

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

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

CASE NO. 11,982

APPLICATION OF POGO PRODUCING COMPANY)
FOR APPROVAL OF A PRESSURE MAINTENANCE)
PROJECT AND TO QUALIFY SAID PROJECT FOR)
THE RECOVERED OIL TAX RATE PURSUANT TO)
THE ENHANCED OIL RECOVERY ACT, LEA)
COUNTY, NEW MEXICO)

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: MICHAEL E. STOGNER, Hearing Examiner

June 11th, 1998

Santa Fe, New Mexico

OIL CONSERVATION DIV.
98 JUN 25 AM 8:48

This matter came on for hearing before the New Mexico Oil Conservation Division, MICHAEL E. STOGNER, Hearing Examiner, on Thursday, June 11th, 1998, at the New Mexico Energy, Minerals and Natural Resources Department, Porter Hall, 2040 South Pacheco, Santa Fe, New Mexico, Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

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June 11th, 1998
Examiner Hearing
CASE NO. 11,982

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A P P E A R A N C E S

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* * *

1 WHEREUPON, the following proceedings were had at
2 8:32 a.m.:

3 EXAMINER STOGNER: I will call at this time Case
4 Number 11,982.

5 MR. CARROLL: Application of Pogo Producing
6 Company for approval of a pressure-maintenance project and
7 to qualify said project for the recovered oil tax rate
8 pursuant to the Enhanced Oil Recovery Act, Lea County, New
9 Mexico.

10 EXAMINER STOGNER: Call for appearances.

11 MR. BRUCE: Mr. Examiner, Jim Bruce of Santa Fe,
12 representing the Applicant. I have three witnesses to be
13 sworn.

14 EXAMINER STOGNER: Any other appearances?

15 Will the witnesses please stand to be sworn?

16 (Thereupon, the witnesses were sworn.)

17 TERRY GANT,

18 the witness herein, after having been first duly sworn upon
19 his oath, was examined and testified as follows:

20 DIRECT EXAMINATION

21 BY MR. BRUCE:

22 Q. Would you please state your name and city of
23 residence?

24 A. Terry Gant, Midland, Texas.

25 Q. Who do you work for and in what capacity?

1 A. Pogo Producing Company. I'm the division
2 landman.

3 Q. Have you previously testified before the Division
4 as a petroleum landman?

5 A. Yes, I have.

6 Q. And were your credentials as an expert petroleum
7 landman accepted as a matter of record?

8 A. Yes, they were.

9 Q. And are you familiar with the land matters
10 involved in this case?

11 A. Yes, I am.

12 MR. BRUCE: Mr. Examiner, I would tender Mr. Gant
13 as an expert petroleum landman.

14 EXAMINER STOGNER: Mr. Gant is so qualified.

15 Q. (By Mr. Bruce) Mr. Gant, would you identify
16 Exhibit 1 for the Examiner and describe what Pogo seeks in
17 this case?

18 A. Exhibit 1 is a land plat of a portion of Township
19 22 South, Range 32 East. Pogo seeks an order approving a
20 pilot pressure-maintenance project for two federal leases,
21 Lease NM-86149 covering the west half of Section 26, and
22 Lease NM-81272 covering the east half of Section 22 and the
23 east and the east half of Section 27. The leases are
24 identified on the exhibit. The plat also identifies the
25 offsetting leases.

1 Q. How many injection wells are in the initial phase
2 of this proposed project?

3 A. There's one, the Prize Federal Number 4 well,
4 which is located in the southeast quarter of the northeast
5 quarter of Section 27. This well is also marked on the
6 Exhibit 1.

7 Q. What is the current status of the Prize Federal
8 Number 4?

9 A. It's currently producing approximately 11 barrels
10 of oil per day, along with 50 barrels of water per day and
11 40 MCF per day, and that's coming from the Cherry Canyon
12 and Brushy Canyon zones.

13 Q. How many producing wells are in the project?

14 A. There are eight producers in the initial phase of
15 the project. These wells are identified on Exhibit 1.
16 They're going to be the Prize Federal Number 3, 5, 6, 7 and
17 8 wells and the Red Tank 26 Federal Number 2, 3 and 4
18 wells.

19 I'll point out to you on the plat, the lease
20 names or well names are going to be printed down in the
21 bottom portion of the leases in small letters.

22 Q. Okay. And are these wells all currently Delaware
23 producers?

24 A. Yes, they are.

25 Q. What pool are these wells in?

1 A. These are all in the West Red Tank-Delaware Pool.
2 This Pool includes the Bell, Cherry and Brushy Canyon zones
3 and is developed on statewide rules.

