



## A P P E A R A N C E S

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For Amoco Production Co.: Daniel R. Currens  
Attorney at Law  
Amoco Production Company  
Post Office Box 3092  
Houston, Texas 77253

For Cities Service: W. Thomas Kellahin  
Attorney at Law  
KELLAHIN, KELLAHIN, & AUBREY  
P. O. Box 2265  
Santa Fe, New Mexico 87051

For Amerigas, Inc.: James C. Bruce  
Attorney at Law  
HINKLE LAW FIRM  
P. O. Box 2068  
Santa Fe, New Mexico 87504

For Ross Carbonic: Kurt Sommers

For Amerada Hess: Jim Hefley

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## I N D E X

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STATEMENT BY MR. CURRENS

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JAMES W. COLLIER, JR.

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STATEMENT BY MR. CARR

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## E X H I B I T S

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Amoco Exhibit One, Map

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Amoco Exhibit Two, Reproduction

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Amoco Exhibit Four, Graph

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MR. CATANACH: Call next Case 8190.

MR. TAYLOR: In the matter of Case 8190 being reopened pursuant to the provisions of Division Order R-7556, which order established special rules and regulations for the Bravo Dome 640-acre area in Union, Harding, and Quay Counties, including a provision for 640-acre spacing units.

Interested parties may appear and show cause why the Bravo Dome 640-acre area should not be developed on less than 640-acre spacing and proration units.

MR. CATANACH: Are there appearances in this case?

MR. CARR: May it please the Examiner, my name is William F. Carr, with the law firm Campbell & Black, P. A., of Santa Fe. We represent Amoco Production Company.

I'm appearing in association with Daniel R. Currens, attorney for Amoco Production Company from Houston, who will present Amoco's case.

MR. CATANACH: Are there other appearances?

MR. CURRENS: Daniel Currens,

1 Mr. Examiner.

2 MR. CATANACH: Thank you, Mr.  
3 Currens.

4 MR. KELLAHIN: Mr. Examiner,  
5 I'm Tom Kellahin of Santa Fe, New Mexico, appearing on be-  
6 half of Cities Service Oil and Gas Corporation.

7 MR. BRUCE: Mr. Examiner, my  
8 name is Jim Bruce from the Hinkle Law Firm in Santa Fe, rep-  
9 resenting Amerigas, Inc.

10 MR. SOMMER: Mr. Examiner, my  
11 name is Kurt Sommer. I appear on behalf of Ross Carbonics,  
12 Inc.

13 MR. HEFLEY: My name is Jim  
14 Hefley. I appear on behalf of Amerada Hess Corporation,  
15 Tulsa, Oklahoma.

16 MR. CATANACH: I'm sorry, I  
17 didn't get your name, sir.

18 MR. HEFLEY: Hefley, H-E-F-L-E-  
19 Y.

20 MR. CATANACH: Anybody else?  
21 How many witnesses are we going  
22 to have?

23 MR. CURRENS: I've got one  
24 witness, Mr. Examiner.

25 MR. CATANACH: One witness.

1 Does anybody else have any witnesses?

2 Will the witness please stand  
3 and be sworn?

4

5 (Witness sworn.)

6

7 MR. CATANACH: Do you want to  
8 put the map on the wall?

9 MR. CURRENS: I don't think  
10 it's necessary, Mr. Examiner. I think the people that are  
11 interested in them have some copies available.

12 This is merely an orientation  
13 map, this first particular map. The exhibits that we will  
14 be using are all easily lap size beyond -- besides this one.

15 MR. CATANACH: Okay.

16 MR. CURRENS: And perhaps while  
17 people are looking at those exhibits, Mr. Examiner, I might  
18 just go ahead and restate, as you said, this is a reopening  
19 of Case 8190, which was heard in May -- on May 15th, 1984,  
20 concerning rules for the Bravo Dome Carbon Dioxide Area.

21 From that case Order No. R-7556  
22 issued and established on a temporary basis a Bravo Dome  
23 160-acre area and a Bravo Dome 640-acre area, and set this  
24 matter to be reopened at this time.

25 Since the engineering analysis

1 of drainage at the time of that earlier hearing in 1984 was  
2 primarily based on calculations and modeling, the order in-  
3 cluded a requirement that a plan be furnished the Division  
4 for field testing to demonstrate the drainage efficiency of  
5 wells located on 640-acre spacing units.

6 Now plans to accomplish this  
7 were submitted and approved. Tests have been run, the in-  
8 formation analyzed, and we're here today to present you the  
9 results.

10 Those tests will conclusively  
11 demonstrate 640-acre spacing is proper. Our recommendation  
12 is that the temporary rules that were previously issued in  
13 this cause be adopted for the 640-acre area and be made per-  
14 manent.

15

16 JAMES W. COLLIER, JR.,

17 being called as a witness and being duly sworn upon his  
18 oath, testified as follows, to-wit:

19

20 DIRECT EXAMINATION

21 BY MR. CURRENS:

22 Q Will you state your name, by whom you're  
23 employed, at what location, and in what capacity?

24 A My name is James W. Collier, Junior. I'm  
25 employed by Amoco Production Company in Houston, Texas, as a

1 Senior Petroleum Engineering Associate.

2 Q Mr. Collier, have you ever testified be-  
3 fore this body before?

4 A No, I have not.

5 Q Will you briefly summarize for us your  
6 educational and work background in the field of petroleum  
7 engineering ?

8 A Yes. I graduated from Texas A & M  
9 University in 1972 with a Bachelor of Science degree in pet-  
10 roleum engineering.

11 I was employed by Amoco Production Com-  
12 pany in 1972 and have worked for this firm for the past fif-  
13 teen years.

14 I have worked in various reservoir engin-  
15 eering positions, handling primary, secondary, and tertiary  
16 oil recovery engineering projects. I've also been assigned  
17 to various engineering supervisory positions over the past  
18 ten years in West Texas and in Houston.

19 Also I have been accepted as an expert  
20 witness by the Texas Railroad Commission in the past.

21 Q Mr. Collier, let me further ask you with  
22 respect to the matter that's before this hearing today, have  
23 you had occasion to make studies of individual well perfor-  
24 mance histories and tests that were run in conjunction with  
25 the Commission order having to do with 640-acre drainage?

1           A           Yes, sir.

2                           MR. CURRENS: I submit Mr. Col-  
3   lier is --

4                           MR. CATANACH: Mr. Collier is  
5   so qualified.

6           Q           Mr. Collier, let me direct your attention  
7   to what's marked as Amoco's Exhibit One, and that's our only  
8   large exhibit, a map, and ask you what that depicts.

9           A           Okay. This map depicts the Bravo Dome  
10 CO2 Gas Area in New Mexico. The map includes both the Amoco  
11 operated Bravo Dome CO2 Gas Unit and the Cities Service  
12 operated West Bravo Dome CO2 Gas Unit.

13                           The Amoco unit is outlined with the  
14 heavy, bold, solid border. The Cities Service West Bravo  
15 Dome CO2 Gas Unit is in the cross hatched area in the south-  
16 western part of this map.

17           Q           Okay. I also see a dashed line on this  
18 map. What does that depict?

19           A           That depicts the outline of the 640-acre  
20 area as defined by the NMOCD following two hearings in 1984.

21           Q           Those being the hearings that Amoco had  
22 on 640-acres and the one that Cities Service subsequently  
23 had for 640-acre spacing.

24           A           Yes, sir, that's correct.

25           Q           Okay. Just generally would you describe

1 for us that outline that covers the eastern side and the  
2 south and the north a little more?

3 A Okay. Essentially, the entire Amoco  
4 operated Bravo Dome CO2 Gas Unit is spaced on the 640 acres.

5 Following the hearing 8190 in May of  
6 1984, the order subsequent to that hearing established tem-  
7 porary 640-acre spacing rules for a period of three years  
8 for the entire Bravo Dome Unit Area, with the exception of  
9 twelve townships in the southwest part of this map.

10 If one were to draw a line north/south  
11 between Ranges 31 East and 32 East, traversing across Town-  
12 ships 18 North and 19 North, then you would have a picture  
13 of what the 640-acre area was subsequent to the Case 8190.

14 Q Okay, and then the changes that were made  
15 beyond that were as a result of the second hearing held by  
16 Cities Service having to do with that area.

17 A Yes, sir.

18 Q All right, sir. I further notice on this  
19 map you have some colored symbols. Do they have signifi-  
20 cance?

21 A Yes. There are two symbols on this map.  
22 There are three orange dots. Those are the locations of  
23 Amoco's long term flow tests which were run to help validate  
24 640-acre spacing was proper, and there are four green  
25 triangles. Those are the locations of shut-in pressure mon-

1 itor wells that have not produced and the purpose is to see  
2 interference from the offset producing wells in the form of  
3 pressure response.

4 Q Okay, anything further with respect to  
5 this map?

6 A No, sir.

7 Q Let me recall that back at the hearing in  
8 1984 we showed some long term flow tests and those were  
9 tests where production had taken place for some period of  
10 time, and that production had been analyzed and I believe in  
11 two of those instances a projection had been made as to what  
12 performance would be expected if 160 acres or 640 acres was  
13 being drained.

14 Is my memory correct?

15 A Yes, sir. Those are the two -- two  
16 southernmost orange dots on Exhibit One.

17 Q Okay, let's look at Exhibit Two and tell  
18 me what that is, please.

19 A All right, Exhibit Two is a reproduction  
20 of the old Exhibit Thirteen from Case 8190 held in May of  
21 1984.

22 Q And that's the exhibit that was entered  
23 at that time and has to do with one of these orange dots?

24 A Yes. Exhibit Two is the long term flow  
25 test data and the predictions therefrom for Well 1934-201G,

1 which is the westernmost of the two orange symbols on Exhi-  
2 bit One.

3 Q The southern orange symbol.

4 A Yes, sir.

5 Q Okay, now there was another long term  
6 flow test that had predictions made at that time. Do you  
7 have a copy of the exhibit that we entered at that time?

8 A Yes, sir, Exhibit Three for this case is  
9 a reproduction of the old Exhibit Fourteen from the original  
10 Case 8190.

11 Q Now which orange dot is that?

12 A That is the easternmost of the two south-  
13 ern orange dots, or Well 1935-221G.

14 Q And it similarly made a projection as to  
15 the results that would be expected if 160 acres was being  
16 drained or if 640 acres was being drained.

17 A That's correct.

18 Q Okay. That's been three years ago. Were  
19 those two tests continued?

20 A Yes, sir. We continued the monitoring  
21 flowing tubing pressure and rate performance on both of  
22 these wells in order to validate our predictions.

23 Q Okay, well, let's look and see what addi-  
24 tional data we've obtained in the interim.

25 I believe Exhibit Four has to do with

1 Well 1934-201G.

2 A Yes.

3 Q Let's look at that exhibit.

4 A Yes, sir. This Exhibit Four is again  
5 back on Well 1934-201G, which corresponds to Exhibit Two,  
6 whcih I just discussed.

7 What I've shown here is an updated  
8 performance. If you look at the middle third of this graph  
9 you can see that we have updated the flowing tubing pressure  
10 performance out to a total test period of about 1000 days.

11 Likewise, we've updated the gas produc-  
12 tion rates for this well the same time period of 1000 days.

13 Q Okay, now you show on there the old rate  
14 prediction you had down in the bottom third of that exhibit,  
15 I believe. Is that what the dashed line is?

16 A Yes, sir. The dashed line is the predic-  
17 tion of gas flow rate from this well that was made back in  
18 1984.

19 Q And has production from that well been  
20 substantially different than the amount that we had predic-  
21 ted at that time?

22 A Yes, sir, we have averaged -- actually,  
23 since 1984 we've averaged roughly 2-million cubic feet a day  
24 from this well as compared to the 1984 prediction, which was  
25 just under 1-million cubic feet per day.

1 Q Now what's the top third of this particu-  
2 lar graph, cumulative production?

3 A The cumulative -- yes, sir, this is cumu-  
4 lative production with the actual being the solid, heavy  
5 line, and the 1984 prediction being the dashed line.

6 Q The two dashed lines just went together  
7 and the solid lines are what's actually occurring?

8 A Yes, sir.

9 Q All right, then using this additional da-  
10 ta, were your old predictions still good?

11 A No, sir.

12 Q So was it necessary then to make a new  
13 prediction to match the actual production history that you  
14 have over this more extended period of time?

15 A Yes, sir, that's correct.

16 Q Do you have a prediction on this particu-  
17 lar well?

18 A Yes. Exhibit Five is an updated predic-  
19 tion using the same modeling technique that was used for the  
20 '84 prediction.

21 Q Okay, let's just discuss that for us,  
22 please.

23 A Okay. Again, if you look at the lower  
24 third of this graph, the actual gas flow rate performance is  
25 shown in a light blue solid line. The model was updated --

1 well, let me move to the next curve, in the middle curve,  
2 you can see that I've also superimposed actual flowing tub-  
3 ing pressure performance and if you'll look closely, you'll  
4 see that the red line in the middle third of this graph  
5 overlies the blue line. The reason it does that is because  
6 I chose to input the actual flowing tubing pressure perfor-  
7 mance from this well into the model and instructed the model  
8 to predict flowing tubing -- excuse me, flowing gas rates  
9 from this well, and the match that resulted from this model-  
10 ing work can be seen in the lower third; if you compare the  
11 solid red line to the solid blue line, you can see that we  
12 have a very acceptable and very valid match of producing  
13 rates.

14 Q I take it in the upper third the blue  
15 line is the actual cumulative production there, too.

16 A Yes, sir. The --

17 Q Okay, now in addition to those lines  
18 there are some black lines on this exhibit. What are they?

19 A Those black lines are the predictions  
20 that we obtained by inputting the same flowing tubing pres-  
21 sure performance but yet instructing the model to assume a  
22 160-acre drainage area rather than a 640 area.

23 Q Okay, so you tell the model it can't  
24 reach out past 160 acres and the black line is the result  
25 you get.

- 1           A           That's correct.
- 2           Q           The bottom one is for the rate?
- 3           A           That's correct.
- 4           Q           And the top one would be the cumulative  
5 that was associated with that rate.
- 6           A           Yes, sir.
- 7           Q           Now, Mr. Collier, let me ask you if --  
8 which one of those predictions most closely fits the actual  
9 data, the 160 or the 640?
- 10          A           I think it's obvious that the 640-acre  
11 drainage prediction more closely fits actual performance.
- 12                    If you look at the cumulative perfor-  
13 mance, the percent difference between the predicted cumula-  
14 tive on 640 acres and the actual cumulative is less than 4  
15 percent.
- 16          Q           All right, sir, let me ask you if based  
17 on this work, if you you have an opinion as to the drainage  
18 associated with the production from this well?
- 19          A           Yes, sir. I believe this particular well  
20 is draining 640 acres.
- 21          Q           Anything further with respect to this ex-  
22 hibit?
- 23          A           No, sir.
- 24          Q           Okay, we had two of those 1984 exhibits  
25 we were looking at awhile ago, and I assume you've done sim-

1 ilar work on the second of those wells?

2 A Yes, sir, I have.

3 Q Well, let's go ahead and look at Exhibit  
4 Six, then, and tell me about that.

5 A Again Exhibit Six corresponds to Exhibit  
6 Three, which, Exhibit Six provides an update of actual flow-  
7 ing tubing pressure performance and gas flow rate perfor-  
8 mance for Well 1935-221G, which is the easternmost of the  
9 two orange dots on Exhibit One.

10 Q And is the setup on this similar to what  
11 we just looked at before?

12 A Yes, sir. We are looking at actual gas  
13 flow rates in the solid blue curve in the bottom third of  
14 this graph, and you can see that the '84 prediction was  
15 about 1.2-million cubic feet a day, held constant, but the  
16 actual flow rate has been something on the average in excess  
17 of 2-million cubic feet per day in this well.

18 Q Okay, so again we have a situation where  
19 we were able to produce at a higher rate than we had used in  
20 the earlier predictions. I take it that again necessitated  
21 a new match and prediction system.

22 A Yes, sir.

23 Q Okay, let's turn to Exhibit Seven and  
24 look at those predictions that will appear on that one, sir.

25 A Exhibit Seven provides the updated pre-

1 diction. Again we have input the actual flowing tubing  
2 pressure into our predictive model. Again the solid blue  
3 curve in the middle third of this graph overlays the red  
4 curve. That is because we've input the actual flowing tub-  
5 ing pressure measured on this well and have instructed the  
6 predictive model to predict gas flow rates from this well,  
7 using that flowing tubing pressure performance, and that  
8 prediction is shown in the solid red line in the bottom  
9 third of this graph.

10 Q Okay, that's the 640-acre prediction?

11 A Yes, sir.

12 Q And there's a black line in the bottom  
13 third of that graph, as well. That's the 160-acre predic-  
14 tion?

15 A Yes, sir.

16 Q Let me ask you, Mr. Collier, which is the  
17 best match?

18 A I think it's obvious from looking at both  
19 rates, our history match performance as well as the cumula-  
20 tive performance in the upper third of this graph, that the  
21 640-acre prediction more closely matches actual performance  
22 than the 160 does.

23 Q Okay, again let me ask you with respect  
24 to this particular well, if you have an opinion as to what  
25 area is being drained by production from it?

1           A           Yes, sir, I conclude without a doubt that  
2 this well is draining 640 acres.

3           Q           Anything further with respect to this ex-  
4 hibit?

5           A           No, sir.

6           Q           Okay, I notice that up at the northern  
7 end of the map we have one more orange dot. Is that another  
8 long term flow test?

9           A           Yes, sir, it is.

10          Q           And do you have that one depicted on Ex-  
11 hibit Eight?

12          A           Yes. Exhibit Eight is the flow test in-  
13 formation gathered from Well 2233-321K.

14          Q           Okay, and that test ran for a much  
15 shorter period of time than the ones we just looked at,  
16 which were, what, about 1000 days. This is how long?

17          A           About six months, 180 days.

18          Q           About six months, so this test was a rel-  
19 atively new but short term test.

20          A           Yes, this test was initiated in late 1985  
21 and concluded in early 1986.

22          Q           Okay. You had from this the same data,  
23 rates, and flowing tubing pressures, and did they allow you  
24 to make a prediction?

25          A           Yes, sir, using the measured rates over

1 this 180-day period, we input those rates into a model simi-  
2 lar to the two we've previously spoken about, although using  
3 the actual reservoir parameters inherent to this well, and  
4 again have made predictions assuming a 160-acre drainage  
5 area and a 640-acre drainage area, and those predictions are  
6 shown as flowing tubing pressure performance in the upper  
7 part of this graph, the red line being the 640-acre predic-  
8 tion and the green line being the 160-acre prediction.

9 Q What's the relationship or the comparison  
10 between the actual performance and those predicted perfor-  
11 mances under different drainage radius?

12 A The prediction on 640 acres of flowing  
13 tubing pressure is a better match with actual than the 160-  
14 acre prediction is. In fact, the actual flowing tubing  
15 pressure performance is even above the 640-acre prediction  
16 for this particular well.

17 Q Indicating drainage greater than 640,  
18 probably, from that well?

19 A It indicates to me that in all likelihood  
20 this well is draining more than 640 acres.

21 Q Okay, let me ask you if there are any  
22 other characteristics having to do with your predictions on  
23 this 6-month test that you have seen on your 3-year tests  
24 that lend some validity to the work on this shorter term  
25 long-term flow test.

1           A           Yes, sir, in all the modeling work that I  
2 have done and seen, the characteristic of these models is  
3 that the prediction for 160 acres and 640 acres is similar  
4 in a very early time period of the prediction, approximately  
5 at 60 to 70 to 80 days, you start seeing a divergence of the  
6 two predictions, and this has been a very common trait.

7           Q           And you saw that divergence on the two  
8 long term flow tests that we looked at --

9           A           Yes.

10          Q           -- just prior to this one?

11          A           Yes, sir.

12          Q           All right, sir, anything further with re-  
13 spect of this exhibit?

14          A           No.

15          Q           Okay, I believe that's all the long term  
16 flow tests that we had in this particular series. There  
17 were the green triangles on the map. Tell me again what  
18 those were denoting?

19          A           Those four green triangles denote the  
20 locations of shut-in pressure monitor wells that have never  
21 produced since the unit went on production in 1984.

22          Q           Okay, if I understand correctly, the  
23 green triangles are at the locations of wells that have been  
24 shut-in except for testing purposes on completion, or  
25 something of that nature, but when production started from

1 the unit they were not turned onto production even though  
2 all of their offsets and neighbors may have been.

3 A That's correct.

4 Q Okay. Since these were shut-in wells did  
5 you have a data gathering program to go with them?

6 A Yes, sir. We, well, first of all, we ran  
7 initial bottom hole pressure build-up tests on those four  
8 wells and then subsequent to the offset producers being put  
9 on production we have monitored the bottom hole pressure in  
10 all four of these shut-in wells on approximately a quarterly  
11 basis.

12 Q Do you have a tabulation of the results  
13 of that pressure monitoring?

14 A Yes, sir, Exhibit Nine is such a  
15 tabulation.

16 Q Okay, we have individual well analyses  
17 and work that's been done on each of these?

18 A Yes, sir.

19 Q So we may want to refer back to Exhibit  
20 Nine from time to time, but why don't we move on and look at  
21 the individual well tests or shut-in histories of these  
22 wells and see what they show us.

23 Let's look at Exhibit Ten, which I think  
24 is a three part exhibit?

25 A Yes. Exhibit Ten is actually is three

1 parts, labeled Ten-A, Ten-B, and Ten-C.

2 Q Okay, what well is that associated with?

3 A This is Well 1833-351G, which is the  
4 southwesternmost shut-in pressure monitor well.

5 Q Okay, what's the A part of this depict?

6 A This is a plot of pressure versus time  
7 for this particular well.

8 Q And is anything else shown on there ex-  
9 cept those actual points?

10 A We -- the actual points are shown with  
11 the blue X's. We have also constructed a 9-section model  
12 describing the producing system around this shut-in well and  
13 the prediction of pressure versus time is shown as a rust  
14 colored line this Exhibit Ten-A.

15 Q Okay. What's the B portion for orienta-  
16 tion so that we kind of get all of these in mind?

17 A The B portion is a plot of bottom hole  
18 pressure measured in the shut-in monitor well versus the  
19 offset cumulative gas production volumes to the shut-in  
20 well.

21 Q Okay, you've got another rust colored  
22 line.

23 A Yes, that is a prediction from the same  
24 model as I showed you before on the Ten-A, just showing dif-  
25 ferent parameters, those being pressure versus cumulative

1 production from the offsets.

2 Q Okay, what's the third part of this exhi-  
3 bit?

4 A The third part, Exhibit Ten-C, is a tabu-  
5 lation of the offset producer cumulative gas volumes on a  
6 well-by-well basis. This particular well only has two off-  
7 sets and I've shown a tabulation of actual production in the  
8 model, cumulative production, and then the last column is  
9 the percentage difference between the two.

10 Q Okay. Now, if I understand correctly,  
11 what you've done is taken a model with the center of it  
12 being the shut-in well and modeled the -- that section that  
13 that's in and the eight surrounding sections, such that you  
14 have a nine section block being the offsets to that shut-in  
15 well, and then you have made pressure measurements on the  
16 shut-in well and you have model predictions of what should  
17 have happened.

18 Now is that generally the scheme we're  
19 going into here?

20 A Yes, sir, that's correct.

21 Q Okay. Let me ask you what you see from  
22 this first one.

23 A I see no -- no data on this test which  
24 can cause me to make any kind of engineering conclusion.

25 Q Why is that?

1           A           Because the pressures measured bottom  
2 hole subsequent to the initial bottom hole pressure build-up  
3 test run in this well are slightly higher than the initial  
4 reservoir pressures.

5           Q           Looks like we had a bad initial pressure  
6 on that well, then, is that right?

7           A           Yes, sir, it does.

8           Q           And that makes that one incapable of ana-  
9 lysis, really.

10          A           Yes, sir, I would not use this to make an  
11 analysis.

12          Q           Well, let's see if we can find one that  
13 is capable.

14                      Let's look at Exhibit Eleven and that  
15 series. Tell us which well that is.

16          A           All right. Again, Exhibit Eleven has  
17 three parts, A, B, and C.

18                      Exhibit Eleven-A is a plot of pressure  
19 versus time for Well 1835-161M, which is the southeastern-  
20 most shut-in pressure monitor well.

21                      Exhibit Eleven-A again, as I mentioned,  
22 is a plot of pressure versus time.

23          Q           Okay, and I notice that the pressure has  
24 declined with the passage of time. I take it that's been a  
25 period of production from the offsets.

1           A           Yes, sir, it's about a 3-year period.  
2 This well has shown a definite decline in reservoir pres-  
3 sure.

4           Q           Does that indicate to you a good match  
5 between your model and the actual pressure results that you  
6 have measured?

7           A           Yes, sir, I think is a very valid match.

8           Q           Okay, what about the B part of this?

9           A           The B part again plots offset cumulative  
10 production versus pressure in the monitor well, the blue  
11 crosses being the actual points and the model prediction  
12 being the solid rust colored line.

13          Q           How is your match there?

14          A           Again I believe the match is very rigor-  
15 ous.

16          Q           Okay, and the C part shows the production  
17 history. How many offsets does this one have?

18          A           This well is offset all around so it's  
19 got eight offset wells.

20          Q           Okay, and I believe on this you have the  
21 model predicted production and the actual production. How  
22 do those compare?

23          A           They compare very closely. Actually the  
24 percent difference between the prediction and the actual  
25 cumulatives is about one percent out of a total of roughly 7

1 BCF.

2 Q Okay. Let me ask you, Mr. Collier, that  
3 when you analyze this one and you look at the pressure de-  
4 cline that's taken place at this well location, and the off-  
5 set production, do you have a conclusion as to whether or  
6 not the shut-in well is being affected by the production  
7 from its neighbors?

8 A Yes, sir, I believe this well, because it  
9 has shown a definite drop in reservoir pressure, has to have  
10 been affected by offset production.

11 Q Okay, is it your opinion that production  
12 in this particular area is evidencing 640-acre, or greater,  
13 drainage?

14 A Yes, sir, I believe it is.

15 Q Okay, we've got two more of these shut-in  
16 tests. Let's look at them, or did you have anything further  
17 on that one?

18 A No, sir.

19 Q All right. Let's go to -- what's the  
20 next one, the northeastern green dot, triangle?

21 A Yes, the next series of exhibits is  
22 Twelve-A, Twelve-B, and Twelve-C. This depicts the shut-in  
23 performance of Well 2034-201G, which is the northeasternmost  
24 of the shut-in pressure monitor wells.

25 Q Okay, why don't you just run through the

1 A, B, and C parts in a similar manner? We all know the X's  
2 are the actual and that the --

3 A Correct.

4 Q -- rust color is the predicted, so what  
5 -- just tell us what we're seeing there.

6 A Okay. Again in this well, it is offset  
7 by eight producers and it has shown a definite decrease in  
8 reservoir pressure at the shut-in location, and that's de-  
9 picted on Twelve-A.

10 Q Good match?

11 A Yes, I believe again this is a good  
12 match.

13 Q All right, sir.

14 A Exhibit Twelve-B is a plot of cumulative  
15 production from the offset eight producers versus pressure  
16 in the shut-in monitor well, and again we have a good match  
17 between the actual and the predicted.

18 Q Okay. How did our predicted and actual  
19 production compare?

20 A Okay, out of a total cumulative offset  
21 production of about 9 BCF our prediction was only one per-  
22 cent difference from the actual.

23 Q Let me ask you again with respect to this  
24 well, the analysis that you've made of it, as to any opinion  
25 you have with respect to pressure interference from its off-

1 set wells and what drainage may be being recognized by the  
2 shut-in well.

3 A Since this area is spaced on 640-acre  
4 well spacing and yet we've seen a definite pressure decline  
5 in this well, I conclude that we are definitely affecting  
6 this well on this type of spacing.

7 Q All right, sir. Anything else with  
8 respect to this series?

9 A No, sir.

10 Q We have one more shut-in series of tests,  
11 I believe, and that would be the northwestern of these  
12 wells. That's Exhibit series Thirteen, A, B, and C?

13 A Yes, sir.

14 Q How about discussing those in a similar  
15 manner?

16 A Okay. This is the pressure performance  
17 for a shut-in monitor Well 2033-161G, which is the  
18 northwesternmost of the four shut-in pressure monitor wells.

19 Exhibit Thirteen A again is a plot of  
20 pressure versus time. This shows a decline again in  
21 reservoir pressure measured at the shut-in well over a  
22 period of three years.

23 Again we have constructed a nine-section  
24 model and that is -- again the prediction is shown in the  
25 rust colored line and again we have a very valid match.

1 Q Okay, B part?

2 A The B part again is the cumulative pro-  
3 duction versus pressure plotting the offset cumulatives ver-  
4 sus the pressure in the monitor well, and again we have a  
5 very valid match between the actual measured pressure versus  
6 cumulative and the predicted.

7 Q Okay. How many offset wells are there?

8 A This well is only offset on four sides.

9 Q And how did the production and the pre-  
10 diction from those compare?

11 A Well, as shown on Exhibit Thirteen C,  
12 offset cumulative has been about 1.3 BCF from the four off-  
13 set cumulatives total and our prediction is less than 1 per-  
14 cent in there or off of that actual.

15 Q All right, deviation.

16 A Deviation.

17 Q Let me ask you again your opinion with  
18 respect to your analysis of the data on the 2033-161G test  
19 location as to whether or not you believe 640 acres is being  
20 effectively and efficiently drained as evidenced by a de-  
21 cline in shut-in pressure in that well.

22 A I believe since the wells again in this  
23 location are on 640-acre spacing, and that we've seen a  
24 pressure decline in a shut-in well, that we are effectively  
25 draining an area of 640 acres.

1           Q           Okay, you've mentioned a time or two here  
2 that wells are on 640-acre spacing in here and I take it by  
3 that you mean that there's one well per section.

4           A           Yes.

5           Q           Is the geometry of the well locations ab-  
6 solutely uniform and in a grid so that each one's exactly in  
7 the same spot in all of the sections that we've been looking  
8 at?

9           A           No, geometrically there are slight varia-  
10 tions for various reasons. The wells are not exactly one  
11 section apart.

12          Q           Okay. Let's look at Exhibit Fourteen and  
13 see if we can get a little better understanding of that par-  
14 ticular aspect here. Tell me what Exhibit Fourteen shows,  
15 please.

16          A           Exhibit Fourteen is a schematic showing  
17 the first shut-in pressure monitor well and its offset sit-  
18 uation. This is the first one I discussed earlier, this  
19 being Well 1833-351G.

20                    The shut-in pressure monitor well is  
21 shown with the -- again with the triangle, and I've shown  
22 arrows with distances from that well to the offset produ-  
23 cers.

24          Q           Okay, I notice you have some concentric  
25 rings there. It looks like the center of the circles is the

1 shut-in well. Is that correct, and what are those rings?

2 A Okay, on this graph -- on this plot I've  
3 superimposed the radius that corresponds to a drainage area  
4 of 640 acres, that being the inside concentric ring.

5 Also, the middle concentric ring is a  
6 drainage radius depicting a 960-acre area.

7 And the outside ring is the radius  
8 depicting a 1280-acre area.

9 Q Okay, so if I understand correctly,  
10 you're saying that what is seen at the triangle there, if it  
11 -- if -- the wells are located a certain distance away are  
12 being affected by what has happened over that distance, in  
13 withdrawal.

14 A That's correct.

15 Q Okay. Is there anything -- if I recall,  
16 you said you didn't really see anything significant about  
17 this particular test.

18 A Yes, sir. I made no conclusions from  
19 this test.

20 Q Okay. Is there anything further with  
21 respect to Exhibit Fourteen?

22 A No, sir.

23 Q Let's look at Exhibit Fifteen. I believe  
24 that's the southwestern shut-in well. Do you have a similar  
25 exhibit there?



1 well even outside a 1280-acre radius of drainage.

2 Q Okay, so if I understand correctly,  
3 you're saying that because you see in this shut-in well,  
4 which has never produced, a decline in pressure of 35 psi,  
5 while the eight offset wells were on production, and all of  
6 those offset wells are at a distance that is equal to or  
7 greater than a 640-acre drainage area, and radius, that you  
8 believe that that definitely shows that they're in pressure  
9 communication and interference --

10 A Yes, sir.

11 Q -- to that shut-in well. Couldn't have  
12 come from anywhere else except the production --

13 A That's correct.

14 Q -- of those wells. All right, sir. Any-  
15 thing else with respect to this one?

16 A No, sir.

17 Q Well, let's look at the next one of  
18 those, please.

19 A All right. Exhibit Sixteen is a schema-  
20 tic of the shut-in pressure monitor Well 2034-201G, which is  
21 the northeasternmost shut-in pressure monitor well.

22 Q Let me just ask you if that leads you to  
23 a conclusion having to do with the area affected by produc-  
24 tion in the vicinity of this well.

25 A Yes. Yes, sir, it does. Again we've

1 seen a substantial pressure drop in this well of 22 psi from  
2 the original of 385 psi.

3                   The nearest offset producing well to this  
4 pressure monitor well is off to the east, southeast a little  
5 bit, at a distance of 2,952 feet, which is right on or very  
6 near the radius depicting a 640-acre area of drainage.

7           Q           Okay, so it's your conclusion that 22  
8 pound pressure drop, I believe you said, --

9           A           Yes, sir.

10          Q           -- and the location of all these wells  
11 currently supports your prior conclusion.

12          A           Yes, sir. With one well at 640-acre  
13 distance and the other seven offsets well outside of the  
14 1280 acres, I conclude that we're draining 640 acres as a  
15 minimum area.

16          Q           Let's look at the last shut-in test.  
17 We'll mark that Exhibit Seventeen. I believe it's the one  
18 with four offsets.

19          A           Yes, this is Well 2033-161G. Again I've  
20 placed on this plat the shut-in pressure monitor well in the  
21 center and shown the straight line distances to the offset  
22 four producing wells.

23          Q           Are any of those offset wells within the  
24 640-acre circle?

25          A           No, sir.

1 Q Are any of them within the 960-acre cir-  
2 cle?

3 A No, sir.

4 Q Are any of them within the 1280 circle?

5 A No, sir, they're all outside the 1280  
6 circle.

7 Q They're all even more remote than that.

8 A Yes, sir.

9 Q Did you see a pressure drop in the shut-  
10 in well?

11 A Yes, sir, a 10 pound pressure drop.

12 Q Do you believe that that -- well, do you  
13 reach a conclusion based on these things?

14 A In this particular location we're drain-  
15 ing an area probably even larger than 640 acres.

16 Q Anything else with respect to this exhi-  
17 bit, sir?

18 A No, sir.

19 Q Mr. Collier, in the data that you've  
20 looked at in the long term flow tests and the shut-in tests,  
21 I believe there were seven wells involved. I believe that  
22 in one of them you said the data was not subject to inter-  
23 pretation, and I believe you said the other six were.

24 In the analysis of that data, have you a  
25 conclusion as to whether or not drainage, efficient drainage

1 is achieved on 640-acre spacing as demonstrated by these  
2 tests?

3 A Yes, sir, I believe 640 acres is demon-  
4 strated.

5 Q Okay. Do you have anything else, sir?

6 A No, sir.

7 Q Were Exhibits One through Seventeen, in-  
8 cluding all of their lettered parts, prepared by you or un-  
9 der your direction and supervision?

10 A Yes, they were.

11 MR. CURRENS: I'd offer Exhi-  
12 bits One through Seventeen and all their numbered parts.

13 MR. CATANACH: Exhibits One  
14 through Seventeen will be admitted into evidence.

15 MR. CURRENS: That's all I  
16 have.

17

18 CROSS EXAMINATION

19 BY MR. CATANACH:

20 Q Your performance curves, I was wondering  
21 what factors go into the construction of a model for the  
22 drainage areas, what type of information you used?

23 A Well, we input actual pay characteris-  
24 tics, porosity measured from a log, a density log. We input  
25 permeability measured from a bottom hole pressure build-up

1 or calculated from a bottom hole pressure build-up.

2 We then put, of course, pay height, water  
3 saturation, gas saturation, relative permeability data for  
4 two-phase flow, and we have predicted the performance of  
5 that well be giving it a no flow boundary at either 640 ac-  
6 res or 160 acres.

7 Q On your Exhibit Number Seven, I'm a  
8 little curious, on your flowing tubing pressure you get a  
9 substantial drop and at the same time you get a  
10 corresponding increase in producing rates. How does that --  
11 how do you explain that?

12 A I believe at that time that we performed  
13 a fracture stimulation on this well and actually improved  
14 its productivity. I believe that was a foam CO2 frac.

15 Q The actual production data on the lower  
16 third of that Exhibit Number Seven --

17 A Yes.

18 Q -- the first part of that, up to about  
19 400, or so, that's actual, and then does that go to what?

20 A Well, the entire blue curve is actual.

21 Q That's all actual.

22 A The only -- the reason it's different is  
23 the first 400 plus days is presented as daily, daily rates,  
24 and then the data from 400 to the end of the actual data is  
25 just smooth, but it's still reflective of actual measured

1 flowing rates. Just for ease of presentation and for ease  
2 of inputing into the model we smoothed the data, and that's  
3 what that represents.

4 Q Mr. Collier, how uniform are your  
5 reservoir characteristics in the area of all the test wells?  
6 Are they pretty uniform as far as --

7 A I can --

8 Q -- pay thickness, and porosity,  
9 permeability?

10 A They're -- I guess they're uniform.  
11 They're whatever we measured at that location. I think pay  
12 thickness is thicker from the two southern flow test wells  
13 and thinner for the northernmost well, but I know porosity  
14 is very comparable, within the range of 18 to 22 percent for  
15 the three flow test wells. There is some difference in pay  
16 thickness going from the northern wells to the southern  
17 wells.

18 Q But not exceedingly -- well, how  
19 substantial would the difference be?

20 A Well, if you look at Exhibit Seven, I've  
21 got the actual model parameters. Pay height there being 163  
22 feet. The pay height, if you look at Exhibit Five for the  
23 other southernmost flow test well was 104 feet, and the pay  
24 height for the northernmost well was in the order of 50 to  
25 60 feet.

1           Q           Mr. Collier, are there areas within the  
2 unit where the -- where these characteristics are substan-  
3 tially different from the ones in this area here?

4           A           Well, I've really only studied the area  
5 of production, which is the east central part of the unit.

6                       I personally have not done a geological  
7 study to determine any differences in pay heights or perme-  
8 ability. The area of my study has been confined just to  
9 where we have production and I can only speak to the numbers  
10 that I've just given you. I don't know how varied the pay  
11 is in the rest of the unit.

12          Q           So you can't really say for sure that  
13 this area is totally representative of the whole unit.

14          A           Well, I can say that it is representative  
15 of the area that is currently spaced on 640 acres. We, by  
16 necessity, had to limit our data collection to areas where  
17 we had production; where we had a collection system; where  
18 we had a way to measure it; and where we could produce the  
19 gas and collect it and measure those rates.

20                      So obviously, it had to be limited to  
21 that area in the east central part of the unit, but from  
22 that data I think there's enough of a widespread data in  
23 that area to make the conclusions that I've made; that the  
24 640-acre temporary spacing area is spaced correctly.

25          Q           Mr. Collier, how accurate are the bottom

1 hole pressure gauges? You've got some pretty small differ-  
2 ences in pressure, 10 pounds, are those gauges accurate  
3 enough to -- so that they're --

4 A Yes, the stated accuracy of those bombs  
5 is one-half of a psi per 1000 psi.

6 MR. CATANACH: Are there any  
7 other questions of Mr. Collier at this time?

8 If not, he may be excused.

9 MR. CARR: I'd like to close,  
10 if I may.

11 MR. CATANACH: Go ahead.

12 MR. CARR: May it please the  
13 Examiner, in 1984 Amoco came before the Commission reques-  
14 ting 640-acre spacing for the Bravo Dome Area.

15 By Order R-7556 the Commission  
16 approved temporary 640-acre spacing for a portion of the  
17 Bravo Dome Unit Area, and this approval was given after an  
18 extensive, opposed hearing, in which Amoco presented a large  
19 volume of engineering and geological data.

20 The order didn't only create a  
21 640-acre area and provide for temporary spacing, but that  
22 order also required for Amoco to come back and submit a plan  
23 that was acceptable to the Director that would demonstrate  
24 the drainage efficiency of wells located on 640-acre spacing  
25 units, and it required that that plan should include exten-

1 sive shut-in periods for one or more wells within the unit  
2 area.

3 Amoco came forward with a plan.  
4 The plan was amended. The plan was approved by the Director  
5 and the data you have been given today is the result of the  
6 additional study and data collection that was performed by  
7 Amoco in response to the Commission's directive, and we be-  
8 lieve now that the record is complete in this case. The  
9 data that we developed during the last three years, not only  
10 the long term flow tests, but also the information we've ac-  
11 cumulated from pressure shut-in monitor wells, this data  
12 clearly and absolutely confirms with actual reservoir per-  
13 formance the calculations and modeling work we had done.

14 Now that the record is complete  
15 we think it is clear that the most efficient and effective  
16 way to produce the Bravo Dome 640-acre area is on 640-acre  
17 spacing.

18 The efficiencies that will re-  
19 sult are consistent with conservation principles. They will  
20 prevent waste. They will protect the correlative rights of  
21 all interest owners in this portion of the Bravo Dome and we  
22 therefore ask that the temporary rules be made permanent.

23 The order that created tempor-  
24 ary rules provided that they would be effective for a three  
25 year period of time from June 19, 1984; therefore, to avoid

1 any gap in the rules for the 640-acre spacing area, we re-  
2 quest that your order be expedited and request that an order  
3 be entered on or before June 15 making permanent 640-acre  
4 spacing for the Bravo Dome 640-acre spacing area as defined  
5 by Order R-7556.

6 MR. CATANACH: Anything else in  
7 this case?

8 If not, it will be taken under  
9 advisement.

10 (Hearing concluded.)  
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I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY the foregoing Transcript of Hearing before the Oil Conservation Division (Commission) was reported by me; that the said transcript is a full, true, and correct record prepared by me to the best of my ability.

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 8190, heard by me on page 3, 1987.

