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STATE OF NEW MEXICO  
ENERGY AND MINERALS DEPARTMENT  
OIL CONSERVATION DIVISION  
STATE LAND OFFICE BLDG.  
SANTA FE, NEW MEXICO  
8 June 1983

EXAMINER HEARING

IN THE MATTER OF:

Application of Amoco Production Com-	CASE
pany for NGPA category determination.	<u>7898</u>
	7899
	7900

BEFORE: Michael E. Stogner, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation	W. Perry Pearce, Esq.
Division:	Legal Counsel to the
	Division
	State Land Office Bldg.
	Santa Fe, New Mexico
For the Applicant:	Stephen D. Ring, Esq.
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C. A. (ALAN) WOOD

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E X H I B I T S

(REPORTER'S NOTE)

All exhibits are numbered with a letter designation, A, B, or C.

A indicates Case Number 7899

B indicates Case Number 7898

C indicates Case Number 7900

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1  
2 MR. STOGNER: Let's call next  
3 Case Number 7898.

4 MR. PEARCE: That case is on  
5 the application of Amoco Production Company for NGPA well  
6 category determination, San Juan County, New Mexico.

7 MR. RING: My name is Stephen  
8 Ring. I represent Amoco Production Company. I'm associated  
9 in this proceeding with Mr. William Carr of the Santa Fe  
10 firm of Campbell, Byrd, and Black. My mailing address is  
11 1670 Broadway, Denver, Colorado, 80202.

12 Before beginning in this  
13 particular proceeding, I'd like to ask the Examiner if he  
14 wishes to consolidate the next two proceedings with this.

15 MR. STOGNER: That would be  
16 fine. Then in that case we'll call next Case Number 7899  
17 and 7900.

18 MR. PEARCE: Each of those  
19 cases is also on the application of Amoco Production Com-  
20 pany for well category determination -- NGPA well category  
21 determination, San Juan County, New Mexico.

22 MR. STOGNER: Case Number  
23 7898, 7899, and 7900 will be consolidated for purpose of  
24 testimony.

25 MR. RING: All right. Let me  
begin with a very brief introduction of what Amoco proposes  
to establish today.

In Section 107 of the Natural

1  
2 Gas Policy Act of 1978, Congress identified several sorts of  
3 high cost gas, including what it called occluded natural gas  
4 produced from coal seams.

5 For convenience we will frequently refer  
6 to this sort of gas as coal seam gas today.

7 The Federal Energy Regulatory Commission,  
8 in its regulations implementing the NGPA, has defined coal  
9 seam gas to be naturally occurring natural gas released from  
10 entrapment from the fractures, pores, and bedding planes of  
11 coal seams.

12 Today Amoco will present evidence that  
13 gas produced from the three wells under discussion in these  
14 combined proceedings is, in fact, coal seam gas. To do so  
15 Amoco will establish several facts. The first is that the  
16 wells are underlain by a coal seam. Secondly, the coal seam  
17 is gas-bearing. Thirdly, Amoco has done all that is mech-  
18 anically possible to assure that gas entering the bores of  
19 the three wells at issue here today is entering through the  
20 coal seam; and fourthly, and I guess most importantly, that  
21 the natural gas recovered through the three wells is being  
22 produced from the coal seam as its source and not from any  
23 other zone or formation.

24 In establishing this final fact, Amoco  
25 will offer into evidence for three points. Once those three  
26 points are proven, the important fact follows, that the --  
27 the three points simply are this: That production recovered  
28 from the coal seam has certain unique features. Those

1  
2 features are not exhibited by production recovered from  
3 other potentially productive formations immediately above  
4 and below the coal seam and those unique features are exhi-  
5 bited by the gas being recovered from the three wells which  
6 we will discuss here today.

7 Before the swearing in of Amoco's single  
8 witness today, let me say a brief word about our exhibits,  
9 in the hopes of keeping the enumeration of these exhibits  
10 clear.

11 In December of last year Amoco submitted  
12 applications to the Division requesting determination that  
13 gas from the three wells at issue was coal seam natural gas.  
14 Those applications contained materials which today we will  
15 offer into the record as Exhibits One through Eleven-A for  
16 the Cahn Well; One through Eleven-B for the Schneider Gas  
17 Com B-1-S Well; and One through Eleven-C for the State Gas  
18 Com BW No. 1-B.

19 So what we're doing is we're using a two  
20 part designation for each exhibit, a number and a letter.  
21 Of those first eleven exhibits for each of the three wells,  
22 the first ten will simply be introduced without discussion;  
23 the eleventh will be discussed and then we will offer  
24 further exhibits which have been prepared particularly for  
25 this proceeding.

All right, with that, I believe Amoco  
would like to call its -- its single witness and have him  
sworn in.

1  
2 MR. PEARCE: Before we begin,  
3 are there other appearances in this matter?

4 Would you rise, please?

5 (Witness sworn)

6  
7  
8 C. A. (ALAN) WOOD,  
9 being called as a witness and being duly sworn upon his  
10 oath, testified as follows, to-wit:

11  
12 DIRECT EXAMINATION

13 BY MR. RING:

14 Q For the record, would you please state  
15 your name, by whom you are employed, and in what capacity  
16 you're employed?

17 A My name is C. Alan Wood. I'm employed by  
18 Amoco Production Company as a Staff Petroleum Engineer in  
19 our Denver, Colorado office.

20 Q Have you previously appeared before this  
21 Division, or before its Examiners, as an expert witness?

22 A Yes, sir, I have.

23 Q All right. Have you made a review of the  
24 engineering and the geological data which Amoco will offer  
25 today?

A Yes, sir, I have.

Q All right.

1  
2 MR. RING: Mr. Examiner, I'd  
3 move that Mr. Wood be accepted as an ex-  
4 pert witness in these combined proceed-  
5 ings.

6 MR. STOGNER: Mr. Wood is so  
7 qualified.

8 Q All right. Mr. Wood, to begin with, I  
9 mentioned in December Amoco had presented applications for  
10 these three wells. Have you made yourself familiar with the  
11 materials which were submitted in those three applications?

