

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

6 26 October 1988

7 EXAMINER HEARING

8 IN THE MATTER OF:

9 Application of Phillips Petroleum CASE
10 Company for salt water disposal, 9511
11 Roosevelt County, New Mexico.

12 BEFORE: Michael E. Stogner, Examiner

13
14 TRANSCRIPT OF HEARING

15
16 A P P E A R A N C E S

17
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1 MR. STOGNER: At this time
2 I'll call Case 9511.

3 MR. STOVALL: Application of
4 Phillips Petroleum Company for salt water disposal, Roose-
5 velt County, New Mexico.

6 MR. STOGNER: Call for ap-
7 pearances.

8 MR. KELLAHIN: Mr. Examiner,
9 I'm Tom Kellahin of the Santa Fe law firm of Kellahin,
10 Kellahin & Aubrey. I'm appearing on behalf of the appli-
11 cant and I have two witnesses to be sworn.

12 MR. STOGNER: Are there any
13 other appearances in this matter?

14 MR. HALL: Mr. Examiner, Scott
15 Hall from Campbell & Black of Santa Fe on behalf of
16 Ensearch Exploration, Incorporated.

17 MR. STOGNER: Mr. Hall, do you
18 have any witnesses?

19 MR. HALL: No, sir.

20 MR. STOGNER: Are there any
21 other appearances?

22 Will the witnesses please
23 stand at this time to be sworn?

24

25

(Witnesses sworn.)

1 MR. KELLAHIN: Mr. Examiner,
2 our first witness this morning is Miss Susan Courtright.
3 She spells her last name C-O-U-R-T-R-I-G-H-T. She's a
4 petroleum engineer with Phillips.

5
6 SUSAN COURTRIGHT,
7 being called as a witness and being duly sworn upon her
8 oath, testified as follows, to-wit:

9
10 DIRECT EXAMINATION

11 BY MR. KELLAHIN:

12 Q For the record, Miss Courtright, would
13 you please state your name and occupation?

14 A My name is Susan Courtright and I'm the
15 reservoir engineer for Phillips Petroleum.

16 Q Have you previously testified before the
17 Oil Conservation Division of New Mexico?

18 A No, I haven't.

19 Q Would you describe for us when and where
20 you obtained your engineering degree?

21 A I obtained a BS in petroleum engineering
22 in 1986 from Colorado School of Mines.

23 Q Subsequent to graduation, would you de-
24 scribe what has been your employment experience as a petro-
25 leum engineer?

1 A For the last year and a half I've been
2 employed by Phillips Petroleum Company and the last 9
3 months of which I've been the reservoir engineer.

4 Q What geographical area has been the area
5 of your involvement in preparing work as a reservoir en-
6 gineer for Phillips Petroleum Company?

7 A One of my job responsibilities is the
8 Lovington sub-area in New Mexico.

9 Q Within that Lovington area what county
10 are we in, Roosevelt County?

11 A Roosevelt and Lea County.

12 Q Specifically, have you made a study of
13 the production in the -- what is called the Lambirth Area?
14 It's the Fusselman production in Roosevelt County?

15 A Yes, I have.

16 Q Would you describe generally what type
17 of production that is?

18 A What we're seeing in the Lambirth Area
19 is an active waterdrive reservoir.

20 Q What were you specifically asked to do
21 by your company?

22 A I was asked to examine the Lambirth Area
23 and choose one of our wells to use as a disposal well.

24 Q In making that study what was the source
25 of the information that you utilized?

1 A I used the completion reports from PI
2 and I also used the production reports as recorded with the
3 state.

4 Q And have you completed that study?

5 A Yes, I have.

6 Q And have you found a well that in your
7 opinion as a reservoir engineer is suitable for disposal
8 purposes?

9 A Yes. I chose our Lambirth "A" No. 6.

10 MR. KELLAHIN: At this time,
11 Mr. Examiner, we tender Miss Courtright as an expert re-
12 servoir engineer.

13 MR. STOGNER: Mr. Hall, are
14 there any objections?

15 MR. HALL: No, sir.

16 MR. STOGNER: Miss Courtright
17 is so qualified.

18 Q Miss Courtright, let me direct your at-
19 tention to the package of exhibits and to the first plat,
20 which is marked as Exhibit One, identified as Area of
21 Review.

22 A Yes.

23 Q Would you take a moment and identify
24 that exhibit for us?

25 A This exhibit is an area of review. The

1 circle, the inner circle is the half mile radius sur-
2 rounding our proposed well, and the outside circle is a
3 2-mile radius.

4 Q Are you familiar or have you familiar-
5 ized yourself with the Commission rules and regulations for
6 the preparation and filing of the Commission Form C-108?

7 A Yes, I have.

8 Q And did you cause such a form to be
9 prepared, completed, and filed?

10 A Yes.

11 Q When we look at this particular area,
12 can you identify for me what you have chosen to be the
13 disposal well?

14 A Yes. The disposal well that we've
15 chosen is highlighted by the green arrow and this is our
16 Lambirth "A" No. 6.