David K. Cretson, Examiner  
Oil Conservation Division

1 STATE OF NEW MEXICO  
2 ENERGY AND MINERALS DEPARTMENT  
3 OIL CONSERVATION DIVISION  
4 STATE LAND OFFICE BLDG.  
5 SANTA FE, NEW MEXICO

6 16 May 1984

7 COMMISSION HEARING

8 VOLUME I OF TWO VOLUMES

9 IN THE MATTER OF:

10 Application of Amoco Production Company for temporary special spacing rules, Union, Harding, and Quay Counties, New Mexico. CASE 8190

11  
12  
13 BEFORE: Commissioner Joe Ramey, Chairman  
14 Commissioner Ed Kelley

15 TRANSCRIPT OF HEARING

16  
17  
18 A P P E A R A N C E S

19  
20 For the Oil Conservation  
21 Division:

W. Perry Pearce  
Attorney at Law  
Legal Counsel to the Division  
State Land Office Bldg.  
Santa Fe, New Mexico 87501

22  
23 For the Applicant:

Clyde A. Mote  
Attorney at Law  
Amoco Production Company  
P. O. Box 3092  
Houston, Texas 77253

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A P P E A R A N C E S

and

William F. Carr  
Attorney at Law  
CAMPBELL, BYRD & BLACK P.A.  
P. O. Box 2208  
Santa Fe, New Mexico 87501

For Amerigas:

Owen M. Lopez  
Attorney at Law  
HINKLE LAW FIRM  
P. O. Box 2068  
Santa Fe, New Mexico 87501

For Cities Service:

W. Thomas Kellahin  
Attorney at Law  
KELLAHIN & KELLAHIN  
P. O. Box 2265  
Santa Fe, New Mexico 87501

For Energy-AGRI Pro-  
ducts, Inc.:

Ernest L. Padilla  
Attorney at Law  
P. O. Box 2523  
Santa Fe, New Mexico 87501

For Ross Carbonics:

Arthur Jaramillo  
Attorney at Law  
JONES, GALLEGOS, SNEAD &  
WERTHEIM  
P. O. Box 2228  
Santa Fe, New Mexico 87501

1 STATE OF NEW MEXICO  
2 ENERGY AND MINERALS DEPARTMENT  
3 OIL CONSERVATION DIVISION  
4 STATE LAND OFFICE BLDG.  
5 SANTA FE, NEW MEXICO

6 15 May 1984

7 COMMISSION HEARING

8 VOLUME I OF TWO VOLUMES

9 IN THE MATTER OF:

10 Application of Amoco Production  
11 Company for temporary special  
12 spacing rules, Union, Harding, and  
13 Quay Counties, New Mexico.

CASE  
8190

14 BEFORE: Commissioner Joe Ramey, Chairman  
15 Commissioner Ed Kelley

16 TRANSCRIPT OF HEARING

17 A P P E A R A N C E S

18 For the Oil Conservation  
19 Division:

20 W. Perry Pearce  
21 Attorney at Law  
22 Legal Counsel to the Division  
23 State Land Office Bldg.  
24 Santa Fe, New Mexico 87501

25 For the Applicant:

Clyde A. Note  
Attorney at Law  
Amoco Production Company  
P. O. Box 3092  
Houston, Texas 77253

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MR. RAMEY: Call Case 8190.

MR. PEARCE: That case is on the application of Amoco Production Company for temporary special spacing rules, Union, Harding, and Quay Counties, New Mexico.

MR. RAMEY: Are there any appearances in this case?

MR. CARR: May it please the Commission, my name is William F. Carr, with the law firm Campbell, Byrd and Black, P. A., of Santa Fe, appearing on behalf of Amoco Production Company.

I'm appearing in association with Clyde A. Note, a member of the Texas Bar, attorney for Amoco Production Company from Houston, who will present the case for Amoco.

MR. KELLAHIN: Mr. Chairman, I'm Tom Kellahin of Santa Fe, New Mexico, appearing on behalf of Cities Service Oil and Gas Corporation. We are a working interest owner in the Bravo Dome Unit.

In addition we're the applicant in the subsequent case on the docket, which is numbered 8191, and we'd request at this time that the cases be consolidated for testimony but that at the conclusion of the case separate orders be entered.

MR. LOPEZ: Mr. Chairman, my name is Owen Lopez with the Hinkle Law Firm of Santa Fe, New

1  
2 Mexico, appearing on behalf of Amerigas and with respect to  
3 the consolidation of the two cases, we would strenuously ob-  
4 ject. We feel they are two separate pools and two separate,  
5 distinct reservoirs.

6 Our concern is that Cities Service is  
7 going to attempt to bootstrap their case on the evidence  
8 being presented by Amoco with respect to drilling, well in-  
9 formation, all with respect to wells far removed from their  
10 area.

11 In addition, as we understand the appli-  
12 cations, we understand that Amoco is only asking for special  
13 pool rules for the Tubb formation under 640-acre spaces.  
14 The Cities Service application is not so limited and in-  
15 cludes also the Santa Rosa and Glorieta. This is something  
16 we can work out or I'd like to have at least explained, and  
17 we would hope that the two cases would not be consolidated.

18 We are here to protest both applications.

19 MR. RAMEY: Any other appear-  
20 ances?

21 MR. PADILLA: Mr. Commissioner,  
22 my name is Ernest L. Padilla, Santa Fe, New Mexico. I'm ap-  
23 pearing on behalf of Energy-AGRI Products, Inc. We are ap-  
24 pearing to protest Case Number 8190.

25 MR. RAMEY: Thank you, Mr. Pa-  
dilla.

MR. JARAMILLO: Mr. Commis-  
sioner, my name is Arthur L. Jaramillo with the firm of

1  
2 Jones, Gallegos, Snead and Wertheim in Santa Fe, and I am  
3 here appearing on behalf of Ross Carbonics in opposition to  
4 the Amoco application.

5 I would join Mr. Lopez' opposi-  
6 tion to consolidation of these two cases.

7 MR. RAMEY: Any other  
8 appearances?

9 MR. KELLANIN: Mr. Chairman,  
10 I'd like to argue the motion for consolidation, if that's  
11 appropriate at this time.

12 MR. RAMEY: You may proceed,  
13 Mr. Kellanin.

14 MR. KELLANIN: Mr. Chairman,  
15 it's my understanding that the Cities Service application  
16 proposes to do the identical same thing as the Amoco  
17 application, in that the vertical limits of the proposed  
18 spacing area are the Tubb formation; that we propose 640-  
19 acre spacing in what we will characterize as the West Bravo  
20 Dome; that we will request well locations 650 feet from the  
21 outer boundary of a section, which will conform to the  
22 identical application for special rules as Amoco has filed.

23 We believe that our evidence  
24 will demonstrate that the West Bravo Dome is a natural  
25 geologic extension of the big Bravo Dome Unit operated by  
Amoco, and that after proof is presented you'll find that  
there is no reason to treat these as separate pools.

We believe that will facilitate

1  
2 a decision by the Commission to have the testimony taken  
3 with regards to the entire Bravo Dome as opposed simply to  
4 that portion operated by Amoco and that portion involved in  
5 the Cities Service application. These projects are immedi-  
6ately adjacent to each other. The request by Amoco is out-  
7lined on their proposed exhibit in the yellow. The area  
8proposed by Cities Service is this area defined down here to  
9the south and west.

10 We believe that it will facili-  
11tate the hearing, it will save the Commission's time, to  
12hear both cases as a consolidated matter and we would so  
13move.

14 MR. RAMEY: Mr. Lopez.

15 MR. LOPEZ: Mr. Chairman, as  
16you undoubtedly are aware Amerigas has been the operator of  
17CO2 wells for many years, which are located on the leases  
18from the Mitchell-Libby Ranches.

19 In previous discussions with  
20Mr. Note representing Amoco, it is clear that the applica-  
21tion of Amoco in this case is excluding the existing wells  
22on the Mitchell and Libby Ranches as a separate pool and  
23which have been drilled on 160-acre spacing, which is the  
24statewide rules, and which we continue to support.

25 In this light and in light of  
the fact that it is our grave concern that both these appli-  
cations represent an effort to force Amerigas' interests in-  
to the unit, once where we did not voluntarily join the unit

1  
2 and where the unit has already in Amoco's case been approved  
3 and in the Cities Service now coming before the Commission,  
4 it appears clear to us that this is going to be an effort by  
5 Cities Service, without any other evidence in the record, to  
6 clearly bootstrap itself with the evidence presented by Amoco  
7 with respect to production at the eastern boundaries of  
8 the unit many miles removed from the Cities Service area of  
9 concern.

10 In any event, if our objection  
11 is not adopted and the cases remain separate, I think it is  
12 only right and proper that any evidence presented by Amoco's  
13 witnesses not have any bearing whatsoever on the Cities Service  
14 application that their application would have to stand  
15 alone.

16 MR. RAMEY: Thank you, Mr.  
17 Lopez.

18 MR. NOTE: May it please the  
19 Commission, while I have great sympathy and admiration for  
20 Cities Service and Tom Kellahin, I don't believe the two  
21 cases should be consolidated for purposes of trial or for  
22 purposes of an order.

23 I believe they're at different  
24 stages. We have a unit approved, which they do not. I believe  
25 that it would merely complicate Amoco's case to have  
Cities Service in it for the purpose of taking testimony or  
any other matters.

I suggest that we remain on

1  
2 separate dockets, separate hearings, separate decisions and  
3 orders.

4 MR. RANEY: Thank you, Mr.  
5 Note.

6 MR. PEARCE: Excuse me. Mr.  
7 Padilla, when you entered your appearance, do I understand  
8 that your client objects only to the Amoco application?

9 MR. PADILLA: That's correct,  
10 if nothing else it going to be presented that would have the  
11 effect -- well, if there was some demonstrative evidence  
12 presented at hearing that would tie in Cities Service to the  
13 Amoco application then it would be hard to separate both of  
14 the cases.

15 My clients own interest inside  
16 the Bravo Dome Unit and to that extent I don't think I can  
17 claim to the Cities application.

18 MR. PEARCE: Mr. Jaramillo, if  
19 I may ask you the same question. Do I understand that Ross  
20 Carbonic objects only to the Amoco application in this mat-  
21 ter?

22 MR. JARAMILLO: Mr. Pearce, I  
23 believe we are in pretty much the same position as Mr. Pad-  
24 illa just related with respect to his client. Our interests  
25 fall within the outer boundaries of the Bravo Dome Unit, al-  
though our leasehold interest are uncommitted to that unit.

To the extent that Cities Ser-  
vice intends to adopt and rely upon the evidence presented

1  
2 on behalf of Amoco, then I, again, I believe it's difficult  
3 to separate it out if they are proposing that as part of  
4 their own application which of necessity means the granting  
5 of Amoco, then we would oppose it to that extent.

6 MR. PEARCE: Thank you, sir.

7 MR. KELLAHIN: Mr. Chairman,  
8 might I close debate on my motion?

9 MR. RAMEY: Yes, sir.

10 MR. KELLAHIN: Mr. Chairman,  
11 the opposing parties to the consolidation of the hearings  
12 are focussing their attention on their various interests  
13 within the Bravo Dome.

14 We think that is a matter that  
15 is immaterial to the subject before the Commission. We be-  
16 lieve that the subject matter of both applications deals  
17 with the appropriate spacing that ought to take place in  
18 that area that's geologically defined as the Bravo Dome Re-  
19 servoir, and whether or not those interests differ from the  
20 west side of the unit, from the middle of the unit or the  
21 east side of the unit, certainly should make no difference.

22 The decision here today is to  
23 determine what is the appropriate area to space, first of  
24 all. You have to determine what the geologic evidence  
25 demonstrates to be a reasonable configuration for the pool.  
Now that is a decision that is different from what the ac-  
reage ought to be included or excluded from an individual  
unit operated by whatever operator. That's the first ele

1  
2 ment of proof, is what is the geologic boundary.

3 We believe that our evidence  
4 will demonstrate to you that there is no geologic reason to  
5 separate artificially the west from the east and that those  
6 areas ought to be spaced upon the same spacing pattern.

7 It seems to me to be a waste of  
8 time to take a given area and hear a hearing on how that  
9 ought to be spaced, another hearing over here, and here and  
10 here, when the whole point of the discussion is how to space  
the entire geologic area.

11 And we would request that for  
12 that purpose the cases be consolidated.

13 MR. RAMEY: Mr. Kellehin, I'm  
14 going to deny your motion for consolidation of the hearings  
15 and we'll hear Case 8190 at this time.

16 You may proceed, Mr. Note.

17 MR. NOTE: May it please the  
18 Commission, I'd like to make an opening statement.

19 MR. RAMEY: You may.

20 MR. NOTE: This is the applica-  
21 tion of Amoco Production Company1 for temporary special  
spacing rules. I emphasize the word "temporary".

22 This is for the Bravo Dome CO2  
23 Gas Unit Area and it's to include everything within the  
24 outer boundary.

25 We're asking for 640-acre  
spacing with specified well locations within each one of

1  
2 those 640-acre tracts.

3 Now I emphasized the word "tem-  
4 porary" because in my opinion that has a definite meaning as  
5 opposed to permanent. Temporary rules are applicable and  
6 appropriate in instances where definitive data is not avail-  
7 able, conclusive proof is not available, and that is an in-  
8 stance such as we have here where production has not -- has  
9 barely commenced. We have no production history in order to  
10 completely, conclusively show you what we're going to show  
you this morning.

11 We do feel like that there is  
12 some risk, however, that the field will be drilled too  
13 densely on 600 acres -- 160-acre spacing unless something is  
14 done at this time to control the drilling of a well.

15 We feel like there will prob-  
16 ably be too many unnecessary wells drilled and to be able to  
17 give you some conclusive proof as to what is necessary to  
properly develop the field we need this production history.

18 Now, if we have -- if the 640-  
19 acre application is granted and the production history wan-  
20 dates something else, such as the fact that smaller spacing  
21 is in order, then the unit size can at that time be reduced  
22 if 640 acres are not appropriate. Additional wells can be  
23 drilled and as we all know it's very difficult to undrill  
wells.

24 We're going to have three wit-  
25 nesses. We're going to have Jim Allen first, who is going

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to be an engineering witness who is going to give an overview of our proposal. He's going to tell you that production has commenced, that there's a need to protect the rights of unsigned tracts; that there's a need to maximize deliverability while minimizing the number of wells drilled.

He's going to tell you that there's a need to provide orderly development; that there's a need to minimize use of the surface; that there's a need to spread development to wider areas of the unit; and then he's going to tell you a little bit about the new data that we've acquired since March 18th, 1981, when the last hearing was held on spacing for 640-acres.

He's going to tell you about the new wells that we've drilled.

He's going to tell you a little bit about the flow tests that have occurred.

Then he's going to summarize our proposal.

Our next witness is going to be Bruce May, a geologist. He's going to tell you how he has by crossplotting technique determined permeability from electric logs. He's going to show you how he obtained this permeability technique; he's going to show you how he prepared his cross sections. He'd going to do this and also show you the number and new wells that have been drilled and how that is compatible with his previous testimony in a previous hearing.

1  
2 He's going to tell you that he  
3 based his information and his exhibits and his assessment on  
4 not only the new wells but on cores that have been observed  
5 and reviewed by him since the last hearing. He's going to  
6 tell you that he's examined nearly a mile of cores in order  
7 to be able to come to the conclusion to be sure that he's  
8 right so that he's bringing the correct information to this  
9 Commission.

10 His final conclusion is going  
11 to be for the geologic continuity throughout this Bravo Dome  
12 Unit and that he believes that there's no reason why one  
13 well would not effectively -- efficiently and effectively  
14 drain 640 acres from a geological standpoint.

15 Our next witness is going to be  
16 Larry Sheppard, who's also an engineer. He's going to give  
17 you the engineering data. He's going to talk to you about  
18 the new data that's been acquired since the last hearing.  
19 He's going to tell you about the new wells that have been  
20 drilled; he's going to explain the new cores that have been  
21 taken, and he's going to give you the results of the long  
22 term flow tests that we've taken. There have been four of  
23 them and he's going to give you the results of those tests.

24 He's then going to tell you  
25 that he's made a reservoir engineering analysis of this re-  
servoir, whether or not to drill on 160 as opposed to 640  
acre spacing, and he's going to tell you that from his ana-  
lysis that 160 as opposed to 640-acre spacing will result in

1  
2 economic waste, that there will be no gain in reserves,  
3 there will only be a gain in a rate by drilling on 160 acres  
4 as opposed to 640, and he's going to tell you that there's a  
5 need to protect the correlative rights of the unsigned roy-  
6 alty interests in the field, and he will demonstrate this by  
7 exhibits as to how this can be accomplished through the pro-  
8 posal which is before you at this time.

9 In summary we're going to at-  
10 tempt to establish to your satisfaction a need to establish  
11 temporary rules for 640-acre spacing and the necessity to  
12 keep these rules in effect for some three years untilw we  
13 obtian sufficient production history, and that this is ne-  
14 cessary to prevent waste and protect correlative rights

15 We'll call as our first witness  
16 Mr. Jim Allen.

17 MR. RAMEY: I think we'll re-  
18 quest all witnesses to stand at this time and be sworn.

19 (Witnesses sworn.)

20 MR. PADILLA: Mr. Ramey, before  
21 we commence may I seek a clarification from counsel for Amo-  
22 co concerning the scope of their application, whether that  
23 includes unleased and uncommitted tracts to the Bravo Dome  
24 Unit Area?

25 MR. NOTE: Yes, it does, that  
lie within the outer boundary.

1  
2 MR. PADILLA: On the basis of  
3 that clarification, Mr. Ramey, we'd move for dismissal of  
4 the application insofar as uncommitted and unleased tracts  
5 inside of the Bravo Dome Unit Area or within the outer  
6 boundaries of the Bravo Dome Unit Area are concerned.

7 As I read the application or  
8 the advertisement for this case, it indicates the -- it  
9 doesn't exclude anything inside the Bravo Dome Unit area.  
10 The application or the advertisement is ambiguous. The  
11 Bravo Dome Unit Area, as I understand it, included lands  
12 that are committed to the unit and uncommitted lands should  
13 not be included in the nature of the hearing.

14 MR. JARAMILLO: Mr. Commis-  
15 sioner, we join in that, as well. As a matter of fact, this  
16 case was only brought to my attention last Thursday because  
17 of the notice problem and the question not resolved really  
18 until right now as to whether the uncommitted acreage of  
19 Ross Carbonics was part of this.

20 The choice of the language,  
21 unit area, is not specific and we submit there is a problem  
22 jurisdictionally in terms of the adequacy of the notice on  
23 this application.

24 MR. LOPEZ: Well, I guess maybe  
25 I should join in before -- Mr. Chairman, I also will join in  
that request made by Mr. Padilla, but I guess I'm a little  
confused and maybe Mr. Note can help alleviate my confusion.

I was under the impression that

1  
2 the existing Americas wells were not going to be subject to  
3 the 640-acre spacing requirement, or request of yours. Is  
4 that incorrect? Am I mistaken?

5 MR. MOTE: Partially incorrect.  
6 I believe that it will become evident through testimony as  
7 to exactly what our proposal is, and I hesitate to give a  
8 long explanation of it at this time. I think the witnesses  
9 themselves can better explain what it is.

10 But I would like to suggest  
11 that there's a great deal of difference between  
12 participation in the unit and spacing and it's our  
13 recommendation that -- that it apply as to everything within  
14 the outer boundary description as we made our application  
15 for.

16 Our application of April 4th,  
17 1984, clearly states that we intend for it to apply to  
18 everything within the outer boundary description. That was  
19 the subject matter of our application and I believe that is  
20 our application at this time and it has not been changed.

21 Now, we were going to suggest  
22 ways in which those who do not desire to be included in this  
23 spacing proposal could -- could elect to get themselves out.  
24 That is, our suggestion is going to be that if they want a  
25 pool declared for the acreage in which they operate and they  
want to operate on 160's, then they can get a pool declared  
and designated for that area, and then they would be exempt  
from the 640-acre spacing, which we hope will be adopted by

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the Commission pursuant to this hearing.

MR. LOPEZ: Mr. Chairman, Amerigas has been operating several wells, as I indicated earlier, on the Mitchell and Libby Ranches for many years, since the 1920's. The operation of these wells has been based on statewide 160-acre spacing. Some of these wells were drilled on closer spacing patterns prior to the adoption of the statewide rules and were grandfathered in on the -- at their existing locations and on the existing units at the time the statewide rules were adopted. At least that's my understanding.

In light of that, it would seem clear to us that the existing wells on those two ranches should certainly be exempt from the application pending before you here today and we would also join in Mr. Padilla's motion that those uncommitted lands to the unit be dismissed from the coverage of the application.

MR. KELLAHIN: Mr. Chairman, might I be heard on this question?

MR. RANEY: You certainly can, Mr. Kellahin.

MR. KELLAHIN: Mr. Chairman, counsel wants to continue to confuse, make artificial and unreasonable distinctions in what's trying to be accomplished today. It makes absolutely no difference whether or not there are wells in this area that have been drilled on 40, 60, or 1000 acres. That's a matter of proof of this

1  
2 case to decide what the spacing pattern ought to be for the  
3 geologic area confined to the application.

4 Cities Service got the same  
5 notice that these gentlemen received. We're not confused by  
6 the notice. That application is very clear to us. It says  
7 everything within the outer boundaries of the Bravo Dome  
8 Unit. It does not contemplate creating windows artificially  
9 in this case in the absence of proof that that is necessary.

10 I think there is case law that  
11 will clearly establish for you, and I will be happy to pro-  
12 vide that to you subsequent to the hearing, that says that  
13 you can space an area for geologic reasons based upon sound  
14 engineering irregardless of the ownership; irregardless of  
15 whether or not wells have been drilled and developed on 40's  
16 or 80's or 160's.

16 The courts in Oklahoma, I be-  
17 lieve, have held that that does not violate correlative  
18 rights. The Commission is free to change at any time the  
19 spacing in an area so long as it's based upon sound evidence  
20 to demonstrate that at that time it is appropriate to drill  
21 wells no closer than X number of acres.

22 It seems to me that counsel for  
23 the opposing parties continue to want to interject their  
24 problems for the unit participation, either if they're in or  
25 out, into this case. We believe that's inappropriate and is  
not proper for you to decide.

We ought to go ahead with the

1  
2 proof that Mr. Lopez has proof that these wells that Ameri-  
3 gas has operated all these years are only capable of drain-  
4 ing 40 acres, then as Mr. Mote has suggested, let them prove  
5 that and let the Commission decide that that is a separate  
6 pool.

7 But at this point we think the  
8 application is clear, appropriate, and proper and that all  
9 parties have had due and adequate notice.

10 MR. RAMEY: Mr. Carr.

11 MR. CARR: Mr. Ramey, I'd like  
12 to make one comment in response to the objections.

13 It seems to me, if I understand  
14 how pool rules operate in New Mexico, the special pool rules  
15 would apply to the Bravo Dome and any acreage within a mile  
16 thereof, and the reason for that is you have, you want to  
17 have consistent development outside of the pool so when you  
18 don't have pools abuttin one another you do extend the ap-  
19 plication of special pool rules unless you make specific  
20 provision there's no buffer zone, or no -- they have no ap-  
21 plication beyond the unit or the pool boundary. You provide  
22 that these pool rules apply to a pool and that they also ex-  
23 tend and govern any wells drilled within a mile thereof.

24 We think that if that is true,  
25 then the objections raised by Mr. Padilla in fact have no  
meaning for they're talking about isolated tracts that in  
any event would be within a mile of the Bravo Dome Pool.

We think that they are simply

1  
2 again trying to inject their ownership interest problems in-  
3 to a hearing which is designated to provide for orderly de-  
4 velopment that will insure that as this acreage is developed  
5 waste will be prevented, correlative rights protected.

6 We think their motion should be  
7 denied.

8 MR. RAMEY: Thank you, Mr.  
9 Carr.

10 MR. PADILLA: If I may.

11 MR. RAMEY: Mr. Padilla?

12 MR. PADILLA: I believe that  
13 Mr. Kellahin and Mr. Carr are confusing the conservation  
14 practices with the sufficiency of the notice.

15 Our objection is solely on the  
16 sufficiency of the notice. I have here what was published  
17 in the paper and it just simply says the Bravo Dome Unit  
18 Area.

19 My objection is -- the Motion  
20 for Dismissal is solely based on uncommitted tracts to the  
21 unit area. That's all.

22 MR. LOPEZ: Mr. Chairman, could  
23 we go off the record a moment to consult with Mr. Carr and  
24 Mr. Note?

25 MR. RAMEY: Yes.

(Thereupon a discussion was had off the record.)

MR. RAMEY: Any other argu-  
ments?

1  
2 The Commission will deny the  
3 motion to dismiss.

4 You may proceed, Mr. Note.

5  
6 JAMES C. ALLEN,

7 being called as a witness and being duly sworn upon his  
8 oath, testified as follows, to-wit:

9 DIRECT EXAMINATION

10 BY MR. NOTE:

11 Q Mr. Allen, if you would, please state  
12 your name, by whom employed, in what capacity and location?

13 A My name is James C. Allen. I'm a Region-  
14 al Petroleum Engineering Supervisor for Amoco's Regulatory  
15 Affairs Section in Houston, Texas.

16 Q Have you previously testified before this  
17 Commission and are your credentials as an expert in the  
18 field of petroleum engineering a matter of public record?

19 A Yes, sir.

20 Q You'll be asked to testify concerning  
21 certain exhibits. Were these exhibits either prepared by  
22 you or under your supervision and direction?

23 A Yes, sir.

24 Q Are you the same James C. Allen that tes-  
25 tified in the March, 1981 -- March 18th, 1981 hearing, which  
was the last hearing concerning spacing for the Bravo Dome  
Unit Area?

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A Yes, sir, I am.

MR. NOTE: Are there any questions concerning Mr. Allen's qualifications?

MR. RAMEY: No, he is qualified.

Q Mr. Allen, what is the reason that Amoco is making this application at this time?

A Mr. Note, there are several reasons why that we're asking for 640-acre spacing at this time and I think they're quite appropriate at this time, also, and I'd like to go through some of them. A great number have been covered in the opening statement, but I will -- would like to go through them myself.

Since the March '81 hearing there have been 193 wells either drilled or completed within the Bravo Dome Carbon Dioxide Gas Unit.

In addition there's been some 15 wells, I think, drilled or completed outside the unit but in the vicinity of our Bravo Dome Unit.

During this drilling program there have been additionally, I believe, two wells cored and we have conducted four long term flow tests. This then gives us a significant amount of additional geological and engineering data to evaluate the drainage area in this area.

In addition, one of the factors which I think makes 640 very appropriate at this time is the fact that production did commence from the unit on April the 2nd,

1  
2 1984, from the initial 26 wells producing at a rate of from  
3 30 to 42-million cubic feet of gas per day. Therefore the  
4 need to protect the correlative rights of not only those  
5 tracts within the unit boundary which are committed to the  
6 unit, but those unsigned tracts becomes, in my opinion, very  
7 important at this time.

8 We have also found that during our flow  
9 tests and doing the initial production from 26 wells that  
10 deliverability is better than we anticipated; therefore we  
11 would like to force maximized deliverability while at the  
12 same time minimizing the number of wells in which we drill.

13 Particularly we would like to eliminate  
14 those wells which would be drilled solely for the purpose of  
15 protecting correlative rights and would not develop any ad-  
16 ditional reserves whatsoever.

17 In addition the 640-acres, if the rules  
18 are adopted that Amoco is seeking, provide a mechanism  
19 whereby that acreage can be pooled on a 640-acre basis,  
20 whether it's committed to the unit or not. This would pro-  
21 vide a mechanism to protect correlative rights and eliminate  
22 the drilling of these unnecessary wells I mentioned earlier.

23 At the same time the adoption of 640  
24 acres will still permit the drilling on 160 acres in those  
25 areas where an operator so desires without a hearing neces-  
sary before this Commission.

One other factor which I think is impor-  
tant, particularly to those people who are making a living

1  
2 using the surface in that area, is that development on 640  
3 acres will minimize the concentrated use of surface acreage.

4 One other fact which I would like to men-  
5 tion is that by adopting 640-acre spacing this then will en-  
6 courage development on a much wider area within the unit,  
7 which not only gives us wider geological and engineering da-  
8 ta to continue to evaluate the reservoir, but it proves up  
9 the productive area within the unit at a much quicker date  
10 than it would if we were forced to drill those unnecessary  
wells on 160-acre basis.

11 Q Mr. Allen, if you would, please go over  
12 to the wall where Exhibit Number One is hanging and I'll ask  
13 you some questions concerning that exhibit.

14 A All right.

15 Q Mr. Allen, you mentioned in connection  
16 with your testimony already that there's been some new data  
17 which has been acquired since the last hearing. Does this  
map exemplify that new data that has been acquired?

18 A Yes, sir, it does.

19 Q If you would, please explain the color  
20 coding you have on there and what it represents.

21 A All right, sir, before I do this, I would  
22 like to point out that this is a map which was generated  
23 from our exploration and scout ticket information. In other  
24 words, it's a computer generated map so the well locations  
are approximate. They were not put on there by hand.

25 In addition, there may be some wells that

1  
2 are not operated by Amoco that may not be spotted on here,  
3 such as in the area where Ross is developing.

4 If it is not in the scout ticket informa-  
5 tion within our information or industry-wide sources, we  
6 would have failed to pick it up in this size of a map.

7 To the best of my knowledge most -- the  
8 vast majority of the wells that have been drilled in this  
9 area are on this map.

10 The area outlined in yellow is the outer  
11 boundary of the Bravo Dome Carbon Dioxide Gas Unit.

12 The wells highlighted with an orange dot  
13 are those wells which have either been drilled or completed  
14 since the March '81 hearing for the 640-acre spacing, or  
15 special pool rules, excuse me.

16 In addition, four wells highlighted with  
17 red dots and a red arrow, these are the wells in which the  
18 long term flow tests have been conducted and the information  
19 from these tests will be presented by a subsequent witness.

20 You'll notice that in one area, one of  
21 the windows, there's a light area shaded in light blue.  
22 This, I think, is commonly referred to as the Hueyeros area,  
23 or the Libby Ranch, and is an area which has been productive  
24 for a great number of years.

25 On the far west or southwest portion of  
the unit is some fifteen, I think, green dots, or wells  
highlighted with green dots, and to the best of my knowledge  
those are wells outside the unit area which were developed

2 since March, 1981, either drilled or completed.

3 Q I see some lines across that map. What  
4 do those represent?

5 A Yes, sir, these are our cross section  
6 traces, which Mr. May will discuss in detail.

7 Q All right. Do you have a legal descrip-  
8 tion of the property within the Bravo Dome Unit?

9 A Yes, sir, I do.

10 Q Is that your Exhibit Number Two?

11 A Yes, sir.

12 Q In your opinion what does -- what does  
13 the four long term flow tests represent and what did they  
14 result from -- what was the result from those long term flow  
15 tests?

16 A Well, the purpose, of course, for the  
17 long term flow tests were several, there were several reasons  
18 for running them, which will also be covered, but of  
19 course one was to determine long term deliverability on a  
20 640-acre basis.

21 We did see that the deliverability was  
22 higher and was more sustained than we had originally antici-  
23 pated. Reviewing just the data of those tests, the raw  
24 data, the pressure and the rates versus time, I see no de-  
25 cline in deliverability. There was no decline in producing  
pressures to indicate to me that a wide range  
area is being counter drained.

Q Does -- do the additional wells which

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have been drilled, do they support wider spacing?

A In my opinion, yes, sir.

Q In your opinion, Mr. Allen, does -- from the information which you've seen and the analysis has been run, in your opinion will one well efficiently and effectively drain 640 acres in this -- in the Bravo Dome Gas Unit Area?

A The information I have seen, yes, sir.

Q All right. With regard to our proposal, exactly what is it, Mr. Allen, that you're recommending?

A Amoco is proposing 640-acre spacing units within the outer boundary of the Bravo Dome Carbon Dioxide Gas Unit.

We're also requesting that orthodox locations be located 1650 feet from section lines and 330 feet from quarter quarter section lines.

Q Do you have an exhibit which exemplifies this placement of wells?

A Yes, sir.

Q What is that? Exhibit Number Three?

A It's Exhibit Number Three.

Q If you would, explain Exhibit Number Three.

A Exhibit Number Three is a schematic of the spacing proposal which Amoco is making today. This shows a 640-acre governmental section. Located in the center or in the middle of this exhibit are four cross hatched

1  
2 areas. These areas are 1650 feet from the boundary of the  
3 section and they're 330 feet from the quarter quarter sec-  
4 tion lines.

5 Q You're not recommending that only one  
6 well be allowed to produce on each 640-acre unit, are you?

7 A No, sir, I am not.

8 Q All right. On this Exhibit Three you  
9 show four cross hatched spaces. Is it your recommendation  
10 that this Commission permit the drilling of four wells on  
11 640 acres and that each one of the four wells, if the opera-  
12 tor, or unit operator, desires necessary can be located in  
one of those cross hatched areas?

13 A Yes, sir, anywhere within those cross  
14 hatched areas would be an orthodox location.

15 Q Do you know of any areas either within or  
16 within one mile of the Bravo Dome Unit that is producing and  
has been designated a separate pool?

17 A No, none that have been designated as a  
18 separate pool.

19 Q How would you suggest that these areas  
20 be handled under your proposal?

21 A I think I could best state this if I sum-  
22 marize or rephrase our proposal somewhat.

23 It's Amoco's desire and attempt today, we  
24 seek 640-acre spacing within the outer boundary of the Bravo  
25 Dome Carbon Dioxide Gas Unit and within a mile of the out-  
side of such boundary, this in keeping with the general way

1  
2 in which the State normally regulates designated pools.

3           However, Amoco would have no objection to  
4 existing non-unit producing areas, such as the Hueyeros Pool  
5 or area being designated as a separate pool by the Commis-  
6 sion and remaining on statewide 160-acre spacing.

7           This same philosophy then would apply in  
8 treating the buffer zone on the outside of the unit bound-  
9 ary.

10           Q           Does this proposal differ somewhat from  
11 the -- from a letter which was written to Amerigas concern-  
12 ing this matter before this hearing?

13           A           I think it does, yes, sir, if I recall  
14 that letter correctly.

15           Q           And did that letter -- I believe that  
16 letter was written by me, or at least I signed the letter,  
17 is that correct?

18           A           Yes, sir.

19           Q           And was there not an indication in the  
20 letter that some of the proposals might be changed before  
21 the hearing and reservations were made in order to be able  
22 to make changes necessary in order to comply with what we  
23 thought was better at protecting correlative rights and pre-  
24 vention of waste in this area?

25           A           Yes, sir, I think it was.

          Q           All right. What term are you suggesting  
for the spacing rules?

          A           It's my recommendation that these rules

1  
2 be adopted for a period of three years.

3 Q Were you -- I believe you have already  
4 testified you were present on March 18th, '81, were you not,  
5 at the previous hearing?

6 A Yes, sir.

7 Q And are you familiar with the testimony  
8 of Mr. L. J. Sanders, which was presented in that hearing?

9 A Yes, sir, I am. I believe in that hear-  
10 ing that Mr. Sanders had presented a timing calculation to  
11 prove some 25 psi pressure depletion.

12 MR. NOTE: May it please the  
13 Commission, at this time we would like to incorporate as a  
14 part of this record a portion of the testimony of Mr. San-  
15 ders, which is pages 97 through line 7 on page 100, and I  
16 have a copy of it. I don't see any need to present it as an  
17 exhibit in the record, but I would like to give you for your  
18 reference of copy of those pages of the transcript and I  
19 would like to read them into the record.

20 This was on -- by direct exam-  
21 ination in Cause Number 7918, being the application of Amoco  
22 Production Company for temporary special pool rules, Union,  
23 Harding and Quay Counties, New Mexico, heard on March 18th,  
24 1981.

25 The questions were being asked  
by Mr. Buell of Amoco of Mr. Sanders, an engineering witness  
in that case.

"QUESTION: Mr. Sanders, would you state

1  
2 your complete name, by whom you're employed and in what ca-  
3 pacity and what location, please?

4 ANSWER: My name is L. J. Sanders,  
5 Junior. I'm employed as Staff Petroleum Engineer and Asso-  
6 ciate by Amoco Production Company in Houston, Texas.

7 QUESTION: Mr. Sanders, in this hearing  
8 here today we're recommending temporary operating rules for  
9 the Bravo Dome Unit Area. IN connection with that temporary  
10 rule request we're making, have you made any study to enable  
11 you to make a recommendation to this Commission as to the  
12 temporary period that we might possibly need?

13 ANSWER: Yes, I have, and I would recom-  
14 mend that we have a period of three years after first pro-  
15 duction into a pipeline.

16 QUESTION: From the unit?

17 ANSWER: From the unit.

18 QUESTION: All right, sir, in connection  
19 with your recommendation, will you direct your attention now  
20 to what has been identified as Amoco Exhibit Sixteen and  
21 state for the record what Exhibit Sixteen reflects?

22 ANSWER: Exhibit Sixteen is a timing cal-  
23 culation for an initial 25 psi reservoir pressure decrease  
24 using the Heimann No. 1 and State "FI" No. 1 area character-  
25 istics. This is the area where we had run our -- was two of  
the sites where we ran pressure interference tests.

QUESTION: Would you point out the Hei-  
mann area generally on Exhibit One and just say that it ap

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pears to be about in the south central -- central -- south central area?

ANSWER: Well, it's in the -- might be called the east central. The Heimann 1 was our producing well. It's located in Township 19, 33 North, and then in the east central at the State "FI" site, this one -- this is a lease that's in Township 20, Range 34.

QUESTION: All right, just what did you do in making your study to prepare yourself to make your recommendation to this Commission?

ANSWER: I looked at time here as the time that it would take to produce enough gas from an area to cause 25 psi decrease. I picked an area five miles by five miles that was developed on 640 acres. I picked this large of an area because in the center of it is going to be a pressure observation well and I wanted to minimize as much as I could the interference from outside, just this five mile area that would facilitate evaluation of the tests.

And in this five mile tract there's 10,240 acres. The net wells inside the test site, there's fifteen producers and one pressure observation well.

Millions of cubic feet of CO2 were removed from this area to lower the initial pressure, which was 375 psig, 25 psi is 15.2 BCF, and the time to remove this 15.2 BCF, using a million a day, million cubic feet per day producing rate for the producing wells, which I believe will be reasonable, that calculates then to be 2.78 years,

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the time required to remove enough gas to cause a 25 psi pressure decrease and this is about a 7 percent pressure depletion from the initial pressure point.

QUESTION: So your 25 psi drawdown in your observation well doesn't look like much when you're just saying 25 psi, but percentagewise the original pressure that would be in the observation well is a significant percent?

ANSWER: Yes, it is.

QUESTION: Now if your prediction on the original gas in place in the area that you studied is wrong in that there is less original gas in place, we should see the pressure interference in the observation well sooner than three years?

ANSWER: We'll see it sooner and we'll see a larger decrease.

QUESTION: And by the same token if you have understated the original gas in place, and hopefully, I'm going to say I hope that's the case, it will take a longer than your predicted three years to see the same incremental decrease in pressure in your observation well?

ANSWER: Yes, sir, that's -- that's correct."

MR. LOPEZ: Mr. Chairman, we have no objection to this having been read into the record. What we would suggest is that the Commission take administrative notice of the entire record in Case 7198 and we'd

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so move.

MR. NOTE: We have no objection to that.

MR. RAMEY: All right, we'll take administrative notice of Case 7198.

MR. LOPEZ: Right, in 1981. There's a case in 1980 that was previous to that. I think it was Case Number 6823 and we would request the Commission take administrative notice of that case as well, since it's on the same matters as before it today.

MR. NOTE: We have no objection to that, either.

MR. RAMEY: All right, we'll take administrative notice of those two cases.

Q Mr. Allen, do you have anything further for this hearing that I failed to ask you?

A No, sir.

MR. NOTE: We offer into evidence Exhibits One through Three and tender the witness for cross examination.

MR. RAMEY: Exhibits One through Three will be admitted.

Are there any questions of Mr. Allen?

MR. LOPEZ: If the Chairman please.

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CROSS EXAMINATION

BY MR. LOPEZ:

Q Mr. Allen, you stated that you believe that the additional wells Amoco's drilled since the 1981 hearing support the 640-acre spacing request.

I guess my question to you is how? How would that, the general statement that you made about minimizing surface damage and mitigating the economic impact of drilling unnecessary wells?

A I think what you'll see with our later testimony, Mr. Lopez, is that all the wells drilled fit in and support all our testimony in previous hearings. The Tubbs is contiguous, is correlative from well to well throughout the entire area which we'll drill the additional wells.

In addition, the core test and the analysis of that will show again that 640 acres is the appropriate spacing in our opinion.

Q Is it true that the net pay thickness on the eastern side of the Bravo Dome Unit is much greater than that encountered on the west side of the unit?

A As I recall, that statement is correct.

Q And wouldn't the pressure information and drawdown information be affected by the amount of -- the rate of withdrawal in the various thicknesses on the eastern and western flanks of the unit?

A There is -- not exactly. The reservoir

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parameters are not exactly the same on the east and west side of the unit, so to answer to your question the way you've worded it, I don't know that I can.

I can say that the thicker pay section in the east, if the parameters were the same and the pay thickness were thinner, that there would be a difference in the time that you would see interference from well to well.

Q You've suggested that we would have these pool rules in effect as temporary for only three years. What would you expect to happen during the three year period?

A I think at the end of the three year period there should be sufficient production to either substantiate the 640 acres is in fact correct spacing, and if it isn't, I would anticipate that a show cause hearing by the Commission that it would probably be reverted back to statewide rules or to a spacing that the information indicates is correct.

Q If I understood your testimony correctly, I believe it's Amoco's position that at the current time and while the temporary special pool rules may be in effect that you would have no objection to other operators within the unit drilling four wells per section if they could justify that or it's deemed that's the way to go in their own prudent judgment.

A Mr. Lopez, that question is relatively general. If I may try and answer it in a couple of -- two

1  
2 different parts, if I may, I'll try.

3 In the area where Amerigas is operating,  
4 sometimes referred to as, I guess it's Bueyeros --

5 Q Bueyeros.

6 A -- or the Libby area, areas, that area's  
7 been on production for a long period of time and in that  
8 case I think the Commission's nomenclature hearing would  
9 probably adopt it if they saw fit to, so an operator which  
10 may be in one of the other windowed areas, which is not --  
11 has no production history whatsoever, I don't know that I  
12 would necessarily agree that we ought to let him drill four  
13 wells -- let me back up.

14 I think I understand your question a lit-  
15 tle better.

16 If an operator developed on 640 acres and  
17 did want to drill the four wells, in that case, yes, we  
18 would even have no basis for objection.