12 A Yes, sir, I have.

13 Q All right. I wonder if -- could you  
14 briefly run through those materials and indicate how they  
15 have been numbered as exhibits today?

16 A Very well. As indicated earlier, Exhi-  
17 bits One through Eleven for all three of the applications  
18 are the same.

19 Exhibit Number One is a letter dated De-  
20 cember 13th, 1982, from Amoco Production Company to the New  
21 Mexico Oil -- the New Mexico Oil Conservation Division,  
22 transmitting the application for the price determination.

23 Exhibit Number Two is a State Form C-132,  
24 which is the Application for wellhead Price Ceiling Cate-  
25 gory Determination.

26 Exhibit Number Three is the FERC Form  
27 121, which is the Application for Determination of the max-  
28 imum lawful price under the NGPA, and that is a two-page ex-

1  
2     hibit.

3             Q             Exhibit Number Four is State Form C-101,  
4     which is the application for permit to drill, deepen, or  
5     plug back.

6             Exhibit Number Five is State Form C-105,  
7     which is the well completion or recompletion report and  
8     logs.

9             Exhibit Number Six is the State Form for  
10     the well location and acreage dedication.

11             Exhibit Number Seven is a statement that  
12     the gamma ray log is shown as part of the stratigraphic  
13     cross section, which is Attachment Number Twelve, or can be  
14     found on Attachment Number Twelve, excuse me.

15             Exhibit Number Eight is an analysis of  
16     the absorb gas content for two wells. The first well was  
17     the Amoco Elam Gas B-1, and the second well was the Amoco  
18     Cahn Gas Com No. 1. This exhibit shows that the recovered  
19     coal from these two wells did produce gas under laboratory  
20     conditions.

21             Exhibit Number Nine is a Certificate of  
22     Mailing, and Exhibit Number Ten is the applicant's sworn  
23     statement.

24             Q             All right. I believe that an exhibit was  
25     also submitted with the application, which is titled a  
26     Stratigraphic Cross Section, and that is the exhibit which  
27     Amoco will refer to today as Exhibit Number Eleven.

28             Mr. Wood, could you please explain what

1  
2 is illustrated by this exhibit?

3           A           Exhibit Number Eleven is the strati-  
4 graphic cross section hung on the top of the Pictured Cliffs.  
5 In the upper righthand corner of this exhibit there is a  
6 well location plat that shows the line of the cross section.  
7 The first well on the cross section, which is on the left-  
8 hand side of the exhibit, is the Valentine B No. 1. Now,  
9 this well is located in Section 32 of 32 North, 10 West.  
10 The second well was the Amoco State BW No. 1, which is one  
of our coal wells.

11                   The third well on the cross section is  
12 the Elam No. A-1, followed by the Cahn No. 1, the Schneider  
13 B No. 1, and the Schneider B No. 2.

14                   I would like to point out at this time  
15 that there is a correction to this exhibit. The Schneider B  
16 No. 2 is the coal well that's currently identified as the  
17 Schneider B-1 S. The name was changed, but that is the log  
from the B-1 S.

18                   The bottom portion of the cross section  
19 we have highlighted in red, the main basal coal sand, which  
20 is found in this area. Now, what we have done with our  
21 cross section, due to the fact that the completion of our  
22 coal wells is an open hole completion through the coal sec-  
23 tion, and we set casing above that point, we did not have  
24 the open hole logs available for the coal section, and so  
25 this cross section is tying the coal degas wells back into  
the closest well for which we have open hole logs. The

1  
2 logs indicated on the cross section are gamma ray and also a  
3 density log.

4 If one looks at the Valentine B No. 1,  
5 which is the lefthand log on this exhibit, and we look down  
6 there where I've got the main basal coal seam indicated, we  
7 see that we've got an extremely low radioactive count on the  
8 gamma ray and we have an extremely low bolt density measure-  
9 ment on the density curve.

10 In my opinion, this log response is in-  
11 dicative of a coal and the fact that we have seen these  
12 coals in the wells which have penetrated through that and  
13 logged through that, that the coals are present in the three  
14 coal degas wells.

15 Q All right.

16 MR. RING: At this time Amoco  
17 would offer Exhibits One-A through Eleven-A, which pertain  
18 to the Cahn Well; Exhibits One-B through Eleven-B, which  
19 pertain to the Schneider Gas Com B No. 1-S; and Exhibits  
20 Numbers One-C through Eleven-C, which pertain to the State  
21 Gas Com BW No. 1-B, into evidence.

22 MR. STOGNER: All of those ex-  
23 hibits will be admitted into evidence.

24 Q Mr. Wood, in preparation for today's  
25 hearing have you prepared additional exhibits?

A Yes, sir, I have.

Q Would you indicate the sort of informa-  
tion you've reviewed to prepare these exhibits and by way of

1  
2 a quick preview could you tell the titles or briefly the  
3 nature of those exhibits?

4 A When I prepared for this hearing there  
5 was a number of parameters I looked at in the area.

6 The first exhibit that I'll be presenting  
7 is a wellbore schematic that shows that Amoco has done every  
8 thing mechanically possible to isolate the coal seams from  
9 the overlying Fruitland, and I'd also point out that the TD  
10 of these wells are about 13-to-20 plus feet above the top of  
11 the PC.

12 I've also taken a look at the gas analy-  
13 ses which are available for both the coal wells and the  
14 Fruitland wells and the PC wells, and I've prepared exhi-  
15 bits to show that there are distinguishable differences be-  
16 tween the gas produced from each one of those zones.

17 I have also looked at the analysis of the  
18 produced water and I have prepared exhibits which will show  
19 that the produced water from the various reservoirs have  
20 different characteristics.

21 The last point that I reviewed was the  
22 reservoir pressure found in both the Fruitland, the PC, and  
23 also in the coal, and I've prepared an exhibit that will  
24 show that there is a definite pressure differential between  
25 the coal wells and the underlying PC wells, or Pictured  
Cliffs.

Q All right. After that preview of exhi-  
bits you wish to develop, would you proceed to actually dis-

1  
2 cuss those exhibits in somewhat more detail?

