accumulated a
2 break-even position in their gas bank, and they
3 would have been accumulating underage.

4 Q. Well, where in the rules for Oxy do you
5 cancel the underproduction?

6 A. There is no method for accumulating -- the
7 method for accumulating underproduction is through
8 the gas bank system.

9 Q. Okay. So even though at the end of '87
10 they're underproduced by some 674,000 reservoir
11 barrels, that is not carried forward into 1988?

12 A. Well, that's not quite right. In '87 they
13 were underproduced by 674,000 reservoir barrels,
14 that brought the 528,000 cumulative from the
15 previous year in Column G down to zero, but then the
16 difference didn't accumulate because they still had
17 a negative gas bank, and the method for accumulating
18 underage is through the gas bank system.

19 Q. Without that interpretation of working off
20 the gas bank, all of this overproduction in Column G
21 would have been worked off, if you will, in years
22 '87 through '90 by the underproduced allowable?

23 A. I'm a little bit lost on that one. I show
24 it worked off in '87. You want to say it again or
25 explain it to me a little more?

1 Q. Sure. When we look at line 13 we have an
2 overproduced 528,000 reservoir barrels at the end of
3 that year.

4 A. Yes.

5 Q. And in the next row in that same column
6 it's zero.

7 A. Yes.

8 Q. Okay. But if you had carried over from
9 Column F to G the underproduced allowable, you would
10 have had a credit in Column G and it would now be
11 underproduced rather than overproduced, but you
12 zeroed it out based upon your interpretation of the
13 working of the gas bank?

14 A. Right.

15 Q. Okay. And so that's the basis for your
16 position that Oxy cannot accumulate and carry
17 forward the underproduction?

18 A. I'm not -- when?

19 Q. Well, Mr. Foppiano, in his calculations,
20 shows he's underproduced, but if the Examiner
21 disregards that and determines that he's
22 overproduced based upon your calculation, the
23 recommendation is to have the project shut in, okay?

24 A. Yes.

25 Q. If Mr. Foppiano's position is adopted by

1 the Examiner, he has an underproduced situation.
2 Are you contending that if his position is adopted,
3 that he cannot carry forward his underproduced
4 allowable?

5 A. Yes. The order, as it's written, provides
6 for that mechanism by the gas bank. If he wants to
7 inject gas, then it's in place to do that.

8 Q. Okay. If that's your position, isn't that
9 position inconsistent with starting the debit
10 against the unit for that year prior to gas
11 injection in your spread sheet?

12 A. Prior to gas injection ceasing; is that
13 what you meant?

14 Q. Sure. You started your spread sheet
15 with --

16 A. No, because in '87 there was still a
17 negative bank being accumulated because the
18 reservoir voidage balance -- the calculation of
19 reservoir voidage balance gas was higher than the
20 amount of gas injected in '87.

21 Q. I'm not sure I made myself clear. Prior to
22 gas injection in '74 -- your calculation starts in
23 September of 74; gas injection starts in June of
24 '75, okay?

25 A. Okay.

1 Q. You're charging a debit in the gas bank
2 prior to the time gas injection takes place?

3 A. I think that's correct, yeah.

4 Q. Well, why are you doing that?

5 A. Well, that's the way the order is written.

6 Q. I don't want to belabor the point with you,
7 Mr. Smallwood, but if you're debiting the gas bank
8 account prior to gas injection, why don't you credit
9 it after gas injection ceases?

10 A. Because there's a cap of three months.

11 Q. Okay. If you calculate the three-month cap,
12 you haven't put that in column G, have you? You've
13 zeroed it out?

14 A. That's right.

15 Q. What happens if you change that and put the
16 three-month cap in there?

17 A. Well, I show the gas bank as negative all
18 this time. A negative gas bank cannot exist because
19 Rule 9 of the order says "You will shut in and make
20 overproduction up the following month." It's not
21 entitled by the order to have a negative gas bank.

22 Q. How does Arco handle the overproduction
23 under its order? There's a rule that deals with
24 that; isn't there? Let me see if I can find it.
25 Sure, Rule 5.

1 MR. MORROW: What page is that on?

2 MR. KELLAHIN: If you look at Mr. Foppiano's
3 books, it's behind tab four, and it would be the
4 last page of the order that's behind tab four, and
5 it's in the first column. It's the first
6 paragraph.

7 A. I'm sorry. I haven't found that yet. Which
8 amendment are we looking at?

9 Q. (By Mr. Kellahin) I'm looking at the
10 current status of your order under tab four. Do you
11 have tab four?

12 A. Yes, sir.

13 Q. To the Empire Abo Unit it says, "The
14 allowables assigned shall result in production of
15 casinghead gas averaging no more than 65 million
16 cubic feet of gas per day for the month, provided,
17 however, that on a cumulative basis the unit
18 operator may carry gas overproduction of 325 million
19 cubic feet of gas." Is that what you're doing?

20 A. No. We're accumulating more gas than that,
21 and we're doing it by authority from the commission,
22 and I have a letter that I'll enter as an exhibit
23 that says it's okay for us to do this.

24 Q. Okay. Let's do that.

25 A. I might add, there's a very big difference

1 between a unit that accumulates --

2 Q. I've gone ahead and marked your response to
3 my question, Mr. Smallwood, as Exhibit 15 for the
4 record. Do you want to paraphrase or tell me what
5 this is supposed to do?

6 A. Well, we approached the commission in, I
7 think, 1987, and asked for authority to accumulate
8 our gas bank the way we've been reporting it, and
9 this is the waiver that says we have the authority
10 to do so.

11 Q. Okay. I'm curious again, and not to
12 belabor it any further, Mr. Smallwood, but give me
13 your position on starting the allowable calculations
14 for the Oxy project with this September date in 1974
15 as opposed to the month in which first gas
16 injections take place.

17 A. Well, as I understand it, that's the way
18 the order is written.

19 Q. Did you review any commission records or
20 files with regards to the Citgo Empire Abo Unit?

21 A. I've just -- can I back up a minute?

22 Q. Yes, sir.

23 A. I started with June. That's when the order
24 was signed.

25 Q. Did you? Maybe I misunderstand the display.

1 You started in June of '74 and I said September.

2 It's June of '74 is the start date; right?

3 A. Yes, sir.

4 Q. Okay. Did you review any of the commission
5 files and records concerning the implementation of
6 the calculations for the Oxy project to determine
7 whether or not the division and Oxy were utilizing
8 the date of the order, or the date of first
9 injection by which to report the allowables?

10 A. I looked at the project maintenance reports
11 that we have on record.

12 Q. And what does that show you?

13 A. Well, it shows the Cities company filed
14 their first report in 1975.

15 Q. Did you find any indication in any of your
16 files that Arco had in 17 years ever objected to the
17 start date by which the allowable calculations were
18 being made?

19 A. No, I didn't, and -- I didn't.

20 Q. Okay. The order for Arco is dated April 25,
21 1973. Do you know whether or not Arco used that
22 order date as the start date for its allowable
23 calculations pursuant to the pressure maintenance
24 order?

25 A. I think they did.

1 Q. When did Arco first file its first monthly
2 operator's report on the pressure maintenance
3 project, Mr. Smallwood?

4 A. I don't know.

5 Q. Thank you. Mr. Examiner.

6 FURTHER EXAMINATION

7 BY MR. CARR:

8 Q. I have just a couple of points.
9 Mr. Smallwood, Mr. Kellahin asked you some questions
10 about page 28 of Exhibit Number 1?

11 A. Yes.

12 Q. My question is, does pressure have any
13 impact on how you get this number of 180 percent
14 recovery of original gas in place?

15 A. No, it does not.

16 Q. Now, there was some discussion about, you
17 know, higher pressures versus lower pressures being
18 used in certain calculations and allowable letters.
19 If higher pressures are used in allowable letters,
20 what impact does the use of a higher pressure in
21 these calculations have on voidage?

22 A. Well, when you use higher pressures, you
23 calculate a voidage that is lower.

24 Q. And then what does that mean in terms of
25 allowable?

1 A. It means you get to produce more than your
2 allowable.

3 Q. And if you use higher pressures in, say,
4 your material balance calculations where you
5 determine influx into the reservoir, what would
6 using higher pressure numbers mean in terms of the
7 amount of influx?

8 A. It would calculate more gas influx into the
9 Citgo Unit.

10 Q. Now, in doing your material balance
11 calculations in determining the influx into the
12 Citgo Unit, what pressures did you use?

13 A. The pressures from the form C1-24s or the
14 lower pressures.

15 Q. And there were higher pressures used for
16 the allowable calculations?

17 A. That's right.

18 Q. And they were from the allowable letters
19 filed by Oxy?

20 A. Yes.

21 Q. That's all I have.

22 MR. MORROW: I have few questions of
23 Mr. Smallwood.

24 EXAMINATION

25 BY MR. MORROW:

1 Q. When you made your calculations and
2 corrected those pressures that you obtained from the
3 report filed with the OCD, to what datum pressure
4 did you correct those corrections?

5 A. Minus 2264 reservoir midpoint.

6 Q. The datum shown on the itself, what use did
7 you make of that?

8 A. I used that to calculate the gradient that
9 they used on their form.

10 Q. Okay. You subtracted the elevation from
11 the reported depth and then used the difference in
12 those two depths as --

13 A. Yes, sir.

14 Q. There's one place where you subtracted --
15 3610 from 5600 and came up with 2010; is that how
16 that is?

17 A. Yes, sir.

18 Q. I was off by 21. That was one calculation
19 I was able to check.

20 A. That's what we said. We'd better do this
21 again.

22 Q. Okay. I wanted to use those depths.

23 A. I used the 5600 depth and subtracted the
24 3610 and got 1990.

25 Q. Okay. But you did that this morning? That

1 was not a part of your original calculation?