19 Q However, isn't it true that his -- the  
20 production rate that he would be entitled to enjoy would be  
21 affected if prorationing was put into effect?

22 A If prorationing were put into effect and  
23 it were prorated 100 percent acreage basis, everybody were  
24 tied to the same pipeline, a lot of other assumptions, it's  
25 possible it could be affected. However, I think you're  
going to see some information to show that whether you drill  
one or whether you drill four wells, you're probably going  
to recover the same amount of gas. The rate would be

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2 affected if he drills four on 640 acres.

3

Q So I guess your answer to my question is  
4 yes, if prorationing were into effect, then the allowables  
5 would be set that would restrict the operator of four wells  
6 per section to the same rate enjoyed by the operator of one  
7 well per section.

7

A I understand your question better now,  
8 Mr. Lopez.

9

If in fact prorationing were established  
10 and this was all declared to be one big pool, that includes  
11 the windows that may be carved out, yes, prorationing would  
12 be affected.

13

Q Do you know of any other areas in New  
14 Mexico where a request for such an extensive field-wide pool  
15 request has occurred?

15

A The only one that I can recall which was  
16 -- relates to this in any way is probably the Southeast  
17 Chaves Queen, and it's not a direct comparison but it's very  
18 similar. There is an area that is on one spacing and spe-  
19 cial pool rules were adopted within that area.

20

Q Isn't this a clear attempt by Amoco to  
21 protect its expense of unitization in the Bravo Dome area  
22 with the least amount of continued economic commitment on  
23 the basis of one well per 640 throughout the area rather  
24 than four wells per 640?

24

A No, sir.

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Q What is Amoco's position with respect to

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an operator in the unit, nonparticipating in the Amoco unit, who has an acreage position of less than 640 in a given section? If your application is granted and special pool rules are adopted, would, let's say, an operator that only has 580 acres within a section be precluded from drilling a well unless he force pooled the entire 640?

A Mr. Lopez, I think there's a lot of ways that could be addressed.

One, which you mentioned is compulsory pooling on 640's. There could be voluntary pooling or if the operator so chose he could seek a nonstandard unit.

Q Does Amoco have any objections or would they raise any objections to operators within the unit coming forward and drilling on nonstandard units?

A Mr. Lopez, I think we would like to look at those on a case by case basis rather than give a general answer to that question at this time.

Q Do you have an opinion as to, in view of your knowledge of the development of the market for CO2, when or if prorationing will become a reality?

A No, sir, it appears to me that CO2 is in the development for CO2 in this area, governed more by a market than anything else. I don't foresee in the immediate future that proration would be -- even become a reality.

Q But isn't the market with respect to CO2 somewhat unique in that the major operators and producers of CO2 have target areas for using the CO2 in depleted oil

1  
2 pools and that each lease within a given area can be pretty  
3 much developed on its producability when connected with the  
4 target area for the use of that CO2?

5 A Which lease are we talking about, then,  
6 the oil --

7 MR. MOTZ: Mr. Chairman, I'm  
8 going to object. I believe this is outside the scope of the  
9 witness' expertise. He didn't qualify as a market analyst  
10 or an expert and he's not involved in that part of it and I  
11 believe it's outside the scope of his expertise.

12 MR. LOPEZ: We were discussing  
13 prorating and the aspects of being allowed to drill with-  
14 out restriction four wells under current statewide rules on  
15 160-acre spacing as opposed to being restricted to drilling  
16 one well per 640, and Mr. Chairman, I think this witness has  
17 discussed this issue and I think it becomes important inas-  
18 much as the ultimate impact with which Amerigas is concerned  
19 with respect to his request is that even though Amerigas  
20 were in a position to market the entire production of its  
21 leases that are not committed to the unit, drilling it on  
22 160-acre spacing pattern, because it has developed a parti-  
23 cular market which would take that rate of production, they  
24 will be restricted by the application of a 640-acre spacing  
25 requirement if Amoco determines that its needs for its tar-  
get areas are fully satisfied on that intensive drilling  
pattern and this is why we're here today.

MR. NOTE: Mr. Chairman, under

1  
2 the -- under the proposal that's been made by Amoco we've  
3 stated that we do not oppose, in fact suggest to anyone who  
4 feels like they have a separate pool to come to this Commis-  
5 sion and get a separate pool designated. As we all know,  
6 proration is on a pool by pool basis and if -- if Mr. Lopez  
7 feels like that he is in a separate pool and he wants to get  
8 special pool rules for his special pool, then proration as  
9 to the rest of the Bravo Dome area would have no effect on  
10 Mr. Lopez, and I hope Mr. Lopez knows that.

11 Actually proration has nothing  
12 to do with this hearing. We're talking here about what's in  
13 the best interest of the State; what will conserve the re-  
14 sources of this state; what is best from the standpoint of  
15 waste. How will correlative rights of the people be invol-  
16 ved and proration is not a part of this issue.

17 MR. RAMEY: Mr. Lopez, would  
18 you repeat your question?

19 MR. LOPEZ: I'll certainly try,  
20 Mr. Chairman. Perhaps not word for word.

21 Maybe we could take it a step  
22 at a time.

23 Q Mr. Allen, would you agree with me that  
24 the marketing of CO2 is quite different than that for  
25 natural gas or oil?

A Well, I guess it's different from the as-  
pect that CO2 is not sold as it is, per se, like natural gas  
or crude oil.

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Q           Rather it's actually sold to, in most instances, to major producers that use of CO2 for enhanced recovery in depleted oil reservoirs, is that correct?

A           That is a major use that has developed recently for CO2, yes, sir.

Q           And in that connection prorationing could be established by a major operator in a field area simply because that operator had the control over the use of that CO2 at the tail end of the pipeline with respect to the production from the pool from which he's taking the CO2.

A           Mr. Lopez, I really can't agree with that. I'll tell you why but first I would like to say that I am not in on the marketing of the CO2, natural gas, or crude oil, or anything else, and that is not an area of my expertise; however, I do not see any one operator in a position to control or cause prorationing or anything else.

          CO2 is highly competitive, as I understand it. There are a lot of projects that I see on the docket in Texas that operators are seeking permission for. I do not know where they're going to purchase their CO2.

Q           The transportation line for CO2 that Amoco is intending to build, will this be a common carrier line?

MR. NOTE: Objection. I believe that's outside the area of expertise of this witness and not any part of this hearing. It's irrelevant and immaterial.

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MR. LOPEZ: Mr. Chairman, I think all these questions go to the issue before the Commission today and if the witness is saying that he believes no one operator can control the market and thereby impose rationing on a given field, I think it's material and I would expect the witness if he can answer to answer the question because I think it's probably common knowledge within the Amoco operation to see if there's going to be access to their pipeline for non-unit operators within the field to market their gas to other pools at the other end of the line.

And I think that if the witness can answer the question, he should be asked to.

MR. RAMEY: I'm going to overrule the objection. If the witness has any knowledge of this he may answer it.

A All right, sir. Mr. Lopez, I've had no connection whatsoever with the pipeline in any way, shape, or form, or at any phase of its conception.

Q Is there any witness here today that will be able to answer that question?

A Not to my knowledge.

MR. CARR: Mr. Ramey, I might be able to help Mr. Lopez.

We also represent Bravo Pipeline and I can for the record state that the Bravo pipeline will be operated as a common carrier. It will be

1  
2 available as a common carrier to other interest owners and  
3 it will transport gas based on tariff rates that are equal  
4 and made available to other interest owners as well as unit  
5 production and other working interest owners in the unit.

6 MR. LOPEZ: Thank you.

7 MR. CARR: And that Amoco does  
8 not market and is prohibited from joint marketing efforts of  
9 production from the unit and that all working interest  
10 owners in the unit independently market CO2 produced there-  
11 from.

12 MR. RAMEY: Thank you, Mr.  
13 Carr.

14 MR. LOPEZ: I have no further  
15 questions of Mr. Allen.

16 MR. RAMEY: Any other questions  
17 of the witness?

18 Mr. Padilla.

19 CROSS EXAMINATION

20 BY MR. PADILLA:

21 Q Mr. Allen, of the 193 wells that have  
22 been drilled inside the Bravo Dome Unit Area, how many of  
23 these wells have been shut in?

24 A Mr. Lopez, I'm going to have to make an  
25 assumption on that. There are some 300 total wells within  
the unit area and as of today there are 26 wells, I believe,  
producing. We hope by July to have an additional 24 or so

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more, and even more as the year goes on.

I cannot tell you how many of those wells are actually shut in at this time.

Q March, 1983 was the first month that the Bravo Dome Unit went on production status, isn't that correct?

A It went on production status on April 2nd, 1984.

Q Did I say 1983?

A Yes, sir.

Q I meant that 1984. Do you know what the production was for April of 1984 from the unit?

A Monthly production? No, sir, those figures are not available to me at this time.

Q Are those wells producing into a pipeline now, the wells that are connected?

A Yes, as I recall, I think that is gas going into different pipelines. It is producing into a pipeline.

Q Has Amoco produced and sold -- well, has Amoco sold any gas from the Bravo Dome Unit Area other than in April, 1984?

A To my knowledge as unit operator the only gas which has left the Bravo Dome, other than vented during a short term flow test, is going down this pipeline and I believe it's Amerada Hess. I'm not certain.

Q You have not made any definition of the

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boundaries of the Bravo Dome in the pooling order. You have not designated Bravo Dome Area as a pool, have you?

A Not at this time. We have not reached any limits to designate it as a pool at this time.

We're seeking area-wide rules so that the space which is not developed at this time can be developed in an orderly fashion.

Q Is it true that inside the Bravo Dome Area you have leases that were issued by -- that are commonly called the Hutchinsohn leases?

A Yes, there are some leases in there for Hutchinsohn.

Q You had to drill those prior to the effective date of the unit, is that correct?

A I think some of them were. Whether all of them were or not, I don't -- I don't think so. I believe we were required to drill a certain number prior to the expiration date of that lease. I have not read the lease but that's my recollection.

Q You were also required to drill a great number of existing wells in the Bravo Dome Area that were on State leases, is that also -- that's also correct, is it not, prior to the effective date of the unit?

A We drilled some wells on State leases. Whether we were required to or not I can't answer that question. I did not review those leases.

Q Were you the completion engineer on those

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wells?

A No, sir, I was not.

Q Are you the engineer in charge of the Bravo Dome Area?

A Would you repeat the question? I didn't hear it.

Q Are you the production engineer in charge of the Bravo Dome Area?

A Bravo Dome is operated out of our Hobbs District Office. No, I'm not.

Q Do you have any input into the decision as to where to locate your flow tests?

A Those exact locations were chosen by our Reservoir Department. My connection with those was in seeking approval from the State.

Q You had no input at all whatsoever as to where those flow tests were located?

A I had no direct input, no, other than we were wanting them spaced out.

Q You testified at the last hearing in 1981 concerning the Bravo Dome --

A Yes, I did.

Q -- spacing. You've also -- did you testify at the first hearing?

A Yes.

Q Are you telling me that you have been involved in the hearings but that you have not been involved

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with any decision making as to location and production of these wells?

A I didn't mean to imply that I have not been involved at some stage. I did not make the decision as to which wells would be chosen. There were wells which were chosen which would give representative tests by our reservoir people that wanted to cover those areas.

My input was strictly from the standpoint that what we would need to get the permission from the State to run those tests and how they should be conducted.

Q Now, Mr. Lopez covered some of this questioning but I'm not sure that if I owned 160 acres out in the middle of the Bravo Dome Area and I wanted to drill that 160 acres, under your proposal I would have to force pool the other remaining acreage in the section, is that correct?

A Not necessarily. You could also seek a voluntary unitization or communitization on 640.

Q Well, assuming there was no voluntary communitization of the section and --

A Then I guess there'd be two recourses. You could get a compulsory pooling or you could seek a non-standard unit.

Q Under the unit plan Amoco can develop at its discretion the unit area as it so chooses, can't it?

A I think with the direction and in concurrence with the working interest owners that that statement in general would be correct.

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Q You are not now restricted by 160-acre spacing, are you, as far as the development of the unit area.

A As far as development, no, sir.

Q Nor would you be restricted on 640-acre spacing.

A No, sir, we would not be restricted. That is correct.

Q In other words, if you so choose now you can develop it or commence drilling on four section pattern, if you choose.

A Yes.

Q Therefore spacing is irrelevant to development of the unit area, and the unit plan.

A No, sir, I don't think it is. I think it's very pertinent to the protection of correlative rights and prevention of waste.

Q Well, isn't the unit designed to protect waste or prevent waste and protect correlative rights?

A Yes, sir, and if all royalty interest as well as working interest owners were committed to the entire unit and there were no window areas, I think that would accomplish that fact.

Q You don't have any problem with apportionment of royalties under the unit plan, do you?

A I'm not involved with them. I assume that our people can apportion them.

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Q           Everybody under the unit plan as far as royalty owners are concerned, get paid on the basis of surface acreage, is that correct?

A           They're getting paid in accordance with the unit agreement provisions, whichever one that is.

Q           That's a participation formula under the unit plan, isn't it?

A           Yes, it is.

Q           You have not defined within the unit are a common source of supply.

A           No, sir.

Q           And would you agree with the opening statement of Mr. Note that you have no production history from the unit area?

A           Other than from April 2nd and the flow test, I would agree with that, yes.

A           And considering that it's a one million acre unit, that's very sparse production, would you agree with that?

A           Yes, sir, sparse production.

Q           Are you going to present any testimony today concerning pressure data in other areas other than where the flow tests have been conducted?

A           I don't believe there will be any. We're concentrating on data which we have developed since the last hearing.

Q           And the flow tests are the only new data

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that you have since the last hearing.

A No, sir, we've drilled a great number of wells, which gives geological data, also.

Q You have not tested those wells, is that correct?

A There may be short term tests on them. They've not been turned to the line, that's correct.

I'm sure when a well was drilled it's tested for a short period of time.

Q Well, you're not going to present any data on that -- on those tests today, are you?

A No, sir.

MR. PADILLA: Mr. Chairman, I believe that that's all the questions I have.

MR. RANEY: Any other questions of Mr. Allen? Mr. Jaramillo.

MR. JARAMILLO: I have just a few questions.

CROSS EXAMINATION

BY MR. JARAMILLO:

Q Mr. Allen, my name's Arthur Jaramillo. I represent Ross Carbonic and I have just a few questions that I'd like to ask you that touch on somewhat what Mr. Lopez and Mr. Padilla have asked you.

You indicated to Mr. Padilla that as the operator of this large unit Amoco, with certain concurrences

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2 of the other leasehold owners that have committed acreage to  
3 this unit, can pretty well decide where it wants to place  
4 its wells and how to space them within the unit and without  
5 being bound by any spacing requirements, is that correct?

6 A In general that's correct, yes, sir.

7 Q All right, and when Mr. Padilla asked  
8 you, well, is it -- aren't the spacing requirements there-  
9 fore really immaterial and irrelevant, you said no, because  
10 they -- they affect and impact correlative rights and waste.

11 A Yes, sir.

12 Q Can you explain how or why that is the  
13 case?

14 A I think I can. If we were forced to de-  
15 velop on statewide 160, there is no provision for drilling  
16 on 640, unsigned acreage within the unit would receive a  
17 royalty unless additional wells were drilled, if I under-  
18 stand that correctly.

19 We need to protect their interest as well  
20 as the unit interest, to see that everyone is treated  
21 fairly.

22 640 acres will permit us to develop the  
23 deliverability needed without drilling a large number of un-  
24 necessary wells for the sole purpose of protecting correla-  
25 tive rights and for no other reason whatsoever.

Q Well, just say if you're forced to deve-  
lop on 160, how would you be forced to develop on 160 acres?

A Lack of any provision to pool areas lar-

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2 ger than 160 acres would mean those uncommitted acreages  
3 would have of necessity to be developed to protect correla-  
4 tive rights. We will show this later with exhibits.

5 Q I'm not sure I understand which uncommit-  
6 ted areas we're talking about here.

7 A Talking about working interest owners  
8 which -- or royalty interest owners which have not committed  
9 to the unit and they're treated in separate leases.

10 Q Royalty interest owners and working  
11 interest owners?

12 A Well, all working interest owners in the  
13 Bravo Dome are 100 percent committed in the unit.

14 Q Right. What about the uncommitted inter-  
15 est in the Bravo Dome, the windows that there has been some  
16 reference to?

17 A Yes.

18 Q What impact is that on your analysis of  
19 protection of correlative rights and waste when you say that  
20 if you're forced to develop on these 160's that's what's  
21 going to result?

22 A Well, in my opinion 640-acre spacing is  
23 actually to the benefit that own the windows. You have a  
24 wide open choice then either to request pooling with acreage  
25 which is not in the window to form a 640 acres and drill  
only one well, or drill on 160 if you get poolings adopted  
for that area.

MR. NOTE: Mr. Chairman, I

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2 might suggest for the benefit of Mr. Jaramillo that we're  
3 going to have another witness who's going to introduce exhi-  
4 bits showing how this correlative rights will apply on the  
5 unsigned tracts and you might wish to reserve your questions  
6 for him. Although this witness is fully qualified to an-  
7 swer, it might be more efficient to ask it of a witness  
8 who's going to testify to that very thing.

9 MR. JARAMILLO: I'll do that,  
10 but if I can just have an outline, a brief response to my  
11 question, Mr. Allen, so I might be more prepared when the  
12 witness who's going to deal with this matter --

13 Q Would you repeat the question again? I  
14 lost it in the exchange.

15 A Well, I want to know about the uncommit-  
16 ted acreage, the windows within the unit, that have not been  
17 committed. You talked about if you were forced to develop  
18 on 160 acres in answering my prior question, and we were  
19 getting to -- let me backtrack just a little bit here.

20 First of all, why would you be required  
21 to drill on 160 acres if, as you previously answered my  
22 question and Mr. Padilla's, as a unit operator you pretty  
23 well determined where you want to put the wells within this  
24 unit?

25 A I go back again and say the requirement  
26 to develop certain areas on 160 is to protect correlative  
27 rights where there is unsigned interest in that area. If  
28 there were no unsigned interest it would not be necessary to

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do so.

Q Well, is that to offset production that unsigned interests may pursue, is that what you're saying?

A It is to keep drainage from occurring from one interest to another.

Q Well, isn't that the whole objective of this 640-acre spacing rule request you have, to -- in order to eliminate the need of offset wells by operators in uncommitted -- with uncommitted acreage that are doing their own development of their own leases?

A It provides a mechanism to prevent the drilling of unnecessary wells that we do not have now and it could minimize the number of offset obligations occurring if it were developed on 640. It certainly would provide much more orderly development of a large area which has not been developed to date.

Q Unnecessary wells that you are talking about are the offset wells that you would be required to put in in order to offset wells that were put in by uncommitted acreage, isn't that the long and short of it?

A Not necessarily. You could be -- when I'm talking about an unnecessary well, I'm talking about the well that must be drilled for the sole purpose to protect correlative rights that generates no additional reserves at all.

Q Well, didn't you indicate a little while ago in some testimony that whether you put in one well or

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2 four wells per section you're not going to take out any more  
3 gas? Didn't I hear you say that?

4 A I'm not exactly sure that I answered it  
5 that way. I might have.

6 MR. NOTE: Mr. Chairman, I  
7 might --

8 Q You'd get the same amount of gas, I be-  
9 lieve is what you said.

10 MR. NOTE: I believe, Mr.  
11 Chairman, that the attorney's referring to probably my open-  
12 ing statement. We will have a witness who will testify to  
13 that fact, but it will be -- I don't believe Mr. Allen tes-  
14 tified to that.

15 Mr. Sheppard has made that ana-  
16 lysis and I believe the questions should be directed to him.

17 Q Well, Mr. Allen, can you explain why so  
18 much of the development of the Bravo Dome Unit has been over  
19 on this east side surrounding the four flow wells that you  
20 have designated there?

21 A One reason that the development has oc-  
22 curred there at this point is if you were present at any of  
23 the unit hearings where we testified there would be several  
24 compressor sites within the unit area as the market devel-  
25 oped, our compressor site is located, I don't know exact lo-  
cation, but it's pretty close to the center of that develop-  
ment there. At that time I think we stated that we were  
drilling on acreage that it was necessary to hold prior to

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2 the adoption of the unit, which has been brought up earlier.  
3 We were trying to minimize surface obstructions by utilizing  
4 existing roads. There were a lot of reasons that the devel-  
5 opment got started there first. Since the compressor sta-  
6 tion is there, it's logical to expand outward.

7 Q Now you rendered an opinion, I believe it  
8 was your testimony, not something that was read in by some-  
9 body else, that one well per section would effectively drain  
10 that section, and is that testimony applicable throughout  
11 the entire Bravo Dome Unit? Is that the testimony?

12 A Okay. Information that I have seen and  
13 that you will see today, it is my opinion that one well will  
14 drain 640 acres.

15 Q Is it your testimony that you have no  
16 lease obligations at the present time that would have any  
17 effect or impact on your drilling obligations if the spacing  
18 remains at 160 acres?

19 A Would you rephrase that? I just want to  
20 make sure I understand your question.

21 MR. NOTE: Mr. Chairman, I be-  
22 lieve I'm going to object to that question because I think  
23 it asks for a legal conclusion which this witness is not  
24 qualified to answer. I don't believe he knows what leases  
25 Amoco has and what lease requirements there would be in con-  
26 nection with drilling. I don't believe that's within the  
27 area of his expertise.

MR. JARAMILLO: I'm just asking

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factually what this witness does know about the lease obligations. If he doesn't know anything he can so state, but if he does, I believe I'm entitled to an answer.

MR. RAMEY: Repeat your question, Mr. Jaramillo.

Q Mr. Allen, are you aware of any obligations, lease obligations, that Amoco has at the present time that would cause the requirement, or cause them to increase their drilling activity, notwithstanding the creation of this Bravo Dome Unit, unless the spacing was changed from 160 to 640? In other words, do you have lease requirements that require you to drill additional wells under the current spacing rules?

A To the best of my knowledge I know of none.

Q All right. Who, is there any witness that would have greater knowledge of that area that is anticipated to be presented here today?

A No, sir. The conditions are not the same as they were in '81 as far as lease obligations are concerned.

That much I do know.

Q All right, but you do not know whether there exist any other obligations in spite of the creation of the unit?

A If there are, they have not been brought to my attention.

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2 Q Has that been a factor in any way in the  
3 filing of this application?

4 A No, sir.

5 Q Now, Mr. Allen, by requiring the uncom-  
6 mitted acreage, the leasehold owners in the uncommitted ac-  
7 reage with less than 640 acres to force pool or seek a  
8 special pooling -- a special pool designation from the Com-  
9 mission, aren't you effectively by making these rules 640  
10 acres throughout this whole unit forcing in those uncommitted  
11 acres back into the unit for all practical purposes?

12 A I don't see how at all, no, sir.

13 Q Well, first of all, if an uncommitted  
14 leasehold owner cannot develop his own property on less than  
15 640 without voluntary or compulsory pooling, isn't that  
16 true?

17 A Or obtaining a nonstandard unit in which  
18 case he could go right ahead.

19 Q Now, would not the unit itself be a  
20 necessary party to those if the remainder of the acreage ne-  
21 cessary happens to fall within the unit itself?

22 A In the 640 acres?

23 Q Yes.

24 A Yes, the unit would be but we would not  
25 be forcing them into the unit.

Q How -- how -- well, for all practical  
purposes, though, you would have to take the whole unit on  
in order to get a nonstandard unit or to compulsorily pool

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in order to get 640 acres to develop, would you not?

A Exactly what do you mean by taking on the whole unit? I'm --

Q The unit would have to be named and would either have to oppose or not oppose the --

A On a nonstandard compulsory pooling or voluntary, the unit and Amoco as operator would be the parties which you'd deal with, yes, sir.

Q And under the current spacing rules if you've got 160 acres you don't need the concurrence of the unit or any leasehold or anything in order to develop your acreage.

A Yes, sir, you do if you don't have a full 160 acres. The same thing applied regardless of the spacing.

Q Right, but if you have a full 160 acres you can develop it without that type of process.

A That is correct.

Q What percentage of the acreage of the entire unit is controlled, operated by the unit? Do you know what that percentage is?

A Would you repeat that? What percentage of the --

Q The acreage within the Bravo Dome Unit is committed to the unit?

A It's pretty high but I do not know a number, counselor.

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Q 95 percent or so?

A I don't know that exact number.

Q And the real focus of your request for rule changes is really on the remainder, is it not, since the unit can effectively put a well at whatever spacing it wants to within the unit?

A No, sir, it's not.

MR. JARAMILLO: That's all I have, Mr. Chairman.

MR. RAMEY: Any other questions of Mr. Allen?

MR. LOPEZ: I know Mr. Johnson has some there, Mr. Chairman, but before you get to him could I pursue a line of questioning that Mr. Jaramillo raised with this witness?

MR. RAMEY: Certainly.

RECROSS EXAMINATION

BY MR. LOPEZ:

Q Mr. Allen, I think in response to one of Mr. Jaramillo's questions with respect to the initial development by Amoco of the unit on the eastern flank, your statement was that that was where the first compressor facility was going in and that fact alone affected development significantly.

Isn't it also true that the thickness of the pay, the pressure data, the flow rates, and all the rest

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has significant effect on the fact that you developed the eastern flanks?

A I'm sure that was a factor involved, but as you recall, and I think you were present at those hearings, prior to formation of the unit we did testify as to the number of wells we would be forced to drill to hold acreage and we had a management commit in 1981 to do that. 1980, when the unit --

Q Right. That unit was in large part --

A That's where a lot of that drilling was going on at that time.

Q Much of this was on State leases, was it not?

A A lot of it was on Hutchinson leases, you bet.

Q And isn't it true that the pressure data -- well, second question.

Isn't there considerable faulting throughout the unit area?

A I have seen on some of our maps some faults there. I don't know the magnitude of them nor do I know whether they're sealing or not, but yes, there is some faulting, probably.

Q And is it not also true that the thickness of pay, the pressure information, and other reservoir data on the western flank of the pool is quite different from that experienced on the eastern side of the pool?

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2           A           There is considerable difference, yes,  
3 sir.

4           Q           Isn't it also true that the rate of flow  
5 on the eastern side is quite different from that experienced  
6 on the western side?

7           A           From earlier tests that I've seen, and  
8 these are just short term completion flow tests, I think in  
9 general that's a correct statement.

10           Q           Again, as you recall, the pressure is  
11 much higher on the west side which would compensate for the  
12 difference, compensate for some of the differences in reser-  
13 voir pressures.

14           Q           Would you agree that the flow rate on the  
15 eastern side of the pool as compared to that, for example,  
16 experienced by Amerigas on the western side of the pool, is  
17 about two to one?

18           A           I can't agree with you because I do not  
19 know what the producing rates on Amerigas' property is. If  
20 I recall the testimony of Mr. Peters, I don't recall if he  
21 gave any rates. Now, he may have. So I don't know whether  
22 it's two to one.

23           Q           Well, your wells are experiencing about  
24 what, a million a day?

25           A           The ones that are going on the line now  
are doing a million a day or better.

          Q           And would you have any reason to object  
if I were to suggest that Amerigas' best well is only cap-

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able of sustaining at the maximum 400,000 a day?

A           Would I object to your statement? I  
couldn't object to it. I don't know.

Q           I think it was in the previous record but  
I just can't recall.

A           I just don't recall it, either.

MR. LOPEZ: Thank you.

MR. RAMEY: Any other questions  
of the witness?

Mr. Johnson?

QUESTIONS BY MR. JOHNSON:

Q           Mr. Allen, is it correct that 50 or 55 of  
these wells will go on stream in the ARCO line, Sheep  
Mountain line?

A           Is this -- is this the line that (not  
clear), the Sheep Mountain?

Q           Yes.

A           It's my understanding the 26 wells now  
producing are going there and I think the next 24 to go on  
are going there, also.

Q           Is that going to be a permanent status?

A           I don't know whether it is or whether it  
isn't, Roy. Right now it's the only pipeline out there.

Q           Okay. Well, assuming that it is a perma-  
nent status, the remainder of the wells that are shut in  
right now, are they capable of producing sufficient volumes

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2 to fill your proposed line?

3 A Are the wells that are drilled and com-  
4 pleted now capable of doing what?

5 Q Filling your proposed line and delivering  
6 your maximum capability amount of CO2?

7 A Roy, I don't know what the forecast is,  
8 what the market will demand, and I don't know what the capa-  
9 city of the line will be designed for.

10 The only thing I can answer is that I  
11 think that we have and can develop much more deliverability  
12 than we have at this time.

13 The wells that are completed, as I under-  
14 stand our plans, you know, by year end, up until around Jan-  
15 uary 1st of 1985, we may be producing as high as 170-million  
16 cubic feet of gas a day.

17 Whether that's all going down Sheep Moun-  
18 tain -- I assume it's all going to have to go down Sheep  
19 Mountain, I don't know whether the other line is going to be  
20 completed.

21 Q Mr. Allen, do you know if Amoco is planning  
22 any future drilling programs to meet the demand or produce  
23 sufficient quantities to fill your line, your proposed line?

24 MR. NOTE: Mr. Chairman, I  
25 might suggest for purpose of efficiency, although I realize  
the witness is qualified to answer this question, that we do  
have Mr. Sheppard here who has those figures and if those  
questions were addressed to Mr. Sheppard during his cross

1  
2 examination, he'll have an exact or a better answer than Mr.  
3 Allen does.

4 MR. JOHNSON: Thank you.

5 MR. RAMSEY: Thank you, Mr.  
6 Johnson. Mr. Stamets.

7  
8 QUESTIONS BY MR. STAMETS:

9 Q Mr. Allen, on your Exhibit Number One you  
10 colored in blue what you identified as the Bueyeros Area. I  
11 presume that none of the blue areas take in a whole section,  
12 so I presume that there must be some wells in the blue areas  
developed on 40 acres, is that correct?

13 A That's my assumption, yes.

14 Q Would Amoco have any objection if an area  
15 were carved out in the middle of the Bravo Dome area for  
16 some spacing less than 640 for the Bueyeros area, if we took  
17 in whole sections as opposed to just the parts you've  
labeled blue?

18 A Mr. Stamets, I don't think that we would  
19 have any objection to it. We certainly have no objections  
20 to this that's already been developed and producing as being  
21 excluded out on 160's.

22 Q It seems like that might be more logical  
23 than having one half of a section on, say, 160's and the  
24 other half on 640's but still only having one section  
available.

25 A It would appear to make it -- make the --

1  
2 that area where we do not have clear cut sections easier to  
3 handle for both parties. In that respect I think that we  
4 would probably not object to it.

5 Q If during this three year temporary  
6 special pool rule period Amoco were to, say, force pool some  
7 of this acreage which is not dedicated to this unit in order  
8 to drill a well on a 640 acre tract, and that well were to  
9 produce a year or two and then the spacing was, say, went  
10 back to 160, how would you then go back and straighten out  
the equities relative to that section?

11 A Are we speaking totally uncommitted, such  
12 as the window acreage as opposed to unsigned or just either  
13 way?

14 Q Either way. I'd like to hear you answer  
15 both of those questions.

16 MR. NOTE: Mr. Stamets, I be-  
17 lieve that would be a legal question and the best I can do  
18 to answer from a legal standpoint is I think that's address-  
19 sed in the unit agreement and it provides for no past read-  
20 justment of equities so that there would be no past adjust-  
ment of equities if the spacing was changed down to 160.

21 Q But the people that would be pooled  
22 aren't signatories to the unit agreement, so we'd still have  
23 a question of how their equities would be addressed in any  
24 change of spacing.

25 MR. NOTE: People who are not  
pooled? Maybe I didn't answer your question.

1  
2 Q People who are not parties to the unit  
3 agreement, those who didn't sign, if the unit pools them and  
4 then later their acreage is determined not to be properly  
5 dedicated to this well, how do we go back and adjust the  
6 equities to that, how should they be adjusted? How would  
7 you adjust them?

8 MR. NOTE: I think we can be  
9 prospective only up until that time. They would have re-  
10 ceived their share of unit production by virtue of having  
11 been pooled into a 640-acre unit that was a part of 640-acre  
12 area that would apply to the unit. There would be no retro-  
13 active adjustment of their -- of the proceeds they'd already  
14 received. That's my legal opinion.

15 MR. STANETS: So if they had  
16 paid for their half, say, of drilling this well and the well  
17 was on unit acreage and then the 160-acre spacing, they  
18 would have just lost their investment in that well?

19 MR. NOTE: I thought you were  
20 talking only about royalty interest owners. Are you talking  
21 about working interests?

22 MR. STANETS: I'm talking about  
23 both types.

24 MR. NOTE: I'm sure there's an  
25 answer to it but it doesn't occur to me right now.

A We'd be in almost that identical situa-  
tion if that occurred either in an oil or gas area and not  
just CO2. I don't think it would be unique here. I think

1  
2 it would be the same statewide if we had a field on tempor-  
3 ary rules and it was collapsed back.

4 Q Is that a --

5 A I don't recall how it was handled in the  
6 past.

7 Q That's true, and this has been one of the  
8 reasons that has been given at hearings for not changing the  
9 spacing; that we've had production for some period of time  
10 and now we really can't straighten out the equities and we  
11 don't think you ought to change.

12 A Well, I guess one -- one approach if that  
13 occurred and we found that the spacing of 640 was inade-  
14 quate, that it would still be possible to infill drill and  
15 make some sort of an adjustment, if 160 or 320 were more ap-  
16 propriate.

17 Q It would seem incumbent upon Amoco in  
18 this case, they've made the statement that temporary pool  
19 rules aren't going to create a problem, to come up with a  
20 plan relative to pooling of royalty interest and relative to  
21 pooling of uncommitted interest and straightening out those  
22 equities upon change in pool rules.

23 MR. MOFF: I think I know the  
24 answer now. Let me try again.

25 Let's suppose one tract was 160  
acres and it was -- you passed the 640-acre thing. That  
160-acre tract were force pooled into a 640-acre unit,  
that's the circumstances you're talking about, where neither

1  
2 the royalty nor working interest were committed to the unit.  
3 Upon that forced pooling that 160-acre tract gets one-fourth  
4 of all the production attributable to that well insofar as  
5 the unit's concerned, whether you've got 160-acre spac-  
6 ing, 640-acre spacing, or whatever, and if it was determined  
7 by production history that 160 was appropriate, regardless  
8 of what spacing occurred that royalty owner who was force  
9 pooled and that working interest owner who was force pooled  
10 in the 160 acres would still be entitled to get one-fourth  
11 of the well and all wells that were drilled on the 640 acres  
12 because the forced pooling would not be abrogated.

12 MR. PEARCE: And counsel for  
13 the Commission has been put in a quandary on that.

14 MR. STANETS: Mr. Note, I think  
15 that your response needs more work but I don't believe I  
16 care to pursue it at this point.

17 That's all that I have.

18 MR. PEARCE: May I just follow  
19 along that same dangerous line.

20 CROSS EXAMINATION

21 BY MR. PEARCE:

22 Q Do you know if Amoco Production Company  
23 would object to a provision in any order which might be is-  
24 sued granting 640-acre spacing that during the temporary  
25 pool rule period no such forced pooling action would be  
brought so that the problem could not arise during the three

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year temporary period? Do you know if Amoco would object to that?

A Mr. Pearce, I believe that to put a condition like that may make it very difficult for us to protect the correlative rights within the unit.

Q Thank you, sir.

MR. RAMEY: Any other questions?

MR. KELLAHIN: Mr. Chairman.

MR. RAMEY: Mr. Kellahin.

#### CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Allen, with regards to the 640-acre spacing case, would you tell me specifically what is your responsibility and what have you done on behalf of your company, Amoco?

A Well, my --

Q What is it you do for Amoco that has got you involved in the 640-acre spacing case?

A I am, of course, Engineering Supervisor for our Regulatory Affairs Group in Amoco, and basically we furnish technical advice to our operating people as to interpretation and application of statewide rules and regulations.

Q All right, sir, you are an engineer by education and degree?

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A Yes, sir, I am.

Q And where are you located in Amoco, what community or town?

A In Houston, Texas.

Q And is it your responsibility as the Regulatory Coordinator for Amoco to be responsible for the applications Amoco files in the State of New Mexico before the Oil Conservation Commission?

A Yes, sir.

Q And when matters that become the subject of hearings or applications at the Oil Commission come to your attention, do you delegate and coordinate the preparation of documents and witnesses for the presentations of cases to the Commission?

A Yes, sir.

Q And in your capacity as an expert do you review those documents and the data supplied to you by your engineers and geologists and reach your own independent conclusions about that data?

A Yes, sir, I do.

Q And have you done so in this case?

A Yes, sir.

Q And in making that review, Mr. Allen, have you reached a conclusion in your opinion that 640-acre spacing for the proposed area involved in your application is the most effective and efficient way for a temporary period of three years in which to develop this pool?

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A Yes, sir, I think it definitely is.

Q And is your proposed application one that includes the Tubb formation?

A Yes, sir.

Q Now when Mr. Lopez asked you in general that there was an area in the east side of the applied for area that showed a greater net thickness of Tubb sand than some areas to the west, what is your understanding of what you were addressing when you responded to that question?

A Primarily the information which is shown by cross section trace -- is that A-A' or B-B', the northwest/southeast -- A-A'?

Q Northwest to the southeast is A-A'?

A Yes. As I recall the Tubbs is essentially gone as you get further to the northwest, so it does thin out in that direction.

Q All right, sir, I wonder if you might simply come to that exhibit and in response to Mr. Lopez' questions, when you were identifying a western portion of the proposed area that demonstrated a greater net thickness than another area, would you locate for us by whatever manner you think appropriate that western -- that eastern area that showed the greater thickness?

A The area which I was talking about is in essence what we're now calling our productive area in the Bravo Dome Unit. It's in the area of development centered in Township 19 North, 34 East, further to the east.

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2                   The area of the thinner pay section which  
3 I was referring to is that which is more up and outside of  
4 this map as we go across in this direction.

5                   Q           When you proceed up to the northwest the  
6 net pay thickness and the Tubb formation tends to thin as  
7 you move to the north and to the west.

8                   A           Yes.

9                   Q           All right, sir. Now as I correct in  
10 understanding when you refer to the net pay thickness that  
11 you have identified at a particular well, how do you make  
12 that identification?

13                   A           The identification which we are -- what  
14 I'm going to refer to as net pay thickness at this hearing  
15 is what we would show on our cross sections has been  
16 determined to be an area with a permeability with one  
17 millidarcy or greater.

18                   Q           All right, and that is done by simply  
19 looking at the log information and analyzing that log  
20 information for logs run on the various wells.

21                   A           Yes, sir.

22                   Q           And as I correct in understanding that  
23 the net pay thickness as you determine it from the log  
24 analysis demonstrates the capacity of the reservoir to hold  
25 or contain gas in a given quantity under a specific acre?

                  A           The way in which we have correlated it,  
Mr. Kellahin, would more, I think, more appropriately be  
termed the ability of the reservoir to transmit gas. If it

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were -- if we had correlated a Phi-H effect, then what you said would be correct, it would represent the volume of gas.

Q In making your study and applying only for purposes of my question the information you have compiled and applying it to the area that we've identified as the eastern portion that has the thicker section, have you concluded for that area that 640-acre spacing is an appropriate spacing?

A Yes, sir.

Q As we proceed to an area in which the net thickness decreases, whether you move to the northwest or the north or whatever direction you go, if the trend demonstrates that the net thickness decreases, would that require a greater number of acres to be dedicated to one well in order to make that well economic?

A If I understand your question, if the net pay thickness decreased would it require a dedication of a larger amount of acreage?

Q Yes, sir, would you need more than 640 acres as the net pay thickness decreases in whatever direction?

A It's possible, depending on the other reservoir parameters, yes, sir.

Q In making your study of the other wells involved outside of this western portion, have you encountered reservoir parameters or criteria that would cause you to believe at this point that there are areas included with-

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in your application that would not be appropriately spaced at this time on 640 acres?

A That would not be appropriately, sir? With the exception of the areas that we have said we would agree to not accept or we would agree to exempt, I think they could all be on 640 acres.

Q In your examination, Mr. Allen, have you determined any geologic discontinuity across the area that would isolate the Tubb reservoir from the area in which you concentrated your drilling?

A I have not seen that discontinuity.

Q In determining whether 640-acre spacing is appropriate, Mr. Allen, what is the significance of the fact elicited from you by Mr. Lopez that the pressure in the western portion of the proposed area is greater than that in which you found the pressure to be in the eastern portion?

A It would not change my opinion as to whether 640 is appropriate or not.

Q Why not?

A Well, in the area normally where the pressure is higher, I believe we found that there may be some other factors that would cause us to calculate very similar gas in place, whether it be in the east or in the west.

Also, the rates may vary somewhat but I think that again would depend on the individual reservoir parameters for that well.

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Q Mr. Jaramillo asked you some questions, Mr. Allen, with regards to whether or not the spacing per well isn't irrelevant because you can control the spacing at whatever acreage you require as a function of the unit operations. He put that question to you. Do you remember that conversation?

A I think so, yes, sir.

Q And I believe your answer to him was that the 640-acre spacing application in fact was not irrelevant nor made irrelevant by the fact that this was largely contained within the unit.

A Yes, sir.

Q And I believe your response to Mr. Jaramillo was that it could result in the drilling of unnecessary wells.

A Yes, sir.

Q All right, let me give you an example. If we pick a window in the unit and by a window I mean acreage in which Amoco does not control, it's excluded from the unit, and for sake of the question, in which you have no working interest. And let's assume that window occurs in the middle of the eastern portion, as a hypothetical, let's assume that window is 640 acres.

Now if the operator of that 640 acre takes it upon himself to determine in his own mind that he wants to drill four wells in a section, how many additional unnecessary wells will the operator of the unit have to

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drill in the adjoining offsetting sections in order to meet that drainage exposure?

A Any -- you mean the number of unnecessary wells?

Q The additional unnecessary wells that you would have to drill in order to protect the unit and the unit owners from the exposure of the offsetting drainage from that window.

A At least four.

Q All right, sir, and let's assume that the unit operator of that 640-acre unit took it upon himself to decide that he wanted his reserves faster and he decided to drill on 40 acres, and in order to meet that drainage response by the unit, Amoco, as unit operator, will have to drill how many additional unnecessary wells?

A It will be at least twice that number and maybe more. I think one of our exhibits shows this a little bit better in hypothetical form, I believe.