3 A The exhibit that was just handed out is a  
4 wellbore diagram for each of the three wells. The hearing  
5 of the exhibit reads Amoco Production Company, Denver  
6 Region, NMOCD Hearing, June 8, 1983.

7 Directly below that is a case number.

8 Exhibit Twelve-A is Case Number 7899,  
9 which is the Cahn No. 1 Well.

10 Exhibit Number Twelve-B is a similar ex-  
11 hibit for the Schneider B No. 1-S.

12 Exhibit Number Twelve-C is a similar ex-  
13 hibit for the State BW No. 1.

14 Turning to Exhibit Twelve-A, which is the  
15 wellbore diagram for the Cahn Well, this shows that con-  
16 ductor pipe was set at a total depth of 253 feet and was  
17 cemented in place with 250 sacks of cement. The production  
18 string was set at a depth of 2795 feet and was cemented in  
19 place with 600 sacks of cement.

20 The report on the completion indicated  
21 that the cement did not circulate to surface; however, there  
22 was no indicated loss of returns. A volumetric calculation  
23 shows that the 600 sacks of cement is approximately 150 per-  
24 cent of the calculated annular volume.

25 The total TD reached by this well was  
26 2812 feet. The projecte top of the Pictured Cliffs sets at  
27 2845, which indicates that this well is 35 feet, or 33 feet,  
28 above the top of the Pictured Cliffs.

1  
2 The top of the Fruitland in this well was  
3 determined to be 2430 and the top of the coal seam was at  
4 2807.

5 Exhibit Number Twelve-B is a wellbore  
6 diagram for the Schneider B No. 1-S. Surface pipe was set  
7 at 299 feet and was cemented in place with 350 sacks of  
8 cement. The production casing was set at 2826 feet and was  
9 cemented in place with 545 sacks of cement. Again, the vol-  
10 umetric calculations indicate this is approximately 150 per-  
cent of the volume in the annular space.

11 The TD of the well for the Schneider was  
12 2853 feet. The projected top of the Pictured Cliffs is at  
13 2876, which indicates that the bottom of this well is some  
14 23 feet above the Pictured Cliffs.

15 The top of the Fruitland was encountered  
16 at 2460 and the top of the coal seam was encountered at  
17 2835.

18 Exhibit Number Twelve-C is the wellbore  
19 diagram for the State BW No. 1. This exhibit shows that  
20 conductor pipe was set at 293 feet and cemented in place  
21 with 350 sacks of cement. The production casing was set at  
22 2680 feet and was set in place with 540 sacks of cement.  
23 Again, this is an over-displacement of approximately 150  
percent.

24 The top of the Fruitland was encountered  
25 at 2316. The top of the coal seam at 2698. The total depth  
of the well was 2713 feet and the projected top of the Pic-

1  
2 tured Cliffs was at 2726, which indicates that this well was  
3 approximately 13 feet above the top of the Picture Cliffs.

4 The next exhibit that I have prepared  
5 will be Exhibit Number Thirteen. These exhibits are not the  
6 same exhibit for each of the individual wells.

7 Exhibit Number Thirteen-A is a lithology  
8 description of a core that we recovered from the Cahn No. 1  
9 Well. We actually cored 25 feet -- excuse me, 7 -- 15  
feet, of which we recovered 11 feet.

10 That exhibit is labeled at the upper  
11 lefthand side of the exhibit, Cahn Gas Com No. 1, 33-32  
12 North-10 West.

13 The lithology indicates that the recover-  
14 ed core was indeed coal. If we read at the foot depth of  
15 2797, the lithology was shaley coal, black, hard, and thin-  
bedded.

16 2799, the lithology was a coal, black,  
17 shiny and friable.

18 At 2801, lithology was coal, black,  
19 shiny, very friable, and resinous.

20 I would point out that the lithology from  
21 the 2799 is consistent down to 2801.

22 The bottom of the recovered core is at  
23 2808. The lithology to that point is coal, black, shiny-  
banded, friable to blocky.

24 What this indicates is that the open hole  
25 section of the Cahn Well is opposite the coal seam.

1  
2 Exhibit Number Thirteen-B is a desorb gas  
3 content from chip analysis for the Schneider B No. 1-S. The  
4 heading again is Amoco Production Company, Denver Region.  
5 The case number just for clarification is again 7998. The  
6 Exhibits Thirtee-B and Thirteen-C are similar exhibits for  
7 the Schneider 1-S and the BW No. 1.

8 What this exhibit shows is that in the  
9 laboratory the recovered drill cuttings from these two wells  
10 did produce gas. They were actually analyzed by two dif-  
11 ferent laboratories. One was the Tulsa Laboratory, which is  
12 our research center, and the other samples were -- or simi-  
13 lar samples were analyzed by the University of New Mexico.

14 The results of that analysis indicates  
15 that the chips did produce gas, and this is a content or  
16 volume of gas produced.

17 Exhibit Number Fourteen is an analysis of  
18 that produced gas, the gas that was produced from the core  
19 on the Cahn well and from the chips on the Schneider Well.

20 There is no Exhibit Fourteen-C. A gas  
21 analysis from the desorb gas was not available on the State  
22 BW No. 1.

23 Exhibit Number Fourteen-A is for the Cahn  
24 Gas Com No. 1. It's entitled Desorb Gas Analysis. The  
25 samples, which is indicated on the lower -- or excuse me --  
the lefthand side of the exhibit, are from the samples which  
we had absorb gas content measured from, which is a pre-  
vious exhibit.

1  
2                   What this indicates that the gas produced  
3 from the core itself had an extremely high carbon dioxide  
4 content, a methane content of approximately 90 percent, and  
5 a very low ethane plus content. The actual numbers for  
6 Sample No. A shows that the gas was 10.35 percent carbon  
7 dioxide, 89.1 percent methane, and .55 percent for your  
8 heavier ethane plus.

9                   Exhibit Number Fourteen-B is entitled De-  
10 sorb Gas Analysis, Schneider Gas Com B No. 1-S. This was  
11 the gas that was produced from the chips which were pre-  
12 sented, or at least the data was presented for, in Exhibit  
13 Number Thirteen-B.

14                   The components of this gas was found to  
15 be 4.39 percent carbon dioxide, 95.08 percent methane, and  
16 approximately .32 ethane plus.