2 A. Yes, it was. They provided me with the
3 form C1-24s before this hearing, and I calculated
4 all the gradients on all their forms that they gave
5 me, and used it in all of my -- or all my pressure.

6 MR. STOVALL: And what he means you made the
7 mathematical mistake this morning when you did it.
8 Not in the course of making the calculation.

9 Q. (By Mr. Morrow) On page 19. Now, this --
10 down Column 14, this is the year you say that the
11 overproduction had been -- had been balanced; is
12 that correct?

13 A. Yes, sir.

14 Q. And it would have -- tell me again why they
15 didn't -- weren't able to carry forward the
16 difference in the oil production and the amount that
17 they made up -- they actually came into a negative
18 overproduction status?

19 A. It was a little bit of a quirk of the
20 rule. They still had a negative gas bank status,
21 and it didn't get worked off even though they -- in
22 a sense I did include that underage, but it didn't
23 work off the negative gas bank, so it didn't count.

24 Q. Okay. And so you didn't -- further didn't
25 count the first three months of 1988; is that --

1 when they were continuing to inject and
2 underproducing, but you didn't let them carry
3 forward?

4 A. They didn't continue to inject long enough
5 to make the gas bank go positive in 1988.

6 Q. Okay. On page -- no, I believe I got my
7 questions answered there. On page 29, what's the
8 significance of the red numbers?

9 A. That's the calculated total injection into
10 the Citgo Unit 7.1 BCF.

11 Q. Why are some of them red down there in the
12 column?

13 A. Well, another one is red because that's
14 the -- the one in 1988, that's red, is there because
15 it shows that the influx actually decreased from the
16 year before during this time period, that they were
17 on real low voidage rates because of various
18 reasons, mainly because they didn't have a gas
19 contract.

20 Q. In 1990 was it increased again -- or that
21 changed every time it changed to red?

22 A. Yes, sir.

23 Q. How much difference do you think the use of
24 absolute pressures instead of gauge pressures would
25 make in your calculations?

1 A. Not very much.

2 Q. Ten percent?

3 A. A small amount. Maybe as much as ten
4 percent.

5 Q. On page 38, to be sure I understand that
6 block, these are average pressures for each unit; is
7 that correct?

8 A. Yes.

9 Q. And cumulative poor volume you show with
10 red arrows are comparative -- are those comparative
11 poor volumes at a time when each reached the same
12 pressure?

13 A. Yes.

14 Q. Only page 41, this shows -- three and four
15 show the oil field poor volume and the hydrocarbon
16 poor volume to be the same for both units, and I
17 believe you'd shown some free gas --

18 A. Yes, sir.

19 Q. -- in another calculation.

20 A. I put a little note down here below. It's
21 just a matter of the significant figures that are
22 shown on this page. The free gas was so small
23 compared to the total amount of original oil in
24 place initially on this field, it just didn't show
25 up when I added it in.

1 Q. How much would it be less than point one up
2 there, say, where you show 7.15, how much would it
3 change that?

4 A. Less than point one, yes.

5 Q. The letter introduced as Oxy Exhibit 15, do
6 you have the application of the letter that's used
7 to reply for that relief?

8 A. I have another letter but it wasn't --
9 it's not the application. I think I can find it and
10 supply it to you.

11 Q. All right. Why don't you do that in case
12 we're unable to find it in our files? That's all I
13 have.

14 DIRECT EXAMINATION

15 BY MR. STOVALL:

16 Q. I've just got a real simple, dumb
17 question. Is it true that the reason we've been
18 here for the last six hours is because of in the
19 course of calculations you've used C1-24 pressures
20 to make all your exhibits and calculations, and Oxy
21 has used a different pressure?

22 A. No, sir. And I think that is not a dumb
23 question. There's more to it than just that.

24 Q. I mean, that leads to a lot of things.
25 Isn't that probably the fundamental question, is

1 what pressure is used to determine reservoir
2 voidage?

3 A. That's one part of it. That's how we think
4 they became overproduced based on the allowable they
5 had, but we're also saying that that allowable they
6 were given is much too high, and that allowable, as
7 defined, allows them to produce at nearly three
8 times the rate at what we get to produce our unit.

9 Q. Yeah. But, I mean, okay. The allowable --
10 they have the allowable. You're not arguing that
11 allowable -- that they -- you want to change that
12 perspective?

13 A. We want that allowable changed in the
14 future. That's too high an allowable.

15 Q. But really the factual background, which
16 you spent a bulk of the time on, is that they used a
17 different pressure number, a higher pressure number,
18 which shows a lower voidage; is that correct?

19 A. Yes.

20 Q. And yours is based on C1-24 and calculated
21 to the datum, and theirs is based -- if I think I
22 heard Mr. Foppiano, on a bottomhole pressure test --
23 a monthly test; is that correct?

24 A. That is correct, and that's what the C1-24s
25 are based on.

1 Q. I don't have any other questions.

2 MR. MORROW: We'll give you another chance.

3 MR. CARR: I did not need one.

4 MR. MORROW: Go ahead if you want to.

5 MR. CARR: I don't have any questions.

6 MR. MORROW: Thank you. All right. I guess
7 if there's no more questions, then we'll excuse
8 Mr. Smallwood.

9 THE WITNESS: Thank you, sir.

10 MR. CARR: That's concludes our direct case of
11 Mr. Smallwood.

12 MR. KELLAHIN: Mr. Examiner, I'd like to call
13 as a rebuttal witness, Mr. Scott Gengler will be
14 need to be sworn as a witness. He was not sworn
15 this morning.

16 (At which time, Scott Gengler was sworn.)

17 MR. MORROW: Before you start, Mr. Gengler,
18 let me ask Bill and Tom a question. Is this --
19 dated Number 14, is that a monthly version of what
20 was in Arco's packet as an annual presentation?

21 MR. KELLAHIN: That's my understanding,
22 Mr. Examiner. And I haven't done so. We move the
23 introduction of Exhibits 14 and 15 for the record.

24 MR. MORROW: 14 and 15 are admitted into the
25 record.

1 (Oxy Exhibits 14 and 15 were
2 admitted in evidence.)

3 DIRECT EXAMINATION

4 BY MR. KELLAHIN:

5 Q. Mr. Gengler, for the record, will you
6 please state your name and occupation?

7 A. My name is Scott Gengler, spelled
8 G-e-n-g-l-e-r, and I'm a petroleum engineer with Oxy
9 USA.

10 Q. Where do you reside, sir?

11 A. Midland, Texas.

12 Q. Summarize for us your educational
13 background.

14 A. I have a bachelor of science degree in
15 petroleum engineering from Texas A&M University.

16 Q. In what year?

17 A. 1979.

18 Q. Subsequent to graduation, summarize for us
19 your employment experience as an engineer.

20 A. I have been employed, since I got out of
21 college, with Cities Service which is now Oxy USA as
22 a petroleum engineer.

23 Q. What is your primary function now?

24 A. I'm a petroleum engineer.

25 Q. Within your area of responsibility, what is

1 it that you do for what has been characterized as
2 the Citgo Empire Abo Unit?

3 A. I'm an engineer that looks after the
4 operation of the Citgo Empire Abo Unit.

5 Q. To prepare yourself for the hearing,
6 describe for the Examiner the various engineering
7 details that you have simulated in order to make a
8 study of the facts surrounding this particular
9 case. What did you do?

10 A. We met with Arco when they made their
11 allegations of overproduction. We went back in and
12 they had made an allegation that we were 385,000
13 reservoir barrels overproduced since re-injection
14 had been ceased. We went back and found that the
15 errors that Arco had found were indeed correct, that
16 being in the (Bg) calculation. We corrected those,
17 corrected our reports to the state, and then we
18 filed those.

19 We then thought that was taken care of.
20 Arco came back and made the allegation that we were
21 then a million barrels overproduced prior to the
22 injection. At that point in time, instead of trying
23 to go back and find out what was done, and why it
24 was done, because most of the people weren't there
25 any longer to ask why they did it that way, a lot of

1 times after the initial computer program was set up,
2 we had nontechnical people running the program,
3 which was probably an error on our part, and we
4 decided that we did not want to take anybody else's
5 work, and especially have to come here to Santa Fe
6 and testify on someone else's work. We decided that
7 going back and doing our own calculations was the
8 best method of being satisfied in our own mind that
9 these calculations were indeed correct.

10 Q. We, meaning you and Mr. Foppiano?

11 A. Yes, sir.

12 Q. You've heard Mr. Smallwood's presentation
13 today concerning Arco's position. Do you agree with
14 his conclusions?

15 A. No, I don't.

16 Q. Let's deal with the various positions that
17 he's taken and have you respond to them for me,
18 Mr. Gengler. Have you made a study of and have you
19 satisfied yourself as to the proper over and under
20 status of your project?

21 A. Yes, I have.

22 Q. Have you satisfied yourself that you have
23 used the best available, reliable, measured pressure
24 information by which to make your calculations?

25 A. Yes, I have.

1 MR. KELLAHIN: Mr. Examiner, we tender
2 Mr. Gengler as an expert petroleum engineer.

3 MR. MORROW: His qualifications as a petroleum
4 engineer are accepted.

5 Q. (By Mr. Kellahin) As part of your study,
6 have you examined the contention that the allowable
7 calculations should be commenced with the date of
8 the order June of '74 as opposed to the June '75 gas
9 injection date? Have you examined that?

10 A. Yes, I have.

11 Q. And what have you concluded?

12 A. I concluded that in about August of 1975 we
13 filed our initial pressure maintenance report with
14 the State of New Mexico. We asked them to review
15 this pressure maintenance report, asked them if that
16 satisfied what they were wanting out of the order,
17 and basically we were saying in our letter -- in our
18 report -- that that's when we were starting our
19 pressure maintenance project.

20 Q. Subsequent to that time, has there been any
21 objection by either the Oil Conservation Division,
22 Arco, or anyone else to utilizing the June 1974
23 start date for the allowable calculation?