Q All right, sir, and my question is --

A We would have to drill sufficient wells to create a no-flow boundary between -- around that 640 acres.

Q And why would you want to create a no-flow boundary around 640 acres?

A To prevent uncompensated drainage from one area to another.

Q And is that not the whole purpose of the

1  
2 spacing application to determine not only for you but for  
3 everyone else, what the most effective and efficient way is  
4 to develop this reservoir on how many wells can be at this  
5 point supported geologically and engineering, so that un-  
6 necessary wells are not drilled?

7 A That is correct.

8 Q Now let's talk about the forced pooling  
9 question that came up awhile ago, Mr. Allen.

10 Let's assume that we had 640 acres in  
11 which 320 on the east half of a section is contained within  
12 the unit. The west half of the section is controlled by a  
13 nonparticipating party outside of the unit.

14 If Amoco elects to drill on that 640 ac-  
15 res, it's my understanding that of the several options one  
16 of them is to force pool the 640-acre tract as a spacing  
17 unit.

18 A Yes, sir.

19 Q To what degree would the force pooled  
20 party in the west half of the section, in what percentage  
21 would it participate in the production from that well?

22 A On a 50/50 basis.

23 Q That percentage is not reduced to repre-  
24 sent his percentage of the whole unit, is it?

25 A No, sir.

Q Mr. Allen, are you familiar with the in-  
fill drilling orders in the San Juan Basin in the Blanco  
Mesaverde and Basin Dakota Pools?

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2           A           Mr. Kellahin, I have not reviewed those  
3 pools at all, so I'm not.

4           Q           As Conservation Coordinator for your com-  
5 pany are you generally familiar with the concept of infill  
6 drilling?

7           A           Yes. There's a lot more of it done in  
8 the northwest, as you mentioned, which is handled out of our  
9 Denver Office.

10          Q           All right, sir, are you familiar with the  
11 Catclaw Draw Morrow Pool in southeastern New Mexico?

12          A           Not intimately, no, sir.

13          Q           All right, sir. Are you familiar with  
14 the formation of a working interest unit?

15          A           Yes, sir.

16          Q           If a working interest unit is formed for  
17 the purposes of drilling and developing the Tubb formation  
18 and that working interest unit contains 640 acres and you  
19 drill one well, how does the unit participant share in the  
20 production from that well?

21          A           They would share in proportion to the ac-  
22 reage which they contributed to it.

23          Q           All right, sir, and if the spacing is  
24 changed to 320 acres as opposed to 640, and a second well is  
25 drilled, will the participants in the other half share in  
100 percent of the production or will it be shared among the  
working interest units in the 640-acre unit?

A           It would share on the initial basis on

1  
2 which the working interest unit was formed.

3 Q All right, sir, and if the spacing is  
4 changed to 40 acres and additional wells were drilled, how  
5 is that production shared?

6 A It would be shared again in the propor-  
7 tion in which the working interest unit was formed.

8 Q All right. In your opinion will that  
9 violate correlative rights?

10 A No, sir.

11 Q So if the spacing is changed from 640 to  
12 160, in your opinion would the reduced spacing at a later  
13 date, if that is required, violate correlative rights by  
14 creating at this point 640-acre spacing?

15 A No, sir.

16 Q Now, Mr. Allen, we have talked about a  
17 voluntary working interest unit on 640 acres. Based upon  
18 your knowledge and experience with forced pooling applica-  
19 tions, could not that same concept be applied to protect the  
20 correlative rights of the various parties involved?

21 A Yes, sir, I think it could.

22 MR. RAMEY: Any other questions  
23 of the witness?

24 MR. STANETS: May I ask Mr.  
25 Kellahin one?

MR. KELLAHIN: Do you want me  
to be sworn, Mr. Chairman?

MR. STANETS: He didn't exactly

1  
2 testify on this issue but --

3 MR. KELLAHIN: I tried my best,  
4 Mr. Chairman.

5 MR. STAMETS: The working  
6 interest units are voluntary. Compulsory poolings are in-  
7 voluntary. How do you go from an involuntary compulsory  
8 pooling on 640 to a voluntary working interest unit if the  
9 spacing is changed?

10 MR. KELLAHIN: By extracting  
11 from the applicant in the forced pooling application the  
12 concession that in order to protect the correlative rights  
13 of the various parties, that they have to share in the pro-  
14 duction for the smaller pool tract in the same percentage as  
15 they shared in the original forced pool tract, and unless  
16 you take that measure, then you'll find that the people that  
17 helped pay for the first well and for which they have shared  
18 in some quantity of production will not receive the benefits  
19 from the second well drilled, and I think it's clear that  
20 you have the necessary statutory authority in order to bal-  
21 ance the equities to make that work.

22 This is the same discussion we  
23 had in the infill drilling programs in the San Juan Basin.  
24 It's exactly the same discussion we had in the Catclaw Draw  
25 Horrow when we went from 640's down to 320's and the reason  
we elected infill drilling was that we couldn't simply re-  
space them without violating correlative rights, and I think  
Mr. Pearce and a number of us here can devise for you a sta-

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2 tutorily acceptable means of accomplishing that goal, but my  
3 point is you should not allow the decision on what is the  
4 most effective and efficient way to initially space the pool  
5 to be dictated by what would happen in an isolated pooling  
6 case when we know we can balance the equities.

7 And having made my closing ar-  
8 gument in this case, I will stop.

9 MR. STAMETS: I do believe Mr.  
10 Kellahin has volunteered to take on that task.

11 MR. KELLAHIN: I'd be delighted  
12 for my customary fee, Mr. Chairman.

13 MR. RAMSEY: Any other questions  
14 of the witness? Mr. Padilla.

#### 15 RE-CROSS EXAMINATION

16 BY MR. PADILLA:

17 Q Mr. Allen, in connection with the example  
18 on the working interest unit that Mr. Kellahin just now  
19 asked you, isn't it customary under working interest units  
20 only the royalty owner underlying the proration unit where  
21 the well is drilled is the only one, or the only royalty  
owners who are going to share in production?

22 A On the royalty interest owners as opposed  
23 to the working interest owners?

24 Q Correct.

25 A I believe that's correct.

Q So on our east half/west half, people

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outside the unit that the well was drilled on unit land would not -- the royalty owners and such working interest would not share.

A On a 640-acre basis they would, yes.

Q Assuming the spacing is 160 acres?

A Then adjustment would have to be made, that's correct, if the royalty were a factor.

Q Mr. Kellahin also asked you concerning the thinning out on the thickness of the sands in the west side of the unit and he suggested that it may be necessary to have wider spacing in order to adequately drain and recover the same amount of reserves.

Now isn't it also true that depending on the characteristics of the reservoir you may need to space on smaller -- on smaller spacing in order to adequately drain the sands?

A It's possible that that is true. I think that in the case we're talking about with thinner sands you normally will have some wider drainage.

Q In fact --

A It may affect the rate depending on the reservoir parameters.

Q In fact we don't know as to whether or not smaller spacing or larger spacing is adequate at this point, say on the west side.

A I would think that what we've testified to holds whether it's on the east, west, south, or north,

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that it's certainly easier to drill wells later than to try to undrill them when it was not necessary.

Q Well, you haven't drilled any wells over in the northwest side to speak of.

A That's true.

Q In fact you really don't know.

A At this point, that's true.

Q The fact that you would speculate at this point on drilling unnecessary wells, you still don't know whether it would be unnecessary wells or not because you haven't drilled the acreage.

A I think the information that we do have indicates to us that the, I guess the drilling on 160's probably is still not going to develop any additional reserves.

It will develop, initially anyway, a higher rate, but we are still of the opinion that we can recover the reserves with one well, even in the thinner area.

Q That's still an opinion, is that correct?

A Yes, sir, only I think in three years we'll have more facts.

Q It's not based on fact.

MR. PADILLA: No further questions.

MR. RAMEY: Any other questions of the witness? He may be excused.

MR. NOTE: No questions on re-

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direct, Mr. Chairman.

MR. RAMEY: The witness may be excused.

We'll take about a ten minute break here.

(Thereupon a recess was taken.)

MR. RAMEY: The hearing will come to order.

MR. NOTE: We'll call our next witness, Mr. Bruce May.

BRUCE I. MAY,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. NOTE:

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

A My name is Bruce I. May. I'm a Staff Geologist. I work for Amoco Production Company in Houston, Texas.

Q Have you previously testified before the Commission and are your credentials as a petroleum geologist a matter of public record?

A Yes, they are.

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Q You'll be asked to testify concerning certain exhibits. Were these exhibits either prepared by you or under your supervision and direction?

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A They were.

5

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Q Did you testify in the March 18, 1981 hearing, Mr. May?

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A Yes, I did.

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Q If you would, please relate to us to some extent what and how long has been your involvement with the Bravo Dome Area?

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12

A I've been working on the Bravo Dome Area for approximately five years.

13

14

Q And what was your assignment when you started working with Bravo Dome?

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16

A My assignment was to examine the completions within the Bravo Dome Area so that we could improve our completions and also to try to better understand the reservoir.

17

18

19

Q So it was not your intention when you originally got involved with Bravo Dome to necessarily be used as a witness but that you had other assignments, is that correct?

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21

22

A That's correct.

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Q And were those well completion techniques which you designed and decided were appropriate for this area, were they implemented by Amoco in its completion of wells in this Bravo Dome Area?

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A Yes.

Q If you would, go up to the wall where you've got your Exhibit Number Four and explain what is shown by that exhibit, which is -- has a heading of calibration technique.

A This exhibit is the technique that I utilized to help me understand the reservoir in addition to helping us with our completion technique.

Basically what it involves is trying to rate the density porosity with permeability.

MR. NOTE: Excuse me, are there any questions concerning his qualifications, Mr. Chairman?

MR. RAMEY: No, there are not, Mr. Note.

Q Go ahead, Mr. May.

A The technique that I used involves using core analysis throughout the unit. There are a total of 41 cores that I used during my calibration technique and those are located in the lower lefthand corner. The unit boundary is colored in yellow and the hexagons indicate those wells that I used, a total of 41 wells within the unit and two that are just outside the unit. I used those core analyses in doing this calibration.

The first step in my calibration technique was to equate the density porosity to the actual reservoir core porosity. And what I did is I calibrated for each one -- cross plotted, excuse me, for each one of these wells

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2 the density porosity value and the core porosity value and I  
3 found a distribution of points and based on that distribu-  
4 tion of points I felt I saw a relationship between density  
5 porosity and core porosity.

6 The second step in my calibration techni-  
7 que was to cross plot all the core permeabilities against  
8 the core porosities and again I cross plotted those points I  
9 felt represented a relationship cross plot, and I drew the  
10 line to represent that relationship.

11 So utilizing these two cross plots I can  
12 then take any density porosity, generate a calculated core  
13 porosity, come over here, take that core porosity and gener-  
14 ate a calculated core permeability.

15 An example of a depth plot where I used  
16 every foot of the density log to generate these permeabili-  
17 ties is located in the center display on Exhibit Number  
18 Four.

19 To get you oriented here stratigraphical-  
20 ly what's colored in blue is the Cimarron anhydrite. The  
21 top of the basin is indicated by the wavy line, so this is  
22 the unitized interval, Tubb interval.

23 The tracks on the lefthand side is the  
24 gamma ray and on the righthand side the solid line repre-  
25 sents my calculated permeability based on the technique that  
I developed.

This is a new well that was drilled since  
the last hearing and it also included a core. I've also

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depth plotted the core analysis in a dashed line all the way down the depth track to see how well my calculated permeabilities matched actual core permeabilities.

Q So in effect, to make sure we understand what you've done, you've taken log porosity, density, and by the use of cores and correlating those two, come up with a permeability which you have then assigned to each of the wells which you considered, is that correct?

A Yes, each of the wells foot by foot density porosity measurements.

Q All right, and in the lower lefthand corner there, that's the -- how do you show it, by hexagon shapes? Is that the wells in which core data was taken?

A That's correct.

Q And are they pretty well scattered over the entire Bravo Dome Area?

A Yes, they are. There's good distribution of the core analyses throughout the Bravo Dome Area from east to west and from north to south.

Q And how many wells would you say you cored in order to be able to come to the results which you've reached?

A On this particular case I've used 43 different core analyses.

Q Approximately how many feet of cored rock did you examine in order to come to your conclusions?

A Over 5000 feet.

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Q This method that you've used to calibrate and determine the permeability, is this a method which is commonly used in the industry?

A Yes, it is.

Q And is -- does Amoco rely on this technique to improve its well completion technique?

A Yes, it does.

Q And is this the basis on which you reached a conclusion as to how to properly complete wells in this reservoir?

A That's correct.

Q What kind of a cutoff did you use in making your exhibit, the cross section that you're going to testify to later?

A What I did is I used a one millidarcy cutoff. I felt that permeability in the rock with greater than one millidarcy would flow gas and as a result I've colored everything that's greater than one millidarcy orange and you can see from this display that there's quite a bit of rock that is greater than one millidarcy.

Q Well, it's not your testimony that anything less than one millidarcy would not transmit gas, is that correct?

A That's correct.

Q How did you arrive at the one millidarcy cutoff?

A Again, I arrived at the one millidarcy

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cutoff because I felt that gas could flow above one millidarcy.

Q All right. How does that relate to tight gas as determined by the FERC under the Natural Gas Policy Act?

A I believe the designation is 0.1 millidarcy and the cutoff I've used is ten times that.

Q All right. If you would, go to your Exhibit Number Five. I believe it's also on the wall and is a cross section A-A', and explain what you have on this exhibit, Mr. May.

A Utilizing the technique that I developed, I selected wells with density logs across the unit and generated a calculated permeability for those particular logs and then I constructed cross sections going across the unit.

This particular cross section is one that goes from the southeast to the northwest, designated A-A'. It also shows the unit boundary and the trace of that cross section.

It starts in the southeast with the CO2-in-Action No. 1 kutz, which is just outside the unit, and eventually ends up with the Amoco State "FE" No. 1, which is outside the unit and is a dry hole.

On all these displays the same format will be used. Anything that's colored in, that's greater than one millidarcy is colored in orange. Everything that's

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less than one millidarcy is white. The solid track, again, right track, represents my calculated permeability. The cross sections are all hung on top of the Tubb.

Q And how do you show new wells on this exhibit?

A I've indicated those new wells that were drilled since the last hearing by coloring in the number designations above each well.

Q All right. Did you find any geologic continuity by virtue of this cross section which you prepared?

A Yes, I did. Looking at the cross section for intervals greater than one millidarcy across the unit and I -- the continuity of that greater than one millidarcy reservoir rock.

Q And is this indicative of the fact that permeability does thin and decrease as you go to the northwest as has been previously testified in this hearing?

A Yes, total section of the Tubb decreases, the amount of section that contains intervals greater than one millidarcy decreases as we go toward the northwest.

Q The new data which you've examined since the last hearing in the form of the logs on the new wells that have been drilled and the new cores that you've examined, does that support the previous testimony which you gave in this case in the previous hearing?

A Yes, it does.

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Q All right, let's go to your Exhibit Number Six.

Mr. May, you've got before you now B-B', which is Exhibit Number Six, now is it and the previous one shown over in the righthand side in a little inset as to what that cross section does? I mean where it it with respect to the unit area?

A Yes, it's -- basically this cross section goes north to south in the unit.

Q All right, and like the previous exhibit do you show your new wells by coloring in the circled numbers at the top of each one of those logs?

A That's correct.

Q And is this the same as the other exhibit in the fact that the orange coloring is the permeability which you've shown is over one millidarcy on this exhibit, also?

A That's correct, those intervals I've correlated that are greater than one millidarcy are colored in orange and it indicates to me we have extremely good continuity north/south direction across the unit.

Q I noted some lines down at the bottom which are dot-dashed and some little arrows. What do those mean?

A Those indicate the position of faults based on a Tubb structure map.

Q Does the new data which you've examined,

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being the new wells that you have the logs available and the new cores which you've examined, indicate any geologic continuity across this reservoir?

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A Yes, it indicates to me that there's extremely good continuity of greater than one millidarcy rock across the unit.

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Q Does that conclude your testimony with regard to this exhibit?

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A That's correct.

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Q Would you look now to your Exhibit Number Seven?

You now have before you what is Exhibit Number Seven. I believe it's an east/west cross section designated C-C', is that correct?

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A That's correct, located on the eastern portion of the unit.

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Q And referring to what -- the first and the last and the beginning wells are on this cross section, so we'll have it designated properly.

A The last well on this particular cross section, the 19-35-13 1F, and the first well on this particular cross section is 20-33-34 1K.

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Q Now does this differ from your previous cross sections in any regard?

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A Yes, in this particular case the wells that I've used on this cross section are in general on 640-acre spacing, or one mile between each well.

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Q All right, and do you see any -- in preparing this exhibit the new wells are again colored at the top of the logs. In the new core data you have did you see any evidence of not having geologic continuity from the section which you have used to cross section?

A No, I did not see any geological discontinuity of that interval greater than one millidarcy when examining the new wells that I've incorporated in this cross section.

Q And these wells, I believe you said, are approximately one mile apart.

A That's correct.

Q That would be the end result of 640-acre spacing if granted by this Commission, it would be a display similar to this, is that correct?

A That's correct.

Q Do you have anything further in connection with this exhibit?

A No, I -- well, excuse me. There is one well, this is the 19-34-06 1G, one of the new wells in the unit that we did core, one of the two new wells that we have core analysis for, and you can also see, using that calibration technique, I am matching the permeabilities from the core analysis very well.

Q What is the writing that you have below each one of these wells, Mr. Bruce?

A They indicate the well history, the ini-

1  
2 tial rate that was measured.

3 Q Does that conclude your testimony on this  
4 exhibit?

5 A That's correct.

6 Q Let's go to your Exhibit Number Eight,  
7 which I believe is the north/south cross section.

8 All right, you now have before you Exhi-  
9 bit Number Eight, which is D-D'. It appears to be a  
10 north/south cross section. If you would, please explain  
11 what you show on this exhibit?

12 A This particular exhibit I -- I show the  
13 north/south cross section through the area again that is  
14 drilled approximately 640-acre spacing or one mile between  
15 each well, and on this particular exhibit again I've corre-  
16 lated those intervals that I've calculated to be greater  
17 than one millidarcy across this area, and I've seen extreme-  
18 ly good continuity in the reservoir of those permeabilities  
19 greater than one millidarcy.

20 Q And do the new wells that you show  
21 colored in the circles at the top of the logs and the core  
22 data that you've seen, does this give any support to your  
23 previous testimony with regards to geologic continuity?

24 A Yes, it does. It fits right in to what  
25 my previous testimony indicated. It fits right in to where  
my previously calibrated wells were.

Q In addition to -- you might come back and  
sit down, now, if you would, Mr. May.

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2 In addition to the wells, logs of which  
3 are shown on the exhibits which you've put on the wall and  
4 testified to, have you seen the vast majority of all logs on  
5 all 193 wells inside the unit area that have been drilled  
6 since the last hearing?

7 A Yes, I have.

8 Q And did you take these into consideration  
9 in making your determination and conclusion with regard to  
10 geologic continuity?

11 A Yes.

12 Q Do you see anything from your study that  
13 would indicate that one well could not drain 640 acres?

14 A No, I haven't seen anything from my study  
15 that would indicate it would not drain 640 acres.

16 Q And do you see geologic continuity over  
17 one millidarcy of permeability rock throughout the entire  
18 Bravo Dome Unit Area?

19 A Yes, I do see that continuity.

20 MR. NOTE: We offer into evi-  
21 dence Amoco's Exhibits Four through Eight and tender the  
22 witness for cross examination.

23 MR. RANEY: Exhibits Four  
24 through Eight will be admitted and we will recess till 1:15.

25 (Thereupon the noon recess was taken.)

MR. RANEY: The hearing will  
come to order.

Are there any questions of Mr.

1  
2 May?

3 MR. LOPEZ: Mr. Chairman, if  
4 you please.

5  
6 CROSS EXAMINATION

7 BY MR. LOPEZ:

8 Q Mr. May, I think upon the closing of your  
9 direct testimony you said that you hadn't seen anything, or  
10 you have not seen anything that would indicate that one well  
11 would not drain 640 acres.

12 What have you seen that indicate that it  
13 will drain 640 acres?

14 A Well, I've seen reservoir quality that  
15 I've been able to correlate over a 640-acre area, and I be-  
16 lieve that indicates to me that you could have one well  
17 drain 640 acres. The continuity of the pay over that one  
18 mile area, that 640 acres, is fairly good, greater than one  
19 millidarcy.

20 Q I suppose that I could agree with the  
21 premise that if there is reservoir continuity that a well  
22 can drain an indefinite area over a period of time. How  
23 long in your judgment would one well be able to drain all  
24 the recoverable CO2 under a 640-acre tract?

25 A I believe that's an engineering question.  
I'm not qualified to answer that.

Q But then if I understand your testimony  
correct, it's essentially on the premise that since there

1  
2 may exist reservoir continuity over an indefinite period of  
3 time, be it infinity, one well will be capable of draining  
4 that tract.

5 A Geologically, yes.

6 Q The next thrust of my questioning is  
7 going to address the wells from which you obtained samples  
8 and in order to expedite the questioning process, I'm par-  
9 ticularly interested in what wells near the Mitchell-Libby  
10 Leases were involved in your sampling, sample testing, and  
11 how are they correlated on your calibration chart?

12 A The wells that I used in the study are  
13 indicated by the lower lefthand corner map indicating dis-  
14 tribution. The two wells that I think are probably close to  
15 the western area are the Amoco State No. 1 "FN" and "HN",  
16 and they both correlated extremely well, the cross plot data  
17 that I have. They followed the relationships that I'd esta-  
18 blished.

19 Q My next question involves your Exhibit  
20 Seven and that's right behind that Exhibit Eight, I believe.  
21 You can just lift it up, if you want.

22 I'm just curious for you to explain to me  
23 why the Well No. 10 indicated on that exhibit has the Base-  
24 ment jogging up so dramatically compared to the others.

25 A Well, you'll notice a question mark by  
it. In this particular case I did not know where the Base-  
ment was in this well and whether we had penetrated it or  
not, so as a result I know the Basement is down there, I put

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a question mark indicating that we had not penetrated it in that well.

Q What indications of faulting do you have on that exhibit?

A In this particular cross section, none.

Q Would the exhibit show it if the faulting was in the Tubb?

A No, it wouldn't.

Q Why is that?

A Because it's a stratigraphic cross section.

MR. LOPEZ: I have no -- I have no further questions.

MR. RAMEY: Any other questions of Mr. May? Mr. Padilla.

#### CROSS EXAMINATION

BY MR. PADILLA:

Q Mr. May, in the last spacing hearing you testified that, well, you presented other cross sections that were colored in orange, as well, is that correct?

A Yes, that's correct.

Q And you chose the same color for this hearing as being appropriate to show the one millidarcy cut-off.

A That's correct.

Q Now, that one millidarcy cutoff doesn't

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show whether the formation is water saturated or not, does it?

A No, it doesn't. It indicates that reservoir quality is there. The interval that I correlated, however, corresponds to the perforations that we have in each one of the wells in the productive interval as we know right now.

Q In fact, in orange you have numerous stringers that are shown and each of those stringers could have a different pressure or reservoir characteristics, could they not?

A I couldn't answer that, the pressure, due to pressure. I'm not familiar with that.

Q Well, you don't work with the other engineers working with Amoco at all and have never discussed the pressures with the engineers working on this case?

A We've -- in this case, no. We've talked about pressures but I'm not qualified to talk about them. I don't understand them that well.

Q Even, even generally of your own knowledge you don't have any idea what the pressures are in each of these stringers?

A No, I don't.

Q Would you agree with me, do you know enough reservoir engineering to know that some of those stringers could have different pressures?

A It's possible but I don't know enough re-

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reservoir engineering to tell you.

Q Let me go to cross section A-A', and show you Well No. 2, if you'd step over there, please.

I think that shows enough, but I would just like to ask you whether in your opinion that lower stringer that's shown on that well might be a different lens or a different pool altogether from the rest of the other wells, even though it may be connected to other wells?

A Based on my cross section and the way I've correlated the greater than one millidarcy interval, I do not have any separate pool.

Q Just merely indicates that the Tubb formation is underlying that well, isn't that correct?

A That's correct, underlying --

Q Or that you've encountered the same type of reservoir quality underlying that well.

A I'm not sure I understand your question.

Q Well, let me ask the question this way. Is that, in your opinion, a separate lens as shown on that well?

A No, in my opinion and the way I've correlated it, as I said previously, I have picked it as a separate lens.

Q Would that just be a thicker sand?

A That's correct. That interval that I've correlated as greater than one millidarcy is thicker in that particular well.

1  
2 Q Would you agree with me that that could  
3 have a -- that would be a different -- that could have dif-  
4 ferent reservoir quality than the rest of the wells?

5 A It has permeability greater than one mil-  
6 lidarcy similar to the wells that I've correlated all  
7 through the cross section.

8 Q And you don't know what the pressures are  
9 for that particular sand section?

10 A No, I don't.

11 MR. NOTE: Objection. He's al-  
12 ready answered that question.

13 Q You don't know whether that particular  
14 sand section is water saturated?

15 A No, I do not.

16 Q Were you present when the wells were  
17 drilled?

18 A No, I wasn't in this particular case.

19 Q Were you present when most of these wells  
20 were drilled?

21 A Quite a few of the cases I was present at  
22 the project when some of these wells were drilled.

23 Q Did you encounter water in some of the  
24 wells and not in others?

25 A Based on the testing data, yes, they en-  
countered some water in some wells.

Q That would affect permeability, wouldn't  
it, water would?

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A Water would affect permeability? It would affect the permeability to gas, I believe. Permeability is a function of whether fluid or gas will flow through it. Permeability would still be there.

Q Generally in a gas well too much water will kill the well, won't it?

A I believe that's a correct generalization.

Q And generally you would agree that some wells Amoco has drilled have more water than others.

A I think that's true.

Q Have you in your cross section included wells that are dry holes?

A No, I have not.

Q What have you encountered in those wells where -- where you have dry holes?

A In those particular wells I encountered reservoir quality rock but in these cases they were wet.

Q Did those wells -- did you core any of those wells?

A Yes, we did.

Q And did they show permeability in excess of one millidarcy?

A Yes, they did. As a matter of fact, I used one of those wells in this cross plot.

Q So basically what we have here is that we know that the Tubb formation or on your one millidarcy cut-

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2 off, you could have a commercial -- you just haven't aban-  
3 doned those wells, is that correct?

4 A I don't believe I understand the ques-  
5 tion.

6 Q Well, let me -- the wells that you have  
7 shown on your cross sections are all shut in wells.

8 A As far as I know, that's correct.

9 Q And at this point without further produc-  
10 tion you don't know whether they will ultimately be commer-  
11 cial or noncommercial.

12 A I think someone else will determine  
13 whether they're commercial or not. As far as I'm concerned  
14 they produce gas; that's what I was concerned with, and re-  
15 servoir quality was there.

16 Q So you can't determine whether those  
17 wells would be productive or nonproductive depending on a  
18 future decision as to whether to shut them off or plug and  
19 abandon them.

20 A I -- I --

21 MR. NOTE: Mr. Chairman, I'm  
22 going to object to that question. That's an engineering  
23 question which this witness is not qualified to testify, and  
24 it's not within his expertise.

25 MR. PADILLA: Mr. Chairman,  
he's testifying on one millidarcy cutoff. I think I've es-  
tablished that there are certain dry holes that contain per-  
meability in excess of one millidarcy. I'm simply trying to

1  
2 determine whether or not Amoco will decide to keep those  
3 wells they have. I'm trying to establish that -- whether or  
4 not Amoco will even produce those wells.

5 MR. RAMBY: Well, I think he's  
6 already answered the question, Mr. Padilla.

7 MR. PADILLA: Well, let me --  
8 let me continue.

9 Q This morning you testified and you made a  
10 comparison on tight formations for NGPA purposes. You don't  
11 -- you're not attempting at all to compare incentive gas  
12 pricing with CO2 production, are you?

13 A No, I'm not.

14 Q The cross sections did not show any pool  
15 definition, is that correct?

16 A Correct, other than the A-A' did show the  
17 pinchout of the Tubb as it goes towards the northwest, so  
18 the Tubb is completely gone in that cross section by the  
19 time you reach the Amoco State "PD".

20 Q Did you use any wells in your cross  
21 sections that were not Amoco-operated wells?

22 A Yes, I believe I used the Amerada No. 1  
23 State Well. I also used the core analysis on that particu-  
24 lar well in my cross plot technique.

25 Q Amerada is another working interest and  
is joined in the operating agreement with Amoco, is that  
correct?

A That's correct.

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Q For development of the unit. But you did not choose any other wells controlled by other entities or persons within the outer boundaries of the unit?

A Outer boundaries of the unit?

Q Yes, or within the area of the application.

A I did include two wells that Amoco had drilled prior to formation of the unit towards the southwest but they again were Amoco-operated wells.

I did not include any wells that were not Amoco-operated or had been Amoco-operated.

Q If I compared your testimony today with the testimony you gave in 1981 at the second hearing, in effect I would be comparing the same thing except you presented more cross sections at that hearing, is that the essence?

A Yes, that's correct. This particular hearing I included new well data inserted into the cross sections to show the continuity of the reservoir greater than one millidarcy permeability.

Q All you're saying now and that you said in 1981 is that you felt that given that reservoir quality, a well would be capable of draining 640 acres.

A That's correct. I don't see anything in the cross sections which would lead me to believe that it could not drain 640 acres.

Q But you have not taken into consideration water saturation or pressures.

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2 A That's correct.

3 Q The only way you could really find out is  
4 through further production, is that correct?

5 A My understanding is yes, we could find  
6 that information out, but that would be an engineering ques-  
7 tion that someone else would have to answer.

8 MR. PADILLA: I believe that's  
9 all the questions I have, Mr. Ramey.

10 MR. RAMEY: Any other questions  
11 of Mr. May? Mr. Jaramillo.

12 MR. JARAMILLO: Just a few, Mr.  
13 Chairman.

14 CROSS EXAMINATION

15 BY MR. JARAMILLO:

16 Q Mr. May, in the five years that you've  
17 been working on the Bravo Dome Unit, what instances of  
18 faulting have you run across from your geological studies of  
19 this unit?

20 A Instances?

21 Q Instances significant enough to give you  
22 some concern as a geologist that you'd want to explore them  
23 in some detail.

24 A You mean -- I'm not sure I understand you  
25 exactly.

26 Q Have any major faults been plotted, for  
27 example, on any of your maps of the unit?

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2           A           Yes.    A map that I submitted at the unit  
3 hearing contained faults in the Tubb formation and I've also  
4 indicated those same faults on these cross sections when  
5 they've occurred.

6           Q           All right.   What is your analysis in  
7 working with this unit as to the potential for those faults  
8 and their angle to cause some discontinuity in the forma-  
9 tions underlying this unit?

10          A           There is the potential for discontinuity  
11 due to the faults, that is correct; however, the section  
12 contains such a large portion of greater than one millidarcy  
13 permeability that I believe there's a chance that sections  
14 of greater than one millidarcy permeability would be in jux-  
15 taposition and continuity and the reservoir could be main-  
16 tained.

17          Q           Well, when you say there's a chance,  
18 there's a possibility, is there not an equal possibility  
19 that that discontinuity may not permit that continuity  
20 along these -- among this formation?

21          A           There is an equal possibility that con-  
22 tinuity could be broken, that's correct.

23          Q           Now, the effect of a fault, assuming it  
24 does have some, does cause some discontinuity, in terms of  
25 ultimate production would be what, in your estimation?

                  What effect on production would you have,  
for example, on the east side of a fault compared to the  
west side in this Bravo Dome Unit if there was some discon-

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tinuity caused by faulting?

A I'm not sure I understand the question. I might say this, that since the fault would occur, if it was sealing, in sections that had one millidarcy permeability, I believe that on either side of the fault you still have the capability to drain 640 acres, or larger.

Q What is the basis for that opinion?

A Well, I've correlated the greater than one millidarcy intervals across the unit. If there was a fault present that could cause some discontinuity the pay quality is still there in the reservoir rock, and you still would be capable of draining large areas, such as 640 acres.

Q Has there been any seismic testing done on any of the fault structure?

A Yes, there has been some seismic testing.

Q What is the result of that?

A We are still in the process of processing that data and interpreting it.

Q You have no conclusion reached from that testing?

A No, not at this time.

Q Why was the testing done?

A To determine the location of those faults to better understand the reservoir.

Q And you have no answers as to the effect of the faulting because those tests were not yet analyzed or completed?

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A I can't tell you what the effect of the faults will be, right, because the data has not been analyzed yet; still in the process.

Q There are at least two major faults that cross as you go from the east side of the unit to the west side of the unit. There are at least two major faults coming across that -- about the middle of it, are there not?

A I'm not sure.

Q Let me show you just for purposes of identifying these.

This is simply a map of the entire unit and I just want to ask you if you can identify the broken line that runs from the northwest side down to the southeast side across the middle of the unit here and farther to the left, from the northeast side down to about the center of the unit. Do you recognize those as fault lines that have been discovered and actually plotted by Amoco?

A I'd have to see the original map. They look fairly close to where I -- the same attitude. I'm unsure about the location of the exact faults.

Q Okay, well, have these, to the best of your knowledge, been the main faults that have been studied or at least commenced to be studied with seismic testing?

A Those particular faults? We have shot some lines across those faults, yes. We have also shot lines to the north of those faults.

Q All right, and the ultimate impact or

1  
2 effect, if any, of these faults on the comparability of the  
3 productive formations on the east side as compared with the  
4 west side, those questions are still obviously unanswered,  
5 are they not if those faults any effect in changing the  
6 characteristics of the productive formations from the east  
7 side to the west side?

8 A Yes, we haven't determined whether those  
9 faults have an influence, that's correct.

10 MR. JARAMILLO: I don't have  
11 anything else.

12 MR. RANEY: Any other questions  
13 of Mr. May?

#### 14 CROSS EXAMINATION

15 BY MR. RANEY:

16 Q Mr. May, on these faults I think you im-  
17 plied that the throw of the faults really wasn't enough to  
18 completely displace the Tubb formation on one side of the  
19 fault versus the other.

20 A That's correct.

21 Q The Tubb formation is still within con-  
22 tact with the Tubb formation on each side of the fault.

23 A That's correct. The unitized interval  
24 from the top of the Tubb all the way to the Basement in  
25 every case is in juxtaposition as far as we know.

Q So there could be movement across the  
fault within the Tubb formation --

1  
2 A That's correct.

3 Q -- or they could be sealing faults.

4 A They could be, that's correct.

5 Q Thank you.

6 MR. RAMEY: Any other questions  
7 of Mr. May?

8 MR. KELLAHIN: Mr. Chairman.

9 MR. RAMEY: Mr. Kellahin.

10 CROSS EXAMINATION

11 BY MR. KELLAHIN:

12 Q Mr. May, do you have an opinion based  
13 upon the study of the information that you have reviewed  
14 over the course of your review as to whether or not you're  
15 dealing with a Tubb formation in the area applied for as one  
16 common and distinct source of supply?

17 A Would you repeat the question?

18 Q Yes, sir. Based upon your study of the  
19 Tubb formation in the area for which you've applied for the  
20 640-acre spacing, you meaning Amoco, do you have an opinion  
21 at this point as to whether or not you're dealing with one  
22 common, distinct source of supply?

23 A At this point in time I recognize the  
24 possibility, or have recognized the possibility there may be  
25 several distinct sources of CO2 within the unit, all depend-  
ing on whether the faulting was sealing or other geological  
factors we haven't identified yet.

Q Your examination of the well information,

1  
2 geologically, from all the areas you've described for us,  
3 have demonstrated to you that in your opinion one well ought  
4 to be able to drain and develop 640 acres regardless of  
5 where it may be within this area.

6 A That's correct.

7 Q Now if we look at the eastern boundary of  
8 the area applied for, does that eastern boundary generally  
9 correspond to the eastern unit boundary?

10 A That's correct.

11 Q Have you seen any geologic evidence that  
12 the eastern boundary of the unit is in fact the eastern pro-  
13 ductive limits of the Tubb formation in this reservoir?

14 A No, I've not seen anything to indicate  
15 that the unit boundary is the limit of the productive por-  
16 tion of the Tubb.

17 Q All right, sir. If we look at the north-  
18 ern boundary of the applied for area, have you examined and  
19 determined whether or not the northern boundary of the ap-  
20 plied for area is in fact the northern limits of the produc-  
21 tion for the Tubb reservoir?

22 A The northern boundary of the unit I do  
23 not believe at this time is the limit of the productive Tubb  
24 interval.

25 Q All right, sir, and I believe if we look  
at the northwest corner, then, of the applied for area, you  
have given us the opinion that at least based upon one well,  
that we demonstrate a thinning of the Tubb sands and that

1  
2 at that point approximate the limits of the Tubb reservoir  
3 in the northwest corner.

4 A We have one well, as I pointed out in the  
5 cross section, the "PD", in which the Tubb is extremely  
6 tight, so we have at least one limit that we know outside  
7 the unit, but the extent of that reservoir outside the unit  
8 I do not know.

9 Q All right, sir, and when we examine the  
10 western boundary of the applied for area, does the western  
11 boundary that you've examined correspond to the western  
12 boundary of the unit?

13 A Will you please repeat that?

14 Q All right, sir. Have you confined your  
15 cross sections as to the western boundary of the applied for  
16 area to correspond to simply the western limit of the unit?

17 A That's correct, other than the one well  
18 that I did take outside the unit.

19 Q And that one well was which well?

20 A The Amoco State No. 1 "PD". Also I did  
21 take one well outside the unit toward the southeast, CO2-in-  
22 Action No. 1 Kutz.

23 Q Have you examined any of the geologic  
24 data with regards to the wells drilled by Cities Service Oil  
25 and Gas Corporation west of the Bravo Dome Unit?

A I've examined a few logs but not that  
many.

Q All right, sir, in your opinion is the

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western limits of the area for which you have applied the actual western limits of the Tubb reservoir?

A I believe that -- I do not think that the Tubb reservoir stops at the unit boundary in the western area.

Q All right, sir, and when we examine the south boundary of the applied for area, does that south boundary correspond to the southern limits of the Tubb reservoir?

A No, it does not.

MR. KELLAHIN: Thank you, Mr. Chairman, I have nothing further.

MR. RAMEY: Any other questions of Mr. May?

REDIRECT EXAMINATION

BY MR. HOTE:

Q Mr. May, several questions were asked you concerning faulting and the effect it would have on the ability of one well to efficiently and effectively drain 640 acres. Some of the questions were asked by Mr. Padilla and Mr. Ramey also asked you questions.

In your opinion as a geologist, do you see any reason why faulting would affect whether or not a well can drain 640 acres?

A The reservoir quality is there that would indicate to me that you could drain 640 acres. It's just

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that you have a discontinuity of fault present there.

Q The discontinuity would be only along the line of fault, is that correct?

A That's correct.

Q That would not prohibit that well from draining 640 acres, would it?

A That's correct.

MR. NOTE: No further questions.

MR. RAMEY: Any other questions of the witness? He may be excused.

MR. NOTE: We'll next call Mr. Larry Sheppard.

LARRY W. SHEPPARD,  
being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. NOTE:

Q Please state your name, by whom employed, in what capacity and location?

A My name is Larry W. Sheppard. I'm employed by Amoco Production Company in our Houston Production Group. I'm a Senior Staff Petroleum Engineer in that group.

Q Have you testified on previous occasions before the Commission and are your qualifications as an ex-

1  
2 pert in the field of petroleum engineering a matter of pub-  
3 lic record?

4 A Yes, sir, they are.

5 Q You did not testify in the 1981 hearing,  
6 did you?

7 A No, sir, I did not.

8 Q In connection with the Bravo Dome case,  
9 that is.

10 A No, sir, I did not.

11 Q Have you had some familiarity with the  
12 Bravo Dome Unit Area in your employment with Amoco?

13 A Yes, sir, I have.

14 Q If you would, explain what those exper-  
15 iences were.

16 A I've been associated with the Bravo Dome  
17 project for approximately five years in various capacities.

18 My initial encounter with the project was  
19 while I was previously situated in Houston in our Division  
20 Operations Group. I was the Operations Engineer responsible  
21 for initial completion and testing of the 20-well program in  
22 which we obtained a large portion of the core data that was  
23 used by Mr. May in his study.

24 Subsequently I was transferred to Hobbs,  
25 New Mexico, where I was located for approximately two and a  
half years. During my tenure of stay in Hobbs I was an En-  
gineering Supervisor in charge of completions. As such I  
did have under my area of responsibility completions that

1  
2 were affected during that period of time in the Bravo Dome  
3 Area.

4 I was transferred back to Houston in 1982  
5 and have testified in two cases before this Commission in  
6 the intervening period of time relating to Bravo Dome.

7 Q And what were those hearings concerning?

8 A Both of those hearings were concerning  
9 salt water disposal wells situated within the Unit bound-  
aries.

10 Q You'll be asked to testify concerning  
11 certain exhibits. Were those exhibits either prepared by  
12 you or under your supervision and direction?

13 A Yes, sir, they were.

14 MR. NOTE: Are there any ques-  
15 tions concerning this witness' qualifications to testify as  
16 a petroleum engineer?

17 MR. RANEY: No, sir, Mr. Note.  
18 You may proceed.

19 Q Mr. Allen referred to new data that's  
20 been acquired since the March, 1981 hearing and also Mr. May  
21 referred to that data. Would you have some further informa-  
22 tion with regard to data that has been accumulated and ac-  
quired since that date?

23 A Yes, sir, my testimony will reflect that.

24 Q All right, and what was that new data  
25 that has been obtained?

A The new data, as I recall, specifically

1  
2 was the fact that we have approximately, I believe, 190 ad-  
3 ditional wells that have been drilled since the 1981 hear-  
4 ing. That data has been used to help confirm our geologic  
5 continuity.

6 We also have conducted extensive bottom  
7 hole pressure work on those wells and we have also completed  
8 and tested those wells.

9 Other data, as Mr. May has mentioned, in-  
10 cludes the fact that we have obtained two new core datas  
11 which he incorporated in the study that he testified to, and  
12 we have also performed some reservoir engineering analyses  
13 of the data regarding to the four long term flow tests in  
14 order to help establish proper drainage and to establish  
15 proper completion methods and to help gain experience in  
16 long term operation of CO2 wells.