17                   What these two exhibits show is that the  
18 gas produced from the coal is high in CO<sub>2</sub>, high in methane  
19 content, and has very low content of your ethanes plus.

20                   The next exhibit, which is Exhibit Num-  
21 ber Fifteen, is a historical summary of the gas analysis  
22 from the three coal degas wells.

23                   Exhibit Number Fifteen-A is a gas analy-  
24 sis from the coal gas for the Cahn No. 1. The first date at  
25 which the gas sample was captured and analyzed was in March  
of 1977. This sample showed a carbon dioxide content of  
7.33 percent, a methane content of 92.32 percent, an ethane  
content of .35 percent, and no concentration of your heavier

1  
2 ends.

3 I'd like to make a comparison of that  
4 analysis to the analysis that I showed you on Exhibit Four-  
5 teen-A. Again, the carbon dioxide content is high. We  
6 measured approximately 9-to-10 percent from our core. We  
7 measured in the field produced gas, 7 percent.

8 The ethane plus content from the core  
9 analysis was approximately .55 percent. In the laboratory  
10 the produced gas was .35 percent.

11 I believe that this indicates that the  
12 gas which was physically produced from this well is the same  
13 gas, quality gas, that was produced from the core under lab-  
14 oratory conditions.

15 The last sample for which we had data was  
16 recovered in November of 1982. That sample, and I'll read  
17 the last row of numbers, showed a carbon dioxide content  
18 6.33 percent, a methane content of 93.37 percent, an ethane  
19 content of .18 percent, a propane content of .03 percent,  
20 and none of the heavier ends.

21 There is one sample point that I would  
22 like to discuss and that is the one where the date indi-  
23 cated December, 1981.

24 That sample shows a carbon dioxide con-  
25 tent of approximately 2, a methane content of approximately  
85 percent, an ethane content of 7 percent, and a concen-  
tration of the heavier ends.

We feel that this sample is not repre-

1  
2       sentative of the gas that is actually being produced from  
3 the Cahn. I would point out that none of the samples before  
4 that one, or after that one, have shown that type of analy-  
5 sis.

6               Exhibit Number Fifteen-B is the gas ana-  
7 lysis for the coal for the Schneider B No. 1-S. The first  
8 sample recovered from this well was in December of 1981 and  
9 showed a carbon dioxide content of 4.76 percent, a methane  
10 content of 94.99 percent, an ethane content of .23 percent,  
11 a propane content of .02 percent, and no heavier ends, be-  
12 yond propane.

13              Again I'd like to draw your attention  
14 back to Exhibit Number Fourteen-B, which was the analysis of  
15 the desorb gas. As indicated on Exhibit Fourteen-B, the  
16 carbon dioxide content from the desorb gas was 4.39, which  
17 compares to the 4.76 that we measured from the produced gas  
18 from the Schneider. The methane content was 95.08 percent,  
19 which compares to the 94.99 percent that we measured from  
20 the produced gas. The ethane content was -- for the desorb  
21 gas was .31 percent; the produced gas .23 percent. The pro-  
22 pane content was less than 1 percent for the desorb gas; the  
23 produced gas showed .02 percent. Neither of these samples  
24 showed any concentration of components heavier than the  
25 propane.

              The last sample for which we've got the  
analysis is November of 1982. Again, this sample shows a  
carbon dioxide content of 4.87 percent; methane content of

1  
2 94.91 percent; ethane content of .17 percent; propane cont-  
3 ent of .05 percent, and no concentration of the heavier  
4 ends.

5 In my opinion, this does show that the  
6 gas produced from the Schneider B No. 1-S is the same gas  
7 that was produced in the laboratory in the desorb chip ana-  
8 lysis.

9 There is one test, that is the one dated  
10 August, 1982, which shows concentrations or components dif-  
11 ferent. That actually shows a nitrogen content of 5.25 per-  
12 cent; carbon dioxide of .53 percent; methane approximately  
13 88 percent, and it does show the presence of the heavier  
14 ends.

15 The report that we received back from the  
16 laboratory that did that analysis indicates that sample was  
17 possibly contaminated. I would point out again that the  
18 samples analyzed prior to that test compare quite well with  
19 our most recent samples.

20 Q Mr. Wood, you've shown now on the basis  
21 of gas sampling in Exhibit Fourteen that gas produced  
22 directly from -- from core samples exhibit certain unique  
23 features, and you've shown on Exhibits Fifteen-A through C  
24 that those unique features are exhibited by the gas being  
25 recovered from the three wells which we're discussing here  
today.

Can you take us one step further, now,  
and show that samples from potentially productive zones im-

1  
2 immediately above and below the coal seam do not exhibit these  
3 unique features?

4  
5 A Before I do that I would like to refer  
6 back to Exhibit Fifteen-C. That is the gas analysis for the  
7 State BW No. 1.

8 The first sample was gathered in December  
9 of 1981 and again similar to what we've talked about on the  
10 Schneider and the Cahn Wells, showed a high carbon dioxide  
11 content, a high methane content, and a low concentration of  
ethanes plus.

12 Those actual numbers were 5.82 percent  
13 carbon dioxide, 93.68 percent methane, and .21 percent  
14 ethane, .02 percent propane, with no reported heavier ends.

15 The most current sample was again taken  
16 in November of 1982. That shows a carbon dioxide content of  
17 5.96 percent; methane 93.55 percent; no reported ethane, and  
a propane of .07 percent.

18 This exhibit, I feel, shows that the gas  
19 produced from the State BW No. 1 is similar to the gas which  
20 is produced from both the Cahn and the Schneider Wells.

21 In addition to reviewing the gas analy-  
22 sis from the three wells which are producing from the coal,  
23 I also reviewed the available gas analyses for both the  
Fruitland wells and the Pictured Cliffs wells in the area.

24 Exhibit Number Sixteen is the same ex-  
25 hibit for all three applications. The two producing Fruit-

1  
2 land wells are the Keese Gas Com E-1, located in Section 27,  
3 and the Holmberg Gas A-1, located in Section 28.