24 A. Not that I am aware of.

25 Q. Even apart from any objection, is it fair

1 and reasonable to start the calculation with the
2 month in which you have first gas injection?

3 A. Yes, it is.

4 Q. Why?

5 A. Well, as Mr. Smallwood testified, he said
6 that, he believes that "the gas bank is not
7 applicable after we've ceased injection." If the
8 gas bank is not applicable after we ceased injection
9 because we're no longer injecting, how can the gas
10 bank be applicable before we start injection?

11 Q. Let me show you what is marked as Oxy
12 Exhibit Number 16, Mr. Gengler. In making a search
13 of the files in preparation for this case, did you
14 find in the regular course of your search that
15 Exhibit Number 16 was part of that file?

16 A. Yes, I did.

17 Q. Without reading it, summarize for us what
18 components of it support your conclusion that the
19 June '74 commencement date for the allowable
20 calculations is the appropriate date at which to
21 commence that calculation?

22 A. In the first paragraph we mention that this
23 was our initial pressure maintenance project report,
24 which indicates that we are commencing our project
25 in June of 1975 with this report, which is for the

1 month of June of 1975. At the very end we also
2 asked the Oil Conservation Division to review the
3 report and to get back with us if they have any
4 questions on the accuracy or the procedure used in
5 filing this report.

6 Q. Let me have you turn to the last spread
7 sheet attached to the letter. It's captioned "Gas
8 Bank Statement." Summarize for us what's happening
9 here.

10 A. From this statement, this is the initial
11 month of the project, we show, using the pressures
12 that were filed, that we have a gas bank debit of 31
13 million 470 MCF which we use as our initial start of
14 our gas bank status.

15 Q. In making your investigation of pressures
16 to utilize for the allowable calculation pursuant to
17 your order, what did you do to simulate the pressure
18 information and then determine in your own mind what
19 was the best available way to approach determining
20 an accurate reservoir pressure for the calculation?

21 A. First of all, we decided that we would go
22 back and find our own pressure survey reports that
23 were in our files, because the same people that were
24 filing the monthly operator report for the most
25 part, were filing the C1-24s. We didn't want to

1 rely on that data because it was done by somebody
2 else. We wanted to satisfy ourselves that all of
3 the data that we used in our calculations were our
4 own data. We then took and extrapolated every one
5 of the wells down to 2264 and averaged those at a
6 datum of 2264 and added the 15 pounds pressure based
7 to get us the psi.

8 Q. Do you have an opinion as to whether that
9 is the best engineering method in order to determine
10 a reliable reservoir pressure to utilize in the
11 calculations for allowable purposes for this
12 project?

13 A. It is the best method that I know of
14 because you're going back to the raw data. You are
15 not relying on someone else's work.

16 Q. Have you had an opportunity to examine
17 Mr. Smallwood's spread sheet and his summary
18 calculation concerning how he applies his
19 interpretations to what should be the status of your
20 project?

21 A. Yes, I've looked it over.

22 Q. Would you give us your comments and
23 observations about whether you agree or disagree
24 with these calculations?

25 A. I disagree with his calculations; number 1

1 being the start date. We clearly told the OCD and
2 asked them to approve the start date of June in
3 1975. They had no objections to that, so I believe
4 the official start date should be June of 1975.
5 Other than that, the way that the calculations are
6 made, I have no differences between how they did it
7 and how we did it other than the pressures that they
8 used.

9 Q. Let's assume that you utilized
10 Mr. Smallwood's pressure, and the only thing you do
11 in the calculation is recalculate the start date.
12 Instead of using his start date of June '74, using
13 everything else he used and back it down to
14 June of '75 -- can you do that?

15 A. Yes, I can.

16 Q. Have you done it?

17 A. Yes, I have.

18 Q. What's the result?

19 A. The result is on a cumulative basis and
20 March 1980 when injection was ceased, that we were
21 underproduced 387,000 reservoir barrels.

22 Q. Let's talk about the contention that your
23 underproduction cannot be carried forward. Arco
24 contends that you cannot, after you cease injection,
25 carry forward the underproduction. Do you agree

1 with that position?

2 A. No.

3 Q. Why not?

4 A. We feel like that -- we can carry forward
5 the underproduction because the results in our order
6 do not say that we can't, so therefore, you know, we
7 really don't believe that it says that we can't do
8 that.

9 Q. Okay. When you examined the relationship
10 of the pressures between your project and the Arco
11 project, were you able to come to any conclusions?

12 A. Yes, I was.

13 Q. Have you displayed your reservoir pressure
14 conclusions in an exhibit?

15 A. Yes, I have.

16 Q. Before you discuss your conclusions, let me
17 have you identify Exhibit 17, Mr. Gengler. Did you
18 prepare this?

19 A. Yes, I did.

20 Q. Describe for us the information that you
21 utilized in order to prepare this display.

22 A. I utilized the bottomhole pressure as
23 calculated from our pressure survey report for all
24 of the Citgo Empire Abo wells corrected to a 2264
25 datum.

1 Q. And that is displayed with the green line?

2 A. Yes, sir.

3 Q. How did you arrive at the Arco pressure
4 line on the display?

5 A. They were given to us by Arco at a pressure
6 datum of 2264.

7 Q. All right. What type of pressures were
8 given to you?

9 A. I don't know if I understand your question.

10 Q. In what form were the pressures you
11 received from Arco?

12 A. On a C1-24.

13 Q. For what wells?

14 A. They gave us C1-24s on all the wells that
15 ran each particular year. We chose all the wells
16 that had a common boundary with the Citgo Empire Abo
17 Unit and averaged those wells.

18 Q. Once you take that pressure information and
19 plot it, you've shown a green line for the pressure
20 plot on the Oxy producing wells?

21 A. Yes, sir.

22 Q. And this is all six of your producing
23 wells?

24 A. For most years, not every year, but most of
25 them.

1 Q. Are you using the same bottomhole pressure
2 survey information that Mr. Foppiano had in his
3 exhibit book?

4 A. Yes, sir.

5 Q. And the Arco pressure, then, for its
6 offsetting producing wells is shown in the red line?

7 A. Yes, sir.

8 Q. All right. What is the -- what is the bar
9 graph that goes vertically in the orange shading?
10 What is that?

11 A. That is the calculated reservoir voidage of
12 the Citgo Empire Abo Unit as found in Mr. Foppiano's
13 exhibit.

14 Q. Having plotted that, what does it show you
15 as a petroleum engineer?

16 A. It shows me that throughout the history of
17 our unit from just past injection, that our pressure
18 was consistently higher than Arco's pressure. The
19 rate of decline of the pressure is an average of all
20 these wells, has been fairly constant between the
21 two units. That tells me as petroleum engineer that
22 one of two things is happening. Either both of us
23 are withdrawing at the same rate, or that both -- or
24 one of the two companies is withdrawing more than
25 the other and is affecting the other company's

1 pressure.

2 Q. Were you able to determine which of those
3 two alternatives was existing between those two
4 projects?

5 A. Yes. If you look at 1987, 1988 pressure
6 surveys, you notice that the end of 1987 our
7 reservoir voidage was basically nothing. If you look
8 at what our pressure did, you would assume that if
9 we're not producing, not injecting, our pressure
10 would stay basically the same and maybe drop a
11 little bit, but what actually happened was that our
12 pressure fell at a lot faster rate.

13 We feel like that this was caused by the
14 fact that Arco was influencing us more than we were
15 influencing them, especially since we had a higher
16 pressure. And a classic example of drainage is
17 taking hydrocarbons from a higher pressure to a
18 lower pressure. It's also interesting to note that
19 when our pressure dropped, it stayed fairly constant
20 with Arco's pressure.

21 Q. Historically over the life of the two
22 projects by plotting the pressure declines, are you
23 satisfied that you're getting a reliable picture of
24 the pressure relationship between the two projects
25 with this data?

1 A. Yes, I do because if we're having some
2 problems with pressure and it was a bad data point,
3 you would have spikes in there, and for the most
4 part, both units fall on a fairly straight line,
5 which tells me that the pressure information is
6 fairly reliable.

7 Q. If Mr. Smallwood is correct that Oxy is
8 voiding the reservoir at 3.3 times the rate at which
9 Arco is voiding the reservoir, what will you see
10 happen on the pressure plot?

11 A. I would assume that if we are withdrawing
12 three times as much as Arco would be, our pressure
13 would be way lower than what the Arco pressure is.
14 Contrastingly, we find that the pressure is higher
15 using the correct pressure.

16 Q. What conclusions are you able to reach
17 about the allowable being assigned to your project
18 over the life of that project, and the rate at which
19 the pressure is changed between you and Arco?

20 A. What I've surmised from it is that we look
21 at this, and there was quite a few months where with
22 our new calculations at the new pressures, we did
23 exceed the 2213, and we are not disputing that
24 thing. If our reservoir voidage limit of 2213 was
25 too high, then you would expect if we're

1 overproducing, then our pressure would drop a whole
2 lot more if that was too much of an allowable, and
3 the fact that we stayed above Arco's pressure the
4 entire time tends to tell me that the 2213 wasn't
5 enough of an allowable to keep us on an equal basis
6 with Arco.

7 Q. If Oxy's relief is granted by the Examiner,
8 and we're allowed to return to the pool depth
9 bracket allowable for our project, what do you
10 forecast will happen in terms of the rate of
11 reservoir voidage and pressure relationship?

12 A. As you can see, in 1989 and 1990, we had
13 large volumes of reservoir voidage because we
14 thought we were taking our gas bank down. At times
15 we got over 4,000 reservoir barrels a day. Even
16 though we were voiding the reservoir at that rate,
17 our pressures really didn't differ that much from
18 Arco's once we got pulled down to their pressure.