17 Q Have you also obtained some bottom hole  
18 prassure information?

19 A Yes, sir, on all the newly completed  
20 wells we have obtained bottom hole pressure build-up data  
21 and have performed transient analysis of that data.

22 Q All right, what were the reasons for con-  
23 ducting the four long term flow tests?

24 A We had basically three reasons in mind  
25 behind wanting to conduct the flow tests.

First of all, we needed operational ex-  
perience, particularly in the area of the effects that cor-  
rosion would have on long term production.

1  
2 We also wanted to evaluate the effective-  
3 ness of our completions to help get some field information  
4 to be incorporated with Mr. May's study in order to deter-  
5 mine what is the most effective and efficient way to com-  
6 plete wells in the Bravo Dome Unit.

7 And lastly, we did want to evaluate pro-  
8 per spacing for these wells in order that subsequent drill-  
9 ing would be in accordance with that findings and that we  
10 would not end up drilling unnecessary wells to recover the  
reserves within the unit.

11 Q Does that complete your answer to that  
12 question?

13 A Yes, sir.

14 Q All right, would you please discuss the  
15 results of these flow tests?

16 A Yes, sir. I will refer you first to  
17 what's been marked Amoco Exhibit Number Nine.

18 This is a graph of flowing tubing pres-  
19 sure and rate which are plotted on the vertical axis, versus  
20 cumulative time on the horizontal axis. The particular well  
21 which test I have shown here on Exhibit Number Nine is Bravo  
22 Dome Carbon Dioxide Unit Well 1933-031M. This well was, I  
believe, in previous cases referred to as the Heimann No. 1.

23 We instituted this test in order to pri-  
24 marily obtain corrosion information.

25 The well was perforated above and below  
the water/gas contact in order to accelerate water produc-

1  
2 tion and thereby give us a good handle on what type of cor-  
3 rosion would occur and would help us see in an accelerated  
4 sense what we would have to deal with over long term produc-  
5 tion within the unit.

6 We also wanted to use the data to eval-  
7 uate the drainage within the area of this well.

8 As you can see by looking at the plot, we  
9 had significant mechanical failures primarily of the com-  
10 pressor during the first 330 days of the test. The compres-  
11 sor was replaced and from day 330 to the conclusion of the  
12 test the well was able to be maintained with relatively  
13 problem free operations.

14 One point that I would like to make, as  
15 you can see, after the replacement of the compressor the  
16 well initially commenced flowing at around 1200 Mcf a day.  
17 During the next hundred days you can see a decline of the  
18 production rate. I want to note that that decline was asso-  
19 ciated with liquid loading, not associated with limitations  
20 of the reservoir itself. I substantiate that statement by  
21 referring your attention to around day 540. At that period  
22 of time the water productive intervals were capped off and  
23 you see as the water production was excluded from the pro-  
24 duction stream, gas production increased back to the point  
25 that we were producing in excess of 1200 Mcf a day once the  
well cleaned up.

You can also see the restoration of the  
flowing tubing pressure during that same period of time.

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From that I can conclude, we were able to conclude two things.

First of all, our corrosion information indicated that corrosion would be manageable; that through normal corrosion maintenance program, that any corrosion that was encountered could be mitigated and would not serve an adverse effect on long term production operations within the unit.

The second conclusion that I've been able to draw from this is that we did see no boundary effects during this test and from that I would conclude a wide area of drainage.

Q All right, go on to your next test, Mr. Sheppard.

A I refer you now to what's been marked Amoco Exhibit Number Ten. It's an exactly identical plot to what I have shown on Exhibit Number Nine except this is for Well 1934-111C, which has previously been referred to as the Hutchinson "B" No. 9.

This well, the test on this well was instituted in order to evaluate the production characteristics of a well which had been fracture stimulated, shut in for a long period of time without the recovery of load, and then place on test. We were wanting to see if there was going to be any irreparable damage that would be caused by having fracture fluid remaining on the formation during the shut-in period.

1  
2 From the time the well was fracture stim-  
3 ulated until the well was placed on the long term flow test,  
4 I believe, if I recall correctly, was approximately sixteen  
5 months.

6 Again you can see during the first two  
7 days of the test we had again significant mechanical prob-  
8 lems, primarily related to the reliability of our compres-  
9 sor. Upon replacement of that compressor around day 200,  
10 production was maintained from that point forward relatively  
11 problem free.

12 You can see by observing that period be-  
13 tween day 210 and day 350 that we maintained essentially  
14 stabilized flow rate around 2-million cubic feet a day.

15 I will also direct your attention to the  
16 flowing tubing pressure. You can see that the flowing tub-  
17 ing pressure also maintained relatively constant during that  
18 period of time.

19 From evaluations of pressure transient  
20 data on this well and from evaluations of the flow test it-  
21 self, we were able to conclude that the fracture fluid did  
22 not serve any irreparable damage on the formation and we  
23 were also able to observe that we did not encounter any  
24 boundary during the flow test, again concluding that a wide  
25 area of drainage is suggested.

Q All right, go on to your next test, Mr.  
Sheppard. That's Exhibit Number Eleven.

A Yes, sir. On Exhibit Number Eleven is an

1  
2 exactly identical plot to what I've shown on the previous  
3 two exhibits, except this is for Well 1934-201G, previously  
4 referred to as the Hutchinson "B" No. 16.

5           Again during the first 150 days of the  
6 test we had problems with mechanical aspects on the well;  
7 however after the replacement, or the repair to the compres-  
8 sor, we were able to maintain relatively problem free opera-  
9 tions through the conclusion of the test.

10           This test was instituted in order to  
11 evaluate a well which had not been fracture stimulated. You  
12 can see again we were able to maintain essentially stabi-  
13 lized flow rate through the latter part of the test and that  
14 the flowing tubing pressure was maintained at essentially  
15 constant levels.

16           Again we would conclude from this that we  
17 did not reach boundary and that a wide area of drainage is  
18 suggested.

19           Q           All right, turn to your Exhibit Number  
20 Twelve and your fourth results of test.

21           A           This plot is similar to the previous  
22 three. This is for the final long term flow test. It was  
23 conducted on Well 1935-221G. This well has been previously  
24 referred to as the Cain "E" No. 1.

25           The test on this well was instituted in  
order to evaluate a well which was fracture stimulated  
immediately prior to commencing the test to allow us to  
evaluate the benefits of that versus a long shut-in period

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after fracture stimulation prior to commencement of production.

Again I will note problems with -- mechanical problems, mainly compressor related during the first 200 days of the test.

After these problems were solved we were able to again maintain relatively trouble free operation through the majority of the test up until the end.

From this we were able to conclude from the essentially stable flow rate and flowing tubing pressures that boundaries were not reached, that a wide area of drainage was suggested, and that basically the fracture stimulation did serve to increase the productivity of the well. I believe most of the condition ratios on these wells or production improvement ratios were somewhere between two and three.

Q Is this one of the wells that's now on sales?

A Yes, sir, that is correct. That is one of the 26 wells that is currently flowing to sales.

Q All right, from your review of these tests, did you make any conclusions?

A Yes, sir. We made basically -- we made conclusions along the three areas that we were hoping to evaluate by the tests.

Q All right, what were these conclusions which you reached?

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2           A           First of all, as far as completion ef-  
3           fectiveness, we determined that although irreparable damage  
4           did not result from fracture fluid remaining in contact with  
5           the formation for a long period of time, the most effective  
6           way to stimulate the wells was initially with acid and then  
7           as the wells commenced sales, if we determined that a frac-  
8           ture stimulation was required from the analysis of bottom  
9           hole pressure data, that the stimulation -- that that stimu-  
10          lation could be performed after the well commenced sales.

11                         In the second area, again as far as cor-  
12          rosion is concerned and how that relates to long term opera-  
13          tion within the unit, we found out that it was a manageable  
14          problem and that it would pose no significant adverse effect  
15          on prolonged operations from the unit.

16                         And lastly from the four tests, we did  
17          not see boundary effects from any of the tests. From that  
18          we would conclude that a wide area of drainage is suggested  
19          by all four tests.

20           Q           All right. Mr. Sheppard, have you made a  
21          reservoir engineering analysis on this data which has been  
22          performed?

23           A           Yes, sir, I have.

24           Q           And what was the result of this analysis?

25           A           We took the two wells which had the best  
26          production pressure data and we simulated the production  
27          history in a radial gas flow model.

28                         I'll direct your attention to what's been

1  
2 marked Amoco Exhibit Number Thirteen.

3           Let me first just describe what I've  
4 shown on the exhibit.

5           The upper third of the graph is a plot of  
6 cumulative production, and all of these numbers are plotted  
7 against cumulative time in number of days.

8           The middle third of the graph shows a  
9 plot of flowing tubing pressure, and the lower third of the  
10 graph shows a plot of production rate.

11           What we did with our computer model --  
12 oh, excuse me. One other item as far as description.

13           In the upper righthand corner I have in-  
14 sserted the reservoir parameters as relate to each one of  
15 these wells. These parameters were obtained either through  
16 analysis of open hole log data and also through analysis of  
17 bottom hole pressure transient data.

18           What we did was enter this data into the  
19 radial gas flow model. We entered the production rate and  
20 then allowed the computer to simulate the flowing tubing  
21 pressure in order to obtain a history match and compare that  
22 with what actually resulted during the long term flow test.

23           The first, on Exhibit Number Thirteen I  
24 have shown the results as performed on Well 1934-201C. You  
25 can see again in the lower portion the solid lines represent  
what the actual production data was. The dashed lines re-  
present what the computer model simulated, or what was input  
into the computer model. By input of this data the computer

1  
2 was allowed to simulate drainage on a 640-acre radius and  
3 160-acre radius.

4           You see those plots in the middle third  
5 of the graph. By comparing the actual results of the com-  
6 puter model with the actual data obtained during the flow  
7 test, you see that the 640-acre drainage area much more  
8 closely simulates what actually occurred during the test  
9 than the 160-acre drainage area does.

10           From this I would have to conclude that  
11 at least 640 acres could be drained by this well.

12           Moving to Exhibit Number Fourteen, this  
13 is exactly the same computations except this is for Well  
14 1935-221G.

15           Again we input production rate and al-  
16 lowed the computer to simulate the flowing tubing pressure.  
17 You'll see that we match the actual flowing tubing pressure  
18 much closer with 640-acre drainage case than we do with the  
19 160-acre drainage case.

20           In fact, you'll see toward the latter  
21 period of this test, the flowing tubing pressure, the actual  
22 flowing tubing pressure is slightly greater than the com-  
23 puter predicted flowing tubing pressure and therefore, this  
24 would even suggest possibly slightly greater drainage than  
25 640 acres for this particular well.

26           Q           Sir, to summarize your findings with re-  
27 gards to Exhibits Thirteen and Fourteen, what you've done is  
28 using a computer model, you've matched the production rate

1  
2 and let the computer predict the pressure, is that correct?

3 A Yes, sir, that is correct.

4 Q And the pressure it predicts is more ac-  
5 commodating or facilitating to a 640-acre drainage area than  
6 it is 160, is that the substance of your testimony?

7 A Yes, sir, it is.

8 Q Would you say that, then, that this data  
9 supports both Mr. Allen and Mr. May and yourself to the fact  
10 that this reservoir will support a wide drainage area and  
11 that development on 160 acres would result in the drilling  
12 of unnecessary wells?

13 A Yes, sir, that's my statement.

14 Q All right, have you done any analysis to  
15 reflect any economic waste which would result from drilling  
16 of wells on 160-acre spacing as opposed to 640-acre spacing?

17 A Yes, sir, I have.

18 Q What was the result of this analysis?

19 A The results are shown in several parts on  
20 the following exhibits.

21 Having validated our radial gas flow  
22 model we then used that model in order to predict rates for  
23 wells drilled on 160-acre drainage versus 640-acre drainage  
24 and then used those predicted rates to evaluate the economic  
25 impact this would have on operations from this reservoir.

I would refer you to what's been marked  
Amoco Exhibit Number Fifteen. By identification this is a  
plot of production rate in Mcf per day versus cumulative

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production.

Again the reservoir parameters for the well are set forth in the upper righthand corner of the exhibit.

What I have done is taken a 640-acre block and I have located four wells on that block and allowed the computer to simulate what the production versus the -- the production rate versus the cumulative production rate would be for those four wells.

That is shown by the solid line on this exhibit.

I then took the same 640 acres and placed only one well on it and allowed the computer again to simulate what the production rate versus cumulative production would be.

I might note a couple of aspects of I think significant importance on this exhibit.

First of all, ultimate recovery for either one well or four wells on a 640-acre block will be the same. All that the four wells on the 640 acres will serve to do is to accelerate the rate of production during the early portion of production from the 640 acres.

I took this data and used it in preparation of Exhibit Number Sixteen. I will refer you to that exhibit now.

On Exhibit Number Sixteen I have now shown what the performance of just one well on one quarter

1  
2 of the 640-acre area would perform and how the one well on  
3 the 640-acre would perform versus cumulative production.

4 Again there is no increase in ultimate  
5 recovery from the 640 acres. In fact, you can see on 160  
6 acres that the recovery for that one well will be a quarter  
7 of what it would be for the one well on the 640-acre drain-  
8 age.

9 Using both of these exhibits, I then pre-  
10 pared two subsequent exhibits in order to evaluate what  
11 drilling requirements would have to be on 160 acres versus  
12 640 acres.

13 I refer you to Exhibit Number Seventeen.  
14 This is a drilling profile for 160-acre spacing within the  
15 unit in order to maintain a 300-million cubic feet a day de-  
16 liverability. The analysis was done over a 15 year period  
17 commencing in 1985 and concluding in the year 2000.

18 We started out initially with 120 wells.  
19 During the first year, 1985, we were required to drill 43  
20 more wells in order to maintain the 300-million cubic feet a  
21 day deliverability. The red area shaded, beginning there in  
22 1985 and declining in subsequent years, shows how the pro-  
23 duction from the 163 wells that were producing in 1985 will  
24 decline with time.

25 You can see in 1986 we would have to  
drill 43 more wells in order to maintain the 300-million  
cubic feet a day. The area shaded in white shows how that  
production will decline with time.

1  
2           You can go through each following year  
3 seeing that we have to drill approximately 43 wells a year  
4 through the year 2000 in order to maintain the 300-million  
5 cubic feet a day deliverability, which would mean over that  
6 fifteen year period of time we would have to drill a total  
7 of 815 producing wells in order to maintain the 300-million  
8 cubic feet a day deliverability.

9           Now by comparison, the next exhibit,  
10 being Number Eighteen, shows what the requirement would be  
11 for 640 acres. Because the production declines at a much  
12 shallower rate, we could commence in 1985 with the same 120  
13 wells but we would only be required to drill 11 wells rather  
14 than 43 wells.

15           The red area again shows how the produc-  
16 tion from those initial 131 wells that produce during 1985  
17 would decline with time through the year 2000.

18           In the year 1986 you can see we'll have  
19 to drill 11 more wells and we would essentially have to  
20 drill 11 wells through the year 19 -- through the year 2000  
21 in order to maintain the 300-million cubic feet a day deliv-  
22 erability. That would result in the total well requirement  
23 on 640-acre spacing of 295 wells.

24           And lastly, in order to give some compar-  
25 ative exhibit of the two, on Exhibit Number Nineteen I show  
by the green line the number of wells which would have to be  
drilled commencing in 1985 through -- or the well require-  
ment beginning in 1985 through the year 2000 to maintain the

1  
2 300-million cubic feet a day deliverability.

3 That number again is 815. The red line shows the  
4 drilling requirement for 640 acres. That's 295. You can  
5 see that there's a difference of 520 wells that would have  
6 to be drilled if we were spaced on 160 acres versus 640 ac-  
7 res over the next fifteen year period in order to maintain  
8 the 300-million a day deliverability.

9 Q Do you intend to indicate by these last  
10 three or four or five exhibits that you've put on that Amoco  
11 intends to quit producing in the year 2000?

12 A No, sir, we do not. That was done in or-  
13 der to obtain a reasonable period of time in which we could  
14 show the effects of 640 versus 160. It was done merely to  
15 place everything on an equivalent basis and show what the  
16 effects would be during that 15-year period.

17 It was merely a convenient bookkeeping  
18 method in order to come up with some reasonable comparison.

19 Q And if production continues up to 2020 it  
20 would only accelerate the difference between the two, would  
21 it not?

22 A Yes, sir, that is correct.

23 Q And do you -- in your opinion does this  
24 establish economic waste and the possibility of drilling un-  
25 necessary wells in this reservoir?

A Yes, sir, I think -- I think that it does  
show that recovery would be the same and we would drilling  
520 additional wells just for the sheer fact of maintaining

1  
2 rate.

3 Q Do you have an exhibit which shows the  
4 amount of money that would have to be spent in order to ac-  
5 complish the additional drilling of these wells?

6 A Yes, sir, I do.

7 Q What's that exhibit?

8 A That exhibit has been marked Amoco Exhi-  
9 bit Number Twenty.

10 Q Explain what this exhibit shows.

11 A Exhibit Number Twenty is a tabulation of  
12 the well requirements on 160-acre spacing and 640-acre spac-  
13 ing over the fifteen year period.

14 What I have included is the incremental  
15 costs of drilling on 160-acre spacing, the incremental costs  
16 of operating on 160-acre spacing, and the incremental costs  
17 of plugging wells on 160-acre spacing, versus what would be  
18 required for 640-acre spacing.

19 Q And what did you conclude from this exhi-  
20 bit?

21 A I'll direct your attention to the lower  
22 righthand corner of the exhibit. From my calculations I  
23 have shown that in inflated dollars, that it would cost the  
24 unit approximately a Quarter of a Billion Dollars addition-  
25 al expenditure over the next fifteen years just to maintain  
the 300-million a day deliverability.

Q And if the deliverability required was  
350 or 400-million a day, that figure would increase, is

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that correct?

A That is correct.

Q And if production continues to the year 2020 instead of the year 2000, that figure would increase, is that correct?

A Yes, sir.

Q And I believe you've already stated this, but in order to just sum up your testimony with regard to ultimate recovery, did your study indicate that the drilling of wells on a spacing, or a denser spacing than 640 acres would increase ultimate reserves recoverable from this reservoir?

A No, sir, it would not.

Q What would happen drilling on 160 as compared to 640?

A The only thing that would happen is that you would accelerate the producing rate during the early life of the project.

Q In your opinion will one well efficiently and effectively drain 640 acres in this unit?

A Yes, sir, it will.

Q If you have more wells to produce and operate is it possible that your economic limit would be reached earlier than if you had a fewer number of wells which you had to produce and operate?

A Yes, sir, the possibility of that occurring is there.

1  
2 Q All right, if you would, go to your Exhi-  
3 bit Number Twenty-one.

4 Would you please explain what you've shown  
5 by this exhibit?

6 A Having established the fact with my pre-  
7 vious exhibit that 160 acres will not result in additional  
8 recovery, then, within the unit area and would only serve to  
9 accelerate the early life rate, then, within the unit. we  
10 would, if we maintained 160 acres, would still be required  
11 to drill in order to protect correlative rights.

12 Exhibit Number Twenty-one shows the ef-  
13 fect of the correlative rights issue as it relates to your  
14 application today.

15 Q All right. Explain what you've shown on  
16 these -- I believe that's a series of exhibits, is it, all  
17 of which are numbered Exhibit Number Twenty-one?

18 A Yes, sir, it is. It's a multi-paged ex-  
19 hibit but it is all Exhibit Number Twenty-one.

20 Q All right, go ahead and explain what  
21 you've shown starting at the top and going on down.

22 A This is a typical section within the  
23 Bravo Dome Unit where royalty interests have not been com-  
24 mitted to the unit and therefore correlative rights become a  
25 matter of issue. The protection of correlative rights is an  
obligation upon the unit and upon the separate leaseholders.

This is for means of identification Sec-  
tion 24, Township 18 North, Range 33 East.

1  
2 We have in this section three tracts that  
3 have unique and separate fee lessors and which have not been  
4 committed to the unit.

5 The area shaded in red, Tract A, has 62-  
6 1/2 percent of the gas in place based on acreage dedication.

7 Tract B, shaded in green, has 25 percent  
8 of the gas in place, and Tract C has twelve and 1/2 percent  
9 of the gas in place.

10 If you would turn to the next page,  
11 please. We commence drilling on this section. We drill  
12 the first well in the northwest quarter of the section. 160  
13 acres is dedicated to it. You can see that although Tract A  
14 has 62-1/2 percent of the gas in place, it now has 100 per-  
15 cent of the royalty allocation from the section; therefore  
16 it would be incumbent upon the operator to correct this pro-  
17 blem.

18 Therefore, if you'll turn to the next  
19 page, the next step would be to drill an additional well.  
20 This well was drilled on the northeast quarter to protect  
21 royalty owner B's interest. Now you see that Tract A has  
22 62-1/2 percent of the gas in place but his royalty alloca-  
23 tion for the section is only 50 percent. You can see that  
24 although royalty owner B has 25 percent of the gas in place  
25 his royalty allocation is 50 percent.

Again it becomes incumbent upon the oper-  
ator to protect the royalty holders. Another well is re-  
quired. That's shown on the next page.

1  
2 We drill an additional well in the south-  
3 east quarter. Now Tract A with 52-1/2 percent of the gas in  
4 place still only has 50 percent of the allocation. Tract B,  
5 with only 25 percent of the gas in place now has 33 percent  
6 of the royalty allocation, and Tract C, with 12-1/2 percent  
7 of the gas in place has a royalty allocation of 16.7.

8 Therefore a fourth well would be required  
9 on this section solely for the purpose of protecting corre-  
10 lative rights.

11 This fourth well is drilled in the south-  
12 west quarter. Now with four wells on the section we have a  
13 royalty allocation which is equal to the gas in place allo-  
14 cation among all three separate royalty holders on this sec-  
15 tion.

16 Finally, on the last page I have shown  
17 that with 640-acre spacing one well any place in the section  
18 will result in all royalty allocations being equivalent with  
19 the gas in place allocation to all parties within that  
20 section.

21 Q So it's your conclusion, then, from these  
22 series of exhibits, Exhibit Number Twenty-one, that 640-acre  
23 spacing is necessary to protect the correlative rights of  
24 the unsigned owners, if one well can efficiently and  
25 effectively drain 640 acres, is that correct?

A Yes, sir. The problem with drilling  
solely to protect correlative rights can be mitigated by the  
adoption of 640-acre spacing which will insure the

1  
2 protection of all interests within each section.

3 MR. NOTE: We offer Exhibits  
4 Nine through Twenty-one into evidence and tender the witness  
5 for cross examination.

6 MR. RAMEY: Exhibits Nine  
7 through Twenty-one will be admitted.

8 And are there any questions of  
9 Mr. Sheppard? Mr. Lopez.

10 MR. LOPEZ: Could I have just a  
11 second, Mr. Chairman?

12 MR. RAMEY: Yes. Why don't we  
13 take fifteen minutes.

14 (Thereupon a recess was taken.)

15 MR. NOTE: Mr. Chairman, I need  
16 to ask him one more question, if I could.

17 MR. RAMEY: All right, Mr.  
18 Note.

19 Q Mr. Sheppard, in the area of first pro-  
20 duction, where Amoco intends to first produce, how many un-  
21 necessary wells, in your opinion, would have to be drilled  
22 to protect correlative rights in that area only?

23 A In looking at the unsigned royalty inter-  
24 ests within the area around the first compressor station,  
25 which either is producing or will commence producing in the  
very near future, we would be required to drill at least 70  
additional wells just to protect correlative rights, and as

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we, you know, as I've already shown, that would be the sole purpose of that. It would not result in increased recovery.

MR. NOTE: Pass the witness.

MR. RAMSEY: Before we start it, I want to note that I do have a letter of appearance here from Jeff Taylor, Attorney for Jim Baca, Commissioner of Public Lands, in this case.

Any questions?

CROSS EXAMINATION

BY MR. LOPEZ:

Q Mr. Sheppard, just with respect to that last answer. From my reading of the windows on that east side of the unit, I'd like for you to justify how at least 70 additional wells would be required.

A Mr. Lopez, on our Exhibit Number One we only showed windows with uncommitted working interest. We did not show windows with uncommitted royalty interest, and I have that here with me. We did not enter it as an exhibit but if you would like to see it, I cannot see why it would create any problems.

I've got the little dots and everything on it, if you'd like to count them.

Q Well, we may want to do that.

How much of the unit is -- how much acreage in the unit is committed to the unit agreement?

A I do not know.

2           Q           Does it vary between working interest and  
3 royalty interest?

4           A           I do not know.

5           Q           On what basis then are you capable of  
6 drawing the necessary document you just described?

7           A           I'm capable of taking the exhibit which  
8 is a compilation of all tracts within the unit and from dis-  
9 cussion with our unitization group finding out which tracts  
10 have uncommitted royalty interest.

11                   I then mark those tract numbers and lo-  
12 cate them on the map, shade those areas.

13           Q           Well, in your discussions with the uniti-  
14 zation group, didn't you discover that it's very common that  
15 in many of these major leases that the working interest,  
16 which is by far the vast majority of the interest in the  
17 lease, have committed whereas most royalty owners are not?

18           A           Sir, again, to answer that statement --  
19 that question, I do not know, but if I understood what you  
20 just asked me, a large majority of the royalty interest is  
21 committed within the unit.

22           Q           A large majority of the royalty interest,  
23 so you do know that its percentage is more than half.

24           A           I can't state that for a certainty. Let  
25 me say a large percentage, rephrase my previous statement  
and say a large percentage of the royalty interest is com-  
mitted but I have in no shape or form been involved in uni-  
tization project. I have in no shape or form even been un

1  
2 der my employment, been given the responsibility of helping  
3 put together the unit, and therefore I do not know what the  
4 final outcome of royalty owner commitment to that unit is.

5 Q Well, it seems that if you were able to  
6 testify as to how many offset wells would have to be drilled  
7 to protect correlative rights, you must have a pretty good  
8 clue as to what acreage has joined the unit and what acreage  
9 has not joined the unit to compute exactly how much of the  
unit is committed to the unit and how much is not.

10 A Mr. Lopez --

11 MR. NOTE: Objection. The  
12 question is argumentative and he's already asked the ques-  
13 tion and it's already been answered one time.

14 MR. RAMEY: Sustain the objec-  
15 tion.

16 Q Let's, Mr. Sheppard, let's go to the four  
17 wells that you've discussed with respect to having conducted  
long term flow tests.

18 A Yes, sir.

19 Q Would you describe the location, I don't  
20 believe you did in your direct testimony, the exact location  
21 of each of the four wells? I do realize that they were  
22 shown on I think your first exhibit with red arrows, but  
23 just for the record, if you could identify the section and  
township I think those would help us.

24 A Yes, sir.

25 The numbering system which Amoco devised

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with the permission of the State for Bravo Dome gives the location of each well merely in the number of the well.

Exhibit Number Nine, the well is located in Township 19, Range 33. It's located in Section 3, Tract M.

The next well is located in 19, 34, Section 11, Tract G.

On Exhibit Eleven the well is located in Township 19 North, Range 34 East, Section 20, Tract G.

And the last well is located in Township 19 North, Range 35 East, Section 22, Tract G.

MR. RAMEY: When you say Tract G you mean -- G and M, you mean unit letter?

A Yes, sir, excuse me, as designated by the Commission nomenclature, Unit letter G and M.

MR. RAMEY: Thank you, Mr. Sheppard.

Q Approximately how far apart are these wells from each other?

A Let me just tack this back up on the wall and talk about it.

Let me, Mr. Lopez, let me start with the well in 19,35. You can see that this well is located in the very far southeast corner of the unit.

The next well, which is located in 19, 34, Section 11, is approximately four miles to the northeast.

1  
2                   The next well, which is also located in  
3 19, 34, is approximately three and a half miles to the  
4 southwest of the second well.

5                   And the last well, which is in 19, 33, is  
6 located somewhere around five miles to the northeast.

7                   MR. MOTU: Northwest.

8                   A           Excuse me, northwest. I'll learn direc-  
9 tions one of these days. Northwest of the third well.

10                  Q           And approximately how far is that last  
11 well you've just described located from the Libby and Mit-  
12 chell leases?

13                  A           If you're referring to the Libby and Mit-  
14 chell leases, I'm not quite familiar with it. Those are the  
15 window areas, is that correct?

16                  We're to the nearest boundaries around,  
17 oh, give or take eight miles, nine miles, to the east of the  
18 Libby and Mitchell Ranch areas.

19                  Q           And approximately how far from the blue  
20 area indicated on the map where the production is?

21                  A           Oh, you could give yourself probably an-  
22 other five miles, six miles, something like that.

23                  Q           Now I believe in your testimony you  
24 stated that the flow tests, one of the things you learned  
25 from the flow tests was that they didn't encounter any in-  
terference, indicating to you that this indicated a drainage  
for a large area.

I'd like to discuss that with you for a

1  
2 minute.

3                   What type of interference would you have  
4 expected for the period of time in which the wells were on  
5 in a flow test?

6                   A           Mr. Lopez, I believe my exact words were  
7 that we did not encounter any boundary effects, and boundary  
8 effect, as normally seen by reservoir engineers, would be  
9 most easily seen when the -- when the pressure transient in-  
10 duced by the production from the well reaches a limit and  
11 essentially at that point in time the production rate -- you  
12 will see either one of two things. If you hold your produc-  
13 tion rate constant your flowing pressure will decline. If  
14 you hold your flowing pressure constant your production rate  
15 will decline.

16                   From those two things we are able to  
17 evaluate the effective area of drainage of a well and loose-  
18 ly using the term boundary effect able to define the area at  
19 the boundary of that area as having encountered the boundary  
20 effect.

21                   If I understand the rest of your ques-  
22 tion, we did not expect to see any boundary effects because  
23 we saw geologic continuity over the area from theoretical  
24 calculations that have been performed all the way from  
25 simple Darcy Law through very complex reservoir simulators,  
all of those theoretical calculations showed us that we had  
well in excess of the capability of draining a very large  
area, at least 640 acres in size.

1  
2 Q Isn't it conceivable that at the time you  
3 drilled these four wells for flow test purposes that you  
4 could have drilled an offset well on 160-acre spacing pat-  
5 tern and not encountered any boundary effect as well? We  
6 don't know that, do we?

7 A I'm afraid you'll have to restate your  
8 question because I can't follow it.

9 Q What is the reason you didn't drill an  
10 offset 160 for the purpose of this flow test?

11 A I believe in our previous hearing we pre-  
12 sented information on tightly spaced areas and received tre-  
13 mendous criticism of that data as not showing wide drainage  
14 areas, and therefore we wanted to get an area of wide drain-  
15 age. That's the reason we didn't drill on 160's.

16 Q But on the basis of what you've done, we  
17 have no idea -- we have no information that's been presented  
18 today that an offset well on 160-acre spacing pattern would  
19 have encountered any boundary effect, as well, do we?

20 A Yes, sir, I've very -- yes, sir, we do.  
21 All of the performance calculations that I have made shows  
22 from a reservoir engineering standpoint that from those four  
23 wells -- well, let me back up.

24 From at least two of the wells in which I  
25 performed -- which we performed the reservoir simulation  
work, that those wells performance will drain at least 640  
acres, and if you had a well located closer than 640 acres,  
that well would be within the drainage radius of a well

1  
2 that's going to drain the larger area.

3           And so I don't quite understand the ques-  
4 tion about boundary effects on a well on 160.

5           You know, we could drill a well on 160 as  
6 an observation well, but all that would do is just give you  
7 some other time in which to enter back into interference  
8 calculations and we would calculate the same thing. That's  
9 what we did in our previous hearing, and again, like I said,  
10 we received a large amount of criticism of that work because  
11 of the tight spacing in which we tried to perform the inter-  
ference calculations.

12           Q           Well, your discussion of time brings up  
13 another subject.

14                       Referring to your Exhibit Fifteen, for  
15 example, as I read that exhibit it shows that whether you  
16 drilled one well on 640 acres or four wells on 640 acres,  
17 according to your calculations you should expect to recover  
about 10-billion cubic feet.

18           A           That is correct, yes, sir.

19           Q           And as I read the exhibit, one well or  
20 four wells would recover the 10-billion in the same time  
21 frame.

22           A           No, sir. This is a cumulative production  
23 plot. I'm plotting rate versus cumulative production. Time  
24 is not a reference point in this exhibit.

25           Q           If time were a reference point in this  
exhibit what would it show?

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2           A           Specifically, I don't know. I didn't  
3 make that calculation.

4                       Generally, it would show what everybody  
5 knows, that rate acceleration, four wells is going to drain  
6 the area in a shorter period of time than one well is.

7           C           I believe these exhibits, this series of  
8 exhibits, was based on your earlier Exhibits Thirteen and  
9 Fourteen, and referring you, for example, to Exhibit Thir-  
10 teen, as I read that exhibit it shows that the rate that you  
11 adopted for the purposes of doing your computer simulations  
12 does not decline. It stays at a constant rate forever at  
13 about 950 Mcf a day.

14           A           No, sir, it does not. It shows that that  
15 rate stays constant through day 1020.

16                       What we did, as I mentioned previously,  
17 there's two ways to evaluate a boundary effect: Hold your  
18 rate constant, allow your pressure to decline or hold your  
19 pressure constant and allow your rate to decline.

20                       We chose in this area to hold the pres-  
21 sure constant, or excuse me, to hold the rate constant at  
22 the average rate which was, like you say, somewhere around  
23 950 a day, at the average rate for the flowing period prior  
24 to that. We held that rate constant and then allowed the  
25 pressure to decline in order to evaluate how the pressure  
transient was moving through the reservoir and from that  
what area we most likely would be able to drain with the  
well.

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So it doesn't, no, it does not stay constant forever. At some point in time -- in fact we entered into the calculation a bottom hole pressure cutoff, flowing bottom hole pressure cutoff of 200 psi, and once we encountered 200 psi, which we figure would be the minimum bottom -- flowing bottom hole pressure we would need to get into the system as it is now, at that point in time the rate would start to decline.

So we entered that assumption into the calculations, and as you can see, during the 1000 day period of time that 200 pound bottom hole pressure limit was not encountered so the rate did not start to decline.

Q But would you not agree with me that in a normal well both the rate and the pressure are going to decline over a period of time?

A Well, yes, sir, the rate and pressure are going to decline but in Darcy's Law they are an explicit function of each other; therefore higher rate, greater pressure drawdown; lower rate, less pressure drawdown. So they're -- they're inversely proportionate to each other in Darcy's Law.

Q With infinite reserves?

A No, sir, not with infinite reserves. We are -- we are considering reserves from the point that once you reach the pressure that you have to maintain in order to produce, the rate will begin to decline and the rate will continue to decline till you reach your economic limit and

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at that point in time you will have produced the amount of reserves available to you.

Q Mr. Sheppard, have you calculated what you estimate to be the estimated recoverable reserves under each 640-acre tract in the Bravo Dome Unit?

A Gosh. No, sir, I have not. I don't if we've got enough engineers at Amoco to individually do that.

We have performed a unit-wide simulator but that's been two or three years ago and that was only for the purposes of getting an idea of the total reserves in the unit.

It has been done in house. I have not done it. I helped gather the data that was entered into it.

Q Amoco originally had a calculation of what its required production was going to be, did it not? Wasn't that approximately 1-1/2 billion per day?

A I do not recall that number, Mr. Lopez. If you could give me some background reference maybe I could address it.

Q Well, do you know what your current estimate if your required volumes are on a daily basis?

A Current?

Q What you're projecting for your project at this time as a base?

A Well, I know what our deliverability capabilities are and I can give you the numbers that we have estimated right now.

1  
2 We, as I believe Mr. Allen mentioned, are  
3 producing 26 wells which are delivering, I believe, to Amer-  
4 ada Hess at 35 to 40-million a day currently.

5 Depending on commencement of several  
6 other projects toward the end of this year, we hopefully  
7 will be able to deliver an additional 90-million by the end  
8 of this summer and an additional 120-million by the end of  
9 the year, but those are very, very tentative numbers. That  
10 depends on a lot of things that -- that I have no knowledge  
11 in nor control over. Those are strictly for the purposes of  
12 trying to gear our facility construction right now.

13 Q Could you tell me what, if you know, the  
14 average flow rate of your wells that you've drilled is?

15 A Of all 300 of them?

16 Q Well, yes, if you know.

17 A The average -- no, sir, I cannot say that  
18 I've calculated an average for all 300 wells and I think any  
19 number that I said would be based strictly on conjecture on  
20 my part.

21 Now I can tell you about the ones that  
22 are currently producing and about the ones I have knowledge  
23 about testing, but I've definitely not averaged all 300.

24 Q Well, why don't you then tell me about  
25 those that are now producing and those that you've tested?

A Well, the ones that are currently produc-  
ing right now are making around one and a half million a day.  
We have found that in the initial area of development that

1  
2 the average rate that could be sustained in that area ap-  
3 pears to be, I would say, at least that much if not a little  
4 more.

5 Q Are the wells that you've tested, have  
6 you produced them at their full deliverability?

7 A There are -- yes, sir. Let me give you  
8 just a brief explanation of what we did in the testing pro-  
9 gram since the last hearing.

10 All those wells were drilled and every  
11 one of them were completed and an initial flow test was ta-  
12 ken. On virtually every well we then ran a bottom hole  
13 pressure build-up. We performed transient analysis. We  
14 then stimulated the well and then performed another tran-  
15 sient analysis after another flow period in order to deter-  
16 mine the effectiveness of the completion and also to help to  
17 establish the productivity of the wells.

18 So on virtually every well that's been  
19 drilled since the last hearing we do have bottom hole pres-  
20 sure data and we do also have flow rate data.

21 Q Mr. Sheppard, it seems, or if I recall  
22 correctly at the last hearing on this matter, Amoco sug-  
23 gested that the estimated recoverable reserves in the Bravo  
24 Dome Unit were from 6 to 8-trillion cubic feet. Do you re-  
25 call that figure?

26 A I do not recall having read it in the  
27 transcripts but I -- I wouldn't stand severely opposed to  
28 it, no. That was from, as I previously mentioned, in-house

1  
2 computer simulation of the unit in order to try to determine  
3 approximate reserves beneath the Bravo.

4 Q Does the unit agreement address that at  
5 all, to your knowledge?

6 A Sir, as I've already testified, I have no  
7 knowledge at all of what's in the unit agreement and have  
8 not been -- not worked on it at all.

9 Q Well, again referring to what you've  
10 marked as Exhibit Sixteen, as a typical Bravo Dome Gas Unit  
11 well, if I calculate correctly, if the total cumulative pro-  
12 duction under a typical well is 10,000 -- 10-billion cubic  
13 feet, then a spacing pattern on 640-acre spacing throughout  
14 the unit will only recover approximately 1.6-billion cubic  
15 feet.

16 A I've not done the calculations. I can't  
17 say anything to that.

18 Q Again looking at, let's say, this same  
19 exhibit, I notice that the -- well, we've done some calcula-  
20 tions with respect to your Exhibits Thirteen -- no, Fourteen  
21 and Fifteen and Sixteen, and using your millidarcies and  
22 porosity, and feet, and we get a KH factor of a low of 1373  
23 and a high on this -- on Exhibit Thirteen of 5047, or in the  
24 case of Exhibit Fourteen, 1866.

25 Q Would you agree with me that this varies  
significantly from the wells on the western part of the unit  
by as much as some three to four times, the wells on the  
western unit having approximately 500 KH or less?

1  
2           A           I have not seen evidence showing 500 KH.  
3 I will agree that it is different and that it is probably  
4 less. I don't know if the 500 number is correct.

5           Q           Did you ever inquire of Amerigas the in-  
6 formation with respect to the wells that they have producing  
7 for many years?

8           A           I did not.

9           Q           And would not that information have been  
10 of some help in supporting or not supporting the basis for  
11 your application here today?

12           A           Why did you avoid seeking out that in-  
13 formation and putting it into effect here today?

14           A           Which question would you like me to an-  
15 swer? Both?

16           Q           I guess the last one.

17           A           The last one is because we and Amerigas  
18 seemingly have different ideas about the area and in talking  
19 with other parties in the area who have attempted to gather  
20 some information, we didn't feel it was worth the time or  
21 effort to try to extract that information because we didn't  
22 feel it would be made available to us.

23           MR. LOPEZ: I have no further  
24 questions.

25           MR. RAMEY: Any other ques-  
tions? Mr. Padilla.

CROSS EXAMINATION

BY MR. PADILLA:

Q Do you know if there is any pressure communication between wells on the west side of the unit that are unit wells and that are separated by approximately a mile? I noted that there quite a few locations that are separated by approximately a mile.

A You're speaking of the --

Q The yellow --

A -- the orange dots in the southwest quarter --

Q Right.

A -- of the Bravo Dome Unit?

Q Right.

A If there's any pressure communication, is that correct?

Q Correct.

A No, I do not know that.

Q Do you know if there's any pressure communication between wells in the north portion of the unit?

A With each other?

Q With each other, yes.

A I do not know that.

Q You have not conducted any other flow tests or interference tests other than the four flow tests?

A Yes, sir, we have. That information was entered in the previous hearing.

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Q Did you stimulate the injection wells for the flow tests?

A I do not know.

Q You testified you stimulated all of the wells. Would it be a correct assumption that you stimulated the injection wells, as well?

A Sir, I don't believe we stimulated all of these wells. I said we had --

Q I believe you testified as to the standard procedure that Amoco followed --

A I said a standard procedure. I did not address the number of wells.

Q Do you know what the fracture pressure is on the injection wells?

A The fracture gradient for injection wells, as I can recall from my days in Hobbs which have been a few years ago, was somewhere on the order of .6 and .7, which is a normal fracture gradient.

Q At what rate were you -- at what pressure were you injecting into the wells?

A I do not know.

Q Would it be reasonable to conclude that you fractured the formation, therefore you had pressure communication on the flow tests?

A No, sir.

Q You wouldn't have that barrier if you had -- if you did fracture the formation, would you? It

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wouldn't be shown.

A            If I fractured the formation two and a half miles, which each injection well was located, I believe the minimum distance was two and a half miles, and if I fractured it far enough that the gas could flow down the fracture and then moved into the area being depleted, that would be a correct assumption.

Q            Did you inject water into those injection wells?

A            Not to my knowledge.

Q            All you did was recycle the gas and separate the water and take the gas back and inject it, is that

--

A            Yes, sir.

Q            You don't know what pressures you injected at.

A            No, sir.

Q            Nor do you know what the fracture gradient is.

A            Yes, sir. The fracture gradient is about seven.