17 Q What is the current status of that well?

18 A This well is producing about 19 MCF a
19 day.

20 Q It is a former producer from the Fussel-
21 man formation?

22 A No, it's not. It's currently completed
23 in the Pennsylvanian formation.

24 Q It was originally drilled as a Fusselman
25 well?

1 A Yes.

2 Q Okay, and was it found to be productive
3 in the Fusselman of oil production?

4 A No, it was not.

5 Q Using the area of review as a reference
6 point, can you show the examiner how Phillips' acreage has
7 been developed by your company? Which one of these --
8 which of these wells are yours and which of these wells are
9 other operators?

10 A It's checkerboarded. Our acreage is
11 highlighted. You'll see the pink highlights, the Phillips
12 sections, and our offset operators are identified here as
13 EP operator.

14 Q Historically what was the development of
15 this acreage insofar as the Fusselman is concerned? Was
16 this all Phillips acreage at one time?

17 A Yes, I believe it was.

18 Q And there was a farmout, then, to En-
19 search, now what is called EP Operating Company?

20 A Yes, that's correct.

21 Q And as a result of that farmout, then,
22 there is a checkerboard pattern whereby Phillips has 80-
23 acre tracts and EP Operating has 80-acre tracts.

24 A That's right.

25 Q In selecting a well for disposal pur-

1 poses, what were you trying to do?

2 A To find the best well which would serve
3 -- to serve as a disposal well, and also, well, basically
4 just to serve as the best disposal well.

5 Q What were the factors that caused you to
6 choose the No. 6 Well as the best candidate for disposal
7 purposes?

8 A One was the integrity of the wellbore.

9 Q And what did you find?

10 A It's properly cemented, no casing leaks.

11 Q What is going to be the formation in
12 which you dispose of the produced water?

13 A We wish to dispose into the Fusselman
14 Montoya.

15 Q And the source of that produced water is
16 what?

17 A The Fusselman Montoya.

18 Q And it's those Phillips wells that pro-
19 duce in this particular field?

20 A Yes, that's correct.

21 Q And approximately how many producing
22 wells do you have that produce water?

23 A We have currently four Fusselman wells
24 and we also have three wells which are completed in the
25 Penn.

1 Q In addition to finding a wellbore
2 that had good mechanical integrity and could serve for dis-
3 posal purposes, did you have any other factors that you
4 considered in deciding on whether or not this well was
5 suitable for disposal purposes?

6 A Yes. I wanted to know if there was even
7 a zone which would accept water, and that had properly de-
8 veloped porosity.

9 Q And what did you find?

10 A That the No. 6 Well does have that well
11 developed porosity in the Fusselman Montoya.

12 Q In addition to those two issues, did you
13 examine any other issues?

14 A Yes. I looked at all the offset produc-
15 tion and I just wanted to make sure that no production
16 would be wasted or abandoned.

17 Q And what did you find?

18 A That there would be none.

19 Q Let me direct your attention now to
20 Exhibit One and look at the pink arrow to the north of the
21 plat.

22 A Yes.

23 Q What is that?

24 A That is currently Petrus' water disposal
25 well.

1 Q And in what formation does that disposal
2 well dispose of water?

3 A They are disposing into the Fusselman
4 Montoya.

5 Q And what is the source of the water that
6 they dispose of in the Fusselman?

7 A That I don't know.

8 Q What significance do you attach as a
9 reservoir engineer to the fact that they're using that well
10 for disposal into the Fusselman?

11 A Well, it's showing that the Fusselman
12 Montoya will accept water and is taking water.

13 Q When we look at the purple arrow just to
14 the south and east of your proposed disposal well, what is
15 the significance of that well?

16 A This is a well which Phillips Petroleum
17 Company identified earlier in 1981 for a disposal well.

18 Q Into what formation?

19 A This is going to be into the Wolfcamp
20 formation.

21 Q In making your study of available well-
22 bores for disposal purposes, Ms. Courtright, have you exa-
23 mined the possibility of using any other formation other
24 than the Lower Fusselman formation?

25 A Yes, I have. I've also examined the

1 Wolfcamp in this No. 6 Well.

2 Q Okay, and what did you find when you
3 examined the Wolfcamp in the No. -- I believe it's the 1-H
4 on this display?

5 A Yes.

6 Q Okay. What did you find?

7 A When I examined the Wolfcamp in the No.
8 1-H?

9 Q Yes.

10 A That it does have acceptable porosity in
11 the range of 15 to 18 percent and it would take water.

12 Q Is Phillips able to utilize that well-
13 bore for disposal into the Wolfcamp formation?

14 A No, we have not used it.

15 Q And why not?

16 A Basically it's uneconomical for us to
17 convert this well to a disposal.

18 Q And why is that?

19 A We have -- there was a disagreement be-
20 tween the landowners, Mr. Peterson is the landowner of this
21 well and he did not want to see Mr. Lambirth's water in-
22 jected into this well.

23 Q So there are ownership arrangements that
24 preclude you from utilizing the wellbore for disposal of
25 water produced off the lease.

1 A That's correct.

2 Q Other than that wellbore in the Wolf-
3 camp formation have you found any other wellbore that's as
4 good a disposal candidate as the subject No. 6 Well?