19 Q. And therefore, what are you able to
20 forecast and conclude about the harm or potential
21 harm that would occur to Arco if your application is
22 approved?

23 A. We feel like that we will continue to have
24 similar pressures on both sides of the boundary, and
25 that granting our application for the state wide

1 rules would not harm Arco.

2 Q. Let me direct your attention to the topic
3 of the 1972 October 2nd engineering study that was
4 put together for the Arco Unit. Are you familiar
5 with that reservoir engineering study?

6 A. I have looked at it, yes.

7 Q. A great part of Mr. Smallwood's
8 calculations are predicated on the oil-in-place
9 number that's derived from that study?

10 A. Yes, sir, it is.

11 Q. Have you made a determination of what the
12 oil-in-place calculation is for that project under
13 that study? What was the number that they utilized
14 as their estimate of what would be recovered from
15 the Citgo tracts ultimately? Do you recall?

16 A. I looked at that.

17 Q. Have you compared that forecast under that
18 study with what has actually occurred in your unit?

19 A. Yes, I have.

20 Q. Showing you what is marked as Exhibit
21 Number 18, identify and describe the exhibit,
22 Mr. Gengler.

23 A. This is a table from Arco's study and the
24 engineering study and notes that were taken from
25 that of how they split up the remaining primary

1 reservoirs and secondary reservoirs underneath each
2 tract. From that study in the committee report we
3 found that the Citgo Empire Abo Unit, or the four
4 leases that were assigned to that unit, had primary
5 reserves of 609,954 barrels and secondary reserves
6 of 320,981 barrels. This gives us total primary
7 reserves, if you take into account the reserves
8 produced prior to the 1,171 number that they came up
9 with, of two-and-a-half-million barrels and 320,981
10 secondary barrels, or about 2.9 million barrels of
11 secondary and primary reserves.

12 We then compared that to different dates,
13 the first one being, of course, the start of when
14 this study was taking place; also the start of
15 injection by Arco, the start of injection by Oxy and
16 current date. From this you can see that we have
17 produced, according to Arco's numbers in that study,
18 all our primary reserves and most of our secondary
19 reserves before Arco even started injection, and by
20 the time we had started injection on our own unit,
21 we had produced -- according to their numbers -- all
22 but 30,000 barrels of our secondary and primary
23 reserves, and therefore, now, they're coming up with
24 -- or we came up with -- 3.3 million barrels, which
25 is two -- a little over 500,000 barrels more than

1 what Arco has said that we would recover under this
2 secondary recovery project.

3 Q. Mr. Smallwood, on page 41 of his exhibit
4 book, talks about the fact that based upon that 1970
5 engineering study, he says, "We have received 180
6 percent of the gas recovery."

7 A. Yes.

8 Q. And that we are voiding the reservoir at
9 some -- what is it -- 3.3 times, if not more, than
10 they were voiding the reservoir?

11 A. I believe that's what he stated.

12 Q. Have you examined to determine whether or
13 not there is any reliability to that contention that
14 Oxy is getting its additional reserves at the
15 expense of the Arco Unit?

16 A. Can you state that question again?

17 Q. Yes, sir. He says that you have
18 overproduced the volume of reserves that underlie
19 your unit by a substantial magnitude.

20 A. Yes.

21 Q. And he says that it has to have come from
22 the Arco Unit?

23 A. I believe that is what he is stating, yes.

24 Q. In addition to examining the recovery under
25 the Oxy project in relation to the estimated

1 reserves for that project, have you also made an
2 examination of the reserves that were projected and
3 then recovered out of the Empire Abo project?

4 A. Yes, I have.

5 Q. Okay. Let me ask you to identify and
6 describe Exhibit 19.

7 A. Exhibit 19 from that study was what the
8 projected primary and secondary reserves were
9 according to the study. We took this and added to
10 that the reserves prior to 1-1-71 when these
11 reserves were calculated, and came up with their
12 estimate of 172 million barrels primary could be
13 recovered from the Empire Abo Pool, and a little
14 less than 28 million secondary barrels to be
15 recovered for a total of 200 million barrel of
16 reserves to be recovered both primary and secondary
17 from the pool.

18 Q. That was the estimated forecast for
19 recoveries? What has actually happened?

20 A. As of 1-1-91 the pool has recovered
21 218-and-half-million barrels of oil, which is 18
22 million barrels more than what they projected in
23 this study.

24 Q. Do you, as an engineer, believe that it is
25 reasonable to conclude that you are gaining reserves

1 from the Arco Unit?

2 A. No, I don't.

3 Q. Why not?

4 A. From these two exhibits right here, it
5 shows that to me that they underestimated the
6 reserves on our unit, and they underestimated the
7 reserves in the pool.

8 Q. Do you have any opinion or conclusions as
9 to why the 1970 engineering report underestimate the
10 total reserves not only for the Empire Abo project,
11 but for the Oxy Citgo Unit?

12 A. Yes, I do have.

13 Q. And what is that opinion?

14 A. My opinion is the same opinion that Oxy or
15 Cities Service back then in 1971, '72, '73 -- it
16 doesn't matter -- when this study was put together,
17 and then when unitization of the Arco unit was put
18 on, that we did not believe the acre-feet
19 calculation for our unit, that it far underestimated
20 what we believed was acre feet, and that it did not
21 give a representative number for our unit, and
22 therefore, at that time, our decision was made to
23 withhold our leases from the unit.

24 Q. Okay. If Mr. Smallwood's predicate in
25 terms of poor volume or acre feet is wrong, based

1 upon that study, then can you conclude as an
2 engineer that his conclusions about the magnitude at
3 which we are apparently draining him under his study
4 are wrong?

5 A. Yes.

6 Q. Okay. In terms of relief requested by Oxy
7 in this application, what is your opinion as to
8 whether or not that is fair and reasonable?

9 A. I think it is fair and reasonable because
10 we are just asking to be treated like any other
11 operator who is not in a secondary or -- I should
12 say pressure maintenance project -- and therefore,
13 we feel like we should have the same type rules as
14 they are. I don't think that it really -- our rules
15 the way they are stated now apply to a project that
16 we're not injecting any gas.

17 Q. When you look at the amount of
18 underproduction that you've calculated for the Oxy
19 Unit and translate that into oil at the surface and
20 gas at the surface, what are we talking about?
21 What's the magnitude of the underproduction in
22 reservoir barrels when you bring that to the
23 surface?

24 A. I don't guess I understand your question.

25 Q. If you take the reservoir barrels?

1 A. Uh-huh.

2 Q. We're approximately a million reservoir
3 barrels underproduced?

4 A. Yes.

5 Q. And we apply that in terms of future
6 production. What are we looking at?

7 A. If you apply it to gas production, you
8 would just take the amount of reservoir barrels and
9 use your (Bg) and calculate a surface production,
10 and that would be the amount of surface MCF that we
11 are required to be produced to make up that
12 underproduction from reservoir barrels.

13 Q. Do you have an estimate of what that gas
14 volume is?

15 A. No, I don't.

16 Q. In examining the start dates used for the
17 various allowable calculations for the projects,
18 Mr. Gengler, did you also look to see what Arco was
19 using for a start date of their allowable
20 calculations for that project?

21 A. No, I haven't.

22 Q. You haven't looked at that?

23 A. No.

24 Q. Okay. If we go to a state wide allowable
25 for our project on our unit in terms of reservoir

1 voidage, I think you've described it on Exhibit
2 Number 17, but what is the magnitude of the
3 reservoir voidage if we go to a state wide allowable
4 for our production?

5 A. It would be in the 4 to
6 5,000-reservoir-barrels a day range using the
7 December 1991 oil production and the 284-MCF-a-day
8 gas production per well, which is approximately
9 1.7 million, if you use all six wells.

10 Q. In looking at the recoveries on a per-well,
11 or a per-tract basis for your unit, have you also
12 examined the per-well and per-tract recoveries
13 around your particular unit?

14 A. Yes, I have.

15 Q. What did you find when you compare those
16 recoveries to the forecasted recoveries in the
17 October 2, 1970, Arco engineering report?

18 A. That as of 1-1-91 that they were fairly
19 close to what the estimates were, and that there was
20 no large volumes of oil that were not recovered by
21 any of those tracts as a whole.

22 Q. What does that tell you then as an
23 engineer?

24 A. It tells me if they recovered most of the
25 oil that was originally forecasted in that study,

1 that our additional oil didn't come from them, if
2 their numbers are right in the study.

3 Q. Let me ask you a couple of concluding
4 questions then about Mr. Smallwood's exhibit book.
5 He draws some pressure comparisons in his book
6 between some temporary, abandoned wells and some
7 producing wells when he was trying to support his
8 conclusion about the drainage impact.

9 A. Yes.

10 Q. I think it's on page 33, Mr. Gengler. If
11 you'll turn to Mr. Smallwood's exhibit book.

12 A. This is one of the comparisons that he had
13 compared to one of our wells, which is the 305, one
14 of the two that have been producing ever since we
15 started injection, and he's comparing that to a well
16 that has been shut in since, I believe, according to
17 his map, since 1983.

18 When you take your pressures the way that
19 they have been done by both us and Arco, was shut in
20 -- our producing wells -- for approximately 48
21 hours and measured the pressure at the end of that
22 time. The one thing that that does not take into
23 account is that if you ever look at a buildup curve,
24 you really don't know how long it's going to take to
25 actually get a stabilized reservoir pressure.

1 Therefore, we're not sure whether or not on a
2 producing level, whether it be ours or Arco's,
3 whether or not this is a stabilized pressure if we
4 were still building at the end of 48 hours.

5 If you take a well that's been shut in for
6 several years and measure the pressure, you can feel
7 fairly confident that this is stabilized pressure
8 and the maximum pressure that you can obtain, and
9 using
10 Mr. Smallwood's graph, it obviously looks to me like
11 they're in a stabilized situation because their
12 pressure has leveled off, and he's done this not
13 only on this particular graph, but on other pressure
14 graphs too.