4 MR. QUINTANA: Is there an ex-  
5 hibit for that?

6 A I'm sorry, yes, there is.

7 MR. STOGNER: Thank you, sir.

8 A Exhibit Number Sixteen-A would be for  
9 Case 7899. Exhibit Number Sixteen-B would be for Case Num-  
10 ber 7898, while Exhibit Sixteen-C would be for Case Number  
11 7900.

12 As I indicated, the two producing Fruit-  
13 land wells are the Keese and the Holmberg. On the Keese  
14 Well we have four available gas analyses over a five year  
15 period. These show that the carbon dioxide content on the  
16 March, 1977 test for this well was 1.09 percent; the methane  
17 content was 95.06 percent; ethane content was 1.54 percent;  
18 propane, .82 percent; isobutane, .23 percent; normal butane,

19 The last sample from the Keese Well was  
20 June, 1982. Again this shows a carbon dioxide content of  
21 approximately 1 percent; methane content of approximately 95  
22 percent; ethane, 1.8 percent; propane, approximately 1 per-  
23 cent; and the presence of the heavier ends.

24 The Holmberg A-1 had three gas analyses  
25 available. The December, 1981 showed a carbon dioxide con-  
tent of .18 percent; methane content of 92.85 percent;  
ethane content, 2.11 percent; propane content, 1.49 percent;  
isobutane, .16 percent; normal butane, .76 percent; and the

1  
2 presence of both pentanes and hexanes plus.

3 The last sample from the Holmberg was  
4 from September, 1982. This sample showed similar composi-  
5 tions of both carbon dioxide and methane and the ethane  
6 through hexane.

7 The conclusion to be drawn from this ex-  
8 hibit is that the Fruitland gas has a lower carbon dioxide  
9 content than what the coal gas is. The methane content is  
10 approximately the same, but the Fruitland gas also has a  
11 much higher concentration of your ethanes plus.

12 Exhibit Number Seventeen is a similar an-  
13 alysis of the Pictured Cliffs wells.

14 Once again Exhibit Number Seventeen-A  
15 would be for Case Number 7899; Exhibit Number Seventeen-B  
16 would be for Case Number 7898; Exhibit Number Seventeen-C  
17 for Case Number 7900.

18 There were four wells in this area in  
19 which I had gas analyses available for the Pictured Cliff  
20 production. These are the Martinez A-1, located in Section  
21 32; the Gardner No. 1, located in Section 33; the Valentine  
22 B-1, located in Section 32; and the Leaper C-1, located in  
23 Section 34.

24 Reading across from the Martinez A-1, it  
25 shows that the first gas analysis was from September, 1977.  
The analysis of that sample showed a carbon dioxide content  
of 1.37 percent; methane content, 89.07 percent; ethane con-  
tent of 5.83 percent; propane content, 2.12 percent; iso-

1  
2 butane content, .34 percent; normal butane, .54 percent;  
3 pentane, .32 percent; hexane plus, .26 percent.

4 The last sample from this well was for  
5 November, 1982. The analysis of that sample shows that the  
6 concentrations for the various components are similar to  
7 what we've seen from the September, 1977 sample.

8 The next well on the exhibit is the Gard-  
9 ner No. 1. There was two samples available from this well.  
10 The first one was from December, 1981. Again, without  
11 reading the numbers, it shows that the carbon dioxide con-  
12 tent was similar to what was found in the Martinez, as well  
13 as the methane and the ethane and the rest of the measured  
14 components.

15 The third well for which we had gas ana-  
16 lysis was the Valentine B No. 1. There was three samples  
17 from which we had analysis. The first one was September,  
18 1979. This does show a carbon dioxide content, methane  
19 content, the ethane content, plus the heavier ends, to be  
20 similar to the coal gas and not to the Pictured Cliff gas,  
21 as determined by the previous two wells.

22 Reviewing the completion procedure of  
23 this well, the perforations in the PC were at the very top  
24 of the Pictured Cliffs. The well was stimulated with 30,000  
25 pounds of sand, 30,000 pounds of -- or gallons of foam, and  
as I'll mention later, the pressure data and the water ana-  
lysis also shows that this well is not what I would consi-  
der a PC well.

1  
2 In my opinion, this well is in communica-  
3 tion with the Fruitland.

4 The Leaper C No. 1 had one analysis  
5 available, and that was from October, 1980. Again, without  
6 reading the numbers, the analysis of that sample is similar  
7 to what we've seen both in the Martinez and the Gardner  
8 Wells.

9 In my opinion, this exhibit shows that  
10 the gas produced from the coal is a different gas from that  
11 which is produced from the Pictured Cliffs. In particular,  
12 the carbon dioxide content for the coal gas is much higher  
13 and the ethane plus from the coal gas is much lower.

14 Q Mr. Wood, you indicated that it's your  
15 opinion that the Pictured Cliffs, as encountered in the  
16 Valentine Gas Com B No. 1 may well be in communication with  
17 the Fruitland formation in that well.

18 Is it your opinion that this communica-  
19 tion may have occurred because of the completion procedures  
20 used in that well?

21 A I think there's a strong possibility  
22 that's what caused the communication. The other thing to  
23 note on the Valentine gas analysis is that you do have re-  
24 peatability. The first sample was from September, 1979.  
25 The last sample was from September, 1982, and they show gas  
qualities similar throughout the three tests and similar to  
the coal gas.

Q All right. Now, let's -- let's make one

1  
2 point clear here for the record. We have introduced a sep-  
3 arate Exhibit Sixteen-A, Sixteen-B, and Sixteen-C. Is it  
4 true, however, that the contents of each of those three ex-  
5 hibits is identical from one to the next, except for the  
6 case number indicated at the top?

6 A That's correct.

7 Q All right. Now we have introduced Exhi-  
8 bit Seventeen-A, Seventeen-B, and Seventeen-C. Is it true,  
9 however, that the contents of those three exhibits are i-  
10 dential from one to the next except for the case number  
11 shown at the top?

11 A That is correct.

12 Q All right. Mr. Wood, is it your opinion  
13 judging from the gas sample analysis which you've presented  
14 in Exhibits Fifteen, Sixteen, and Seventeen, that the gas  
15 being produced from the three wells under discussion today  
16 is not being produced from, and does not have its source in  
17 either the Pictured Cliffs formation or the Fruitland form-  
18 ation?