5 A No, I haven't.

6 Q When we look at the yellow arrow which
7 is in the southeast quarter, again, just south of the 1-H
8 Well?

9 A Uh-huh.

10 Q Do you see that one?

11 A Uh-huh.

12 Q What is the significance to you of this
13 yellow arrow?

14 A Well, in 1981 this is the well which
15 Ensearch proposed to convert to a disposal well.

16 Q And what had they proposed to the Divi-
17 sion in 1981 with this application for this well?

18 A They wanted to dispose of their water
19 into the Fusselman Montoya formation.

20 Q And what that application granted?

21 A No, it wasn't.

22 Q And what was the basis of the Division
23 denying to Ensearch the opportunity to utilize that No. 2
24 Well for disposal into the Montoya or the Lower Fusselman,
25 if you will?

1 A Well, at that time our No. 4-A Well,
2 which is located to the northwest of the yellow arrow --

3 Q It's the one right on the edge of the
4 half mile radius circle --

5 A Yes.

6 Q -- Section 31?

7 A Yes.

8 Q And that's called the Phillips 4-A Well?

9 A Yes, it is.

10 Q Okay. What was the problem with that?

11 A At that time our well was producing in
12 excess of 100 barrels per day of oil and we feared that by
13 -- if Ensearch would inject into the Fusselman Montoya
14 this could result in early abandonment of our production.

15 Q And based upon that, then, the
16 Commission denied to Ensearch the opportunity at that time
17 to utilize that wellbore for disposal into the Fusselman.

18 A That's right.

19 Q In looking at the No. 6 Well have you
20 examined the wells within the half mile radius to see if
21 any of those wells are still capable of commercial produc-
22 tion in the Fusselman?

23 A Yes, I have.

24 Q And what have you concluded?

25 A I've found the two wells within the half

1 area -- half mile area of review, the Lambirth No. 7 and
2 No. 8, no longer have such production.

3 Q Let's focus on the No. 7 Well first of
4 all. That is operated by EP Operating Company?

5 A Yes, it is.

6 Q And what -- that well originally pro-
7 duced from the Fusselman?

8 A Yes, it did.

9 Q And does it still produce from the Fus-
10 selman?

11 A No, it doesn't. It was pressure de-
12 pleted and abandoned at about 2 to 3 barrels per day, and
13 recompleted in the Penn.

14 Q At the time of abandonment how did the
15 operator abandon the Fusselman?

16 A That I do not know.

17 Q Well, did they simply set a bridge plug
18 and go and produce out of a shallower zone and giving them
19 an opportunity, then, to come back and produce again the
20 Fusselman at some subsequent date?

21 A At the No. 7 I would believe that they
22 did just set a bridge plug.

23 Q Okay. And at the time they set the
24 bridge plug, what was the producing rate of the well?

25 A It was 1 to 2 barrels of water a day.

1 Q And how much water was being produced
2 in approximate quantity?

3 A Also the same, 1 to 2 barrels a day.

4 Q In your opinion does the No. 7 Well
5 continue to be economic in the Fusselman?

6 A No, it doesn't.

7 Q Let's look at the other well which is
8 the No. 8 Well?

9 A Yes.

10 Q And that's due west of the disposal
11 well?

12 A Yes.

13 Q And that's also operated by EP Operating
14 Company?

15 A That's correct.

16 Q What is your opinion as a reservoir en-
17 gineer about the ability of that well to produce commercial
18 oil or gas from the Fusselman?

19 A I don't believe that it would be commer-
20 cial from the Fusselman.

21 Q And what is the basis upon which you
22 reach that opinion?

23 A It was, at the time of abandonment it
24 was producing 1 to 2 barrels of oil a day and, however, it
25 was producing in excess of 100 barrels of water a day.

1 Q And how did the operator abandon the
2 Fusselman formation in that well?

3 A They squeezed these perforations and set
4 a bridge plug and moved up hole.

5 Q In addition to examining the wells in
6 the half mile radius, have you also examined those well-
7 bores outside the half mile radius?

8 A Yes. There are six wells outside, imme-
9 diately outside the half mile radius that I've looked at.

10 Q And which is the closest producing Fus-
11 selman well that still has commercial oil and gas produc-
12 tion from the Fusselman?

13 A It would be a combination of the EP
14 Operating Lambirth No. 9, Lambirth No. 10, and our --
15 pardon me?

16 Q The No. 9 is in the southeast quarter of
17 25?

18 A Yes.

19 Q The No. 10 is in the northwest of 31?

20 A Yes, and our Lambirth "A" No. 2.

21 Q And that one is in the southeast of the
22 northwest of 31.

23 A Yes, sir.

24 Q And when you talk about commercial pro-
25 duction what is the approximate range of production in

1 barrels of oil per day?

2 A Anywhere in excess of 10 barrels per
3 day.

4 Q Have you reached an opinion as to
5 whether or not the use of the No. 6 well for disposal pur-
6 poses would jeopardize or cause the premature abandonment
7 of any of those wells that are still commercial in the
8 Fusselman?

9 A Yes, I've looked at that and I don't
10 believe that it would.

11 Q Describe for Mr. Stogner what is the
12 approximate range in terms of volume for disposal into the
13 No. 6 Well.

14 A We would like to inject 900 to 2000
15 barrels per day into this well.

16 Q Are -- do you have an opinion as to
17 whether or not you can dispose of water into that well at
18 that rate at a pressure gradient that is less than the .2
19 psi per foot of depth limitation by the Division?

20 A Yes, I do.

21 Q And what is that opinion?

22 A That we will be able to inject at less
23 than -- under 1000 psi.

24 Q Have you made a study to determine
25 whether or not it's economically suitable to Phillips to

1 utilize this wellbore for disposal purposes?