15 I think looking at a producing well and
16 TA'd well is kind of comparing an apple to an
17 orange.

18 MR. MORROW: What page are you talking about
19 now?

20 THE WITNESS: The ones that I remember, page
21 33, which is our 305, and page 34, which is our
22 213. He compares both of our producing wells to two
23 of his temporary, abandoned wells: one being shut
24 in in 1983 according to his exhibit, and the other
25 one, the H17, has been exchanged since 1976. Again,

1 this was using his pressures that he got off the
2 C1-24s, which are numbers from our pressure survey
3 report, differ from what he got from the C1-24s. We
4 did not calculate numbers from the C1-24s, so I
5 don't know how accurate his numbers are, and, again,
6 we didn't want to use anybody's work other than our
7 own work so that we could feel fairly confident when
8 we said that this was the pressure in this well.

9 Q. (By Mr. Kellahin) Let's turn back to page
10 one of Mr. Smallwood's exhibit book. He's plotting
11 Arco voidage rate versus Citgo's voidage rate, and
12 it has a poor-volume component to the
13 calculation --

14 A. Yes, sir.

15 Q. -- based upon the 1970 study?

16 A. Yes, sir.

17 Q. If he's wrong about the poor-volume
18 calculation, what will happen to the relationship
19 between the two curves?

20 A. It would obviously make a large difference
21 if the poor volume is wrong.

22 Q. What's your estimate of the poor volume for
23 your project and how this curve would be adjusted to
24 more truly reflect the actual occurrences in the
25 reservoir?

1 A. We do not believe that poor volume is as
2 small as what Arco has stated, and therefore, the
3 number that they calculate here, which we don't
4 agree with, would be too high on the curve.

5 Q. If this poor volume is actually greater
6 within your project, then that would shift the
7 red-line curve farther down and closer to the Arco
8 voidage rate curve?

9 A. Yes, and this is what we feel is also
10 backed up by the point that our pressures indicate
11 that we're higher pressure than theirs on their side
12 of the boundary, and therefore this curve obviously
13 was not -- has got to be wrong if our pressure is
14 higher than theirs.

15 Q. When you look at page 3 of his exhibit
16 book, recognizing what you know about the reservoir
17 pressures and looking at the poor-volume component
18 to this display, is the same observation about page
19 three?

20 A. Yes.

21 Q. You make the same observations about page
22 3?

23 A. Yes. If the poor volume or pressure is
24 wrong, this curve is obviously wrong.

25 Q. And is that true of all the other displays

1 or calculations that have this 1970 poor-volume
2 component to it within the exhibit book?

3 A. Yes, it is.

4 Q. And you do not agree with the calculation
5 of the poor volume used in that study, do you?

6 A. No, I don't. We haven't agreed with that
7 from the very beginning, and we still don't agree
8 with it.

9 Q. Have you, independent of the study, made an
10 examination of what you anticipate to be the range
11 of poor volume underneath your tract?

12 A. We have made a range. The geologists
13 working underneath me have looked at it. They find
14 that due to the old type logs and stuff, that -- and
15 some other components -- that it's a real difficult
16 number to come up with because all you have is a
17 neutron porosity log to come up with the porosity,
18 but we have come up with a range, and we haven't
19 come up with a definite number, but we feel like
20 that -- I've got that here -- but that range goes
21 from anywhere on a low side of what Arco came up
22 with to around 50,000-acre feet, all the way up to
23 250,000, depending on the method that you use to
24 calculate your acre feet.

25 Q. Okay.

1 MR. KELLAHIN: That concludes my examination
2 of Mr. Gengler. We move the introduction of
3 Exhibits 16 through 18. We had a 19, I'm sorry.

4 MR. MORROW: We accept those. All right.

5 (Oxy Exhibits 16 through 19
6 admitted in evidence.)

7 (Recess taken)

8 CROSS-EXAMINATION

9 BY MR. CARR:

10 Q. All right. Mr. Gengler, if I understand
11 your testimony, I understand that when you started
12 trying to determine what the status of your unit was
13 that instead of relying on the work of anybody else,
14 you and Mr. Foppiano concluded to go back sort of to
15 the beginning and come through it and use data that
16 you yourself compiled and worked with throughout?

17 A. Yes, that's correct.

18 Q. And you stated that you didn't want to rely
19 on the work of somebody else; in fact, you were
20 concerned that there might be errors and problems
21 with that work; isn't that right?

22 A. There might be. We didn't want to take any
23 chances of there being errors that we weren't aware
24 of.

25 Q. You stated that the pressure surveys that

1 you used varied from the C1-24?

2 A. I do not know that. I did not compare
3 them. They may have. From looking at
4 Mr. Smallwood's work it looks like they have, but I
5 have not compared them.

6 Q. And so you do not know if they would be
7 different or not?

8 A. No.

9 Q. And so when -- in exchanging data with you
10 we asked for C1-24s, you sent just the C1-24s and
11 you were unaware that they might be different from
12 the pressure information that you would use in
13 preparing for this case?

14 A. That is correct.

15 Q. You were aware that (Bg) formulas had been
16 erroneously calculated; isn't that right?

17 A. Yes, after Arco pointed it out in our later
18 years, we found that the (Bg) was calculated wrong
19 by the computer program, that there was an error in
20 the programming of it.

21 Q. You were aware that you hadn't used the
22 three-month limit in running your calculations;
23 isn't that right?

24 A. After we got reviewing our unit after
25 Arco's initial allegations, yes, we became aware of

1 that.

2 Q. And you just decided it would be wise to go
3 to these bottomhole pressures instead of using the
4 C1-24s that had been sent to the commission?

5 A. We felt like that it was wise to go to the
6 raw data whether it be pressures or production or
7 whatever.

8 Q. When you filed C1-24s for your company, you
9 signed them, did you not?

10 A. I did a couple of times.

11 Q. What do you use to fill out the blanks on
12 that form?

13 A. To be honest with you I do not fill the
14 form out. Somebody underneath me does.

15 Q. Do you do any independent checking of that?

16 A. I didn't and I agree that I made a mistake
17 by not doing that.

18 Q. You're aware that that is the data that is
19 used by -- which is reported to the state, those
20 pressures are the pressures that are carried in
21 various kinds of reports and used by the state for
22 various purposes?

23 A. They have not been carried by the state
24 since the end of 1985, and that was told to me by
25 the commission office both in Artesia and Hobbs.

1 Q. Did you ever have any involvement in filing
2 allowable letters, or allowable requests for the
3 commission for this unit?

4 A. I signed some of those. They were not
5 prepared by me. Again, that was a policy that was
6 ongoing when I took over this area. I continued it,
7 and, again, I feel like that needs to be changed.

8 Q. Okay. But you didn't make an independent
9 check?

10 A. No.

11 Q. Okay. If I understood your testimony, you
12 said that really when you looked at the methods used
13 by Mr. Smallwood, you did not have any real problems
14 with the methods; there were just two particular
15 points where we differ. One is the start date, and
16 one was the pressures used; is that correct?

17 A. And also whether or not we can carry
18 forward allowable.

19 Q. Now, in essence, Mr. Smallwood's
20 calculations started about a year earlier than
21 yours, did they not?

22 A. Approximately, yes.

23 Q. And when -- were you involved in the
24 calculation of the cumulative over/underproduced
25 status of the Citgo Unit?

1 A. That's found on Mr. Foppiano's exhibits?

2 Q. Yeah.

3 A. Yes, I was.

4 Q. And basically by starting a year earlier,
5 we started with a negative value to begin with,
6 didn't we?

7 A. According to Mr. Smallwood's exhibit, yes.

8 Q. And so when we got to the time you were
9 first injecting, we already had you with a minus
10 number or overproduced number?

11 A. Yes. You also had us with a debit in our
12 gas bank, but you also say that once we ceased
13 re-injection, we don't have a gas bank.

14 Q. I know. I'm only talking about 1974 now.

15 A. Okay. The gas bank you have an
16 overproduced number in there and you say after
17 injection you don't have a gas bank, so I don't
18 think we have a gas bank before '75.

19 Q. I understand that, but if you'll just
20 answer my question we'll get out of here.

21 A. Okay. I'm just trying to make myself
22 clear.

23 Q. All I'm saying is that by the time your
24 calculations start, we said you were already
25 overproduced and that's a disagreement?

1 A. According to Mr. Smallwood's calculations.

2 Q. And when we start out saying that you're
3 underproduced and you've cumulated all the way, that
4 affects those calculations all the way through;
5 doesn't it?

6 A. Yes, it does.

7 Q. Now, you presented, or sponsored, Oxy
8 Exhibit Number 16, which is a letter from Cities
9 Service to the Artesia office of the oil
10 commission. If I understood your testimony, this is
11 the letter where the commission said you shouldn't
12 start calculating the bank -- shouldn't start the
13 calculations until June of '75?

14 A. The commission didn't say anything in that
15 letter.

16 Q. Okay. I just wanted to be sure. There's
17 nothing in this letter that says that; is that
18 right?

19 A. No. We asked the commission if they agreed
20 with what we had done, and we didn't get a negative
21 response from them.

22 Q. It just said if approved this will be a
23 precedent and they never said no; right?

24 A. Right.

25 Q. It's sort of like being able to carry

1 forward underproduction: there's nothing that says
2 you can't, right?

3 A. Well, if you ask them -- if you say that
4 we're going to carry forward underproduction, if you
5 don't agree with that let us know, and they say no
6 or don't respond, then you assume that they don't
7 have a problem with it.

8 Q. But it doesn't reference any particular
9 time for starting a calculation; does it?

10 A. Well, it says our initial pressure
11 maintenance report, which implies that that was the
12 start date of our pressure maintenance project as
13 June of 1975.