Q            You don't know whether you fractured the formation?

A            Are you talking about with our injection rate?

Q            Or with your injection.

A            Conclusively I cannot state that. It's a

1  
2 policy of Amoco's that any injection that occurs, whether  
3 gas or liquid is less than formation parting pressure.

4 Q Assuming that you fractured the forma-  
5 tion, that gas would get back to your producing well quick-  
6 er, wouldn't it, or at least pressure the reservoir to where  
7 the producing wells would produce at a greater rate.

8 A Assuming that we fractured the well, de-  
9 pending on the extent of that fracture, that would be --  
10 that could be a correct statement.

11 Q And that would affect your drainage cal-  
12 culations, wouldn't it?

13 A It could have an effect on the interfer-  
14 ence, yes.

15 Q Would you agree with the general state-  
16 ment that you could simulate all you want but you're not  
17 going to get anything until you actually do a production  
18 test with flowing into the pipeline at an efficient rate of  
19 production?

20 A Two means of simulating. One is taking  
21 theoretical data and simulating based on that; and the other  
22 is taking production data.

23 Q What variables did you use in your model?

24 A The variables I used in my model were re-  
25 servoir properties that were determined either through open  
26 hole log analysis, along with bottom hole pressure transient  
27 analysis, along with actual sustained production.

28 Q But you did not use any assumed data, is

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that what you're saying?

A We did not. The only assumed data that we used was -- was in order to make future projections. The actual history match of the model was from actual data.

Q As to future production, that would -- that would -- or as to future calculations, you're really talking about future deliverability requirements, aren't you?

A Will you please restate that? I don't think I understand, I'm sorry.

Q Well, are you assuming future deliverability requirements in your calculation?

A The ones that I performed in the simulations?

Q Yes.

A No, sir.

Q Whose deliverability requirements are you using when you testify with regard to deliverability requirements? Are they Amoco's or all the other working interest owners in the unit?

A Which deliverability requirements are these, sir?

Q Well, you say that by the year 2000 you're going to have X amount of deliverability requirements. Are you assuming those or do you have -- how did you compute those?

A We used 300-million as a initial start

1  
2 because that is what fairly closely approximates what we as-  
3 sume deliverability will be by year end, this year. We  
4 maintained that in order not to confuse the exhibit any fur-  
5 ther. I assumed that that would be a constant demand, which  
6 is as arbitrary as assuming we're going to cease production  
7 in the year 2000.

8 Q You didn't -- you didn't seek that in-  
9 formation from Amerigas or UGI or any of the other working  
10 interest owners who have not committed their interest in the  
11 unit area.

12 A I'm just a reservoir engineer. I don't  
13 market.

14 Q Well, you testified about and you worked  
15 on those exhibits, did you not?

16 A Yes, sir, I sure did.

17 Q And you are aware -- you must have got  
18 those figures from somewhere, did you not?

19 A I got them from the figures that we were  
20 given for estimated requirements for unit production by the  
21 year end, and we held those constant.

22 Q And those are Amoco's figures.

23 A I don't know whose figures those are.

24 Q Do you agree with Mr. Allen's statement  
25 of this morning that under the unit plan you really don't  
26 have any drilling requirements as far as spacing is con-  
27 cerned?

28 A I would agree with Mr. Allen's full

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statement, and that is that we don't have any drilling obligations as far as spacing is required except in the areas that were necessary to protect correlative rights.

We do feel as a unit operator we have an obligation to the unit that we operate that unit in a prudent manner, which would demand that we space wells at an optimum spacing.

Q The unit would still have an opportunity to offset any wells that might be drilled, wouldn't it?

A The unit would have an opportunity to offset any wells that might be drilled.

Q Outside the unit area?

A We always have that opportunity.

Q That's the definition of correlative rights, isn't it? Opportunity to produce your just and equitable share --

A Just and equitable share of reserves beneath your property.

Q You're not trying to protect the correlative rights of the people within the windows, are you?

A Which windows do you refer to, sir?

Q The ones that are inside the area of the application and not committed to the unit.

A Working interest?

Q Working interest.

A I think that we're interested in protecting everybody's correlative rights.

1  
2 Q You have no obligation, however, to pro-  
3 tect anyone else's correlative rights, do you?

4 A We have the obligation insofar as that we  
5 do not cause action to occur that would adversely affect the  
6 parties correlative rights and put them at a point that they  
7 cannot protect their correlative rights.

8 Q You've had requests from other interest  
9 owners not committed to the unit to protect their correla-  
10 tive rights?

11 A I'm not involved with, again, with uniti-  
12 zation part of it, that being the unit group's responsi-  
13 bilities.

14 Q On this point of drilling 70 additional  
15 wells, I don't understand how you come up with that figure.  
16 I wonder if you might explain that aspect of drilling those  
17 70 wells for me.

18 A Would you like to see the exhibit that I  
19 prepared that on?

20 this is a unit tract map.

21 MR. JARAMILLO: Mr. Chairman,  
22 could we have it put up on the board so perhaps the rest of  
23 us could see it, too?

24 A This is a unit tract map of the first  
25 Bravo Dome Unit. In particular, typically, I look at the  
area from which production is now commenced and in the area  
which we anticipate will be on production by year end, and  
looking at that area I took the tract designation exhibit

1  
2 from the unit agreement, found out from the Unitization  
3 Group the tract numbers that had uncommitted wells and those  
4 areas are shaded in blue.

5           The green dots I put on for existing  
6 wells. I then put on the blue dots, which indicate wells we  
7 would have drilled anyway on 640-acre spacing, and then I  
8 put on red dots which showed the additional wells that would  
9 have to be drilled on 160-acre spacing in order to take care  
10 of the correlative rights issues, just like the one that I  
11 pointed out in Exhibit Twenty-one, which as I mentioned, was  
12 this section right here.

13           Q           Did you obtain that map from your Land  
14 Department?

15           A           I obtained this map from our Unitization  
16 Group.

17           Q           It's not a unit function, then, it's a  
18 lease function as to whether or not the royalty interest de-  
19 dicated the royalty interest to the unit, is that correct?  
20 In other words, those leases are only committed insofar as  
21 the working interest is concerned.

22           A           The working interest is committed. The  
23 royalty interest is unsigned.

24           Q           It would be incumbent on the lease, on  
25 the lessee to protect against drainage in accordance with --  
or pay more royalties in accordance with those various  
leases.

          A           It would be incumbent upon the lease and

1  
2 as far as my very limited knowledge of the unit is concern-  
3 ed, then upon the unit itself to protect that lessor (not  
4 understood) royalties.

5 Q Are those leases United States Government  
6 leases?

7 A The leases that I pointed out, and I can  
8 go through each one of them, but I do believe that, in look-  
9 ing at everyone that I can see right here, each one of those  
10 leases is a fee lease.

11 Q Do you know of any plans for those royal-  
12 ty interests to drill wells to protect their correlative  
13 rights?

14 A Themselves?

15 Q Yes.

16 A I don't quite understand how they could  
17 under the lease they've issued to their lessee.

18 Q It's up to the lessee, isn't it?

19 A It's up to the lessee to protect the cor-  
20 relative rights.

21 Q Do you know of any plans of those lessees  
22 to drill 70 wells?

23 A I think that point is moot. It would  
24 only become incumbent upon that lessee to drill after pro-  
25 duction is commenced. That's the only time correlative  
rights would be affected, and that's the reason we're here  
today. We're trying to resolve that problem.

Q In other words, there -- you don't know

1  
2 of any plans for the lessees of those leases to drill 70  
3 wells that you would have to offset?

4 A Well, the plans of the lessees, which  
5 predominantly is Amoco, would be that we would have to drill  
6 those wells to protect correlative rights if 160-acre spac-  
7 ing is retained.

8 Q Have you had any demands by those lessees  
9 to drill those wells?

10 A I don't know. That would come from the  
11 Unitization Group.

12 Q You can't testify as to any pressure  
13 drawdowns other than the four flow rate -- four tests that  
14 you've conducted?

15 A I cannot testify to any long term pres-  
16 sure drawdown work other than the four that I've testified  
17 to.

18 Q Well, all the wells you've drilled,  
19 that's about the only conclusion you can draw is to those  
20 four tests?

21 A From those four tests plus the interfer-  
22 ence tests that we entered in the last hearing.

23 Q That's really the only new data that  
24 Amoco's presenting at this hearing.

25 A Oh, no, sir. We drilled 193 additional  
wells which showed geologic continuity through the whole  
area, which is the number one premise that you have to have  
in order to obtain wide spacing.

1  
2 We've also obtained new core data.

3 We've also obtained pressure data, bottom  
4 hole pressure data to evaluate reservoir parameters to as-  
5 sure that we have permeability high products sufficient to  
6 produce in the area.

7 Q None of those wells have been produced,  
8 have they?

9 A There's 26 wells on production right now  
10 but only --

11 Q Four months.

12 A For two months, four wells on long flow  
13 tests, three wells which were interference tests.

14 Q You don't know whether those wells, or how  
15 many of them are going to be productive or ultimately suc-  
16 cessful wells till you actually produce them, is that cor-  
17 rect?

18 A No, sir, once we complete them we know  
19 which ones are going to be productive and which ones will be  
20 nonproductive.

21 Q But you don't know for how long.

22 A I think that we have a very good idea be-  
23 cause of geologic continuity of this area how long. That's  
24 one of the things that is absolutely necessary in complete  
25 evaluation of the reservoir, is the interphase of geological  
and engineering data, and in an area where you show contin-  
uity of geology, that makes it very easy to take engineering  
analysis from one area and adjust as the continuity so dic-

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tates.

Q Mr. May testified that there is water in some of these wells but he didn't know the extent of how much water there is. That affects the production characteristics of each and every well, doesn't it?

A Oh, yes, sir.

Q You only have one injection -- salt water injection well on the unit now, isn't that correct?

A Two. We have two.

Q Are you operating both of the wells?

A As I understand, there is a well -- as I know, there is a well at our pressure facility tract. There's another well about six miles away. So far we have not produced any water from the 26 wells that are on production, so we're not utilizing either well.

Q Did you have a period of -- how long does it take to dry out one of those wells, wet wells?

A Again, Mr. Padilla, the term -- dependent upon whether or not the well is fracture stimulated. If there's a large volume of load, that would have to be recovered, but it would vary from portions of the unit; however, from engineering studies that have been made, we have determined that an average producing rate of water, and this was used in designing our facilities, would not exceed more than 2 barrels per day per well.

Q You started to testify about three areas in the area of the test -- of your tests. I think that you

1  
2 got diverted. Can you tell us about what three areas you  
3 started to talk about?

4 You mentioned three areas and I don't  
5 think you ever finished your statement.

6 A Three areas of what, please, sir?

7 Q Three areas in relation to the tests that  
8 you conducted.

9 A Areas that were --

10 Q Or did I hear incorrectly?

11 A I'm sorry, I don't understand. Areas of  
12 concern or areas of --

13 Q Areas of tests. You were talking about  
14 the flow tests at the time.

15 A The three -- the only time I can remember  
16 making a statement concerning three areas was the three  
17 areas of concern that we would address by the performance  
18 data obtained from those four long flow tests.

19 I cannot, I'm sorry, I cannot -- if you  
20 can help me I'll --

21 Q Which --

22 A Are you talking about geographical areas  
23 or perceptual areas? I only testified to perceptual areas  
24 of concern, not geographical areas.

25 Q Well, explain to me what you mean by per-  
ceptual areas.

A The perceptual areas were we need to  
evaluate the effect of corrosion on long term producing

1  
2 operations, so we instituted a test with an accelerated --  
3 with an accelerated ability for corrosiveness by perforating  
4 below the gas/water contact.

5 The second area of concern that we wanted  
6 to address was the effective drainage radiuses of wells.

7 And the third area we wanted to address  
8 was to obtain field data to help substantiate whether or not  
9 Mr. May's geological interpretations of completion effec-  
10 tiveness were valid.

11 And that was the three areas that we set  
12 out to address with the long term flow tests.

13 Q I think I've already established  
14 geographically that the four tests were located fairly close  
15 to each other, I guess, within -- in the -- well, at least  
16 they're in Harding County, or Union County, isn't that  
17 correct?

18 A Yes, sir. I believe that it's  
19 approximately twelve or thirteen miles from the well on the  
20 southeast end to the well on the northwest end, as far as  
21 the four -- situation of the four wells that we tested.

22 MR. PADILLA: Mr. Ramey, I  
23 believe that's all I have.

24 MR. RAMEY: Any other questions  
25 of Mr. Sheppard?

MR. JARAMILLO: Hopefully, a  
very few, Mr. Ramey.

## CROSS EXAMINATION

BY MR. JARAMILLO:

Q Mr. Sheppard, on this drilling of unnecessary wells, again, with respect to the little exhibit you have up there showing that you would have to drill 70 additional wells, what still is not clear in my mind is, what is triggering the responsibility as you see it of Amoco to drill those 70 wells?

A Commencement of production in the area.

Q Okay, whose production? Amoco's production?

A Commencement of production from the Bravo Dome Unit, which is operated by Amoco.

Q Well, who else is producing wells in the Bravo Dome Unit?

A Within the outer boundaries of the unit or within the unit?

A Within the unit the production is the unit, which is operated by Amoco.

Q Well, are you saying that Amoco is triggering its own responsibility to drill these wells?

A No, sir, I'm saying that production from the unit, which in actuality, if we want to get down to hard facts, is going to Amerigas. I mean, excuse me, to Amerada Hess. I'm sorry.

The production is going to Amerada Hess on their demand for the gas and that commencement of that

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production, I believe, as Mr. Allen testified on April 2nd has set up a situation that could trigger offset demands in order to protect correlative rights.

Q Could trigger; has not triggered at this point?

MR. NOTP: Objection. That's a question of law which this witness is not qualified to answer.

MR. JARAMILLO: Well, he's told us that there are 70 wells that somehow or another are going to have to be drilled. I'm just trying to find out what is triggering that problem.

MR. RANEY: I believe the witness can give us some kind of answer on that.

A Sir, we have an obligation under leases, not only Amoco but all other leaseholders in the area, have an obligation to protect correlative rights of the lessees -- lessors, excuse me.

We, whether or not we receive demand, I feel relatively confident that we would have to drill those wells in order to protect us from legal liability.

Q Well, you're going to have to drill a well to offset another well that somebody else has put in, right? Isn't that what we're talking about here?

A That is correct.

Q And is that -- that somebody I'm talking about would be somebody in one of those uncommitted windows,

1  
2 isn't that right? Otherwise the well that would be drilled  
3 and triggering would be an Amoco-operated well.

4 The question seems to be a simple one.

5 A I'm sorry, I can't --

6 Q Whose activity in drilling a well trig-  
7 gers your responsibility to drill an offset well that you  
8 believe is unnecessary?

9 A The unit.

10 Q Amoco.

11 A The unit. Amoco does not own the entire  
12 unit. Now, Amoco is operator of the unit and if you want to  
13 use that synonymously so we can get past the term.

14 Q All right, let's get past the semantics.

15 A Amoco, with the consent of all working  
16 interests.

17 Q Well, Amoco, in testimony throughout the  
18 day determines where and when to drill a well and where to  
19 put it, do they not?

20 A By and large that is true, yes, sir. As  
21 unit operator that is our responsibility.

22 Q So you control the costs you would have  
23 on these offsetting wells by prudent determination as to  
24 where to space your wells within the unit, isn't that true?

25 A I don't understand the relevancy to  
costs, sir.

Q The unnecessary costs for drilling these  
unnecessary wells that you've drawn up here, these 70 wells.

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2           A           If you are suggesting that we don't drill  
3 a unit well offset to a well on an uncommitted tract, that  
4 would be -- that would not be responsible operation of the  
5 unit, I don't believe.

6           Q           Okay. Now we've got to where I want to  
7 be. Uncommitted tract, that's what your concern is, isn't  
8 it, in offsetting?

9           A           We are concerned about preserving the  
10 correlative rights of uncommitted tracts.

11          Q           All right. What facts do you have about  
12 the production plans or drilling plans of the uncommitted  
13 working interest owners within the outer boundaries of the  
14 Bravo Dome Unit?

15          A           Working interest owners?

16          Q           People who can drill a well in the uncom-  
17 mitted acreage that would force you to put an offsetting  
18 well?

19          A           I've become slightly confused in the  
20 questioning. I have been addressing strictly uncommitted  
21 royalty tracts, not uncommitted working interest tracts, and  
22 I have no information about any drilling plans for working  
23 interest owners of uncommitted tracts within the outer  
24 boundaries of the unit.

25          Q           All right. These 70 wells that you have  
up here and that you've talked about are to protect uncom-  
mitted royalty owners?

          A           Royalty solely; all of that acreage.

1  
2 working interest is committed to the unit.

3 Q All right, now is not that protection in-  
4 herent in Amoco as the operator of this in placing its well  
5 in such a situation that you do not impair correlative  
6 rights of uncommitted royalty interest owners?

7 A And that will result in the drilling of  
8 70 unnecessary wells. I cannot understand how we can get  
9 past that point when the only other way is not to drill on  
10 unit acreage adjacent to royalty tracts that are not commit-  
11 ted and there will still be migration. I have no doubt that  
12 gas, although probably in small quantities, would migrate  
13 off those leases if we were producing five miles away.

14 Q Now, here's the problem I have with this.  
15 If you get your 640-acre spacing, you eliminate that 70 well  
16 problem, do you not?

17 A Yes, sir, we can keep the royalty owners  
18 whole as far as they're concerned, whole, whole.

19 Q And why can you not accomplish the same  
20 thing by spacing your wells at 640 without a global rule  
21 change that 's going to impact the entire unit?

22 A How can you do that, sir? I don't under-  
23 stand. How can I compulsory pool 6 -- or voluntarily pool  
24 640 acres when the spacing is 160?

25 Q Why can't Amoco ask for nonstandard drill-  
ing units as has been suggested to the uncommitted working  
interest owners as that's a step that they would have to  
take if the rules are changed?

1  
2           A           It's my understanding of, and in my ex-  
3 perience of over the last two years that I've been involved  
4 in work before this Commission, I don't recall having seen a  
5 nonstandard proration unit larger than the standard state-  
6 wide spacing. I have only seen them smaller than the stand-  
7 ard statewide spacing, and you know, I may be wrong on that  
8 and I'll be glad to be corrected, but I do not recall any  
9 instances.

10           Q           Larger or smaller, it's based on geologi-  
11 cal evidence you can present to support your application,  
12 isn't it?

13           A           It is based on the prevailing circum-  
14 stances of the application itself.

15           Q           And it's a tougher situation to get a  
16 smaller nonstandard unit than get a larger one.

17           A           I'd say, I'd say the converse is -- is  
18 true.

19           Q           Mr. Sheppard, do you know whether or not  
20 Amoco has any leasehold obligations, any lease obligations  
21 to drill 160-acre spaced wells under your current lease ob-  
22 ligations that would be eliminated by the change of spacing  
23 rules from 160 to 640?

24           A           Well, Amoco would have -- would be re-  
25 lieved from that responsibility in part as the unit operator  
and there are -- the Hutchinson Lease is predominantly Amo-  
co's. Tract 14, as you can see the red dots on there, so  
there are wells on what was originally 100 percent Amoco

1  
2 leases that would be eliminated, but as I understand, having  
3 been committed working interest-wise, that now becomes a  
4 unit obligation, not an Amoco obligation.

5 Q All right, so aside from the -- with the  
6 unit now in effect --

7 A Right.

8 Q -- is there any such obligation, to your  
9 understanding or knowledge?

10 A The obligation that would occur only in  
11 the tracts with uncommitted royalty interest owners, yes, as  
12 -- as I've discussed. The red dots I've shown would be the  
13 ones Amoco would have to drill as unit operator and if the  
14 640s were adopted, Amoco, as unit operator, would not be re-  
15 quired to drill them.

16 Q As a petroleum engineer do you have any  
17 communication or relationship with that aspect of that, of  
18 Amoco's business that says I need this much deliverability  
19 in order to put it into the market, carry on that type of  
20 activity, do they not communicate to you as to what they  
21 need?

22 A A totally separate subsidiary handles  
23 marketing and their requirements are conveyed through  
24 management which in turn are conveyed to me and I am so far  
25 down the line I have no direct communication with the people  
that are projecting demands.

Q Well, do you know enough about the opera-  
tion that at the present time and for the next three or five

1  
2 years Amoco does not have a need for the accelerated  
3 deliverability that you would get from 160-acre spaced  
4 wells?

5 A I can say over the life of the project  
6 Amoco would not have the need for the accelerated deliver-  
7 ability of the 160 spaced wells -- 160-acre spaced wells.

8 Q All right, and that's because the market  
9 condition is such that you couldn't take it if you had it.

10 A The prevailing market condition at this  
11 time is such that it's still being developed and shown by  
12 the calculations that I've presented here today, drilling on  
13 640-acre spacing will recover sufficient reserves in order  
14 to meet the demands for the foreseeable future.

15 Q The market demands for the foreseeable  
16 future.

17 A As I understand it.

18 Q Do you know that the plans are that Amoco  
19 is actually at the other end of the pipeline buying the CO2  
20 for enhanced oil recovery operations in the Permian Texas  
21 Basin?

22 A We're going to buy part of it. We're not  
23 going to buy all of it.

24 Q The majority of it, isn't that true?

25 A I don't know that it's the majority of  
it. We have a group that is very actively soliciting mar-  
kets for CO2.

Q All right. Back to this situation,

1  
2 though, the -- in terms of the deliverability that you need  
3 from the Bravo Dome Basin for now and in the foreseeable  
4 future, as you use those terms, the aspect of that is that  
5 market considerations have a very definite factor in your  
6 spacing requirements and deliverabilities, is that not a  
7 fact?

8 A Sir, I feel like -- let's see how to an-  
9 swer this.

10 Deliverability requirements, as I under-  
11 stand the Commission's rules, have no effect on spacing.  
12 Prevention of waste, ultimate recovery, and protection of  
13 correlative rights are the only two things that the Commis-  
14 sion can set up rules based on and deliverability does not  
15 enter into that.

16 Q Well, what if deliverability is a func-  
17 tion of promptly and efficiently and effectively draining a  
18 reservoir or pool? Then it does have a very definite factor  
19 in the Commission's ruling, doesn't it?

20 A And I believe my evidence today has shown  
21 conclusively that the number of wells drilled does not re-  
22 cover additional gas. We're not prohibiting people from  
23 drilling four wells if they need to drill four wells. The  
24 Commission rules allow that to occur. We're not prohibiting  
25 people from putting four wells on their 640 acres, if that's  
what they think they need to meet their requirements. The  
Commission rules are flexible in that regard, and I think  
our application is flexible in that regard.

1  
2 We have taken that into consideration.

3 Q Yes, the Commission rules are flexible,  
4 sir, and what you're asking for is a temporary rule that  
5 would apply across the basin even though there may be other  
6 uncommitted operators with different and varying economic  
7 interests than those of Asoco in terms of the deliverability  
8 and the rate of deliverability from these wells.

9 A I again cannot see how the rules that we  
10 have proposed would affect an operator he desired to put  
11 four wells on his 640 acres to meet whatever his require-  
12 ments were.

13 Q All right, except that if he had 160 ac-  
14 res he would have to ask for a nonstandard unit in order to  
15 accomplish that.

16 A That is correct.

17 MR. JARAMILLO: That's all.

18 MR. RAMEY: Any other questions  
19 of the witness? Mr. Kellahin?

20 MR. KELLAHIN: Mr. Chairman,  
21 thank you.

22 CROSS EXAMINATION

23 BY MR. KELLAHIN:

24 Q Mr. Sheppard, have you encountered natur-  
25 ally occurring water in the Tubb formation?

A Yes, sir, we have.

Q Have you been able to determine whether

1  
2 or not the natural occurring water in the Tubb formation is  
3 going to restrict or limit the ability of a well to effec-  
4 tively and efficiently produce on 640-acre spacing?

5 A No, sir, we would not complete the inter-  
6 vals that are naturally water-bearing.

7 Q All right, sir, I understand that there  
8 are then available appropriate completion techniques to  
9 avoid water encroachment problems in the Tubb formation.

10 A Yes, sir.

11 Q So in your opinion the presence of water  
12 in the Tubb formation, using appropriate completion techni-  
13 ques, would not thereby limit the ability of a well to ef-  
14 fectively and efficiently drain 640 acres.

15 A No, sir.

16 Q I've heard so much about flow tests this  
17 afternoon, Mr. Sheppard, I now no longer know what a flow  
18 test is.

19 What is a flow test?

20 A A flow test --

21 A SPECTATOR: Which one?

22 Q Whichever one he's telling us about.

23 A -- that we performed was to place a well  
24 on production at a stabilized rate and continuously monitor  
25 the rate and pressure in order to evaluate the producing  
characteristics of that well.

Q All right, sir, is the length of time you  
placed that well on production an element or a factor in de-

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termining whether or not that flow test is accurate and fair?

A Yes, sir, it is.

Q All right, sir. And how long did you place each of your four flow tests on production?

A The total time of each test varied from upwards to 600 days to a minimum of around 350 days. All of them extended for a period of at least a year.

Q In your opinion was that sufficient period of time in which to conduct a flow test on each of those wells to establish that spacing on 640 acres was appropriate?

A Yes, sir. On the two which we performed the simulation work on we had all the engineering information we needed both provided from open hole logs, bottom hole pressure data analysis, and actual flow analysis to adequately and accurately evaluate that.

Q Have you picked wells to use for the flow rate test that in your opinion fairly and accurately represent typical wells in the Tubb formation that can be applied or characterized to all the area that will be spaced upon 640 acres?

A Yes, sir. It is such as the west, the characterization of the Tubb formation there, we realize there are variabilities from location to location, but the Tubb formation is continuous and the properties are fairly similar.

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Q All right, did you single out your four best super-doooper wells and use your flow rate tests on those wells?

A No, sir. By far and away we did not use the four best. We attempted to space those wells in order to give a fairly diverse area of evaluation.

Q Let me ask you about the boundary effect. What would you have seen if in fact there was a boundary effect that would cause you to conclude that the well was capable of only draining 160 acres?

A To answer that question, let me refer you to Amoco's Exhibits Thirteen and Fourteen.

On those exhibits what we would have seen is the actual flowing tubing pressures of those wells would have matched the 160-acre drainage predictions greater than the 640-acre drainage projections.

As I previously stated, we hold the flow rate constant, allowed the pressure to decline, it's going to decline for the same given volume of pressure -- of CO2. The pressure will decline at a much steeper rate on 160-acre spacing than it will on 640-acre spacing, if all the other reservoir parameters are equivalent.

Q All right, sir, and what else causes you to conclude that the area studied over here in the east is typical or characteristic of the other areas that you propose to be included in the 640-acre spacing unit?

A There is at least two major things that

1  
2 would help me conclude that.

3 First of all, is Mr. May's extensive ar-  
4 ray of cross sections, which show geologic continuity  
5 throughout the area of application. That is the first thing  
6 that you must have for wide drainage, is geologic continuity  
7 of the rock.

8 I then, realizing that there is better  
9 permeability thickness product on the east side, performed  
10 some theoretical Darcy Law calculations, assuming much poor-  
11 er pay quality on the west side, and assuming a one milli-  
12 darcy permeability, not an -- an average one millidarcy,  
13 which Mr. May shows to be his cutoff, and we know that the  
14 average is higher on the west side, but assuming one milli-  
15 darcy pay, average pay, and 100 feet of pay, Darcy calcula-  
16 tions indicated on 640-acre drainage that we could complete  
17 economical wells and maintain flow rates that would be eco-  
18 nomical and on the converse side, by moving to 160-acre  
spacing, I believe my calculations showed that you would un-

19 Q I'm not sure I understand that.

20 You haven't simply taken an area over in  
21 the east, done your reservoir engineering analysis, and then  
22 either hypothesized or arbitrarily applied that conclusion  
23 to the rest of the pool.

24 A No, sir.

25 Q You have taken the engineering parameters  
that you have discovered in the western portion of the

1  
2 spaced area, made those adjustments, run the calculation  
3 again, and still reach the conclusion that with those ad-  
4 justments tailored to the specific facts of the wells in the  
5 west, you reached a conclusion that you can still drain 640  
6 acres.

7 A Yes, sir.

8 Q Mr. Sheppard, have you come to any en-  
9 gineering conclusions as an expert petroleum engineer that  
10 you have encountered the eastern limits of the Tubb forma-  
11 tion by the yellow line indicated on your Exhibit Number  
12 One?

13 A No, sir, I would refer you to Mr. May's  
14 Exhibit A-A', in which the Coats No. 1 Well in Texas, al-  
15 though significantly down dip, did produce CO2, although it  
16 does have a fairly high water production rate.

17 There is CO2, the possibility of CO2 pro-  
18 duction outside the eastern boundary.

19 Q Correspondingly, when we look at the west  
20 boundary of the proposed area to be spaced upon 640 acres,  
21 have you concluded as an engineer that that represents the  
22 productive limits of the Tubb formation?

23 A No, sir, we know that it doesn't.

24 Q How do you know that?

25 A Well, because we sold Cities Service a  
portion of the acreage on the western side and we know that  
it's productive of CO2 from the Tubb formation.

Q You've talked about the core analysis and

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I forgot the exact number. There were something like 41 or 43 cores analyzed? Is that correct?

A 41, I believe is the number.

Q Is there some way to identify on the exhibits or something else that you have presented as to exactly which wells you used in analyzing the core information?

A Yes, sir. That is shown on Mr. May's exhibit over here in the corner. This was marked Amoco Exhibit Number Four.

The distribution of cores in the unit area are shown by the wells which have little hexagon symbols around them and I believe there are 41 such wells on that exhibit.

Q Mr. Sheppard, you say stay there for a moment.

Mr. Sheppard, in your opinion as a petroleum engineer, have those cores been taken from a widely scattered and fairly representative number of wells in the Tubb formation?

A Yes, sir, we have taken a number of fairly diverse areas.

Q And in fact you've take core information from wells outside the proposed spaced area?

A We took two cores that I know on wells that are now owned by Cities.

Q And what are those wells?

1  
2           A           They were originally the, oh, gosh, the  
3 State "NN" and what's the other one, Bruce, do you know?  
4 And "FN", the old well designations.

5           Q           And how do the qualities of those cores  
6 compare to the general quality of the cores taken within the  
7 proposed spaced area?

8           A           The -- we do find that the Tubb formation  
9 is continuous, as I have previously noted. The properties  
10 of the pay do vary to the west. The permeability in general  
11 decreases some, the net pay decreases some; however, the  
12 basic quality of Tubb pay is still the same as within the  
13 unit area.

14           Q           When you refer to the windows in the  
15 unit, Mr. Sheppard, how have you defined the unit in the --  
16 the window in the unit?

17           A           Sir, I think there are two unique and  
18 completely separate definitions for that.

19           Q           Yes, sir, and I want to make sure we're  
20 using the one you're using.

21           A           When I was talking about windows in the  
22 unit for correlative rights purposes, I was addressing ac-  
23 reage which the working interest owners have committed to  
24 the unit and yet royalty owners have not signed a unit  
25 agreement and therefore are not party to the unit.

26           Q           Are there other windows in the unit in  
27 which the working interest ownership has not committed it-  
28 self to the unit?

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A Yes, sir, there are.

Q With regards to both of those types of windows, do you see as an engineer any engineering reason why those areas ought to be spaced any differently than the balance of the area contained within the outer boundary of the Bravo Dome Unit?

A Given the data I've evaluated, no, sir.

Q And have you evaluated data in the area of those windows?

A We have on our cross sections, which Mr. May prepared and that I have reviewed in order to help conclude geologic continuity, have run cross section lines through those areas and have wells in those areas included on the cross sections.

MR. KELLAHIN: Thank you, Mr. Chairman.

MR. RANEY: Any other questions for Mr. Sheppard? He may be excused.

MR. NOTE: We have no further questions, Mr. Chairman.

MR. RANEY: All right, Mr. Note. The witness may be excused.

Do you have anything further, Mr. Note?

MR. NOTE: We rest, Mr. Chairman.

MR. RANEY: Mr. Lopez, I think

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THIS IS THE FINAL PAGE IN VOLUME I. VOLUME II CONTINUES THE  
TRANSCRIPT COMMENCING WITH PAGE 194.

1 STATE OF NEW MEXICO  
2 ENERGY AND MINERALS DEPARTMENT  
3 OIL CONSERVATION DIVISION  
4 STATE LAND OFFICE BLDG.  
5 SANTA FE, NEW MEXICO

6 16 May 1984

7 COMMISSION HEARING

8 VOLUME II OF TWO VOLUMES

9 IN THE MATTER OF:

10 Application of Amoco Production  
11 Company for temporary special  
12 spacing rules, Union, Harding, and  
13 Quay Counties, New Mexico.

CASE  
8190

14 BEFORE: Commissioner Joe Ramey, Chairman  
15 Commissioner Ed Kelley

16 TRANSCRIPT OF HEARING

17 A P P E A R A N C E S

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19  
20 For the Oil Conservation  
21 Division:

W. Perry Pearce  
Attorney at Law  
Legal Counsel to the Division  
State Land Office Bldg.  
Santa Fe, New Mexico 87501

22  
23 For the Applicant:

Clyde A. Note  
Attorney at Law  
Amoco Production Company  
P. O. Box 3892  
Houston, Texas 77253

24  
25

1  
2 you're up next.

3 MR. LOPEZ: I pass the witness  
4 to Mr. Padilla.

5 MR. RAMEY: All right, Mr. Pa-  
6 dilla.

7 MR. PADILLA: Mr. Ramey, we  
8 call Dan Nutter.

9 DANIEL S. NUTTER,  
10 being called as a witness and having been duly sworn upon  
11 his oath, testified as follows, to-wit:

12  
13 DIRECT EXAMINATION

14 BY MR. PADILLA:

15 Q Mr. Nutter, for the record would you  
16 please state your name and your connection with the protest-  
17 ants in this case?

18 A My name is Dan Nutter. I'm a consulting  
19 petroleum engineer in Santa Fe, New Mexico, and I've been  
20 retained by the protestants in this case.

21 MR. KELLAHIN: Mr. Chairman,  
22 for purposes of clarifying the record, might we know speci-  
23 fically so as to what clients Mr. Nutter purports to be an  
24 expert witness?

25 A Thank you, Mr. Kellahin.

MR. LOPEZ: He, hopefully, is  
speaking for Americas, Mr. Chairman.

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MR. JARAMILLO: And for Ross Carbonics, as well.

MR. PADILLA: And for my clients, as well.

MR. PEARCE: For the record when we started this, Mr. Padilla, the name of your client, Energy --

MR. PADILLA: Energy-AGRI Products, Inc.

MR. PEARCE: Thank you, sir.

Q Mr. Nutter, have you previously testified before the Commission and had your credentials accepted as a matter of record?

A Yes, I have.

Q Are you familiar with the Bravo Dome Carbon Dioxide Unit Area?

A Yes, I am.

Q Are you familiar with the Tubb formation and have you studied and are familiar with the reservoir characteristics of the unit area, within the unit area?

A Yes, sir, I am.

MR. PADILLA: Mr. Ramey, are the witness' qualifications acceptable?

MR. RAMEY: Yes, they are, Mr. Padilla.

Q Mr. Nutter, can you briefly tell us or give us a history of the Bravo Dome Carbon Dioxide Area?

1  
2           A           Yes. As you know, prior to the current  
3 development of the area by Amoco and the formation of the  
4 Bravo Dome Unit Area, there were three carbon dioxide fields  
5 or pools producing in this area.

6                   The first, which I'll mention just brief-  
7 ly, is a small pool located in Township 21 North, Range 30  
8 East, and produces from the Santa Rosa formation.

9                   I do not think the Santa Rosa is under  
10 consideration here today but I'm not sure because the notice  
11 of this case nor the other case that's on the docket speci-  
12 fies what formations are involved in these hearings.

13           Q           What is the second of the original three  
14 pools?

15           A           The second pool that I would mention is  
16 the Mitchell Carbon Dioxide Pool. This pool is located in  
17 Township 19 South, Range 30 East, and would be in the area  
18 immediately to the southwest of the Bravo Dome Unit Area,  
19 and is this row of gas wells depicted in this particular  
20 area, right here, along the southwest boundary of Bravo Dome  
21 Unit.

22                   This Tubb -- this pool was discovered in  
23 1939 and was put on production in 1940 after a dry ice plant  
24 was built. The pool covers approximately 3000 acres and has  
25 about -- has had about twenty wells drilled in it. Some of  
these wells encountered such poor permeability or excessive  
water production that they were never completed as pro-  
ducers.

1  
2 About fifteen of the wells have produced  
3 and after 44 years the pool is slightly more than 50 percent  
4 depleted.

5 Q Tell us about the third pool.

6 A Okay. The third pool would be what's  
7 commonly referred to as the Bueyeros or Libby Pool. This  
8 pool is located in Sections 30 and 31 of 20 North, range 31  
9 West, which would be the area that's shaded in blue on Asoc-  
co's Exhibit Number One.

10 Q Do you know what the original reservoir  
11 pressure was in that Bueyeros Pool?

12 A Well, before I get to that, I'd point out  
13 that that pool is located on a 10,213-acre window in the  
14 Brave Dome Unit Area, being the Libby Ranch. It's believed  
15 -- the pool itself is believed to encompass about 400 -- or  
16 600 acres and is being drilled at the present time by four  
17 wells. One of these wells, incidentally, is producing from  
18 the Glorieta as well as the -- as well as the Tubb forma-  
tion.

19 Q What's the reservoir pressure in that  
20 field?

21 A No one knows what the original reservoir  
22 pressure was. The discovery well was drilled prior to any  
23 efforts to conserve carbon dioxide gas and when it was  
24 brought in, it was allowed to blow to the air under the old  
25 theory that if you let a CO2 well blow long enough it will  
bring in oil, and the well blew for more than a year. I

1  
2 don't know how long it actually blew. I've heard stories  
3 that it was several years and that it was about a year. I  
4 really don't know, and I don't know if -- I've never talked  
5 to Mr. Libby about that. He would be, probably, the only  
6 one who would know how long it was actually blown.

7 But it was finally shut in and then the  
8 well was put on production when a plant was built in 1947  
9 and it's still producing.

10 Q Does that summarize the history of the  
11 Bravo Dome Unit Area?

12 A Yes, that summarizes the history of the  
13 area up to the time when Amoco started its exploration and  
14 development operations.

15 Q Were you here this morning when Mr. Allen  
16 testified before the Commission?

17 A Yes, I was.

18 Q And can you briefly comment on his testi-  
19 mony?

20 A Yes. Mr. Allen suggested that after tem-  
21 porary rules of 640-acre spacing had -- after three years of  
22 those temporary rules adequate reservoir information would  
23 be available, that the operator could come in and present  
24 evidence to either sustain the rules or cause them to revert  
25 back to the 160-acre spacing.

Now, I know there was some conversation  
among the attorneys this morning regarding the prospect of  
reversion back to a smaller size spacing, but I realize that

1  
2 in the past this has been attempted and it's very difficult  
3 to revert to a smaller size spacing.

4 It was tried in the White City Pennsylv-  
5 anian Pool. It was changed from 640 acres to 320 acres,  
6 then they encountered all kinds of equity problems in chang-  
7 ing the spacing.

8 So they came back and asked the Commis-  
9 sion to go back to 640-acre spacing but to allow infill  
10 drilling on 320.

11 The same thing happened in the Catclaw  
12 Draw Pool and of course, in the Blanco Mesaverde Pool, in  
13 the Basin Dakota Pool, the spacing was not changed. It was  
14 simply allowed to do the infill drilling on the larger sized  
15 units.

16 Q Is that all you have concerning Mr. Al-  
17 len's --

18 A No. That's all I have on that point.

19 Mr. Allen also mentioned that the special  
20 rules would -- that if individuals discovered pools in this  
21 Bravo Dome Area where they're seeking the 640-acre spacing,  
22 that the operator of those wells, presumably on the windows,  
23 could come in and get spacing of less than 640 acres.

24 I don't understand, though, where the one  
25 mile buffer would apply. If you have a small pool, now say  
take that pool where it's colored in blue there. If you  
have a pool designated there to cover three or four sec-  
tions, would the one mile pool rules extend outside from

1  
2 that, or do the 640-acre pool rules extend right up to the  
3 boundary of that? Is there a buffer zone around the special  
4 pool rules?

5 And likewise, on the southwest side,  
6 where Americas has the Mitchell Field, the buffer zone of  
7 the 640-acre Bravo Dome rules would extend a mile to the  
8 southwest, and the Cities Service buffer zone, which their  
9 application is for the wells where there are green dots  
10 there, those pool rules would extend one mile to the north-  
11 east, and so the Mitchell Field is caught in the one mile  
12 extension from either direction, left or right.

13 So it's not going to be on anything other  
14 than 640-acre spacing if that holds true.

15 Mr. Allen also mentioned that 640 acres  
16 would allow Amoco to protect owners of uncommitted lands.  
17 Now we see that these windows are of many different sizes  
18 and some of those windows are of sufficient size to support  
19 640-acre spacing. Some of them are small enough that  
20 they're going to have to be communitized, be it 160-acre  
21 spacing or 640-acre spacing.

22 So really the only thing that's being  
23 done by 640-acre spacing is allowing a 160-acre window to be  
24 committed to a gas proration unit where, if it had not been  
25 communitized to form a 640-acre unit, it might not have a  
well drilled on it. The 160-acre tract window is the only  
one that would be protected, and that would be only in the  
event that a well wasn't going to be drilled on the 160.

1  
2           Mr. Allen also went into the -- into a  
3 discussion that if you wanted to you'd be able to drill four  
4 wells on your 640-acre unit, and I guess if you didn't have  
5 640 acres, you'd have to get a nonstandard unit approved.

6           Well, I can just imagine the progress  
7 that an application for a 160-acre unit filed administra-  
8 tively with an offset -- with a copy of the application to  
9 offset operator Amoco, I can imagine the success that that  
10 application would have of cruising through the Division's  
11 offices unprotected.

12           So I think it's in the realm of fancy to  
13 think that an operator is going to be able to get 160-acre  
14 nonstandard unit or any unit less than 640 without having to  
15 come to hearing for it.

16           MR. CARR: May it please the  
17 Commission, I'm going to have to at this time object to this  
18 long, narrative response, which is mixed bag of opinions,  
19 questions for witnesses that were not earlier asked, and  
20 statements which are based on facts which really are not in  
21 evidence and which proper foundation hasn't been laid for.