2 A Yes, I have. I've run several economic
3 cases and have found out that if we reduce our disposal
4 cost that we will be able to actually extend the producing
5 life of this reservoir.

6 Q In making that type of economic analy-
7 sis, Miss Courtright, what is the method that you chose to
8 make that study?

9 A I was running different cases between
10 what our previous -- or what we're actually disposing at
11 right now compared to what we could if we had the No. 6 as
12 a disposal well.

13 Q Did you as a reservoir engineer apply
14 standard reservoir analysis and economic analysis to making
15 that conclusion?

16 A Yes, I did.

17 Q What have you calculated to be the addi-
18 tional recovery from the reservoir from the Phillips wells?

19 A I calculated approximately 58,500 bar-
20 rels.

21 Q And that represents what?

22 A That represents the additional produc-
23 tion that could be gained if our disposal costs are reduced
24 if the No. 6 Well is utilized as a disposal well.

25 Q In reaching that conclusion what -- can

1 you summarize for us were the economics of the current
2 method of disposal? What are you doing with the water now?

3 A Currently we're disposing approximately
4 900 barrels of water per day and this is at 40 cents per
5 barrel.

6 Q To whom do you have to pay the 40 cents
7 a barrel to dispose of the produced water from the Phillips
8 wells?

9 A We're paying EP Operating.

10 Q And it's the same EP Operating Company
11 that Mr. Hall represents today?

12 A Yes, that is true.

13 Q And in utilizing the expense to EP
14 Operating Company of 40 barrels a day, approximately how
15 much money in monthly dollars do you pay that company for
16 disposing of your produced water?

17 A At 40 cents a barrel this is about equi-
18 valent to \$11,000 a month.

19 Q In examining an alternative of using
20 your own well, the No. 6 Well, for disposal purposes, what
21 have you calculated to be the economic effect of doing
22 that? What's it going to cost you in terms of barrels of
23 produced water per day?

24 A We feel that we can reduce our disposal
25 costs to 10 cents per barrel.

1 Q In terms of the ability of these wells
2 to produce from Fusselman oil, how does 58,000 barrels of
3 oil compare to the cumulative production of wells in the
4 pool?

5 A 58,000 barrels is larger than the cumu-
6 lative production to date of at least half of the wells
7 in this area.

8 Q In making your economic analysis have
9 you determined whether or not the utilization of this well
10 for disposal purposes will extend the economic life of the
11 field and thereby produce oil that would not otherwise be
12 produced?

13 A Yes. I've found that we can produce or
14 gain an additional four years of production.

15 Q Let me direct your attention now to what
16 is marked as Exhibit Number Two. Would you identify that
17 exhibit for us?

18 A Yes. This is the Phillips Petroleum
19 Company Fusselman production.

20 Q What does it show you as an engineer?

21 A There are two curves on this graph. The
22 first one is the rate in thousands of barrels per year and
23 the second is the cumulative production in thousands of
24 barrels, both actual and forecasted are shown on this.

25 Q When we look back into the year 1981 on

1 this display and find a point in time at which Ensearch was
2 making an application for disposal into this Lower Fussel-
3 man, what was the status of production in the reservoir?

4 A The reservoir was at its peak production
5 at that time.

6 Q And what has been the change or describe
7 for us what you see to be the change in the reservoir be-
8 tween then and now.

9 A It has declined significantly.

10 Q And therefore what do you conclude?

11 A That we would be able to inject into the
12 Lambirth "A" No. 6 and there wouldn't be any waste of oil.
13 There should be no premature abandonment.

14 Q What is the second page of this exhibit,
15 Miss Courtright?

16 A The second page shows what we could ex-
17 pect to be additional production that we could expect to
18 recover with decreasing disposal costs.

19 Q Let's now turn to Exhibit Number Three.
20 Exhibit Number Three is the Commission Form C-108?

21 A Yes, that's correct.

22 Q And all the attachments that you've had
23 prepared and reviewed?

24 A Yes.

25 Q Let's turn to the first two attachments.

1 One is the type description and then Attachment Two is the
2 wellbore schematic. Let's look at those together.

3 A Yes.

4 Q Would you describe for Mr. Stogner the
5 existing wellbore arrangement in the disposal well that's
6 identified on the Attachment Number Two?

7 A Yes. The existing wellbore is best
8 shown on the wellbore schematic. If you look to the right-
9 hand side of this wellbore you will see how the wellbore is
10 currently completed.

11 Q When the well was originally drilled it
12 was drilled as a potential Fusselman well?

13 A Yes, that's correct.

14 Q And have you shown on your wellbore
15 schematic where the original perforations are?

16 A Yes. I'd like to point out that if you
17 look under sequence Item No. 4 that the original perfora-
18 tions were from 8042 to 8056 and that these were treated
19 with 1000 gallons of acid and they were swabbed dry. There
20 were no oil or gas shows.

21 Q This corresponds to what portion of the
22 Fusselman reservoir?

23 A This is in the Granite Wash formation.

24 Q Okay, this is below, then, the
25 Fusselman.

1 A Correct.

2 Q When we have talked in previous hearings
3 about the Montoya, that is in fact the lower portion of the
4 Fusselman in this area?