14 Q. Okay. Now, if we talk about this earlier
15 start date, and as we carry through the cumulative
16 numbers, we get to 1987, 1988, whenever it was that
17 the Citgo Unit shut down for gas market, and during
18 that period of time the unit zeroes out. Cumulate
19 it anyway you will from any date you want to start
20 with -- '74, '75 -- if you hit a zero point at that
21 time, the ability to accumulate is only significant
22 after that date if you are authorized to do that;
23 isn't that right?

24 A. Yeah. I would agree with that, yeah.

25 Q. Okay. Now the difference on the pressures I

1 guess we've used, is you've used bottomhole pressure
2 survey and we've used C1-24s you sent us?

3 A. Yes.

4 Q. And that's -- and therein lies the
5 difference, and to that extent Mr. Stovall was right
6 when he said that that was one of the primary
7 issues?

8 MR. STOVALL: I catch on quick.

9 A. And that causes a lot of the calculations
10 that we both made to be different.

11 Q. (By Mr. Carr) Okay. If I look at your
12 Exhibit 17, that's the graph.

13 A. I've got it.

14 Q. Basically what you're trying to show here
15 is that the pressures in the Oxy unit are higher
16 than what Arco said they were; is that the purpose
17 of this?

18 A. It also shows that our pressures are higher
19 than the wells directly offsetting the Oxy Unit on
20 the Arco Unit on a consistent basis from year to
21 year.

22 Q. Now, the pressure -- the very last pressure
23 point -- is the lowest point on the curve
24 representing the Oxy Unit; correct?

25 A. That's correct.

1 Q. And that pressure is down following a
2 period in which you show substantial voidage in the
3 unit; isn't that right?

4 A. Yes, it is a small amount.

5 Q. Couldn't that voidage be, in fact, one of
6 the reasons that pressure point is down where it is?

7 A. That's one interpretation, but that's not
8 the interpretation that we made.

9 Q. You don't think that is?

10 A. No. We feel like that the pressure number
11 in 1989 may not be representative, you know. It's
12 hard to believe that we're making all that
13 production and our pressure went up, so we went back
14 and looked at our pressure survey and found that one
15 of our wells that had a lot of paraffin in it we
16 couldn't get as far down. It showed a liquid level
17 and a grading of .465, which is salt water, and we
18 tend to believe that that may be a bad pressure. We
19 don't know that for a fact, but as an engineer you
20 tend to have a doubt on that one, so if that is the
21 case, then our pressure may be lower than that and
22 we may be just in line there.

23 Q. And if the pressure is right it could be --
24 I could interpret that to be related to the
25 voidage. That wouldn't be an unreasonable thing for

1 me to conclude, would it?

2 A. Well, the one thing you're also doing is
3 you're comparing Arco's last pressure point which
4 was run in October 1990, and Oxy's last pressure
5 point was run in April of 1991. That's some six
6 months in difference, and you can look at the
7 curve. A year's difference makes quite a bit of
8 difference in the pressure.

9 Q. I'm really just looking at the Oxy curve,
10 and it just appears to me that it is down after a
11 period in which you're reporting substantial
12 voidage, and my question is just couldn't that
13 voidage be one of the reasons that point is down?

14 A. One of the reasons. There could be others.

15 Q. Now, if we go to your Exhibit Number 18,
16 I'm having a hard time understanding exactly what
17 this is trying to show. If I read it right, and tell
18 me if I'm wrong, it appears to me that we have
19 total -- in the upper portion of Exhibit 18 -- it
20 says "Total Reserves As Per Arco Study"?

21 A. Primary and secondary.

22 Q. And we have a total of approximately 2.9;
23 is that million barrels? Is that what that number
24 is?

25 A. Yes. That's the next line right down there

1 that summarizes with that. It's actually 2.882.

2 Q. All right. Then we go down to bottom
3 figures running across that exhibit and we come over
4 to 1-1-91, and under that we have 3,306,181 barrels;
5 is that right?

6 A. That's right.

7 Q. And what does that show you?

8 A. It shows you one of two things. It either
9 means that we produced a lot more than what was
10 under our lease, or it also means that the numbers
11 that were calculated for primary and secondary
12 reserves were wrong. We feel that the latter one
13 being the case because if you look at the numbers at
14 6-1-75 before we put any gas in the ground, we had
15 produced supposedly what the state said we were
16 going to make cumulative, primary and secondary
17 reserves.

18 Q. So basically this could say the poor volume
19 was larger?

20 A. We feel like it, yes.

21 Q. It also could be that there is some
22 drainage to the unit?

23 A. If you just looked at this exhibit alone,
24 yes, but you put it with pressure data, and I don't
25 believe so.

1 Q. Okay. Let's go to the second one. I'm
2 sorry. Exhibit 19. Does this exhibit attempt to do
3 the same thing for the -- on a -- for the Empire Abo
4 Unit? Does 19 do for the Empire Abo Unit what 18
5 shows?

6 A. Not the Empire Abo Unit, the Empire Abo
7 Pool.

8 Q. Okay. So this is an entire pool number and
9 basically what you're trying to show is the same
10 sort of analysis, I guess it is, as you showed for
11 the Citgo Unit in Exhibit 18?

12 A. Yes.

13 Q. Okay. What does this show you?

14 A. It shows you that what they have projected
15 for primary and secondary reserves for the entire
16 pool is less than what they actually recovered as of
17 1-1-91.

18 Q. And so what conclusion can you reach from
19 that?

20 A. That not only our unit but possibly other
21 leases that were calculated in that study, probably
22 had some poor volume problems.

23 Q. Did you factor into these numbers at all,
24 the fact that Arco drilled over 200 infield wells in
25 this unit?

1 A. No. We were looking at the initial poor
2 volumes. The one thing I'd like to say about that,
3 though, is that you're saying you're draining 40
4 acres with a well, and you're adding additional
5 reserves by drilling more wells in the 40-acre
6 tract, plus the fact that this study assumed that
7 initiation of the pressure maintenance project
8 unitization will occur, I believe, in '71 and
9 initiation injection in '72. I might be a year off,
10 but in other words, what I'm trying to say is that
11 the start of the project was later than what was
12 expected and not all the tracts participated as what
13 was expected.

14 Q. And you would agree with me that 200 well
15 infield program would affect the recovery and
16 increase it from the unit?

17 A. Some, yes.

18 Q. Now, if I understood your testimony, you
19 testified that poor volume was measured in acre
20 feet; is that what you said?

21 A. No.

22 Q. Okay.

23 A. I said that our acre feet ranged from one
24 number to another.

25 Q. Okay. What was that range? 50,000 to

1 250,000?

2 A. That's what our geologists estimate
3 depending on method that you use.

4 Q. If we had 250,000 acre feet, how many acres
5 are there in this unit, do you know, that are
6 productive in your unit?

7 A. Somewhere in the vicinity of 250, 300.

8 Q. And if there were, say, 250 acres, what
9 would you have to have it terms of thickness and
10 porosity to have 250,000-acre feet?

11 A. You would have to have quite a bit of
12 footage.

13 Q. That's all.

14 MR. MORROW: Do you have any more questions?

15 MR. KELLAHIN: No, sir.

16 EXAMINATION

17 BY MR. MORROW:

18 Q. Were you operating under state wide rules
19 between June '74 and June '75?

20 A. Yes, sir.

21 Q. You considered yourself to be under state
22 wide rules since you hadn't started injection; is
23 that what you believe?

24 A. That was our company's interpretation.

25 Q. What was the over/under status of the unit

1 when injection started?

2 A. Can you repeat that question?

3 Q. What was the status as to overproduction or
4 underproduction of that unitized area when you began
5 injection?

6 A. Our study started when injection started,
7 so I don't know.

8 Q. Well, I mean, what -- you must have some
9 record that shows whether you overproduced or
10 underproduced at the time you started, don't you? I
11 guess you don't?

12 A. We were -- the records that I remember, and
13 I didn't do a thorough study on it, showed that we
14 had an allowable and that they were producing that
15 allowable, and I don't recollect ever seeing an
16 overage or underage.

17 Q. So it's just your belief then that you were
18 just about even; is that right?

19 A. As far as I know, but I did not do a
20 thorough investigation of that.

21 Q. Do you have any engineering justification
22 for an allowable equal to the state wide allowable
23 142 barrels, I think it is. Is that right, 142
24 barrels?

25 A. Uh-huh.

1 Q. That much voidage plus the 2001 to one, the
2 284? Had you done a study that showed that would be
3 a good allowable?

4 A. The study that we did, we looked at what
5 our pressures did when overproduced our unit, and we
6 feel like that by overproducing the unit, you know,
7 at one point over 4,000, that we really didn't
8 change the pressure significantly, that we were
9 fairly close to what Arco's pressure was and that by
10 going under this allowable we would not have any
11 drainage going on.

12 Q. Well, what would the allowable be in the
13 event that the OCD adopted that allowable, or let's
14 go back to state wide rules. It's six times 284.

15 A. If all six wells are capable of producing,
16 yes.

17 Q. Would there be any amount in there -- any
18 amount in addition to that 284 because of the oil
19 voidage, or is it just 284 times six plus whatever
20 oil you produce?

21 A. Yes, because none of our wells make that
22 much oil, and the fact that we're well below that
23 142 barrels, the oil is pretty much negligible in
24 the reservoir voidage calculation.

25 Q. So what you would produce would just be

1 back on the oil allowable? Produce whatever oil you
2 can make plus a limit of 284?

3 A. Yes, sir.

4 Q. And let's see. How much does that come to
5 on the surface? I guess about 1700?

6 A. Approximately 1.7 million, yes.

7 Q. And that equates to four to 5,000 barrels
8 of reservoir voidage; is that what you answered
9 Mr. Carr's question?

10 A. Yes, sir.

11 Q. And so that would be roughly twice what you
12 have in the way of allowable now?

13 A. Yes.

14 Q. Okay. And I guess maybe seven times what
15 Arco has recommended. How much did you say you were
16 underproduced using Arco's pressure -- I believe you
17 said you've calculated that, and I think you quoted
18 a time, an underproduced time of March of '88?