19 A That is correct, and in particular, it's  
20 -- that conclusion is derived from review of the data which  
21 we presented in these exhibits, in particular the fact that  
22 we have physically recovered samples of the coal; that coal  
23 has produced gas; the quality of that gas has been measured.  
24 That measured quality compares to what we're producing from  
25 those same wells in the field, and that the quality of that  
gas is different from what you see in both Fruitland and in

1  
2 the Pictured Cliffs.

3 Q All right, so then it is your opinion  
4 that the gas produced from the three wells under discussion  
5 is being produced from the coal seam.

6 A In my opinion, that is correct.

7 Q All right. Would you proceed now to ex-  
8 plain Exhibit Number Eighteen?

9 A Exhibit Number Eighteen is a review of  
10 the water analysis for wells in this area. Once again, Ex-  
11 hibit Eighteen-A would be -- or would relate back to Case  
12 Number 7899; Exhibit Number Eighteen-B to Case 7898; Exhibit  
13 Eighteen-C to Case 7900.

14 On this exhibit I have shown the well  
15 name, the location of that well, the producing zone, the  
16 number of samples which were reviewed in preparation for  
17 this exhibit, and then the average total dissolved solids  
18 content, sodium content, chloride content, and bicarbonate  
19 content.

20 The first three wells are the wells which  
21 are producing from the coal. The Cahn No. 1 has 11 samples  
22 available. It shows an average of those 11 samples of total  
23 dissolved solids of approximately 17,000 parts per million.  
24 The sodium is 5,734 parts per million. The chloride con-  
25 tent is 869 parts per million. The bicarbonate content is  
13,095 parts per million.

The Schneider B No. 1-S had three samples  
available. Again this shows total dissolved solids of ap-

1  
2 approximately 19,000; a sodium concentration of 5400 parts per  
3 million, approximately; a chloride concentration of approx-  
4 imately 800 parts per million; and a bicarbonate concen-  
5 tration of approximately 12,000 parts per million.

6 The State BW No. 1 had four samples  
7 available. Once again, the total dissolved solids for the  
8 BW No. 1 were approximately 19,000 parts per million; sodium  
9 5900 parts per million; chloride 1700 parts per million;  
10 bicarbonate 12,000 parts per million.

11 This shows that the water produced from  
12 the coal has a heavy concentration of total dissolved solids  
13 and the major substances present are sodium, the chloride,  
14 and the bicarbonate.

15 We have four -- excuse me, five samples  
16 available from the Keese E No. 1, which is located in Sec-  
17 tion 27, which produced from the Fruitland. The total dis-  
18 solved solids was approximately 9800. The sodium concen-  
19 tration approximately of 4000 parts per million; chloride  
20 concentration of approximately 1700 parts per million; and  
21 the bicarbonate concentration of approximately 7500 parts  
22 per million.

23 A comparison of the Fruitland water to  
24 the water produced from our coal wells shows that the total  
25 dissolved solids is much less and the bicarbonate was much  
less in the Fruitland as compared to the coal.

There is also a reduction in the measured  
sodium concentration from the coal to the Fruitland waters.

1  
2                   The next four wells are Pictured Cliffs  
3 wells. The first well listed is the Gardner No. 1, which is  
4 located in Section 33. There was two samples available for  
5 this well. It showed the total dissolved solids of approx-  
6 imately 16,000; sodium concentration of approximately 5900  
7 parts per million; chloride concentration of approximately  
8 7600 parts per million; and a bicarbonate concentration of  
approximately 2700 parts per million.

9                   The Leaper and the Compton No. 1, which  
10 are listed below the Gardner on this exhibit, show similar  
11 concentrations in each of these categories.

12                   The Valentine B-1, which is the well that  
13 I told you in my opinion was in communication with the  
14 Fruitland, does not show a water quality similar to what the  
15 other Pictured Cliffs wells have shown us. We had one  
16 sample available from the Valentine B-1. This showed a  
17 total dissolved solid content of approximately 8500; a  
18 sodium concentration of approximately 3500 parts per  
19 million; a chloride content of approximately 900 parts per  
20 million; and a bicarbonate concentration of approximately 78  
parts per million.

21                   This is obviously different from what the  
22 other three Pictured Cliffs wells have the water analysis,  
23 and it is similar to what we've seen in the coal and in the  
Fruitland.

24                   Exhibit Number Nineteen is a review of  
25 the reservoir pressures for both the coal, the Fruitland,

1  
2 and the Pictured Cliffs.

3 Exhibit Nineteen is a two-page exhibit.  
4 Once again, Exhibit Number Nineteen-A will be for Case 7899.  
5 Exhibit Ninetee-B for Case 7898. Exhibit Nineteen-C for  
6 Case 7900.

7 This exhibit shows the wells, the zone  
8 which was tested, the date the well was completed, the type  
9 of test that was available, and the reservoir pressure as  
determined by that test.

10 The first four wells are pressure points  
11 for the coal. They include the Cahn, the Schneider B-1-S,  
12 the State BW No. 1, and in addition there was a DST run by  
13 Amoco on the Keese A No. 2 in the coal.

14 Under type of test, SI indicates that it  
15 was a shut-in pressure; the BHPBU would indicate it's a bot-  
16 tom hole pressure build-up test; the DST would indicate that  
it's a drill stem test.

17 The first measured pressure from the Cahn  
18 Well showed a reservoir pressure of approximately 1562 psi.  
19 The results of the pressure build-up test showed a pressure  
20 of approximately 1465 psi. There was approximately one year  
21 between the dates of these two tests.

22 The Schneider B No. 1-S showed a  
23 reservoir pressure by build-up of 1362 psi, while the State  
24 BW No. 1 showed a reservoir pressure by build-up of 1421  
psi.

25 The Keese No. A-2 showed a reservoir

1  
2 pressure of approximately 1590 pounds on the drill stem  
3 test.