5 A Yes, it's the Lower Fusselman.

6 Q They are not physically separated?

7 A No.

8 Q It's just a geologic nomenclature, if
9 you will, within the Fusselman?

10 A Correct.

11 Q When we look then at the next higher
12 perforations above the Granite Wash --

13 A Yes.

14 Q -- in the original well, where were
15 those?

16 A These are identified by sequence Item
17 No. 6, and these perforations were from 7814 to 7824.
18 These were also treated with 1000 gallons of acid and they
19 also swabbed dry with no oil or gas shows.

20 Q In what formation are we now?

21 A This is in the Fusselman Montoya.

22 Q And in what portion of the Fusselman
23 Montoya?

24 A This would be in the upper portion.

25 Q Then there were a last set of perfor-

1 ations above these?

2 A Yes, sir. These are identified by
3 sequence Item No. 8 and the perforations are from 7607 to
4 7613, and these were treated with 800 gallons of acid and
5 after swabbing they started flowing and the initial comple-
6 tion on this were flowing on 14/64ths inch choke and this
7 was 16 barrels of oil, 3 barrels of water, and 214 MCF.

8 Q Miss Courtright, describe for Mr.
9 Stogner what you propose to do with the wellbore to con-
10 vert it for disposal purposes.

11 A Yes. Our proposed wellbore is seen on
12 the lefthand side of the schematic and is highlighted in
13 red.

14 Several things which we plan to do are,
15 first, squeeze the current producing perforations. Second,
16 perforate at 6050 and circulate cement to surface in the
17 8-5/8ths 5-1/2 inch casing annulus. And then secondly, or
18 thirdly, we would be perforating in the Lower Fusselman
19 Montoya from 7892 to 7944.

20 Q Do you propose to utilize the plastic
21 lined tubing for disposal purposes?

22 A Yes. We'll be using 2-3/8ths inch
23 plastic lined tubing and this will be set at 7850.

24 Q And will you monitor the pressure of
25 the annular space between the casing and the tubing in the

1 wellbore?

2 A Yes, we plan to have pressure tests.

3 Q And you'll place an inert fluid in that
4 space?

5 A Yes.

6 Q In making a study of the data in order
7 to complete the preparation of the Form C-108, did you also
8 make a tabulation of the wellbore information within the
9 area of review?

10 A Yes, I did.

11 Q And that's shown on Attachment -- I'm
12 not sure it's marked as a specific attachment but it's the
13 tabulation following the schematic?

14 A That's correct.

15 Q In addition to the two wellbores within
16 the area of review, have you also tabulated other wellbore
17 information for wells beyond that area?

18 A Yes. There are six wells that I've
19 looked at outside of the area of review.

20 Q What was the purpose of making that
21 study?

22 A To make sure that the surface water
23 would be protected, the fresh -- the groundwater would be
24 protected.

25 Q In making this study, what have you

1 determined to be the likely intervals in which fresh water,
2 if it's available, can be produced?

3 A Well, I wanted to make sure that the
4 surface casing was at least set to 300 feet and in all
5 cases it was.

6 Q And at 300 feet approximately, what
7 occurs at that depth?

8 A That is the top of the Redbeds.

9 Q And produced fresh water in this area is
10 above, then, the depth of the Redbeds, and you have -- what
11 determination have you made of the current producing fresh
12 water sources within the half mile area?

13 Are there any windmills or pumps or
14 stock tanks within this area?

15 A Yes, there are. We found -- we were
16 able to get two fresh water analyses.

17 Q And you have a subsequent display that
18 shows the location of the fresh water sources?

19 A Yes, I do. If you look to Attachments
20 Eight through Ten.

21 Q All right, let's do that now. When you
22 look at Attachment Eight --

23 A Yes.

24 Q The red arrow identifies what?

25 A This arrow identifies the location where

1 we got the fresh water analyses shown on Attachments Nine
2 and Ten.

3 Q In making your review of the integrity
4 of the wellbores in the area, have you found any wellbore
5 that will serve as a source by which water disposed of in
6 the Fusselman will migrate out of the Fusselman into
7 shallower fresh water sands?

8 A No, I have not.

9 Q You don't find any?

10 A No, I don't find any wellbores. There
11 is one which I take a closer look at and this is shown on
12 Attachment Number Four.

13 Q Okay.

14 A And this is the Energy Reserves Group
15 Radcliffe Well No. 1.

16 Q All right, let's find that on the double
17 circle map. That's on Exhibit Number One, the Radcliffe
18 Well is located in Section 30?

19 A In the northwest quarter.

20 Q Okay, it's the dry hole just outside the
21 half mile radius?

22 A Yes, it is.

23 Q And what was your concern about that
24 wellbore?

25 A They had collapsed 8-5/8ths inch casing

1 at the surface.

2 Q On further investigation what did you
3 determine concerning the integrity of that wellbore?

4 A Well, when they plugged and abandoned
5 this well they perforated four shots at 380 and they
6 circulated cement to surface in this 4-1/2 inch annulus.

7 Q What does that tell you?

8 A That the well is properly plugged now.

9 Q Have you also prepared schematics of any
10 other plugged and abandoned wells within the area of re-
11 view?

12 A Yes, there are a total of four plugged
13 wells which I have schematics.

14 Q And on each of the schematics you've
15 shown the available information?

16 A Yes.

17 Q And what is your engineering opinion
18 with regards to the integrity of the way those wells were
19 plugged and abandoned?