19 A. Which is as cessation of injection. If you
20 use the June '75 start date that we feel like is the
21 start of our project, and use Mr. Smallwood's
22 numbers, as far as pressure, at the time that we
23 stopped injection we had a cumulative under/over of
24 387,000 reservoir barrels underproduced.

25 Q. 4-1-88?

1 A. Yes, sir.

2 Q. Would you please submit us a copy of those
3 calculations?

4 A. I could not get them to print with my
5 computer. They're on the computer.

6 Q. Well, you can send them in later?

7 A. Yes, sir.

8 Q. Let's see. Exhibit 17, and tell me again
9 what those red lines and green line represents on
10 this Exhibit 17, would you, please?

11 A. The green line is the average pressure
12 taken on oil wells within Citgo Empire Abo Unit,
13 measured at a datum 2264 from the pressure survey
14 reports that had been measured for each one of those
15 years. The red line is a measurement of all the
16 wells offsetting the Citgo Empire Abo Unit that are
17 in the Arco Unit that have been measured by Arco for
18 each year, provided to us not only in a table by
19 Arco, but also in their C1-24s at a datum of 2264.

20 Q. Okay. And your pressures are those that
21 you've got the wrong data out of the files and
22 recalculated; is that correct?

23 A. Exactly.

24 Q. And you think if the OCD should adopt, or
25 authorize us to go back to state wide rules, that

1 that would cause any hydrocarbons to move from
2 Arco's Unit to Citgo's?

3 A. No, I do not.

4 Q. When you said you didn't use anyone else's
5 work, I'm sure you must have used bottomhole
6 pressure measurement, there's no way you could avoid
7 that?

8 A. Well, that was an outside firm's
9 measurement that they took off the bottom.

10 Q. You meant you didn't use anybody else in
11 Oxy's or Cities calculations as to what that data
12 was?

13 A. No. That was our measured data. We did not
14 use any calculated data by anybody else.

15 Q. How does your acre foot calculations -- how
16 do those compare to Arco's calculations? I believe
17 you've may have said that 50,000 was pretty close to
18 theirs; is that right?

19 A. I believe theirs was in the range of 47 to
20 48,000. Right close to 50,000. I don't know the
21 exact number right off the top of my head. I can
22 look it up if it's important.

23 Q. Have you made calculations through April or
24 May or June or whatever your most recent production
25 is as to what your status would be in this unit

1 based on your calculations and Arco's -- and your
2 calculations using Arco's pressure?

3 A. Not using Arco's pressure because we didn't
4 have those until today.

5 Q. When you send that other stuff, would you
6 go ahead and run it on down as far as you have --

7 A. Yes, sir.

8 Q. --- production information, and do it both
9 ways supplement, and I request that you all do that
10 also.

11 MR. KELLAHIN: I'm not sure I understand.

12 MR. MORROW: Just bring your calculations up
13 to date through the most recent production. I
14 believe they all end in December of '90. Do you
15 have any questions?

16 MR. STOVALL: Yeah, just one.

17 DIRECT EXAMINATION

18 BY MR. STOVALL:

19 Q. If once a final order is issued in this
20 case, is this going to resolve the Oxy/Arco dispute
21 with respect to the operation of these units as
22 well?

23 A. It's a loaded question.

24 Q. You may want to consult with counsel before
25 you answer that.

1 A. I can't speak for Arco, so I can't answer
2 that question.

3 Q. No further questions.

4 MR. MORROW: Tom, do you or Bill have any
5 further questions of Mr. Gengler?

6 MR. KELLAHIN: No, sir.

7 MR. MORROW: Thank you, sir. You may be
8 excused. I appreciate your testimony.

9 MR. KELLAHIN: We have nothing further on
10 rebuttal, Mr. Examiner.

11 MR. CARR: I have one question and that is,
12 Mr. Morrow, the calculations that you want prepared,
13 we start ours back in the year before they start
14 theirs. And do you want it just left that way?

15 MR. MORROW: Start it just like you did. Just
16 bring them up to date.

17 MR. CARR: Okay. We can do that as soon as we
18 can get data.

19 MR. KELLAHIN: We'll supply that next week.

20 MR. MORROW: The situation is where both of
21 you have an application. Who gets to go first?

22 MR. CARR: I have to go first because
23 Mr. Kellahin always wants to make me honest in the
24 end.

25 MR. MORROW: Go ahead.

1 MR. CARR: May it please the Examiner,
2 Mr. Stovall was almost right a few minutes ago.
3 This case really does boil down to relatively simple
4 questions. The answers are where it gets hard.

5 The questions are initially, does Oxy
6 produce more or less than its allowable? And this
7 question, as you can see, basically turns on what
8 kind of pressure information we utilize. We've used
9 one set of numbers, they've used another, and it
10 depends on how we used these numbers in computing
11 the gradient to convert them to the necessary
12 datum.

13 The method isn't the issue. The issue is
14 what figures have we used. At the very beginning --
15 before the very beginning of this particular hearing
16 day, we've met with you repeatedly, and we agreed to
17 exchange all information so that each side knew what
18 the other was going to do, and pursuant to that we
19 requested C1-24 forms on which Oxy would report to
20 you and certify the various pressures that they had
21 obtained on the well in their unit, and it was only
22 today that we learned that they intended to use
23 something else, and so perhaps the hearing hasn't
24 been as meaningful as it could be, because although
25 we thought we'd be before you arguing apples and

1 apples, we found out we were arguing apples and
2 oranges, and so to that extent it may be my error
3 for not requesting something different, but we had
4 based our calculations on the information provided
5 to you by Oxy over the years, the datum that has
6 been used for the operation and monitoring of this
7 particular pressure maintenance project.

8 But the question still stands before you,
9 where do we stand in terms of reservoir voidage, and
10 that's a call unfortunately we haven't been able to
11 provide very much help on.

12 The second question that is before you is
13 whether or not Oxy should be entitled to make up
14 some underproduction. That question again, hinges
15 on whether or not Oxy is over or underproduced, and
16 you know that we believe that they were
17 overproduced.

18 We believe they're overproduced because we
19 believe the orders and rules of the commission mean
20 something. We believe that just because something
21 doesn't say you can't do something, it doesn't mean
22 you can, and there's nothing in the order that would
23 permit to, over a long period of time, cumulate
24 overproduction outside the order, or cumulate
25 underproduction outside the provision of the orders,

1 and there's nothing in the general statutes
2 governing oil production that would permit this, and
3 we think if we looked at the whole history of this
4 unit, the time to start it is when the unit began,
5 when they were under state wide rules, and when they
6 were, in fact, at that time, overproduced.

7 But the interesting thing is, you know,
8 we've talked a lot about the start date. We don't
9 think that means a lot. They obviously do because
10 when the unit was shut down in '87 and '88 out
11 there, they admit there was no bank at that time,
12 there was no pressure maintenance operation going
13 forward.

14 We're aware of nothing that lets them have
15 an allowable in the first place, let alone now be
16 able to reinstate it. All we're looking at is
17 really the overproduction that is approved since
18 they started producing, and admittedly, we're not in
19 a pressure maintenance mode.

20 The next question involves what should be
21 done about the future producing rate. They have one
22 proposal, we have another. I think there's some
23 things in the record, however, Mr. Morrow, that can
24 be of some assistance to you as you address this
25 question. Probably there were three fairly simple

1 questions at the beginning. There are also three
2 particular facts I think which you can look to in
3 trying to determine how you're going to prevent
4 waste of hydrocarbons in this field, and how you're
5 going to protect correlative rights, and how you're
6 going to prevent projects from damaging one another.

7 The first of the three critical bits of
8 evidence is reservoir voidage, and we believe if you
9 look at pressures that have been reported over the
10 years, they have, in fact, voided the reservoir 3.3
11 times faster than the Arco Unit. Admittedly this
12 takes you back into the question of pressure
13 information and the problems there.

14 The second point is the material balance
15 information where we had shown you that the material
16 balance calculation, the 7.1 BCF of gas has migrated
17 from the Arco Unit to the Citgo Empire Abo Unit.

18 There is one thing that I think is
19 interesting in this regard. They used higher
20 pressures in terms of calculating reservoir voidage,
21 and by doing that the voidage was less and their
22 allowable was higher, but if we take the higher
23 pressures that they use and accept those, the
24 material balance calculation will show that, in
25 fact, more production migrated away from the Arco

1 Unit and into the Citgo Unit. That alone -- you can
2 take those pressure numbers and on that score you
3 can accept this, and I think when you do and you see
4 that there's been that kind of migration over 7 BCF
5 from us to them, it's hard to see why you should
6 grant their request and go from about 700 MCF a day
7 in terms of gas allowable to 1700 MCF a day. Because
8 when you do that they're already had 7 plus BCF
9 migrate, and by increasing production rate, it is
10 logical that more will move in that direction.

11 I don't see how in view of that particular
12 fact from the material balance gas calculation, it
13 prevents waste or protects anyone's correlative
14 rights -- ours and the other interest owners in the
15 Arco Unit to turn around and say, "You didn't have
16 any mechanism in place to accrue a bulk of
17 underproduction since you shut in back in 1986.
18 There's nothing that lets you do it. We're going to
19 reinstate it and give you some extra time to make it
20 up because the undisputed evidence in this case
21 shows substantial migration from us to them."