4 The next three wells listed in the left-  
5 hand column are Fruitland wells.

6 The Keese E No. 1, located in Section 27,  
7 had a shut-on test which showed a reservoir pressure of 1267  
8 psi.

9 The Holmberg A No. 1 showed a shut-in  
10 pressure of -- or reservoir pressure determined from shut-in  
11 of 1287 psi.

12 The Scott No. 1 Well had a number of DSTs  
13 run through the Fruitland and it showed approximately 1580  
14 psi.

15 Directly below that and continuing on to  
16 the next page are five Pictured Cliff wells.

17 The first well is the Martinez H-1.  
18 Based on shut-in pressures the reservoir pressure has been  
19 determined to be approximately 10,000 -- or 1,094.

20 The Valentine showed pressure of 1040.

21 The Gardner No. 1 showed a pressure of  
22 884 psi.

23 The Leaper C-1 showed a reservoir pres-  
24 sure of 886 psi.

25 The Scott No. 1 showed a reservoir pres-  
26 sure on drill stem test of 250 psi.

27 The conclusions that I have drawn from  
28 this exhibit is that it appears that the Pictured Cliff has

1  
2 a much lower reservoir pressure than what we found in our  
3 coal gas; whereas, the Fruitland, based on the one drill  
4 stem test, shows that the pressures could be comparable.

5 Q All right. Again, let's make a small  
6 clarification for the record. Amoco has submitted Exhibits  
7 Eighteen-A-B-C. Is the content of those three exhibits  
8 identical from one to the next, except for the case number  
9 shown at the top?

10 A Yes, sir, they are.

11 Q All right. And Amoco has submitted Ex-  
12 hibits Nineteen-A-B-C. Is the content of those three ex-  
13 hibits identical from one to the next, except for the case  
14 number shown at the top?

15 A Yes, sir, they are.

16 Q All right. Does that conclude your pre-  
17 sentation of exhibits?

18 A Yes, it does.

19 Q All right. On the basis of your research  
20 and your study in preparation of exhibits, is it your opinion  
21 that gas produced from the Cahn Gas Com No. 1-C Well is  
22 occluded natural gas produced from a coal seam for purposes  
23 of NGPA Section 107?

24 A Yes, sir, it is.

25 Q All right, and on the same basis, is it  
your opinion that gas produced from the Schneider Gas Com B  
No. 1-S Well is occluded natural gas produced from a coal  
seam for purposes of NGPA Section 107?

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A Yes, sir, it is.

Q All right, and finally, on the same basis is it your opinion that the gas produced from the State Gas Com BW No. 1-B Well is occluded natural gas produced from a coal seam for purposes of NGPA Section 107?

A Yes, sir, it is.

MR. RING: Mr. Examiner, at this time Amoco offers into evidence Exhibits Numbers Twelve-A through Nineteen-A for the Cahn Gas Com 1-C, and Exhibits Twelve-B through Nineteen-B for the Schneider Gas Com B No. 1-S, and Exhibits Eleven, Twelve, and -- excuse me, Twelve and Thirteen-C, and then Fifteen-C through Nineteen-C for the State Gas Com BW No. 1-B.

MR. STOGNER: All those exhibits will be admitted into evidence.

MR. RING: All right. I have no further questions for the witness.

#### CROSS EXAMINATION

BY MR. STOGNER:

Q Mr. Wood, what bothers me on these applications is that you show on Exhibit Eleven the main basal coal marked in red, but your open hole completion extends above that, and in the case of the Cahn Com No. 1, most of your open hole completion is -- shows to be above that basal coal seam. In your testimony in specifically Exhibit Thir-

1  
2 teen-A, you show up to 2796 feet as being shaly coal, black,  
3 thin-bedded. Are you in essence saying that the coal seam  
4 would also -- should be extended up to 2796 feet in this  
particular well?

5 A We can't make that statement at this  
6 time. The core was recovered, there was no gamma ray run  
7 on that core, so there's no way that we can go back and com-  
8 pare depths. You've got a wireline depth indicated on the  
9 logs and out in the field you've got, you know, your drill  
10 stem depth, or drill string depth.

11 Q On your well that is described in Case  
12 7898, on the completion report, C-105, you show that sever-  
13 al other logs were run on that well, and that being a coal  
14 quality log and coal lithology log, and a focussed electric  
15 detailed log. Do you have those available and what do they  
show and --

16 A Mr. Examiner, which case are you refer-  
17 ing to?

18 Q 7898.

19 MR. RING: That's a case con-  
20 cerning the Schneider Gas Com B No. 1-S.

21 A Could you give me about five minutes to  
22 talk to my attorney, please?

23 MR. STOGNER: Sure.

24 (Thereupon a recess was taken.)  
25

1  
2 A If it pleases the Examiner, it's my un-  
3 derstanding that those logs have been filed with the State.  
4 If you desire, we could certainly enter those into the re-  
5 cord. I have reviewed those logs and in my opinion they do  
6 show that that open hole interval does contain coal.

7 Q But there again, especially in the  
8 Schneider Com B No. 1-S, the log that has been submitted  
9 with your FERC application, the FERC application, has no log  
10 within the coal seam, and do you know if those logs that we  
11 just mentioned are logged through that interval?

12 A The logs that you mentioned, and particu-  
13 larly the coal quality log and the coal lithology log, were  
14 run through the open hole interval.

15 The reason that this well -- or this log  
16 was used on this exhibit is to show the correlation in the  
17 Fruitland and the Pictured Cliffs. The logs you're talking  
18 about are primarily through the open hole section, and so we  
19 had to show these logs in order to build the correlation in  
20 the open hole zones.

21 Q I think to make the FERC application com-  
22 plete before I send it to Washington, I believe it would be  
23 in your best interest to include those logs in that appli-  
24 cation.

25 A We'll be more than happy to submit those  
logs.

Q Okay.

A As an exhibit to this -- these

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applications.

Q Now, in the well in Case Number 7899, I show none of these logs were run on the completion report, is that correct?

A Yes, sir, that's correct.

Q Okay, and the well in Case Number 7900, I show that the coal quality log was run. Could you also submit that, too?

A Yes, sir, we will.

Q What does the coal quality log show? Could you give me a brief history of -- or a brief explanation?