20 A That they're all properly plugged and
21 that there's no -- no potential damage to the groundwater.

22 Q Have you also submitted to Mr. Stogner
23 water analyses of the produced water that you propose to
24 inject into the disposal well?

25 A Yes, I have.

1 Q And where do we find that information?

2 A Those are Attachments Number Six and
3 Number Seven.

4 Q Do you anticipate any operational diffi-
5 culty with the using of this type of disposed water and
6 re-introducing it back into the Fusselman?

7 A No, I don't. This is Fusselman Montoya
8 water.

9 Q Have you also provided Mr. Stogner with
10 a narrative of the proposed injection operations?

11 A Yes, I have.

12 Q And that's found on one of the enclo-
13 sures just before Attachment Number Six?

14 A Correct.

15 Q Have you made a determination as to
16 whether or not there were any geologic events occurring
17 that would cause fractures or open faulting by which water
18 disposed of in the Lower Fusselman can migrate beyond that
19 formation?

20 A Based on the last testimony in the last
21 hearing, there are fractures in the area and it will
22 migrate more than likely from the Lower Fusselman into the
23 -- what is referred to as the Upper Fusselman.

24 Q But those fluids will remain confined
25 within the Fusselman formation.

1 A That's correct.

2 Q Do you find any geologic or operational
3 instance whereby we have flows of produced water outside of
4 the Fusselman Montoya formation?

5 A No, sir.

6 Q Has there been any reports of water
7 flows on the surface of any of the wells utilizing this
8 area for disposal purposes?

9 A Not that I'm aware of.

10 Q Do you have an engineering opinion, Miss
11 Courtright, as to whether or not the approval of this ap-
12 plication will prevent waste?

13 A Yes, it certainly will, particularly by
14 extending the life of the reservoir production -- producing
15 life by an extra four years.

16 Q Do you have an engineering opinion as to
17 whether the approval of this application can be made with-
18 out the violation of the correlative rights of any opera-
19 tors or working interest owners?

20 A Yes. I don't believe that there is any
21 production to be wasted in this area.

22 MR. KELLAHIN: That concludes
23 my examination of Miss Courtright.

24 We move the introduction of
25 her Exhibits One, Two, and Three.

1 MR. STOGNER: Exhibits One,
2 Two and Three will be admitted into evidence at this time.

3 Mr. Hall, your witness.

4 MR. HALL: We have no ques-
5 tions.

6
7 CROSS EXAMINATION

8 BY MR. STOGNER:

9 Q Miss Courtright, maybe you can
10 straighten me up on nomenclature here as far as our forma-
11 tions. Now this is within the pool boundaries of the
12 Peterson, South Peterson Fusselman Pool, is that correct?

13 A Yes, sir.

14 Q Okay, now the Montoya formation, is it a
15 separate formation than the Fusselman and if so how is it
16 separated and could you go into a little detail on that for
17 me?

18 A Sir, it has been referred to as the
19 Montoya but there are -- I don't believe that anybody has
20 actually been able to pick the top of the Montoya as com-
21 pared with the bottom of the Fusselman, and that's why we
22 refer to it as the Fusselman Montoya formation.

23 Q Okay, and as such production that is
24 from this area or has been from this area, is it indeed
25 from the upper portion; that is, in the Fusselman, or is

1 any portion of it from the Montoya?

2 A No, sir, it is from the Upper Fusselman.

3 Q Upper Fusselman. And that is indeed
4 Fusselman, is that correct?

5 A Yes.

6 Q Okay. In looking at your schematic of
7 your proposed injection well, I see that you're going to go
8 in an perforate approximately 6050 feet and circulate
9 cement to the --

10 A Yes.

11 Q Why are you going to do that, may I ask?

12 A Because right now, at least according to
13 the New Mexico laws, we need to have cement passed the
14 intermediate casing, casing shoe, and since we need to put
15 cement to that point, I feel it would be best to circulate
16 cement to surface.

17 Q Thank you. When I look at your Exhibit
18 Number Two, this is your actual and forecasted Fusselman
19 production, how many wells are we talking about?

20 A We are talking about what is currently
21 producing now, which is four wells.

22 Q Four wells. I know you went over them
23 but which four wells are they, just the numbers.

24 A The wells which are currently producing
25 out of the Fusselman are our Phillips Lambirth State No. 1,

1 Phillips Lambirth "A" 1, Phillips Lambirth "A" 3, and
2 Phillips Lambirth "A" 2.

3 Q I'd like to look at your tabulation of
4 all the wells in the interest area. Now, you show more
5 wells than really what you need to, but --

6 A Yes.

7 Q -- let's -- let's go in on the No. 7 and
8 8.

9 A Yes.

10 Q Those are the wells that are within a
11 half mile radius.

12 A Yes.

13 Q The depth of these wells --

14 A Is shown --

15 Q -- I'm sorry, go ahead.

16 A The total depth of these wells are shown
17 in column number 4 in parentheses under the date completed.

18 Q And then you show the cement sacks and
19 the production casing.

20 A Correct.

21 Q 450 and 600. Do you have a top of
22 cement calculation, by chance, on those?

23 A No, sir, I don't.

24 Q When you're making your top of cement
25 calculations in here what percentage of fill do you usually

1 use?