22           If there are particular ques-  
23 tions, I think they should be asked and this witness should  
24 answer as if we were in normal direct examination of a wit-  
25 ness.

26           I'm not in a position to pro-  
27 tect my client when they want to start talking about what  
28 sort of action Amoco they might fancy would take and ap-

1  
2 plications which have not been filed, and I know that Mr.  
3 Nutter is knowledgeable in this area. He's been involved  
4 with this as long as I have been. But I think there's a  
5 proper way to put on this testimony and I think it's not  
6 being followed and I think he should respond to specific  
7 questions that we have an opportunity to object if in fact  
8 they're getting into areas that may in fact be objection-  
9 able.

9 We have no idea where they're  
10 going with a question if the only thing is, did you hear the  
11 morning testimony and what did you think about it, and that  
12 is exactly what we've had.

13 And I think they should be di-  
14 rected as to particular questions so we can respond to them.

15 MR. PADILLA: Mr. Ramey, if I  
16 may respond, I think that everything that Mr. Nutter is tes-  
17 tifying to has been brought up previously in Mr. Allen's  
18 testimony.

19 I can ask, and I think it's  
20 discretionary upon me whether to ask questions or let my  
21 witness testify in a narrative fashion. I have chosen to  
22 let him testify in the narrative fashion and I don't see  
23 anything wrong.

24 We have qualified Mr. Nutter as  
25 an expert witness and he may testify under court rules in a  
narrative or a question by question. We have chosen this  
mode to present his testimony here today.

1  
2 MR. CARR: I think there must  
3 at least be a periodic question to direct us, give us some  
4 signal to what area Mr. Nutter is going to be talking about.

5 MR. PADILLA: Mr. Nutter is  
6 testifying concerning nonstandard proration units. He's  
7 testifying concerning specific items that were addressed by  
8 Mr. Allen.

9 A If I may interject here, I'm through mak-  
10 ing remarks concerning Mr. Allen's testimony, Mr. Carr.

11 Mr. Padilla, I'm going to have a couple  
12 of comments to make on Mr. May's testimony and the first  
13 question is going to --

14 MR. CARR: I'd like my objec-  
15 tion ruled on before we continue this.

16 A Well, I'm through with Allen.

17 MR. CARR: My objection applies  
18 to the nature of the questions.

19 MR. RAMEY: I will overrule the  
20 objection and we'll ask Mr. Padilla to try to keep this on  
21 an even keel and try to interject a few questions periodic-  
22 ally.

23 A He doesn't even know what I've got writ-  
24 ten down on my notes.

25 I'm going to have to pass him a note to  
tell him to ask me about these things.

MR. RAMEY: Why didn't you pre-  
pare your testimony prior to the time you sit down?

1  
2           A           Well, I was making notes on Sheppard  
3 then.

4                           MR. RANEY: All right, please  
5 proceed, Mr. Padilla.

6           Q           Mr. Nutter, you heard the testimony of  
7 Mr. May this morning, is that correct?

8           A           Yes, sir.

9           Q           And will you tell us what you believe  
10 these cross sections show as far as -- or his testimony with  
11 regard to the cross sections he presented here today?

12           A           Yes, sir. Mr. May's testimony was that  
13 this orange band that he drew across the Bravo Dome Unit in  
14 several different directions represented zones of at least  
15 one millidarcy of permeability. As obvious from looking at  
16 the exhibits, the permeability thickness, now I don't know  
17 what the quality of the permeability is because this is not  
18 a qualitative exhibit at all. It's not quantitative in  
19 showing the quantity of the permeability, but we do have one  
20 millidarcy of permeability going from one end of the exhibit  
21 to the other in each case.

22                           But it is obvious that the thickness of  
23 those zones with one millidarcy of permeability thin as they  
24 go to the west.

25                           Now this is true on the one going to A up  
there on the A-A' exhibit.

                          It was also true going from B-B', and if  
you had had one going from east to west it would have been

1

2 true in that direction, too, but you didn't have one on that  
3 specific direction, I don't think.

4 We had a short one in the heart of the  
5 sweet spot of the pool.

6 But I'll also note that you see many lit-  
7 tle white streaks throughout this band of continuous one  
8 millidarcy permeability, and I think if you were to draw  
9 this thing on another scale and get these wells down to  
10 where you could really see the zones, you'd find that there  
11 are many, many sand streaks of permeability and nonpermeable  
12 zones throughout almost all of these wells and, of course,  
13 it's a recognized fact that these small lenses of permeabi-  
14 lity and porosity can be missed more easily when you have  
15 wide spacing of wells than when you have a smaller and nar-  
16 rower spacing pattern.

17 So I think that's one factor to consider.

18 I'd also point out that Americas and Ross  
19 Carbonics have smaller quantities of permeability over in  
20 their end of the cross sections in the west side than the  
21 thick, permeable zones that were shown on the -- in the  
22 sweet spot of the pool near the area that's on production at  
23 this present time.

24 Q Mr. Nutter, have you familiarized your-  
25 self with Mr. May's testimony in the Amoco second hearing  
for spacing change?

A Yes.

Q And how does that differ from his testi-

1  
2 money here today?

3           A           There's not a great deal of difference.  
4 He's got new wells on his cross sections, as he indicated  
5 this morning; however the orange colors are the same. The  
6 Cimarron anhydrite is about the same and the streaks of per-  
7 meability and lack of permeability throughout the unit area  
8 pretty much resemble the previous exhibits.

9                       Now he also made mention that -- he com-  
10 pared one millidarcy of permeability here to the tight for-  
11 mation parameter of 0.1 of a millidarcy, and I suppose -- he  
12 said that that wasn't to show any kind of a cost incentive  
13 or anything, but I think what he was making a reference to  
14 was that this is ten times more permeable than what you are  
15 allowed under PERC tight formation regulations.

16                      I might point out that natural gas or me-  
17 thane gas is composed of one atom of carbon, four atoms of  
18 helium, and carbon dioxide is one atom of helium -- or car-  
19 bon, and two atoms of oxygen, and it's much heavier. It's  
20 much denser, and it doesn't flow through a reservoir with  
21 the same ease that natural gas or methane would flow through  
22 that reservoir.

23                      So you need more permeability to have the  
24 same effective permeability of this gas to natural gas.

25                      MR. RAMEY: You do mean hydro-  
26 gen and not helium, don't you?

                  A           Hydrogen, yes, I meant hydrogen.

                  Q           Do you have anything else concerning Mr.

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May's testimony?

A No.

Q Now, let's go on to the testimony that Mr. Sheppard presented here and let me start off by asking you to explain his, I believe, Exhibits Eleven, Twelve, Thirteen, and Fourteen on the flow tests.

A Okay. I don't have much to say about the flow tests themselves. We saw on Exhibit Nine that the flow test on that well encountered problems. He explained that by saying that well had a water zone open in it. They worked on the well, shut the water off and the production came back up and sustained pretty well.

Exhibit Ten is a good flow test and Exhibit Eleven is a good flow test.

And none of these show any real decline in pressures of any magnitude or of productivity in any magnitude.

When we get to Exhibit Number Thirteen we see that he's used the basic parameters here of 104 feet of thickness on this No. 201-G Well with with 14.98 millidarcies. I presume, Mr. Sheppard, this is average permeability throughout the 104 feet? Okay, so it's got 1547.5 millidarcy feet of permeability in it.

On Exhibit Number Fourteen the 221-G Well has 1866 millidarcy feet of permeability and on Exhibit Number Fifteen the typical well has 1373 feet of millidarcy feet.

1  
2 I'd like to point out that over on the  
3 west side in the area that Amerigas drills its wells, it's  
4 very fortunate to have a well with 500 millidarcy feet of  
5 permeability.

6 And so this 1373 being a typical well may  
7 be typical of the sweet spot but it's not typical of the  
8 west side.

9 Q Would you continue with your explanation  
10 of the exhibits that were presented by Mr. Sheppard?

11 A Okay. Then his computer model, as exhibi-  
12 bited on Exhibits Number Thirteen and Fourteen makes this  
13 one great assumption, that if you hold the flow rate con-  
14 stant and you allow the pressure to come down and take the  
15 test for 1050 days, that you have an infinite reservoir.

16 Now I don't know, if this shows true on a  
17 640-acre spacing, it may well have showed true on 160-acre  
18 spacing, too. I don't know.

19 I know we don't have infinite reservoirs  
20 here; that the reservoir has some limit some place and that  
21 when you have a multiplicity of wells in there there's going  
22 to be some point that the production from the two wells is  
23 going to start interfering with each other, but we don't  
24 see the barrier here. That is obvious, but the computer  
25 will do what you want it to do.

Then on -- by taking that data from the  
computer model, we come to Exhibit Number Fifteen, and he's  
got this basic assumption made that four wells are not going

1  
2 to produce any more than one well on 640, and even in a gas  
3 reservoir I find that difficult to believe.

4 He's got each one of the wells producing  
5 10-billion cubic feet and I think that -- I still think that  
6 four wells are going to get more gas than one well, regard-  
7 less of what any computer says.

8 The same with Exhibit Number Sixteen.

9 Q Go on to Exhibits Seventeen and Eighteen  
10 and tell us what you think of those exhibits.

11 A Well, Exhibit Seventeen shows what would  
12 happen if it was on 160-acre spacing. Exhibit Eighteen  
13 shows what would happen if it was on 640-acre spacing, and  
14 to make his 300-million a day demand he needs 131 wells on  
15 640 acres. He needs 163 wells on 160 acres.

16 Now, if you calculate that out with those  
17 131 wells, that means that each one of those wells is going  
18 to have to produce some 2.2-million a day and I don't be-  
19 lieve the average well in there will make 2.2-million a day.

20 These flow tests they didn't and most of  
21 the potentials that have been reported by Amoco for this  
22 pool will run from one million up to maybe three, but the  
23 average, I believe, is closer to about one and a half to one  
24 and three-quarters of a million a day.

25 So I don't know if you can have 131 wells  
averaging over 2.2-million a day to meet a market demand of  
300,000 without having to drill additional wells.

1  
2 Now I'm going to get to pulling wells  
3 hard in a minute, but that's all for now on that exhibit.

4 Q Go on to Exhibit Number Nineteen and --

5 A I don't have any comments on Nineteen.  
6 It's just a reflection of the data that's on Seventeen and  
7 Eighteen.

8 Q Do you find any inherent deficiencies or  
9 assumptions that Amoco has made in Exhibit Number Twenty?

10 A Yes. You take the first page of Exhibit  
11 Number Twenty and he's got Tract A with 62-1/2 percent of  
12 the gas in place, Tract B with 25 percent, Tract C --

13 MR. RAMSEY: Exhibit Twenty-one,  
14 Mr. Nutter?

15 A Twenty-one, Twenty-one, I'm sorry. I  
16 don't have anything on Twenty.

17 Exhibit Number Twenty-one, and Tract C  
18 has 12-1/2 percent of the gas in place.

19 All right, he goes through these gyrations  
20 about drilling wells on A and on B and so forth, but  
21 he finally gets back over here and says if you had a 640-  
22 acre unit, you'd get back to where the royalty allocation  
23 for Tract A is 62-1/2 percent, well, that's exactly what the  
24 gas is in place over here on the first page.

25 Tract B would get 25 percent of the allo-  
cation and you look at the first page, sure enough, Tract B  
has 25 percent.

You look at Tract C and it gets 12-1/2

1  
2 percent and over on page one it's 12-1/2 percent.

3                   So apparently 640-acre spacing is the  
4 ideal spacing and gets these allocations in exact conform-  
5 ance to the gas in place under the tract.

6                   My only problem is if this is not going  
7 to drain that full 640 acres, then Mr. Royalty Owner P is  
8 furnishing all of the -- is -- is furnishing his gas and  
9 sharing his allocation with A and C, and that is not a pro-  
tection of correlative rights.

10                   And in my mind there is serious doubts if  
11 there is efficiency of drainage in this reservoir on 640.

12                   Q           Mr. Nutter, given the fact that under the  
13 unit agreement Amoco Production Company can operate the unit  
14 and drill wells at its discretion, do you see a need for  
15 640-acre spacing at this time?

16                   A           No, I really don't. I don't know how  
17 many tracts there are that Amoco is the operator of, which  
18 there is uncommitted royalty and in which they'd have these  
19 situations like Mr. Sheppard was referring, where 70 wells  
have to be drilled because uncommitted royalty interests.

20                   I know that we do have these other tracts  
21 that are shown on the Exhibit Number One, those little  
22 blocks in there are windows in the unit that are not commit-  
23 ted, but those are on this exhibit. I'll go ahead and admit  
24 this exhibit in a minute. It's a small scale reproduction  
25 of that and the windows have been colored red so they're a  
little easier to see.

1  
2           The windows in here range from 10 acres  
3 to over 10,000 acres.

4           And then there's one that I can't really  
5 call a window but it is. It's an open window. But you'll  
6 see that the unit boundary has been adjusted in here to form  
7 an "inbayment". Well, this is an Amerigas lease in here.  
8 It's outside the unit area but if they have 160 -- if they  
9 have 640-acre spacing for the unit area, this thing is  
10 socked in from all sides with 640-acre spacing. Every por-  
11 tion of it is easily within a mile.

12           So it's not a window, it's an "inbayment"  
13 but I'd call it an open window.

14           These are obviously windows because  
15 they're closed -- they're surrounded completely by unit ac-  
16 reage.

17           Q           Mr. Nutter, in your opinion are the flow  
18 tests representative of the entire unit area?

19           A           No. The flow tests are indicative of the  
20 -- the fairway of the pool. This apparently is the fairway.  
21 This is where all the development's gone on. They've got  
22 better logs there. They've got better core analyses and  
23 everything looks better in that particular area than it does  
24 over to the west side and to the north. The quality deter-  
25 iorates as you go north, too.

          And to the south. That's the -- that's  
the dome, right there.

          Q           Can you tell us anything about what you

1  
2 believe to be the corrosion effects of some of these wells  
3 or the carbon dioxide?

4 A Well, we all know there's going to be a  
5 great demand for this carbon dioxide for many years to come,  
6 at least we hope so.

7 What I'm fearful of with the wide spacing  
8 that's being contemplated here today, is too few wells to  
9 meet this market demand within reasonable limits on the pro-  
10 duction from each well.

11 Carbon dioxide forms with water to form  
12 carbonic acid and most of these wells produce water in vary-  
13 ing amounts, of course, but some water. Therefore it fol-  
14 lows that carbonic acid is going to be formed in the wells.

15 Carbonic acid, though classified as a  
16 weak acid, is very corrosive. Some of the wells in the older  
17 pools that I've discussed have had their casing corroded out  
18 within two years of being placed on first production.

19 Other wells have produced for forty years  
20 with little or no problem.

21 One apparent phenomenon that seems to oc-  
22 cur, is that an increased rate of corrosion results from in-  
23 creased production on the well. Now I can't figure out why  
24 this happens unless it's one of two things.

25 It's either a combination of corrosion  
and abrasion or it's the result only of the higher rate of  
production.

Now, we know that corrosion is a func-

1  
2 tion, a chemical function of ion exchange and if you have a  
3 faster rate of production you'd have a complete and faster  
4 rate of replacement of spent acid as it's coming up the  
5 well, so you'd have a continuous charge of new, fresh acid  
6 that has not been spent and corrosion would be increased.

7 But at any rate, high production rates  
8 result in higher rates of corrosion in these wells, and this  
9 can -- corrosion is not confined to the inside of the well,  
10 either. There is external casing corrosion in these wells.

11 Electrolytic protection and other forms  
12 of corrosion prevention have been tried but the problem per-  
13 sists.

14 Now Mr. Sheppard said they have developed  
15 some corrosion control techniques that are apparently work-  
16 ing. I hope so.

17 Q What is the ultimate result of wide spac-  
18 ing on corrosion, if any?

19 A Well, it's two effects. In the first  
20 place, if you have the wider spacing, you're going to have  
21 to hit the wells harder to meet a given market demand. So  
22 you'll increase the rate of production from a given well and  
23 increase the corrosion.

24 Then, if you have wide spacing the wells  
25 are undoubtedly going to produce longer. I don't think any-  
one would question that, even assuming 100 percent as effi-  
cient drainage on 640's as on 160's, and still have serious  
doubts that everyone here will agree that this cannot be ex

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pected.

But assuming that just as efficient drainage results from the two patterns, we'd have four times the reserves to produce from a given well.

Now the lives of the wells are going to be longer; that is, it's going to take a long time to produce reserves from the 640-acre wells, maybe four times as long. If the reserves outlive the wellbore, they'll be left in the ground unless a replacement well can be drilled, but perhaps at that time, when the wellbore is corroded out, there'll be insufficient reserves to justify drilling a replacement wells, so the remaining reserves will just be lost. It won't be economic to drill for them and they'll be lost.

Q Is that waste?

A That -- that would be waste. It certainly would.

Q Tell us about correlative rights and how you see 640-acre spacing affecting correlative rights.

A Well, I see that correlative rights would be impaired in certain areas. The Brave Dome Unit Area, despite all the efforts put forth by Asoco to form a 100 percent committed unit, still has many windows in it. As I mentioned before, they range in size from 10 acres to over 10,000.

Wells have been drilled in good faith on some of these tracts and to change their spacing now could

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do irrevocable harm.

Take, for instance, the northwest quarter and the southeast of the northeast of Section 12, Township 19 North, Range 30 East. That's this little tip right in here and part of it is over in here. It's indicated with a gas well on it there in Section 12 of 19, 30.

This is a 200-acre tract owned by Ross Carbonics. They came in here and after a hearing received approval for one 40-acre and two 80-acre nonstandard spacing units and two commercial wells have been drilled in this area.

Q What harm can come if these -- to these wells if 600 acres -- 640-acre spacing is allowed?

A Well, no harm, possibly; however stop to think what might happen in the event of proration or if pipeline ratable take enforcement were required in the absence of proration.

As of now, with 160-acre spacing, if prorationing or ratable take enforcement became the rule in the area, those wells would receive either a one-fourth of a standard share of the market allowable or a one-half share, depending on whether they had 40 or 80 acres.

If the spacing was increased to 640 acres, the well would get one-sixteenth or one-eighth of a standard share of the market allowable. This would probably make the wells noncommercial to produce and they'd have to be plugged.

1  
2 That's a violation of correlative rights.

3 Q Do you have anything further to add to  
4 your testimony?

5 A No, I don't believe so at this time.

6 MR. PADILLA: Mr. Ramey, we  
7 pass the witness.

8 MR. RAMEY: Any questions of  
9 Mr. Nutter?

10 MR. CARR: Could I ask one  
11 question just for clarification?

12 Does Mr. Nutter plan to testify  
13 again on direct examination as a witness for other  
14 protestants?

15 MR. LOPEZ: No.

16 MR. CARR: So this is his whole  
17 testimony?

18 MR. LOPEZ: Yes.

19 MR. CARR: I just wanted to be  
20 sure we didn't start back and forth, back and forth.

21 I have a few questions. Could  
22 we take about a three minute break?

23 MR. RAMEY: Let's take a break.

24 (Thereupon a recess was taken.)

25 MR. RAMEY: Mr. Carr, you may  
proceed.

## CROSS EXAMINATION

BY MR. CARR:

Q Mr. Nuttar, you provided us with a history of background of the development of the Bravo Dome Area. You talked about three pools that had been developed in that part of the state.

None of these pools have actually been declared as such by the Oil Commission, have they?

A The Commission has never entered an order designating a gas pool for any of those three areas. It was on the docket at one time and for some reason was dismissed. I don't recall why.

Q So those are not declared pools; they're just production areas.

A They're production areas.

Q Now in regard to the Bueyeros Pool, have you made a study of any of these particular pools?

A Not in depth, Mr. Carr. I've been familiar with these pools for quite some time but I've never made an in depth study of any of them.

Q On the Bueyeros Pool, do you know which well it was that was vented to the air or blew to the air for an extended period of time?

A No, I don't.

Q And do you know how close that would be to any offsetting well?

A They're all close together.

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Q And when you say close, how close?

A I believe the -- well, the exhibit is down right now, but I believe those wells might be on almost 40-acre spacing in there.

Q Do you have --

A I've been out there but I don't recall what's there. You can see from one well to the other, though.

Q Do you have any idea what initial pressures were encountered in any of the other wells that were drilled after this first well was vented to the air?

A No, I don't.

Q Do you know how those pressures -- you wouldn't know how any pressures, then, would compare to what might be a virgin pressure in the Tubbs?

A No, no.

Q So we couldn't tell from that data whether or not that first well drained a large area?

A Couldn't tell.

Q Now if we wouldn't have a buffer zone, and assume we would get an order approving 640-acre spacing, that would mean that anyone offsetting the unit could develop on 160-acre spacing unit, is that correct?

A Yeah, without a buffer zone you'd have, presumably, two spacing sizes abutting directly against each other.

Q And if one -- on one side of the line is

1  
2 developed on 160's to protect against counter drainage,  
3 you'd have to develop on 160's on the other side of the  
4 line.

5 A No, you wouldn't necessarily.

6 Q You could --

7 A You'd, if you were developed on 160's on  
8 the dense -- we'll call the 160 the dense.

9 Q Uh-huh.

10 A If you were developed on 160 you'd have  
11 -- and that well was right here, and Mr. Note's book here  
12 was the 640-acre side, and this is a square mile and this is  
13 a square mile, you'd have two wells here, and this operator  
14 could dedicate north half and south half and have two wells  
15 here, and the unit would be protected.

16 Q And they would have to drill --

17 A Two wells rather than four.

18 Q And they would have to offset each of  
19 those wells well for well.

20 A Yeah, but that would give quite adequate  
21 protection, I would think to the unit.

22 Q Well, when we have an open window in a  
23 unit where you have a tongue, more or less, of the unit ex-  
24 tending into acreage which is not unit area, you wouldn't  
25 have just this simple example that you've just given.

A Well, you have all conformities of ac-  
reage there in those windows.

Q And you could --

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2           A           You mentioned tongues, you've got arms  
3 sticking out and winding around.

4           Q           And in those situations, in those situa-  
5 tions just a simple 100 -- offsetting all of those wells  
6 could result in situations where you would be developing on  
7 a pattern denser than one well per 640 acres.

8           A           Denser than one well --

9           Q           I mean denser than -- you would have to  
10 have more than one well on each 640 within the unit to off-  
11 set production on statewide that's outside the unit.

12          A           There might be cases where you might even  
13 have to have two wells on 60. I don't know. You look at  
14 those little fingers of windows there, or arms, and they are  
15 weird looking.

16          Q           When you have a 160-acre spacing pattern  
17 abutting a 640-acre spacing pattern, and if someone develops  
18 the 160 on 160's, to offset counter drainage you would have  
19 to have more than one well per 640, would you not?

20          A           Probably.

21          Q           Did you testify that if -- that there  
22 could be under existing rules in the unit situations where  
23 if wells were not drilled at least one per 160 that certain  
24 royalty interest owners would be in a situation where they  
25 would not be sharing in production?

          A           I want to be sure that I understood your  
          testimony.

          A           Did I testify what, now?

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2           C           I believe you stated that there was a  
3 situation where if they didn't develop on 160's royalty in-  
4 terest owners might not be sharing in production from the  
5 unit.

6           A           Oh, no, what I was saying was that Amoco  
7 says that they're trying to develop on 640-acre spacing to  
8 protect the owners of the windows.

9           Now as I see it, what they're saying is  
10 that this royalty owner under this little 160-acre window  
11 right here, has no protection if the operator that has the  
12 lease on that 160 does not choose to drill a well.

13           Now Amoco would pool that 640-acre tract  
14 to protect that royalty owner, they say. I don't know what  
15 incentive they would have to go to the effort to pool ac-  
16 reage when they've got a million acres that they don't have  
17 to pool, but at any rate --

18           Q           You said you didn't know that, is that  
19 correct?

20           You don't know what their incentive is?

21           A           I don't know what their incentive would  
22 be.

23           Q           All right, just to be sure --

24           A           Yeah, I don't know what their incentive  
25 would be.

26           Q           -- what you said.

27           A           If -- if they have one.

28           Q           And you don't know that, do you, Mr. Nut-

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tar?

A I don't know if they've got --

Q Thank you, you answered the question I asked you.

A Right, but they're protecting -- what they're really trying to do here is to protect that royalty owner. That's their main purpose for being here, who has the 160-acre tract.

Now this guy here with this 40-acre tract, he's protected because if somebody sees fit to drill a well there, whether it's 160-acre spacing or 640-acre spacing, that little 40-acre tract is going to be dedicated.

Now here's one that's 320 acres, and that's going to be protected whether there's 160 or 640.

It's these 160-acre windows that I see are the only ones that really need the protection.

Q Okay, that's what I understood your --

A Uh-huh.

Q -- testimony to be.

Now, you have stated that you do not believe that a well will drain 640 acres.

A I think there's a serious doubt.

Q And you think that that's an impossibility?

A Well, I -- no, I -- no, I don't think it's an impossibility. I think that given sufficient time that that well would drain that 640. It's a matter of is

1  
2 that casing going to last long enough for it to drain that  
3 \$40.

4 Q Well, let's talk about that casing.  
5 You're concerned with corrosion.

6 A Yes, sir.

7 Q And I think your arguments on waste were  
8 that it's possible that by withdrawing the gas at a faster  
9 rate you're going to increase the corrosion, or that poten-  
10 tial.

11 A Yes, sir.

12 Q And if you do that and then if there are  
13 insufficient reserves at the time that first well is lost to  
14 justify the drilling of a second, reserves will be left in  
15 the ground.

16 A That's correct.

17 Q Now, that is all based on the assumption  
18 that the corrosion is sufficient to destroy the first well,  
19 is that not?

20 A Right.

21 Q Do you know what corrosion control tech-  
22 niques Amoco has developed?

23 A No, I don't.

24 Q Wouldn't you think that as --

25 A But I know that the other operators in  
the pool have tried corrosion protection techniques that  
have not been completely successful.

Q And you don't know what Amoco has done?

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A No, I sure don't.

Q And wouldn't you think a prudent operator would have to consider that in developing a unit?

A Well, I'm sure that Amoco is concerned with corrosion. I know that they've had corrosion problems in some of their wells to date and maybe they've licked them by now. I don't know.

Q I remember three or four, maybe five years ago --

Q I think --

A -- I had discussions with Amoco people about some of their corrosion problems.

Q Were they politer to you then?

A Yes.

Q Mr. Nutter, I believe you stated that going from a 640-acre spacing unit to a smaller spacing unit was a difficult chore and you cited some examples.

A Yes, sir.

Q This is a problem the Commission has addressed in the past.

A The only way they've addressed it, really, is to rescind the order and go back and authorize infill drilling.

Q It's difficult if you've developed on 160 and discover that 640 is appropriate, also, to move that way, is it not?

A Well, it depends. It depends. We've

1  
2 known lots of cases where the initial development has been  
3 on narrow spacing and they've been able to wagonwheel around  
4 and get the acreage dedicated to the wells or else get non-  
5 standard units.

6 Q It does create problems that way, also,  
7 does it not?

8 A The problems are easier surmounted though  
9 in that direction than they are in the opposite direction.

10 Q If you can develop --

11 A It doesn't require rescinding of the  
12 rules and the other one usually ends up rescinding the  
13 rules.

14 Q If you've developed on 160's and then  
15 discover that the wells will drain 640, you run the risk of  
16 having unnecessary investments in -- in the wells, the num-  
17 ber of the wells on 160's, have you not?

18 A Well, that's a possibility.

19 Q Now, Mr. Nutter, I want to be sure I un-  
20 derstood your testimony and your comments on Mr. May's exhi-  
21 bits.

22 A Well, that's a different one than was up  
23 there awhile ago, isn't it?

24 Q Well, I think that we're talking about  
25 the orange area and I think this will suffice.

A Okay, this is -- this is C-C' and it's an  
east/west, right across the heart of the pool.

Q Was it your understanding that Mr. May

1  
2 was testifying that a one millidarcy cutoff is necessary for  
3 the well to flow CO2?

4 A No, I don't know if he made that state-  
5 ment. He said that this demonstrates continuity.

6 Q Are you aware that this --

7 A One millidarcy means continuous orange to  
8 ne.

9 Q Okay, and that is what Mr. -- you under-  
10 stood that that's what Mr. May used, was just that figure as  
11 to what he was going to shade in that --

12 A Right, and I also see white streaks in  
13 the continuous orange.

14 Q We understood you said that earlier, yes.

15 A Okay, I didn't want you to miss that.

16 Q I believe you looked at the exhibits that  
17 Mr. Sheppard offered and I don't have the numbers. They're  
18 the ones that have the number of colors on them.

19 A Okay, yeah.

20 Q And I think you testified that you felt  
21 that --

22 A Seventeen and Eighteen.

23 Q -- there would actually be lower flow  
24 rates than depicted on those exhibits.

25 Was that your testimony?

A Well, yes. Yes. Because he showed that  
with 640-acre spacing you'd have 131 wells that first year  
produce 300-million a day, and this calculates out, I think

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it was to 2279 or some such figure, 2294, I don't remember.

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Q If that's true, doesn't that really mean that to maintain the 300-million a day flow rate that more wells would have to be drilled on 160's over the next fifteen than even Mr. Sheppard indicated?

A I don't know, because that was -- that, what I was talking about there was the 131 wells on 640-acre spacing.

Q Now you talked about correlative rights and made particular reference to the Ross wells, and you said that if we prorate, if retable take becomes an issue, then his correlative rights could be impaired.

A Right.

Q That would mean that if he only had 40 acres that were contributing production, his production would be restricted by a factor that would only, say, give him 40 over, say, 640 acres.

A That's correct, yeah.

Q And so he would be given just his share of the productive acres.

A And when he came in -- and when he came in in good faith, he realized that he'd get 40 over 160 in the event of proration, but now he'd get 40 over 640, so he'd be -- instead of getting one-fourth he would get one-sixteenth.

Q And you're saying that when he came in that was the status of the rules at that time.

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A That's correct.

MR. CARR: I have no further questions.

MR. RAMEY: Any other questions of Mr. Nutter?

MR. KELLAHIN: Yes, sir.

MR. RAMEY: Mr. Kellahin.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Nutter, you've appeared today as an expert witness on behalf of Americas?

A Yes, sir.

Q When did Americas retain you as an expert witness, Mr. Nutter?

MR. LOPEZ: Objection. I don't think that's any of your business. I think that applies for privileged information.

MR. KELLAHIN: I want to know the competency of this witness to express opinions today and I think it's important as to how long he has worked for this client and what he knows about his client's business. I haven't asked him what he's paid. I only asked him how long he's been employed as an expert witness. I think that's a fair question.

MR. RAMEY: I'll sustain the objection. I think it's irrelevant at this time, Mr. Kella-

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him.

MR. FELLANIN: All right, sir.

Q Mr. Nutter, has Amerigas provided you with any production data on their wells?

A I haven't gone into production data, no, sir.

Q All right, sir, where does Amerigas have wells that they operate in this area?

A Well, the map is down.

Q We'll find another map. Mr. Nutter, I show you what is marked as Amoco Exhibit Number One and ask you to locate for us, sir, where Amerigas operates Tubb formation --

A Amerigas, Amerigas operates wells on the southwest flank of the Bravo Dome Unit Area, in between the unit boundary and the row of green wells that is on there. These green wells are wells that are depicted as non-unit wells completed since 3-31-81, so these are the old Amerigas wells right in here.

Q The Amerigas wells are --

A And Amerigas also operates this -- these gas wells up in the blue area.

Q The blue area is contained within the outer boundary of the area in this application.

A That is correct. That's the -- that's the Bueyeros Field in Township 20, 31.

Q And the Amerigas wells to the west of the

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Q And the Americas wells to the west of the applied for area in this case are identified by well symbols that do not have a coloring.

A That is correct. That's the Mitchell Field.

Q All right, sir. With regards to the Mitchell Field, has Americas provided you with any production data?

A I said I haven't gone into production data at all.

Q Has Americas provided you with any core data?

A No, I haven't looked at core data.

Q Has Americas provided you any logs?

A No.

Q Have they provided you any bottom hole pressure data?

A I have a certain amount of bottom hole pressure data.

Q All right, sir.

A I haven't mentioned it.

Q You didn't use it in formulating your opinions here this afternoon?

A No. It was covered this morning. My testimony regarding pressure was covered this morning when they talked about the differential in pressure between this area and that area.

1  
2 I would have brought it up if it hadn't  
3 been covered.

4 Q Has your client provided you with any  
5 pressure build-up tests?

6 A No.

7 Q And that applies to all the wells that  
8 your client, Amerigas, operates. They have not given you  
9 any data with regards --

10 A No, I haven't -- I haven't made a reser-  
11 voir study of the Amerigas area.

12 Q All right, sir. You're appearing today  
13 as an expert witness for Ross Carbonics?

14 A Yes.

15 Q Does Ross Carbonics operate any carbon  
16 dioxide wells in this area?

17 A Yes, they do.

18 Q Would you identify for me where those  
19 are?

20 A This well that's indicated in Section 12  
21 of Township 19 North, Range 30 East is one of their wells  
22 and they have another one in Section 14, I believe it is.

23 Q And they have two producing carbon di-  
24 oxide wells within the area --

25 A Two wells capable of producing.

Q They are not now producing?

A No, sir.

Q Are there any other wells?

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A No, not at this time. They have others planned.

Q Has Ross Carbonics provided you with any well information on those wells?

A No, no specific information on the reservoir.

Q All right, sir, no core analysis, no logs, no pressure information?

A No, I rely on Amoco to furnish all that data.

Q Now you're appearing as an expert witness for some other individual or company, Mr. Nutter?

A Yes, sir.

Q And who was that?

A That's Energy-AGRI --

MR. PADILLA: AGRI Products, Inc.

MR. KELLAMIN: I'm sorry, sir?

MR. PADILLA: Energy-AGRI Products, Inc.

Q Does Mr. Padilla's client have any producing wells in this area?

A No, they don't have producing wells.

Q Has Mr. Padilla's client provided you with any technical data from which to form any conclusions or opinions?

A Not from his wells because he doesn't

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2 have any.

3 Q All right. Now you expressed an opinion  
4 earlier that you thought the Mitchell production area, the  
5 Mitchell Pool?

6 A Mitchell area, I think.

7 Q The Mitchell area was approximately 50  
8 percent depleted?

9 A Yes, sir.

10 Q What was the original bottom hole pres-  
11 sures taken in the discovery wells?

12 A The original pressure in that pool was  
13 around 660 or 665 pounds, someplace in that neighborhood.

14 Q All right, sir, and what is the pressure  
15 now?

16 A It's less than 350.

17 Q All right, and what has been the total  
18 cumulative production out of that area?

19 A I don't believe anyone really knows.  
20 Some of the records in the early days were rather scant, and  
21 no one really knows.

22 Q What are the reservoir parameters that  
23 you used, Mr. Nutter, to determine that that reservoir is 50  
24 percent depleted?

25 A The fact that pressure has declined 50  
percent.

Q Over what period of time, Mr. Nutter?

A Well, the wells, the pool was put on pro-

1  
2 duction in 1940.

3 Q Let me direct your attention now to the  
4 Amoco exhibits and data.

5 Prior to today have you had an opportu-  
6 nity to examine any of that data?

7 A Most of this is data -- most of this data  
8 I've seen in 1980 and 1981.

9 Q All right, sir. Let me ask you on cross  
10 section C-C' if you identified in response to Mr. Carr's  
11 question that there were areas in which they were not shaded  
12 in orange and demonstrated what, Mr. Nutter?

13 A Well, that's areas that he has encount-  
14 ered less than one millidarcy of permeability in a well and  
15 if he encountered less than one millidarcy of permeability  
16 in the adjoining well he connected the two with a white  
17 streak going across there, and if he didn't, he just showed  
18 it as a lens in that one well.

19 Q All right, sir.

20 A As a nonproductive lens, I should say.

21 Q And correspondingly he shaded in in  
22 orange those areas of greater than one millidarcy or one  
23 millidarcy or greater?

24 A That's what he said, yes.

25 Q Do you have any disagreement with what  
Mr. May has determined to be areas within the individual  
logs of those wells that have millidarcies of one or great-  
er?

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2           A           I haven't confirmed his one millidarcy  
3 calculation but I would assume that it's correct.

4           Q           All right, sir. Can you track any of the  
5 orange areas across the pool and show me where they are dis-  
6 continuous on cross section C-C'?

7           A           Well, I don't know if I can or not.  
8 There's no proof. When you've got a little tick on a log  
9 and you've got a corresponding tic on the next log, you  
10 really don't have any positive proof that that is a contin-  
11 uous sand across there. It could be two similar lenses,  
12 both occurring in -- in the adjoining wells. There's no  
13 positive evidence that they're continuous sand bodies across  
14 there.

15                       Just like there isn't any proof positive  
16 that one of these white streaks is continuous. You see this  
17 white streak right here, Mr. Kellahin, and it's coming in  
18 between these two perforated intervals and then it comes  
19 through here. Well, we see that it has risen up. It's not  
20 on the same elevation in this well as it is on this well.

21                       This may be a tight spot here and it may  
22 not be a continuous white spot -- tight spot clear across,  
23 just like a productive zone may not be completely continuous  
24 from one well to the other.

25                       It's all questionable.

                      But essentially, it's -- it's an orange  
                      speedway written across that cross section that shows con-  
                      tinuity of reservoir but not continuous sand bodies.

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2 Q You called it an orange speedway?

2

3 A Yeah.

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4 Q It shows continuity across the reservoir.

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5 A Yes, sir, it shows continuity but it  
6 doesn't show positive continuous sand bodies. They may be  
7 equivalent sand bodies that are not interconnected. We see  
8 some that definitely aren't and there are probably others  
9 that aren't.

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9 Q Are you telling me that you do not see a  
10 uniform thickness continuously across the pool?

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11 A I see, well, that's not across the pool.

11

12 Q Well, it is from east to west.

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13 A This is across the heart of the pool.  
14 Now we don't have the one showing right there right now that  
15 goes from -- we don't have -- I believe there was one that  
16 came across -- this one comes down here, we don't have A-A'  
17 showing and you have a definite change in thickness in  
18 those.

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18 But these are on a completely different  
19 scale than those other ones were, too. These are, as he  
20 stated this morning, Mr. May said these wells are approxi-  
21 mately one mile apart, whereas you get to some of those  
22 others and some of them are three townships apart.

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23 So it's continuous to the extent that you  
24 can rely on a cross section jumps three -- three townships  
25 from well to the other.

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Q Does it make a material difference to any

1  
2 of your clients, Mr. Nutter, if for a temporary period of  
3 three years we put this on 640's?

4 What does it really matter?

5 A Well, I don't -- I don't see how we're  
6 going to go back to 160's if it goes to 640's, really. I  
7 think that's the main problem, because as I mentioned ear-  
8 lier, the difficulty of changing back to another spacing  
9 pattern.

10 MR. KELLAMIN: Nothing further.

11 Thank you.

12 MR. RAMEY: Any other questions  
13 of Mr. Nutter?

14 MR. PADILLA: Just one ques-  
15 tion.

16 MR. RAMEY: Mr. Padilla.

17 REDIRECT EXAMINATION

18 BY MR. PADILLA:

19 Q Mr. Nutter, as you understand the unit  
20 plan of development, does Amoco have development on 160-acre  
21 spacing?

22 A I don't know.

23 THE REPORTER: I'm sorry, Mr.  
24 Padilla, would you repeat your question for me?

25 Q As you understand the unit plan of devel-  
opment does Amoco have to drill each and every 160-acre  
State proration unit?

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2 A Well, no, I don't think so. If the Bravo  
3 Dome Unit agreement requires that, that's a very unique unit  
4 agreement. I've never heard of a unit agreement that re-  
5 quired drilling every single proration unit that's in the  
6 unit area.

7 so, I don't think they do. I think  
8 they've got -- when they got approval for the unit agree-  
9 ment, got the thing ratified, I think that they've got con-  
10 trol as to when and where and how they'll drill those wells,  
11 as far as spacing and location is concerned.

12 There are certain state requirements as  
13 to the amount of acreage that can be dedicated to a single  
14 well and what the well locations would be, but I don't think  
15 there's any requirement that says they must drill four wells  
16 to the section.

17  
18 MR. PADILLA: I have no further  
19 questions.

20 CROSS EXAMINATION

21 BY MR. RAMEY:

22 Q Mr. Sutter, could you or your clients  
23 furnish the Commission with plats, a plat or plats showing  
24 the ownership of existing wells and the acreage dedicated to  
25 the existing wells?

A Yes, sir.

Q Thank you.

MR. RAMEY: Any other questions

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2 of the witness?

3 MR. LOPEZ: Mr. Ramey, I just  
4 have one question of Mr. Nutter.

5  
6 CROSS EXAMINATION

7 BY MR. LOPEZ:

8 Q Dan, I'd like you to refer to the A-A'  
9 cross section, if you will, which is behind the C-C' cross  
10 section and in referring to that exhibit explain why or what  
11 changes in thickness in the Tubb reservoir you see, and why  
12 that exhibit sustains your opinion that it can be discontin-  
uous.

13 A Is that one -- is that one on the same  
14 vertical scale as C-C'?

15 (Thereupon a discussion was had  
16 off the record.)

17 Okay, you were referring to Exhibit --  
18 Cross Section A-A'.

19 Before I get to that, I'm going to go to  
20 C-C' and in the heart of the pool on C-C' we have that such  
21 permeability of one millidarcy or more. How many feet that  
is, I don't know.

22 Q About eight inches on your --

23 A No, it's not that much.

24 We come over to A-A' and we're down a  
25 little farther south than the heart of the pool. That C-C'  
is back up in here.

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2                   So we come down to A-A', which is at the  
3 very extreme southeast boundary of the unit area and we've  
4 got -- we've got a half inch less permeability. As we get  
5 to the middle of A-A' we've got an inch and a half of less  
6 permeability. When we get over to A on the extreme north  
7 end, we've got less than half as much and a much more great-  
8 er amount of white stuff that doesn't have a full millidarcy  
9 of permeability.

10                   So you can see, not only does the area or  
11 the thickness of the formation with the permeability thin as  
12 you go from east to west, but the quality also decreases.  
13 The permeability is less over there on the west side. The  
14 permeability itself, the K is less, and the H is less, so  
15 you've got a lot less KH or millidarcy feet of permeability.

16                   And, of course, millidarcy feet of per-  
17 meability is one of the prime factors that results in drain-  
18 age of reservoirs.