A The coal quality log is basically a gamma ray density tool and it does show the low radioactivity count and a low density count associated with the coal.

Q How about the focussed electric detail log? I'm not familiar with that one, unless I know it by another name.

A Being a petroleum engineer, I'm not that familiar with it, either. I have looked at the logs and I don't have them with me. If memory serves me, that's again a radioactive density type log.

Q As far as going back to these logs here on your Exhibit Eleven, what do you feel the lithology is between the Fruitland sandstone and the main Basin coal?

A I think you've got indications of either some type of siltstone or possibly a shale.

1  
2 Q So in essence it could be impermeable or  
3 of lesser porosity than your sandstone or your coal?

4 A Yes, sir, it could be.

5 Q Was there any stimulation done on these  
6 subject three wells, such as frac or acidizing?

7 A I believe that only one of the wells was  
8 given a relatively small acid job.

9 Q Do you know which one that is, by chance?

10 A I believe that was the Schneider B-1-S.

11 Mr. Examiner, if you'd give me a moment,  
12 I do have the well history here. Let me look through it  
13 real briefly.

14 MR. STOGNER: I'll give you a  
15 few minutes. Sally, let's go off the record a few minutes.

16 (Thereupon a brief recess was taken.)

17 A Mr. Examiner, all three of these wells in  
18 question were not stimulated upon initial completion. All  
19 three of them have been stimulated with small volumes of  
20 acid in a repair type mode.

21 Q Okay, do you have the sundry notice ex-  
22 plaining that procedure on those -- on that particular well  
23 and could you also submit that into the record?

24 A Yes, sir, be glad to.

25 MR. STOGNER: That's all the  
questions I have of this witness. Is there any other ques-

1  
2 tions. Is there any other questions for Mr. Wood?

3 Mr. Chavez.

4  
5 QUESTIONS BY MR. CHAVEZ:

6 Q Mr. Wood, you say that there's probably  
7 some kind of ceiling siltstone or some kind of seal between  
8 the main coal that you're producing and the Fruitland sand-  
stone?

9 A Yes, sir, I do. The reason I believe  
10 that is that the comparison of the gas analysis from the  
11 Fruitland and the coal. Certainly if they were in pressure  
12 communication, you would think that you would have a  
13 blending of the two gases and produce a similar gas. Cer-  
14 tainly the pressure data is not conclusive as showing that  
15 the pressure differential exists that you cannot have com-  
munication.

16 I would point out that the only drill  
17 stem test which showed that high of a pressure was run back  
18 in 1952. The well, to my knowledge, has never produced from  
19 the Fruitland.

20 The more current pressure analysis indi-  
21 cates the reservoir pressure much less than what we've  
measured in our coal wells.

22 Q Have you been able to pick up this kind  
23 of barrier on a log or or anything for us?

24 A I think you can identify the shale or  
25 siltstone on a log. I have not seen any analysis based on

1  
2 a recovered core from that silt or shale.

3 Q Okay, and the second question is  
4 basically the same thing with the difference, or a seal be-  
5 tween the coal and the Pictured Cliffs. Have you been able  
6 to pick up anything like that on the log or on a core, not  
7 necessarily in this area, but say, elsewhere throughout the  
8 basin?

9 A There does appear to be another shale  
10 member below the basal coal, which it could be the barrier,  
11 the permeability seal between the underlying PC and the  
12 coal.

13 Q You say there appears to be. This is off  
14 what?

15 A This is off log analysis in the coal.  
16 For example, on Exhibit Number Eleven, the Valentine B-1,  
17 directly below the indicated basal coal there is an approxi-  
18 mate 15-foot interval that would indicate a possible shale  
19 or silt.

20 Once again, the pressure differential be-  
21 tween the Pictured Cliffs and the coal would indicate that  
22 there is some type of permeability barrier present.

23 Q Well, the -- according to the testimony  
24 you've given today, then, this coal member is actually a  
25 different common source of supply than what would generally  
be considered as true in that area, is that correct?

A Yes, sir, that would be correct.

Q Okay, so you would have no objection then

1  
2 to the Division designating a separate pool name for the  
3 coal production?

4 A In my opinion it is a separate reservoir  
5 both Fruitland and the PC, and as such, if the Commis-  
6 sion wants through the nomenclature to identify this as a separ-  
7 ate pool, I would not think Amoco would have any objections  
8 to that.

9 Q With the large quantities of gas and  
10 water that are being produced out of this coal, have you  
11 done any tests to make a determination of the area of drain-  
12 age for these wells? Have you done some testing? I see  
13 that you did some bottom hole pressure testing. Did you get  
14 any data which would indicate how big an area it's draining?

15 A In my preparation for this hearing I did  
16 not address the question of well spacing or drainage, and so  
17 I cannot offer you an opinion of what the ultimate drainage  
18 or recovery from these individual wells may be.

19 MR. CHAVEZ: I don't have any  
20 more questions.

21 MR. STOGNER: Thank you, Mr.  
22 Chavez. Is there any further questions of this witness? If  
23 not, he may be excused.

24 Do you have anything, Mr.  
25 Pearce?

MR. PEARCE: One thing for  
clarification of transcript. I would like the transcript  
also to reflect that the record of this case contains an en-

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try of appearance filed on behalf of the Commissioner of Public Lands of the State of New Mexico in each of the three separate cases.

MR. STOGNER: Mr. Ring, do you have anything further? Do you have anything further in this case?

MR. RING: No, I have no further questions.

MR. STOGNER: Before we wind up these cases, I'd like to again on record say I need eight copies of this transcript today, two for each NGPA application, and two for our case file, and that should be sufficient for us on that.

And the NGPA applications were received in this office on December 17th, 1982, and that will be the docket date these applications will get when we turn them over to the FERC.

Is there anything further to come in Cases Number 7898, 7899, and 7900?

If not, these cases will be taken under advisement.

(Hearing concluded.)

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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 this Transcript of Hearing before the Oil Conservation Division was reported by me; that the said Transcript of Hearing is a full, true, and complete record of the hearing, prepared by me to the best of my ability.

---

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 7898 heard by me on June 8 1983.  
Michael E. Stogner, Examiner  
Oil Conservation Division