22 The other factor that I think is virtually
23 undisputed, and that is that we have watched them
24 produce about 180 percent of the original gas in
25 place under their unit. That's not a

1 pressure-dependent factor. If you look at the
2 reserves, the original gas in place, and you look at
3 what they've produced, and you work it out, and we
4 believe that our numbers stand before you
5 unassailed. We've shown you how when we modeled the
6 reservoir recently we projected a performance based
7 on our original gas-in-place numbers, and we've
8 shown you how performance matches that initial
9 model, and when you look at that, the conclusion has
10 got to be, we had to be fairly close. Certainly
11 there isn't an error that would suggest that maybe
12 it's 185 percent, maybe it's 165 percent, but what
13 it does say is they have received more than we had
14 to begin with, and in view of that to give them an
15 increased allowable or to void them an allowable
16 bonus is like a pie in the face of preventing waste
17 and protecting correlative rights.

18 The commission has tried to maintain equity
19 in these units, and it's been -- and the
20 commission's been stuck with this responsibility
21 because these things were put together back in the
22 day prior to the statutory unitization act when we
23 could force all of these tracts together. But in
24 trying to do it, you've tried to prevent waste,
25 you've tried to protect correlative rights, and

1 you've tried to protect us, or any party, from
2 damage from an offset, and the only way we believe
3 you can do that is to grant our application,
4 recognize that they are, under the rules,
5 overproduced and they should be shut in until that's
6 made up, and recognize that you, if you don't
7 curtail their allowable, that they are going to be
8 able to produce substantially more than they do now,
9 that the migration and the influx from our unit to
10 theirs will continue. We will be drained, our
11 correlative rights will be impaired and at their
12 higher producing rate, will reduce pressure and will
13 damage the remaining life of our pressure
14 maintenance project. For that reason we believe that
15 if you out your statutory directive, you've got to
16 grant the application of Arco and deny the
17 application of Oxy.

18 MR. KELLAHIN: I always enjoy listening to my
19 good friend, Mr. Carr. Interesting argument,
20 fatally flawed. He has built his contentions as
21 well as Mr. Smallwood's arguments on two basic
22 building blocks that we have demonstrated
23 unequivocally are wrong, the attached rate
24 importance and merit to this October 2, 1970,
25 reservoir study.

1 Mr. Gengler has demonstrated to you, both
2 with Exhibits 18 and 19, that the projected reserves
3 for the Citgo property were some 500,000 barrels
4 less than what we've have actually produced. So what
5 do you suspect? Either they have built a container
6 that is the wrong size and shape, or we're taking it
7 away from Arco.

8 Mr. Gengler does the next calculation. He
9 says, "Well, if we're taking it from Arco, their
10 total recoveries should have been substantially less
11 than their projections." So he looks at that and he
12 finds out that they're substantially overproduced
13 from their original projections. What do you
14 conclude? The container is too small. The
15 engineering study on which this acre-foot
16 calculation is predicated is wrong. We simply have
17 a bigger reservoir underlying the Citgo project than
18 they're willing to admit to us, and that argument
19 dates back some 18 years and it continues today.
20 They use it as a predicate by which to demonstrate
21 that we are somehow gaining an advantage. Why don't
22 we look and see what we really know?

23 As reservoir engineers, don't you want to
24 really know what the reservoir pressure is and what
25 is the best way to find that out? You look at

1 bottomhole pressure surveys that are reported by the
2 independent operator that goes out and takes that
3 information. And you build your blocks from there.

4 Regardless of all the hand waving about how
5 we might have affected them, it is meaningless when
6 you look at the reservoir pressures. The measured
7 data demonstrates that the Citgo project over the
8 life of that project is substantially higher
9 pressure than the Arco project. If you have that as
10 a basic, undisputable fact, then you can ignore the
11 contention that we have somehow voided the reservoir
12 at a far greater rate than they have. There's
13 something wrong with that calculation. It doesn't
14 fit the known data.

15 We apologize to you for errors and mistakes
16 in the calculation of the allowable. We don't think
17 it ought to be punitive against us for coming back
18 in here and showing you what the calculation ought
19 to be. We don't think we should have to sacrifice
20 and forfeit as a punitive penalty the opportunity to
21 produce this underproduction that we have accrued.
22 Isn't it interesting that the only operator in this
23 pool that is limited and curtailed by an allowable
24 based upon reservoir voidage is Oxy?

25 Isn't it interesting that our major

1 opponent in the reservoir is coming and asking us to
2 abide by this curtailment, this restrictive
3 allowable? Is Arco -- and they removed voidage from
4 their allowable calculation in 1984 because they
5 contended that it could receive great oil production
6 if that allowable was increased and based upon a
7 capacity allowable for this gas extraction plant.

8 It's not a level playing field in this
9 reservoir, Mr. Examiner. It never was. Arco
10 constructed the rules of the game to benefit them.
11 We are simply a small player in the pool, and we
12 have been the victim of a regulatory framework with
13 this allowable schedule that has been punitive, and
14 we simply ask you the opportunity to have some small
15 hope of receiving our equitable share of the
16 remaining future production.

17 Mr. Carr wants to make a big point of the
18 fact that we're not injecting gas any longer, but
19 look at the first order in paragraph one of our
20 order, paragraph number one. It defines for us what
21 pressure maintenance is. It's the curtailment of
22 our production and our gas injection. Why should we
23 be arbitrarily penalized because we no longer inject
24 gas? Why can't we now enjoy that underproduction
25 that we've accrued because we have curtailed our

1 production over all those years, principally for the
2 benefit of Arco.

3 The pressure information is not going to
4 lie to you. The bottomhole pressure information is
5 the building block by which you can decide the
6 entire case. With that information you can ignore
7 and disregard Arco's contention that they're getting
8 drained, and they're at a disadvantage because the
9 evidence proves otherwise. There are a couple of
10 items for you to exercise your judgment about. One
11 of those is the start date of the calculation. We
12 think it's important. We've relied upon that start
13 date for some 17 years without any dispute or
14 argument from anyone.

15 It's interesting to note that when you take
16 Mr. Smallwood's calculations and move it back from
17 June of '74 to June of '75, instead of being
18 overproduced we're underproduced. It's a
19 significant point. In fairness we think that it
20 ought to start with the gas injection. In addition,
21 we would like to have the opportunity to produce the
22 underproduction credit that we've accumulated.

23 Mr. Stovall raised with us a while ago
24 whether or not it was good practice to make it
25 retroactive. If you determine that it is not good

1 practice to make this retroactive, we would ask for
2 a prospective opportunity to at least have a
3 prospective opportunity to return to the state wide
4 allowables that other operators not under pressure
5 maintenance enjoy. Perhaps pressure maintenance was
6 a mistake for us. It simply did not work to our
7 benefit. We perhaps would have been better off if
8 we'd have stayed out of that, but we attempted to
9 conserve the dried mechanism in the reservoir for a
10 period of time where it was useful, but by 1984 with
11 Arco's own testimony -- and you may look at that
12 transcript if you desire to do so -- it was based
13 upon their proof that this was predominantly gravity
14 drainage and there was no justification for them to
15 stay on a voidage-based allowable, and there
16 certainly is not one for us.

17 The order is antiquated and outdated. It
18 is not useful for us, it serves no legitimate
19 purpose, and we simply ask that you give us some
20 sort of opportunity for equity and let us protect
21 our fair share of our correlative rights. Thank you.

22 MR. MORROW: Mr. Currens.

23 MR. CURREN: Mr. Examiner, Amoco is working
24 interest owner in the Empire Abo Field, and does
25 recommend to you that you carefully study the rules

1 and presentations and make your decision in
2 accordance with the rules that have been set forth
3 concerning this unit. In the event that you make a
4 determination that there is any underproduction that
5 may have been accrued, however, Amoco would
6 recommend that that underproduction not be granted
7 to be produced at a future date.

8 Allowables aren't forever. This is not the
9 case of a changing market such as you may have in
10 market opportunities in a gas field. Certainly gas
11 rules provide for a balancing of under and overage,
12 and in the oil rules you really only have a balance
13 of overage.

14 The reference that you have in state wide
15 rules to underproduction has to do with
16 circumstances such as pipeline proration and things
17 of that nature that largely seem to be those things
18 that are out of operator's control, so in the event
19 that your determination should come up with the
20 facts that underproduction has accumulated, then it
21 would be Amoco's recommendation that that
22 underproduction not be allowed in addition to
23 whatever allowable system is appropriate. Thank
24 you.

25 MR. MORROW: Anything further? This case will

1 be taken under advisement. That concludes our
2 hearing for today.

3 (The foregoing hearing was concluded at the
4 approximate hour of 4:15 p.m.)
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15 I do hereby certify that the foregoing is
16 a complete record of the proceedings in
17 the Examiner hearing of Case Nos. 10356 and 10369
18 heard by me on Jim Morrow on 8/31/91.

19 Michael C. Morrow Christ Hearing Examiner
20 Oil Conservation Division
21
22
23
24
25

1 STATE OF NEW MEXICO)
) ss.
2 COUNTY OF BERNALILLO)

3 REPORTER'S CERTIFICATE

4 BE IT KNOWN that the foregoing transcript of
5 the proceedings were taken by me, that I was then
6 and there a Certified Shorthand Reporter and Notary
7 Public in and for the County of Bernalillo, State
8 of New Mexico, and by virtue thereof, authorized to
9 administer an oath; that the witness before
10 testifying was duly sworn to testify to the
11 whole truth and nothing but the truth; that the
12 questions propounded by counsel and the answers of
13 the witness thereto were taken down by me, and that
14 the foregoing pages of typewritten matter contain a
15 true and accurate transcript as requested by counsel
16 of the proceedings and testimony had and adduced
17 upon the taking of said deposition, all to the best
18 of my skill and ability.

19 I FURTHER CERTIFY that I am not related to
20 nor employed by any of the parties hereto, and have
21 no interest in the outcome hereof.

22 DATED at Bernalillo, New Mexico, this day
23 November 13, 1991.

24 My commission expires
25 April 24, 1994


LINDA BUMKENS
CCR No. 3008
Notary Public