2 A Sir, are you asking how I would calcu-
3 late the --

4 Q Yes, I was.

5 A -- top of cement? I would take the hole
6 size and the surface casing size and use that annulus to --

7 Q Well, I'm talking about the production
8 casing.

9 A Oh, I'm sorry. I would also do the same
10 thing, take the difference between the bit size used in the
11 production casing.

12 Q Would you put a percentage in there? Or
13 a safety factor or anything? Do you have a fill percentage
14 that you use?

15 A No, sir, not that I'm aware of.

16 MR. KELLAHIN: We'll be happy
17 to make the calculation --

18 MR. STOGNER: Oh, I think I
19 could do that and I will use our standard .5.

20 A Okay.

21 MR. STOGNER: I have no other
22 questions at this time of Miss Courtright.

23 Are there any other questions
24 of this witness?

25 She may be excused.

1 Mr. Kellahin.

2 MR. KELLAHIN: MR. STOGNER,
3 we'd like to call Mr. Bob Strauss. He's a geologist, to
4 show you a cross section and a structure map of the area.
5 Mr. Strauss spells his last name S-T-R-A-U-S-S.

6
7 ROBERT STRAUSS,
8 being called as a witness and being duly sworn upon his
9 oath, testified as follows, to-wit:

10
11 DIRECT EXAMINATION

12 BY MR. KELLAHIN:

13 Q Mr. Strauss, would you please state your
14 name and occupation?

15 A My name is Robert Strauss and I'm an
16 Associate Development Geologist with Phillips Petroleum
17 Company.

18 Q Mr. Strauss, have you testified in pre-
19 vious hearings before the Division as a petroleum geolo-
20 gist?

21 A Yes, I have.

22 Q Pursuant to your employment have you
23 caused to be made a geologic study of this particular area
24 to determine whether or not the No. 6 Well can be utilized
25 for disposal purposes?

1 A Yes, I have.

2 Q And have you completed such a study?

3 A Yes, I have.

4 Q And do you now have such a -- do you now
5 have opinions on that issue?

6 A Yes, I do.

7 MR. KELLAHIN: We tender Mr.
8 Strauss as an expert petroleum geologist.

9 MR. STOGNER: Mr. Hall, are
10 there any objections?

11 MR. HALL: No, sir.

12 MR. STOGNER: Mr. Strauss is
13 so qualified.

14 Q Mr. Strauss, before we talk about the
15 details of your conclusion, let me direct your attention to
16 your exhibit which is marked as Phillips Exhibit Number
17 Four. That's the structure map.

18 A Yes, sir.

19 Q Would you identify that for us?

20 A The -- this particular exhibit is a
21 structure map on top of the Fusselman Montoya.

22 Q Exhibit Number Five is the cross section
23 that we've put on the wall and that's a cross section that
24 you have reviewed?

25 A Yes, sir.

1 Q When we're looking at the structure map,
2 relate to us where on the cross section you have placed the
3 top of the Fusselman upon which then you contoured this
4 structure map.

5 A The -- on the particular cross section,
6 the top of the Fusselman is the wavy line which is a
7 non-conformity.

8 Q On the far left side of Exhibit Number
9 Five, then, it says base of the Penn, top of Fusselman
10 Montoya Granite?

11 A Yes, sir.

12 Q That's the marker upon which the struc-
13 ture is made?

14 A That's correct.

15 Q Okay. What is the line, the red line,
16 running north to south on Exhibit Number Four?

17 A That's the line of cross section that's
18 exhibited on the wall.

19 Q And the red arrow, then, is the disposal
20 well?

21 A Yes, sir.

22 Q Describe for us what you conclude from
23 an examination of the structure map that's shown on Exhibit
24 Four.

25 A My study has shown that the proposed

1 disposal well is structurally down dip from the main part
2 of the South Peterson Fusselman Pool.

3 Q Geologically, when you're examining this
4 area looking for a disposal well as a candidate for dispo-
5 sal of produced Fusselman water, what are you trying to
6 accomplish?

7 A We're looking for a well that's struc-
8 turally down dip from the producing intervals.

9 Q And have you found one?

10 A Yes, sir.

11 Q And is that the disposal well?

12 A That's correct.

13 Q As a geologist, what have you concluded
14 about the relationship of the No. 6 Well to any of the off-
15 set Fusselman production?

16 A The No. 6 Well is structurally down dip
17 and is below the oil/water contact in that zone.

18 Q Do you have an opinion as to whether or
19 not you had sufficient data and wellbore control by which
20 to make a contour map of the structure in which you had
21 confidence?

22 A Yes, sir, this map was made from logs
23 and was not made from any seismic data.

24 Q Would you go through Exhibit Number Five
25 for us, Mr. Strauss, and take us through the information on

1 the cross section?

2 A Yes. As I mentioned, this is a struc-
3 tural cross section, north to my left and south to the
4 right. All the logs on this cross section are porosity
5 logs. The logs themselves are hung on a datum of -3200
6 feet and what that essentially means is what we're looking
7 for, we're looking at here is the true structural relation-
8 ship that exists currently out there.

9 The perforations that have been done in
10 these particular wells are noted. In the Pennsylvanian
11 they are blue. In the Fusselman they are orange. And in
12 the Granite Wash they're red.