19                   And on the west side you just don't have  
20 the KH that you've got in the heart of the pool.

21                   Q                   Would that lead you to conclude that on  
22 the west side of the pool at least more wells or proration  
23 units would more effectively drain the reserves?

24                   A                   Absolutely.

25                   MR. LOPEZ: No further ques-  
26 tions.

27                   MR. DANEY: Any other questions  
28 of the witness? He may be excused.

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2 Do you have anything further,  
3 Mr. Padilla?

4 MR. PADILLA: No, sir.

5 MR. RAMEY: I assume we're  
6 ready for closing statements.

7 MR. JARAMILLO: Mr. Commis-  
8 sioner, we have some brief testimony.

9 MR. RAMEY: Oh, okay.

10 MORRIS YOUNG,  
11 being called as a witness and having been duly sworn upon  
12 his oath, testified as follows, to-wit:

13  
14 DIRECT EXAMINATION

15 BY MR. JARAMILLO:

16 Q Would you state your name, please?

17 A My name is Morris Young.

18 Q Mr. Young, what is your business address  
19 and your occupation?

20 A I am employed by Thriftway Company out of  
21 Farmington, New Mexico. My occupation is an engineer.

22 Q And what is your affiliation with Ross  
23 Carbonics?

24 A With Thriftway I'm Vice President of  
25 Special Projects. Ross Carbonics is an operating subsidiary  
of ours, and as such I have direct responsibility for Ross  
Carbonics.

1  
2 Q All right, and what is the nature of the  
3 business of Ross Carbonics?

4 A Ross Carbonics was formed to operate and  
5 to develop these leases we have in the Quay, Harding, and  
6 Union County Areas.

7 Q All right, and in what manner are these  
8 leases being developed in these three counties by Ross Car-  
9 bonics?

10 A We are drilling. We are in the process  
11 of drilling and have some additional drilling to do. We  
12 have purchased a carbon dioxide liquification plant, which  
13 will be ready for delivery within another ten days, and are  
14 proceeding rapidly to put that plant into operation.

15 Q Can you describe where within the outer  
16 limits of the Bravo Dome Unit the leaseholdings of Ross Car-  
17 bonics are located, as well as the plant location?

18 A Outside of the unit we have -- most of  
19 our acreage is located to the south and to the west of the  
20 existing Bravo Dome Unit.

21 Within the boundaries of the Bravo Dome  
22 Area we are some of the windows that have been discussed  
23 here, and I feel we're almost a direct reason for these  
24 hearings.

25 Q All right.

MR. JARAMILLO: Could we have  
that map just to get some perspective in this?

A SPECTATOR: It's right up

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here on the wall, Mr. Jaramillo.

Q Mr. Jaramillo, you might just step up and point out with some particularity where these leaseholdings are located and where the location of the plant is scheduled to be constructed.

A This is our Garcia lease. This is the Hook Lease. Down here in 12 and 14 we have the Mayo Lease.

Q All right, that's in Township 19 North, Range 30 East?

A Yes.

Q All right. The lease you made reference to previously is in Township 20 North, Range 30 East.

A Yes.

Q All right.

A Both are located on the west side of the Bravo Dome Unit.

Q All right, what's the approximate acreage of your -- what appear to be these noncontiguous leases?

A We have just over 1080 acres.

Q All right. Now, are your -- is your acreage committed to Bravo Dome Unit?

A No, we specifically excluded that acreage from Bravo Dome Unit.

Q All right, and why was that decision made in connection with the development of your leasehold interests within the unit?

A In looking at the marketing plan which

1  
2 was the basis of development of the Bravo Dome Unit, the  
3 carbon dioxide was to be utilized primarily for enhanced oil  
4 recovery in the West Texas area.

5 We didn't see how that would fit into an  
6 economic return for our own acreage, so we elected not to  
7 join the unit simply on the basis of economic reasons.

8 Q All right, and the development plan has  
9 turned to the production of carbon dioxide for feeding the  
10 plant that you've talked about.

11 A Yes. We felt the liquification plant  
12 would in fact provide the mechanism whereby we could ade-  
13 quately market the carbon dioxide under our leases.

14 Q All right, and do you see your economic  
15 interests in terms of promptly and efficiently developing  
16 your acreage as being dissimilar from those of the operator  
17 of the unit, Amoco?

18 A We see a great deal of difference between  
19 our interests and those of Amoco. Amoco, or the Bravo Dome  
20 Unit, has stated a long development period whereby to pro-  
21 vide primary feedstock for the enhanced oil recovery pro-  
22 jects going on in the West Texas area.

23 Our intent would be to liquify and to  
24 pull out in a rather prompt and expedient manner to avoid  
25 waste of any of the carbon dioxide reserves that we have.

26 Q All right. What is your deliverability  
27 need in order to maintain the plan at an economic capacity?

28 A We are going to need approximately 4-mil-

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lion cubic feet.

Q Per day?

A Per day.

Q All right, is any less than that going to be sufficient in order to make the plant operation a viable operation?

A Our economic calculations are that with less than that it will be a poor venture.

Q All right. Now explain what the change in spacing rules as proposed by Amoco that would encompass your acreage by its application would have upon the development plans you have for your acreage uncommitted to the Bravo Dome Unit.

A We will have -- we have four 160-acre standard units that we could develop under the present system that would provide the feedstock for our plant.

Under the 160-acre proposal none of those sites would be available for drilling. We would be forced to force pool as the only alternative to drilling and end up with in most cases less than a quarter of an interest and it just would not become economic for us to go out and force pool the unit and then end up with a quarter of the production.

We would have the risk of drilling. We would have then insufficient delivery to even operate our plant, even if we were to do that.

Q Was the development plan that you have

1  
2 underway predicated upon the 160 statewide rules that now  
3 apply to this?

4 A Yes, they would.

5 Q All right. Now in terms of fully devel-  
6 oping your acreage, preventing waste, and protecting your  
7 correlative rights, what impact is this rule change going to  
8 have?

9 A Well, as far as we can see, what the net  
10 result will be that our leases would not be developed even  
11 if they were taken into the -- the overall impact would be  
12 the same as if we had originally joined the unit, which we  
13 elected not to do, so -- because these -- these windows  
14 would be essentially undrillable for -- from an economic  
15 standpoint.

16 Q Is there any particular incentive with  
17 the thousands and thousands of acres within the unit itself  
18 to develop those portions that constitute isolated windows  
19 as part of a proration unit if you were Amoco and the opera-  
20 tor of the entire unit?

21 A I can only suggest an answer to that and  
22 if I was an operator that had acreage and it was free and  
23 clear of any encumbrance like that, I certainly would deve-  
24 lop that first, and from that reasoning I tend to believe  
25 that the acreage that represents here by these windows would  
be the last acreage to be developed.

Now Amoco has conceded on the Bravo Dome  
Unit application has conceded that drilling would be allowed

1  
2 on less than 160-acre parcels, assuming that you had a total  
3 of 160 acres, that you could have infill drilling, but since  
4 that possibility does not exist with any of our leases, we  
5 would be excluded from the ability to drill and therefore  
6 protect our correlative rights.

7 Q All right. Was Mr. Nutter's testimony  
8 with respect to the impact on the small acreage that you do  
9 have correct from your point of perspective as well?

10 A It was. I also notice testimony earlier  
11 where our interest was the sole objection or one of the sole  
12 objectives of Amoco, that they wanted to protect those in-  
13 terests and quite frankly we don't really want them to pro-  
14 tect our interest. If we had wanted them to protect our in-  
15 terest, we would have elected to join the unit.

16 Q All right. In your view, if the spacing  
17 rules are changed, will the acreage that you own within this  
18 unit ever be properly or efficiently developed, if you don't  
19 develop it yourself?

20 A If these rules are developed we have es-  
21 sentially bought a plant. We've invested well over a mil-  
22 lion dollars at this point in time, and as far as I know,  
23 our -- probably our economic decision will be to scrap the en-  
24 tire project, to just take the loss, and if you're as small  
25 a company as us, as small as we are, we've been talking  
about Amoco and their economic rights and their economic im-  
pact all day long, but the impact that will be to us is very  
significant as compared to Amoco having to drill some addi-

1  
2 tially bringing in these windows within the unit if these  
3 rules are changed, would it be your proposal that if any  
4 rules are changed that it not impact uncommitted acreage  
5 within the outer limits of the Bravo Dome Unit?

6 A That would be, of course, the reason that  
7 we have appeared here today, would be to get our acreage ex-  
8 cluded should they -- should the Commission find the rules  
9 to be applicable for the rest of the Dome.

10 Now the one thing that we do strenuously  
11 object to is the closest flow wells that evidence or testi-  
12 mony has been brought here today, is some fifteen to sixteen  
13 miles away from our closest lease, and with the slingshot  
14 approach they are trying to say that what happened at those  
15 particular flow wells happens every place within the bound-  
16 aries of that Bravo Dome Unit.

17 We don't know that that is true. On the  
18 basis that it may or may not be true, should the Commission  
19 so rule in the favor of Amoco, it would have significant im-  
20 pact on us.

21 Q Do you believe there's enough divergence  
22 of opinion plus the clear demonstration of the -- not only  
23 of the pay as you get to the west, would justify the exclu-  
24 sion of uncommitted acreage?

25 A I have read the orders from previous  
26 hearings and I have set through the entire testimony in this  
27 hearing, and quite frankly I come to the same conclusion  
28 that the Commission came to previously, and that is that

1  
2 these things have not been demonstrated definitively.

3 Q One last question, Mr. Young. Could you  
4 step to the exhibit that has the A-A' cross section and de-  
5 monstrate approximately where your acreage would fall within  
6 that cross section? You may want to take down that first  
7 exhibit there.

8 A Okay. Our acreage would fall within  
9 these -- this area here. As was pointed out earlier, be-  
10 cause this is an area of various lenses, there is some ques-  
11 tion if you drill these on 640-acre spacing whether you  
12 would catch all of those lenses, as compared with what you  
13 would catch with 140 acres -- I mean 160-acre spacing.

14 Q For purpose of the record, you're talking  
15 about the area between Well 1 and 2?

16 A Yes, that is correct.

17 MR. JARAMILLO: I have nothing  
18 further, Mr. Ramey.

19 MR. RAMEY: Any questions of  
20 Mr. Young?

21 MR. LOPEZ: I just have one  
22 question, Mr. Ramey.

23 CROSS EXAMINATION

24 BY MR. LOPEZ:

25 Q Is it your understanding that Ameriges'  
acreage also falls in that same area between Wells 1 and 2?

A Most of it does right in this area, in

1  
2 either this area or scooting it down in a westerly and  
3 southerly direction.

4 Q Thank you.

5 MR. LOPEZ: Nothing further.

6 MR. RANEY: Mr. Young, would  
7 you furnish us a plat of your acreage, please?

8 A Yes, I will.

9 MR. RANEY: So we can visualize  
10 the acreage dedicated to those wells.

11 A Yes.

12 MR. RANEY: Thank you.

13 Any questions of the witness?  
14 He may be excused.

15 I think we're now ready for  
16 closing statements.

17 Mr. Lopez, you may go first.

18 MR. LOPEZ: May it please the  
19 Commission, Amoco is to be congratulated and their efforts  
20 with respect to the development of the Bravo Dome Unit  
21 should be deeply appreciated by all the parties concerned,  
22 working interest owners, landowners, the State of New Mexi-  
23 co, and all the rest, for the efforts, the investment, and  
24 the energy in terms of human resources and economic resour-  
25 ces that have gone into the development of the Bravo Dome  
Area.

And it is with great reluctance  
that we appear here today, Amerigas appears here in opposi-

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2 tion to their application.

3 But we did not think their ap-  
4 plication, in accordance with previous discussions and all  
5 would so directly affect our position in the unit. We  
6 thought we would be left alone and as a result of the testi-  
7 mony produced here today we unfortunately must draw a com-  
8 pletely different conclusion.

9 Initially I would point out to  
10 the Commission that it is clear that in order to change the  
11 pool rules, even if it is for a temporary special pool  
12 rules, which I think is sort of an empty appellation inas-  
13 much as, as has been discussed, special temporary pool rules  
14 often become permanent.

15 The burden of proof rests with  
16 the applicant.

17 The evidence you're heard here  
18 today is based on primarily, and I'm referring to evidence  
19 that is really new and different from the evidence at the  
20 1980 and 1981 hearings, is based on flow tests from four  
21 wells, the closest together of which is at least three and a  
22 half miles, or they're at least three and a half miles  
23 apart, and producing for only approximately eighteen months,  
24 and these wells, the nearest of which is located at least  
25 ten miles from Americas' area of interest.

On the basis of this informa-  
tion, Amoco is requesting the Commission to establish 640-  
acre spacing for approximately a million acre area, encom-

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2 passing portions of Amerigas' leases, and when combined with  
3 Cities Service's application, together with a one mile buf-  
4 fer zones requested in each application, it will encompass  
5 almost the entire amount of Amerigas' leased acreage.

6 Amoco states that their appli-  
7 cation should present no problem but we, unfortunately, have  
8 to take -- object to this because it does indeed present a  
9 problem.

10 Amerigas has drilled and been  
11 producing wells based on statewide spacing rules, namely  
12 160-acre spacing, for over forty years. Amerigas has every  
13 intention of developing the balance of this acreage on 160-  
14 acre spacing, and the problems we face are first, that what  
15 happens to our existing wells if the application is ap-  
16 proved?

17 Essentially what will occur is  
18 that our existing wells and when I say they were drilled and  
19 have been producing on 160-acre basis, that's not entirely  
20 correct because we have some that are on a smaller pattern,  
21 namely forty acres, which were drilled, as I mentioned ear-  
22 lier, prior to the adoption of the statewide rules.

23 What happens to these wells  
24 when they're forced into a 640-acre spacing unit?

25 Will Amerigas be liable to its  
new unwelcome partners in the proration unit for past pro-  
duction, and what will be the drainage issues that engen-  
dered thereby?

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2 Secondly, Amoco states that  
3 Americas should feel free to go forward and drill four wells  
4 per section; that it is no skin off their nose if we should  
5 do so; that there's no current limit with respect to produc-  
6 tion allowed from wells drilled in the unit and therefore we  
7 can produce as many wells as we wish to drill on our unit at  
8 their fullest capacity.

9 Well, two things say that this  
10 can't be done.

11 One is potential prorationing  
12 and if not prorationing, ratable taking.

13 Prorationing will occur when  
14 the market -- when the production capability of the unit  
15 area exceeds the market demand and what will occur, naturally  
16 -- well, that's pretty well clear.

17 In the alternative, if there's  
18 only one pipeline, even though it will be a common carrier,  
19 but its capacity is no more than a certain amount and the  
20 producing capability of the unit area exceeds that, we're  
21 going to be under a ratable take situation where again our  
22 potential production will be curtailed.

23 What then happens to Americas  
24 and the development of its leased acreage? It commits to the  
25 economics, the economic costs of drilling four wells per  
unit and then it faces the prospect that it's allowable  
could be cut to a fourth and that -- and in addition the  
problems of being able to market its leased acreage on the

1  
2 basis of being able to fully produce its acreage on a four  
3 well per 640 basis is also inhibited in that any purchaser  
4 with designated requirements of production from the leases  
5 could not feel secure with the potential of prorating and  
6 ratable take facing them possibly down the line.

7 With respect to the merits of  
8 Amoco's case, and whether or not they've sustained their  
9 burden of proof, I've already pointed out that essentially  
10 we've been asked to address the information obtained from  
11 approximately eighteen months of production of four wells,  
12 the flow tests on four wells, wells which have not even pro-  
13 duced into a pipeline, wells which have not been allowed to  
14 produce for various reasons at their fullest capacity.

15 And it's based, as has been  
16 pointed out in other testimony here today, the additional  
17 core data on all the many other wells drilled, really do not  
18 direct any conclusion that one well will drill on a 640-acre  
19 basis or 160-acre basis is fairly irrelevant. All it states  
20 is that the Tubb formation exists without the unit area, not  
21 only within the unit area, but without the unit area going  
22 either east or west.

23 Based on questions Mr. Kellahin  
24 has asked, why limit it to the unit area? Why not go back  
25 to Guy Suell's original request that it cover three  
counties, if what is going to occur is that any Tubb forma-  
tion should be developed on 640-acre spacing?

But be that as it may, we're

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2 asked to base on these four wells and computer simulation  
3 models, which are either unexplained or unexplainable, using  
4 factors which are admittedly at great variance from the fac-  
5 tors that pertain the Amerigas wells, Amoco claims that one  
6 well will drain 640 acres throughout the entire unit area.

7 Never have they mentioned how  
8 long it will take for that one well to produce the recover-  
9 able reserves from under the 640-acre tract. Never have  
10 they addressed the effect that corrosion will have on these  
11 wells over a long period of time.

12 And finally, they would ask,  
13 they would have us believe that four wells will recover no  
14 more reserves than one will recover, something that almost  
15 of priority defies logic.

16 Further, Amoco has failed to  
17 discuss the time value of money. Amerigas contends that  
18 four wells per section in its area of interest will recover  
19 more CO2 at an earlier date when the value of money is  
20 greater, resulting in greater economic benefit to all con-  
21 cerned, including the State through severance taxes and  
22 royalties.

23 Simply put, Amerigas believes  
24 that Amoco has failed to sustain the necessary burden of  
25 proof to sustain its application. Moreover, it is our opin-  
26 ion that Amoco is overreaching with this application and is  
27 adversely affecting all parties within the unit boundaries  
28 who have elected not to join its unit agreement.

1  
2 Amoco argues that it needs the  
3 640-acre spacing so as not to drill unnecessary wells which  
4 would have to be drilled, but it is our opinion that their  
5 fear has been greatly exaggerated and is somewhat unreal.

6 The offset wells that Amoco  
7 would have to drill would first of all have to be fairly  
8 minimal inasmuch as Amoco controls at least 70 percent of  
9 the unit area.

10 As to the balance of the ac-  
11 reage in the unit area that is not committed to the unit  
12 agreement, it has been discussed here today that Amoco would  
13 really only have to protect against mostly the perimeters of  
14 that acreage, mainly only have to address the problems of  
15 the 160-acre windows, and in respect to the fact that I  
16 claim that their fear is unreal, we don't have any real in-  
17 stances of where there is drainage occurring, nor can they  
18 point to any.

19 They have not been required  
20 thus far to drill any offset wells which they would claim to  
21 be unduly economically burdensome.

22 On the other hand Amerigas'  
23 concern is real and valid. If prorationing or ratable take  
24 comes into effect, Amerigas' leases could be cut to one-  
25 fourth or less of their current value.

26 In summary, Amerigas would have  
27 no objection to Amoco's establishing temporary special pool  
28 rules for the area which it has developed numerous wells on

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the eastern side of the unit, or as we saw here today, they had a plat that showed the green area.

We would have no objection to that being developed on 640-acres. We have no area of interest in that and there seems to enough wells drilled to maybe make a case, but what we have here, I think, in many respects, is competing market demands. As I've indicated earlier today, we have situations where there are target areas. As I recall, the initial thought was that it would be 1.5 billion and the last calculation is we have 300 million that we're looking at. That's Amoco's situation. The thought that Amoco will ever have to drill the northern end of the unit boundary, because it doesn't look terribly inviting at best, is purely speculative at this point. My belief is that Amoco has plenty of production now to meet its current needs.

We have leases that we can market that we can market on 160-acre basis, and to have their problems affect ours on the skimpy evidence that's before you does not seem to be fair.

It is our opinion that the broad requests that Amoco seeks is really no different than that made by them in 1980 and 1981 and should be rejected for the same reasons that are valid today. There just is insufficient evidence in the record to show that one well will effectively drain a 640-acre basis -- a 160 -- 640-acre unit.

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2 They could have run pressure  
3 tests with an offset well and showed direct communication but  
4 they refused to do so.

5 I think I've covered the points  
6 sufficiently.

7 MR. RAMEY: Thank you, Mr.  
8 Lopez.

9 Mr. Padilla?

10 MR. PADILLA: May it please the  
11 Commission, I think it's pure and simple the application be-  
12 fore the Commission today is a scheme by where Amoco is ask-  
13 ing the Commission to bail them out of drilling commitments  
14 under leases that they took in the area of the Bravo Dome  
15 Area.

16 In fact, what they're doing is  
17 deluding the interests of royalty interests and in fact  
18 trying to incorporate by increased spacing areas or smaller  
19 areas into the unit. I don't think that there's a practical  
20 way, other than just producing or developing on 160-acres  
21 the area in the windows not included in the unit area.

22 I don't care how they cut it,  
23 Amoco has a million acre unit. If they took too big a bite,  
24 that's their problem. It's not the problem of the interest  
25 owners that did not choose to join the unit.

Amoco has not here today pre-  
sented any more testimony than they did in 1981 at the  
second hearing or at the first hearing. They have not de-

1  
2 fined the pool, nor have they identified common sources of  
3 supply.

4 Mr. Note this morning indi-  
5 cated, his opening remarks were that that proof was not  
6 available and that they had no production history. If that  
7 is the case, then on that basis alone the application should  
8 be denied.

9 I would agree with Mr. May that  
10 he would not qualify the Tubb formations as a tight forma-  
11 tion under the Natural Gas Policy Act. I believe we saw  
12 more orange because we had more cross sections in the second  
13 hearing and we're no different today.

14 They have drilled additional  
15 wells and I think the testimony is clear that they had to  
16 drill those wells under obligations in order to reserve  
17 leases that had not yet been joined into the unit agreement  
18 prior to the effective date of the unit.

19 That, I believe, -- well, under  
20 the unit plan the only obligations that Amoco had to drill  
21 up to 1984, I believe, was drilling eight wells. They were  
22 apparently forced to drill these wells prior to the effec-  
23 tive date of the unit, and that is why they have drilled the  
24 wells and that is the only reason why they have drilled the  
25 wells. There may have been additional drilling but not to  
the extent that they have been -- they have been drilled.

The pipeline is not in place.  
Amerada Hess is the only one taking gas at this time, under,

1  
2 presumably, an arrangement with Amoco.

3 We have had two months of pro-  
4 duction into the pipeline and still, regardless of how you  
5 cut it, the only additional evidence is the four flow tests  
6 that have been conducted by Amoco in that area, and those  
7 flow tests are not representative of the one million acre  
8 unit.

9 Amoco has indicated that de-  
10 liverability demands here today and by and large I think  
11 they're talking about their own deliverability demands.  
12 They're not willing to recognize that deliverability demands  
13 and the plans of other operators to develop their own pro-  
14 perties.

15 That being the case, they're  
16 opposed to drilling offset wells where other operators are  
17 -- might drill and forcing them to a competitive situation  
18 in that area.

19 In short, the cases before the  
20 Commission, the two other cases, were denied on the basis of  
21 insufficient evidence. I think this case also ought to be  
22 denied on the basis of insufficient evidence.

23 Possibly in three more years  
24 after we have some pipeline -- or production into the pipe-  
25 line, the situation will change. In the interim they may be  
26 allowed to conduct actual tests on their actual production  
27 practices.

28 MR. RANNEY: Thank you, Mr. Pa-

1  
2 dilla.

3 Mr. Jaramillo?

4 MR. JARAMILLO: May it please  
5 the Commission.

6 My colleagues, Mr. Lopez and Mr.  
7 Padilla, have spoken ably to the lack of merit in the  
8 evidence in support of the application. If I might, I'd  
9 like to narrow the perspective some to the effect of this  
10 upon the uncommitted acreage of my client and those  
11 leasehold owners similarly situated, as it relates to the  
12 ultimate standards that the Commission employ in determining  
13 whether to grant or deny or granting part or denying part of  
14 the application.

15 With 1000 acres in a million  
16 plus acre unit with six to eight trillion cubic feet of  
17 reserves, the interests of Ross Carbonics are less than the  
18 tail wagging the dog. It's a small aspect of this entire  
19 operation but nonetheless, Ross Carbonics is not without its  
20 correlative rights in the ownership of acreage in this unit  
21 and we believe that the imposition of these temporary rules  
22 without the evidence that's required to justify globally  
23 across the entire unit and beyond, would not only impair the  
24 correlative rights of Ross Carbonics, it would eliminate  
25 them and would result in waste because the acreage that is  
held by the leases of Ross Carbonics will never likely be  
developed, and if so, would never be sufficiently developed  
in the manner that Ross carbonics has planned and programmed

1  
2 to develop their own properties.

3           The unit was constructed in a  
4 fashion by which leasehold working interest owners could  
5 commit or not commit their properties. They had business  
6 decisions to make and business decisions were made in the  
7 case of my client.

8           The economics of producing  
9 these properties, to sell to the pipeline, to ultimately  
10 Amoco at the other side, was not the way they thought prudent  
11 and economical. The construction of the liquid CO2 plant  
12 was the fashion they saw as the economic, prudent means of  
13 developing their properties, utilizing their own production  
14 to feed that plant.

15           We know from the evidence in  
16 the case that if the acre spacing statewide, 160, which was  
17 in place and part of the reliance on which the business de-  
18 cisions were made to make that investment are changed, then  
19 that investment will not fly, the plant will not be design-  
20 ed, but most importantly for purposes of this Commission,  
21 that property will not be developed.

22           Now, Amoco says you can always  
23 develop this property by asking for a nonstandard proration  
24 unit. They want to shift the burden that now is nonexistent  
25 to Ross Carbonics in order to justify and no doubt against  
the -- with the opposition of Amoco in the future, their  
nonstandard proration unit, that right now is not a problem.

Under the current rules the ac-

1  
2 reage can be promptly, efficiently, and effectively devel-  
3 oped, where otherwise it will not be.

4 The implications are beyond  
5 simply correlative rights and waste. We're also talking  
6 about an operation in a part of the State of New Mexico that  
7 means some employment where otherwise there would be none.

8 Well, the burden is not so  
9 easily shifted. This burden in this application must be met  
10 first, and we submit that with respect to the entire appli-  
11 cation, or with respect to the interests of Ross Carbonics,  
12 the evidence that's been presented is insufficient. It's  
13 unconvincing, and it's inadequate to grant the rules either  
14 across the board or to grant them insofar as the uncommitted  
15 acreage that exists within this unit is concerned.

16 We are on the west half of this  
17 unit and there is no evidence to show that 100 and -- that  
18 640-acre spacing is the appropriate spacing for the develop-  
19 ment of that west half.

20 All of the flow wells are way  
21 to the east. They are sixteen to twenty-two miles from the  
22 wells of Ross Carbonics.

23 We can see from the permeabil-  
24 ity cross sections that there is some very, very serious  
25 question as to whether or not the drainage is going to be  
the same in the far and extreme west side, where our proper-  
ties are located, as they might be in the heart or in the  
far east side of this unit.

1  
2                   if this rule change is to im-  
3 pact and affect the correlative rights of Ross Carbonics,  
4 then the evidence must justify that. We submit that it does  
5 not. We submit that if and when the production figures are  
6 available, three years, they say, that's the span of the  
7 temporary imposition of rules that is sought here, and they  
8 can justify an across the board change in the spacing, and  
9 it is not an inconsiderable change, from 160 to 640 is sig-  
10 nificant, if they can justify it with production history,  
11 fine. They cannot justify it with speculation and they cer-  
12 tainly cannot justify it from the perspective of my client  
13 with the evidence that's been presented here today, that we  
14 submit does not justify in any way, shape, or form, 640-acre  
15 spaced units on the far west side of this development.

16                   We submit that there is both  
17 waste involved in the lack of development that will result  
18 from the Ross Carbonic properties, and a total elimination  
19 of correlative rights, and we submit that is sufficient in  
20 itself for denial of this request and in any event should be  
21 sufficient to exclude the uncommitted acreage within this  
22 unit from the application for the rule change sought by Amo-  
23 co.

24                   Thank you.

25                   MR. RANEY: Thank you, Mr.  
Jaramillo.

                  Mr. Mote or Mr. Carr?

                  MR. KELLANIN: Mr. Chairman.

1  
2 MR. RAMEY: Oh, Mr. Kellahin.

3 MR. KELLAHIN: Forgot I was  
4 here.

5 Mr. Chairman, I have listened  
6 with great interest to Mr. Lopez, Mr. Jaramillo, and Mr. Pa-  
7 dilla, and I've made a list of all the different things that  
8 they have talked about, both in their closing arguments and  
9 throughout the day.

10 We have talked about leases  
11 that do not participate in the unit. We've talked about  
12 ownership of acreage whether it is within or without the  
13 unit. We've talked about deliverability. We've talked  
14 about marketing, unit participation, ratable take, nonstand-  
15 ard proration units, forced pooling, gas prorationing, and  
16 perhaps a few other things that I lost track of.

17 We have talked about everything  
18 in this case except well spacing, and that's all this case  
19 is about.

20 I compliment them for their in-  
21 ventiveness. It's a clever ploy. You talk about everything  
22 but what's material because they can't demonstrate any of  
23 the essential elements that would cause you to deny the ap-  
24 plication.

25 There are four basic elements  
in a spacing case. Guy Buell knew them. He knew them and  
he was not being facetious when he says if it's five  
counties, if it's three counties, it does not matter, if

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that is a common source of supply, that is the first element of proof.

And how do we know? Mr. Nay has told us this is the same reservoir. This is the Tubb formation. He's established both the vertical and the horizontal parameters for the reservoir. We do not yet know the full extent of the reservoir. That's not important. They have covered as much of it as they can at this point.

The second element of proof is to show the continuity. Mr. Jaramillo would attempt to isolate the flow tests done in the eastern part of the reservoir and say, ah, we're different because we're way far west. We're sixteen miles away.

I remind you of Mr. Nutter's gray speedway and it's right there. You can drive a truck down that. I don't know how many Magic Markers they used to color that in but that's a substantial amount of thickness and it shows significant continuity.

Second element of proof established.

The third element of proof is to show by some engineering technique that a given well has the reservoir capacity and properties to develop production on 640-acres.

Mr. Sheppard has done that. Mr. Padilla very cleverly would have you think, oh, in the absence of production we cannot do anything. By the time we

1  
2 know what the capacity of the production of the wells are  
3 we're going to have drilled wells that we're going to have  
4 to undrill.

5 We're going to have to drill  
6 only necessary wells and what does Mr. Sheppard do as pru-  
7 dent engineer? The thing we typically do. We don't look at  
8 past production because we never have it. We are at the  
9 proper time to decide what the spacing will be for the next  
10 three years. Mr. Sheppard conducts his flow tests. He  
11 takes the bottom hole pressure. He's not looking at a  
12 couple of wells, he's got 190 of these things. He's not  
13 speaking from conjecture. He's examined the logs and what  
14 else does he have? He's got 41 cores. They're scattered  
15 throughout the whole area. This guy has not taken a small,  
16 little area and extrapolated it all over the countryside.

17 He's done an excellent job and  
18 you cannot ask any more at this point from anyone.

19 The third factor is the econo-  
20 mic factor that you have to have the appropriate number of  
21 wells at this time to effectively and efficiently and econo-  
22 mically drain the reservoir. That data has been supplied  
23 also by Mr. Sheppard.

24 Those are all the elements of  
25 proof. Any of the rest of the discussion today is irrele-  
vant and that irrelevant discussion is where the opposition  
has focussed their attention.

The only way that you can do

1  
2 what Mr. Jaramillo suggests about letting us go about our  
3 business and come back in three years when we've drilled  
4 some more wells, the only way that's going to work is if you  
5 place a moratorium on Mr. Jaramillo's client, on Mr. Padilla's  
6 client, and Mr. Lopez client, that they will not drill  
7 any wells on less than 640-acre spacing, because if you do  
8 and as you've heard many, many times, we did it in the Nancos  
9 in the San Juan Basin just west of West Puerto Chiquito,  
10 and we found out last year that once you open the door, we  
11 start drilling the wells, as a practical matter you have re-  
12 duced the spacing to the density that whatever that operator  
13 wants to drill. If it's 40, it's 40, and we went through  
14 the example with Mr. Allen this morning.

15 If it's 160's he's got to meet  
16 the offset demand. It doesn't matter if he's in a unit or  
17 not. The equities are different and he's got to protect the  
18 owners.

19 The only way preserve and  
20 balance the correlative rights and to preclude waste is to  
21 grant this application for three years, come back and see  
22 what happens. If we were too optimistic, you can infill  
23 drill. It works.

24 You can -- you can work out all  
25 kinds of legal mumbo-jumbo you want to make it work, but the  
26 decision is to focus in on the reservoir and geology that  
27 establishes the most effective and efficient way to develop  
28 the reservoir and you have that proof and I urge you to grant

1  
2 this application.

3 MR. RAMEY: Thank you, Mr. Kel-  
4 lehin.

5 MR. CARR: Mr. Ramey, before I  
6 close, I've been going through my notes. There's one of  
7 your rulings earlier today I'd ask you to clarify.

8 Were the records of the two  
9 prior spacing hearings incorporated into this record?

10 MR. RAMEY: I think we were re-  
11 quested to take administrative notice of those.

12 MR. CARR: Would you incor-  
13 porate those? We would move that they be incorporated into  
14 these proceedings.

15 MR. RAMEY: Any objection to  
16 that?

17 MR. LOPEZ: None.

18 MR. RAMEY: They will be incor-  
19 porated.

20 MR. CARR: Thank you.

21 Mr. Ramey, Amoco comes before  
22 you today and has presented evidence which establishes the  
23 need for temporary pool rules in the Bravo Dome Area in-  
24 cluding 640-acre spacing. These rules should apply to the  
25 acreage within the unit and also all wells drilled within a  
mile of the unit.

As Mr. Note started today's  
proceedings by advising you there is not conclusive proof

1  
2 that one well will drain 640 acres. We submit, however,  
3 that it is impossible to provide with that kind of data un-  
4 til production history has been obtained, and it will be ob-  
5 tained in the next three years. Then conclusive proof can  
6 be presented.

7 But this is not to mean that  
8 the record is not substantial; that all the prerequisites  
9 for the order we seek have not been met by Amoco and we  
10 would also submit that everything we've presented here today  
11 stands before you unrefuted by one shred of technical evi-  
12 dence.

13 Production has commenced and if  
14 correlative rights are to be protected, if waste is to be  
15 prevented, and unnecessary wells are not to be drilled, then  
16 temporary special pool rules are needed. They're needed  
17 now. This is the appropriate time.

18 You come in with temporary pool  
19 rules, by it's very nature it isn't when you have conclusive  
20 proof. You have temporary pool rules, you proceed, and then  
21 you come back in a show cause hearing to show why and if  
22 those rules should be made permanent. That's the time con-  
23 clusive proof is appropriate and three years from now we  
24 will be able to present that kind of testimony.

25 We submit that there's a sub-  
stantial record in support of this application.

Jim Allen appeared before you.  
He outlined the new data that has been obtained since the

1  
2 prior hearing. He advised you that production had commenced  
3 and that the rules were necessary now if Amoco is to be able  
4 to protect the rights of unsigned interest owners without at  
5 the same time committing a waste which results from the  
6 drilling of unnecessary wells.

7 Approval of this application  
8 will result in the maximum deliverability with the minimum  
9 number of wells, a position we think is consistent with con-  
10 servation practices.

11 Granting this application will  
12 provide for orderly development of the area and it will  
13 spread development into broader areas of the Bravo Dome  
14 Unit.

15 Bruce May came before you again  
16 and we talked a lot about all the orange that he has laid  
17 out before you. The fact of the matter is what he has shown  
18 is that we have a reservoir that from a geologic point of  
19 view is continuous across the reservoir and his testimony  
20 showed that from a geological point of view there is no  
21 reason to suspect that one well, whether it is over on the  
22 west part of the unit or over on the east part of the unit,  
23 will not effectively and efficiently drain 640 acres.

24 Larry Sheppard came before you  
25 and he reviewed the new engineering data. This is not the  
same case that you've heard before, but we submit you con-  
sider this with the records that have previously been --  
been made before this Commission.

1  
2 He's shown you new engineering  
3 data. He's shown you results of long term flow tests, flow  
4 tests that are different from those that were previously  
5 conducted because in the previous hearings we were criti-  
6 cized for the way we were doing them so we did them the way  
7 we thought the Commission expected us to do them.

8 We've provided you with compe-  
9 tent reservoir engineering analysis.

10 Without special pool rules eco-  
11 nomic waste is going to result. Unnecessary wells will be  
12 drilled. Our evidence shows that between now and the year  
13 2000, if we don't go on 640 acres, just to maintain a set  
14 level of production we would have to drill 520 additional  
15 wells.

16 Mr. Nutter says our calcula-  
17 tions are wrong, but he moves them in the other direction.  
18 If he's right, we'd have to drill more wells than that.

19 We've shown that we are not  
20 going to by drilling more wells increase the ultimate re-  
21 covery, only the rate.

22 I think it's important to note  
23 therefore that we have, I think, beyond any doubt estab-  
24 lished that if you do not grant this application you will  
25 have failed to carry out your duty to prevent waste.

Now let's look at correlative  
rights.

Correlative rights were defined

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2 in the course of this hearing by Mr. Padilla in some sense  
3 as being drilling to offset counter drainage. But I think  
4 it's important to note that when we look at the definition  
5 of correlative rights, we have talked about correlative  
6 rights being the opportunity afforded so far as it is prac-  
7 ticable to do so, to the owner of each property in a pool to  
8 prevent without waste his just and equitable share of the  
9 reserves.

9 It's not just you offset me, I  
10 offset you. That goes back fifty years. You have to do  
11 this in a fashion where waste is not the end result.

12 I think Ross has a difficult  
13 situation. But they're before a body that is to look at  
14 correlative rights and the prevention of waste of a re-  
15 source, and I submit to you, no matter how hard their situa-  
16 tion is, you can't be ordering the drilling of unnecessary  
17 wells simply to protect someone's economic venture. That's  
18 outside your scope of authority. It's inconsistent with  
19 your statutory responsibilities.

19 We've raised all sorts of omi-  
20 nous clouds over this proceeding, prorationing, ratable  
21 take. Well, if we ever get to those things and no one has  
22 given us one shred of evidence that shows that's where we're  
23 moving, if we get to that point, everyone will get cur-  
24 tailed. It will fall on all of us and if prorationing is  
25 properly implemented, if ratable take is properly conducted,  
what we will have is each one having their production re-

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stricted in a fashion so that they are entitled to produce their just and fair share of the reserves in the pool.

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4

We simply submit that all the evidence before you today clearly establishes that if you do not grant the application of Amoco you will be authorizing waste, you will be impairing correlative rights.

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Now let's look at what the other side has presented.

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Not only have they talked about things, which, as Mr. Kellanin points out, are really not relevant to the questions before you, they have attempted to impose a higher burden of proof on us than is required in a situation where we are being asked, when we are coming before you asking for an order for temporary pool rules.

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We submit we've made a substantial showing and that the evidence we have presented meets any burden imposed on us and entitles us to the order.

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They have used a number of hypothetical questions in the course of the proceeding.

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Well, what if you fractured the formation? And they've never offered anything that would establish any of the basic premises of any of these hypotheses. They have never shown you that anything was done in that kind of case that would have caused fracturing in the formation and we submit therefore, those questions are nothing more than smokescreens being raised in an effort to confuse the questions really before you.

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1  
2                   The opposition and their coach,  
3 Mr. Nutter, have come before you and they've passed on the  
4 application. They told you what they think. We don't like  
5 this. We don't like this. Well, this doesn't quite muster  
6 up to my experience.

7                   You're technical people. You  
8 have the expertise. We're asking you to judge this applica-  
9 tion, and not Dan Nutter, and we submit that there has not  
10 been on the part of Mr. Nutter, any concrete technical data  
11 that refutes one, single, solitary thing. He's only given  
12 his opinion, an opinion that you independent of him, are  
13 qualified to make and we believe when you do that, you will  
14 concur with us, not with Mr. Nutter.

15                   We believe the only credible  
16 evidence that has been submitted comes from Amoco.

17                   I want to remind you that the  
18 testimony, in quotes, of opposing counsel in closing state-  
19 ment is not evidence. They've talked about the value of  
20 dollars. They talked about market needs. They've talked  
21 about ultimate use of CO2.

22                   Well, these are just comments  
23 of counsel. They are not evidence. We submit they are not  
24 relevant and in some cases they were not true, and we think  
25 they must be disregarded.

                  Now as to the questions raised  
today by Mr. Stasets concerning what future problems might  
arise if we grant 640-acre spacing.

1  
2 Well, we cannot assure you that  
3 future problems will not arise from this Oil Commission or-  
4 der if you decide to grant Amoco's application.

5 We can't ever assure you that  
6 any order you grant will not lead to a subsequent problem.

7 It's possible that the spacing  
8 might have to be reduced, but we can honestly say to you  
9 that that position is not supported by any single bit of  
10 evidence that we have in our possession.

11 If the OCC adopts the position  
12 that it simply won't enter an order unless the applicant can  
13 assure that there won't be future changes required, there  
14 won't be possible future problems, then I submit you'll  
15 never be able to enter an order. You'll never be able to  
16 act on our applications or those of anyone else.

17 If you should deny this appli-  
18 cation, because there is a possibility that the spacing will  
19 have to be reduced, and you do this in the face of the evi-  
20 dence which has been presented in this case, you will be  
21 acting contrary to the weight of the evidence. You will be  
22 acting in a fashion which will impair correlative rights,  
23 and prevent waste. We submit in so doing you would breach  
24 your statutory duty and that you have really only one choice  
25 before you if you are to meet that statutory challenge.

26 If the rules have to be  
27 changed, we submit you can deal with this as you've dealt  
28 with it in the past, infill orders, whatever it may require,

1  
2 and Amoco will be here at that time and ready to assist in  
3 that endeavor.

4 The case being presented shows  
5 that there is a need for temporary pool rules, that the need  
6 is now. Then under these pool rules we will be able to come  
7 forward in three years and justify 640 acres or at that time  
8 it will revert to something else, and we believe that you  
9 have no choice on the record made before you here today, but  
10 to act to prevent waste, act to protect correlative rights,  
11 and grant the application of Amoco Production Company.

12 MR. RAMEY: Thank you, Mr.  
13 Carr.

14 Does anyone have --

15 MR. NOTE: Mr. Chairman, I have  
16 one request or question I'd like to ask and that is would it  
17 be in order if we prepared an order for your consideration  
18 in this case?

19 MR. RAMEY: Yes, I'm glad you  
20 brought that up.

21 I will request all counsel to  
22 -- to submit an order if they so desire.

23 Does anyone have anything fur-  
24 ther to add to Case 81907

25 If not, we'll take the case un-  
der advisement.

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C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

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