13 The first correlation is the top of the
14 Cisco and it's overlaid throughout the cross section, where
15 as on the south end it's laying right on top of the Granite
16 itself.

17 The next correlation is the base of the
18 Penn and the top of the Fusselman Montoya. This is what
19 the structural map itself was made on and it is on conform-
20 ity surface. This surface runs, again, across the cross
21 section. You can see that it pinches out as we move to the
22 south. The top of the Fusselman pinches out as we move
23 southward.

24 The next correlation is what we're
25 calling the Lower Fusselman porosity and this particular

1 zone also continues across the area and it pinches out
2 further to the south until it's laid directly on the
3 Granite itself.

4 Q Describe for us the relationship between
5 the proposed disposal interval in the No. 6 Well and the
6 former producing interval in the Fusselman for the Ensearch
7 No. 7 Well.

8 A This is the Phillips Lambirth "A" No. 6.
9 The proposed open zone is this green zone here in the lower
10 Fusselman porosity zone. This particular zone calculated
11 wet. This well here was tested wet. This particular zone
12 does not produce until we get up above the oil/water con-
13 tact. This particular well was tested nonproductive --

14 MR. STOGNER: Let's go back,
15 Mr. Strauss.

16 A Yes, sir.

17 MR. STOGNER: Now, you're
18 talking "this particular well", "this particular well", and
19 pointing. Now that's not going to come out on the tran-
20 script, so let's do that again and name the wells that
21 you're looking at.

22 A Our Phillips Lambirth "A" No. 6, we have
23 the green disposal zone here. As we move up dip the Lam-
24 birth, Lambirth No. 7, which is in the same section, was
25 not drilled deep enough to encounter this Lower Fusselman

1 porosity. That particular well was producing in the Upper
2 Fusselman.

3 Q And that's the well that Miss Courtright
4 referred to as having been abandoned in the Fusselman at
5 this pressure.

6 A I believe it was.

7 Q We move then south and the next well-
8 bore is the Phillips No. 4 Well?

9 A Yes, sir. That particular well was
10 tested in the -- in the Upper Fusselman. It didn't pro-
11 duce and since has been shut in.

12 And as we move up dip the Ensearch Lam-
13 birth No. 3, this particular well was tested in the Lower
14 Fusselman, nonproductive. It produced in the Upper Fussel-
15 man. Since then it's been plugged and abandoned and it now
16 produces in the Upper Penn.

17 The Lambirth No. 1 produces currently in
18 the Lower Fusselman porosity.

19 The Phillips Lambirth "A" No. 3 also
20 produces from the Lower Fusselman porosity.

21 Q You mentioned awhile ago that you had an
22 investigation of the oil/water contact in relation to the
23 disposal interval.

24 A Yes, sir.

25 Q Have you concluded that the disposal in-

1 terval is below the oil/water contact?

2 A Yes, sir.

3 Q And what's the basis upon reaching that
4 conclusion?

5 A The particular basis is the testing down
6 dip. Our particular log calculations in this particular
7 well here that the nonproductive zone's even further up dip
8 here.

9 Q When we look at nonproductive zones
10 we're looking at the No. 4 Well?

11 A This one here is the Ensearch No. 3
12 Well.

13 Q Okay. Your ultimate conclusion, then,
14 is what, Mr. Strauss, in terms of utilizing this wellbore
15 for disposal purposes?

16 A My conclusion stratigraphically it's in
17 an ideal location, down dip in a wet zone and also struc-
18 turally (not clearly understood.)

19 Q All right, thank you.

20 MR. KELLAHIN: At this time,
21 Mr. Stogner, we move the introduction of Exhibits Four and
22 Five.

23 MR. STOGNER: Exhibits Four
24 and Five will be admitted into evidence at this time.

25 Mr. Hall, your witness.

1 MR. HALL: No questions.

2
3 CROSS EXAMINATION

4 BY MR. STOGNER:

5 Q Mr. Strauss, I'm going to ask you the
6 same question that I asked Miss Courtright, and where do we
7 see the break between the Fusselman and the Montoya?

8 A It's very difficult on logs to depict
9 that particular interval.

10 Q And why is it? Can you give me a little
11 background on that?

12 A Essentially lithologies are the same,
13 even in type sections in the Sacramento Mountains it's dif-
14 ficult when you're actually looking at the rocks. You need
15 to have some paleontological or insoluble residue data to
16 try to pick the top and even then the top is a transitional
17 zone and it's very difficult to pick it on logs.

18 Q So essentially what we're seeing is a
19 break in the time schedule according to the marine life
20 that we find in the --

21 A Yes, sir. Yes, sir.

22 MR. STOGNER: I have no other
23 questions of this witness.

24 Is there anything further of
25 this witness, Mr. Kellahin?

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MR. KELLAHIN: No, sir.

MR. STOGNER: He may be ex-
cused.

Do you have anything further,
Mr. Kellahin?

MR. KELLAHIN: No, sir.

MR. STOGNER: Mr. Hall, do you
have anything at this time?

MR. HALL: No, sir.

MR. STOGNER: Does anybody
else have anything in Case Number 9511?

This case will be taken under
advisement.

(Hearing concluded.)

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 (Commission) 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.

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. 9511,
heard by me on 26 October 1988.

Michael Thompson, Examiner
Oil Conservation Division