4 Q. Referring to Exhibit 2, who are the interest
5 owners in the -- in this area?

6 A. Like you said, I'll refer to Exhibit 2. I was
7 not going to go ahead and state all of the owners, but
8 basically Exhibit 2 lists all of the owners that are
9 involved in this area. All the leases are federal.

10 Strata Production Company is the operator of the
11 southwest quarter of Section 22, and Burlington Resources
12 Oil and Gas Company is the operator of the southwest
13 quarter of Section 23, and Pogo is the operator of all the
14 lands highlighted on yellow on the plat.

15 Q. And all the other leases that are listed on
16 Exhibit 2?

17 A. That's correct.

18 Q. Okay. Now, we did a notification of this
19 hearing. Who was notified?

20 A. Basically -- well, I was going to -- Let me
21 backtrack a little bit.

22 The one thing I wanted to point out, too, in
23 connection with Exhibit 2, is that there were Strata,
24 Strata Production Company, and then you've got Intoil and
25 Burlington Resources Oil and Gas Company in the southwest

1 quarter of Section 22.

2 Q. And that's listed on page 1 of Exhibit 2,
3 correct?

4 A. That's correct.

5 Q. And you'll notice that both of those companies
6 are showing up as 50 percent with an "or" between them.
7 And what's going on there is, Burlington has filed a case
8 in district court. There's a little bit of a disagreement
9 between Burlington and Strata right now, which has brought
10 in Intoil.

11 Burlington sold its interest to Intoil. The
12 assignment has not been placed of record yet, but Pogo was
13 aware of the actual assignment. And our understanding is,
14 money has changed hands and Burlington has sold the
15 property. But right now they're having a disagreement with
16 Strata regarding an assignment provision in the JOA.
17 That's the reason why we listed both of them there.

18 Q. And that's the only tract affected by that
19 dispute?

20 A. That's correct.

21 Q. Okay. Now, getting back to it, Exhibit 2 lists
22 all interest owners, royalty, overriding royalty and
23 working interests; is that correct?

24 A. That's correct.

25 Q. For each tract?

1 A. For each tract.

2 Q. But who did -- Who was notified of this hearing?

3 A. That's going to be shown on your Exhibit 3.

4 Q. Okay, and Exhibit 3 is the affidavit of notice,
5 but looking at the map, under Pogo-operated tracts you
6 notified everyone within the area of review?

7 A. That's correct.

8 Q. The royalty, overriding and royal- -- overriding
9 royalty interest owners?

10 A. That's correct.

11 Q. As to non-Pogo tracts, you only notified the
12 working interest owners, I believe?

13 A. That's correct. And that brings up the other
14 point, which goes on in Exhibit 3, is that initially we --
15 or -- I say "initially". We did contact or sent notice to
16 the Losees that also showed up in Section 23 where
17 Burlington was an operator.

18 Initially, we were under the understanding that
19 they had a working interest owner in those wells. We later
20 came to find out that the Losees had actually assigned
21 their interest to Burlington and kept the overriding
22 royalty interest.

23 So we actually sent notice to them, but in
24 essence we did not need to.

25 Q. Okay.

1 A. We would not have if we were aware that they were
2 not a working interest owner.

3 Q. Okay. Now, the -- Who is the surface interest --
4 surface owner in this area?

5 A. That's the BLM.

6 Q. And so they were also notified as a surface
7 owner?

8 A. That's correct.

9 Q. Okay. Are you seeking unitization of this area
10 at this time?

11 A. No, as you can see from Exhibit 2, Pogo is a
12 hundred percent of the two leases in the project, so we
13 have effective control in the area. In addition, there's
14 only one royalty owner.

15 Furthermore, the pool is not fully developed in
16 this area, so unitization may be premature.

17 Q. Were Exhibits 1 through 3 prepared by you or
18 under your supervision or compiled from company business
19 records?

20 A. Yes, they were.

21 Q. And in your opinion, is the granting of this
22 Application in the interests of conservation and the
23 prevention of waste?

24 A. Yes.

25 MR. BRUCE: Mr. Examiner, at this time I'd move

1 the admission of Pogo Exhibits 1 through 3.

2 EXAMINER STOGNER: Exhibits 1 through 3 will be
3 admitted into evidence.

4 MR. BRUCE: And I have no further questions of
5 this witness.

6 EXAMINATION

7 BY EXAMINER STOGNER:

8 Q. Mr. Gant, the two leases that you're referring
9 to, is that -- shown on the map here, is that the total sum
10 of those two leases, or is there additional properties
11 elsewhere off this map --

12 A. No, sir.

13 Q. -- that are included in those leases?

14 A. No, those are -- That's what the leases do cover.

15 Q. Okay. How about the expenses of putting in the
16 injection well? How will that be incurred to the working
17 interests shown on Exhibit Number 2?

18 A. As to -- Again, Pogo owns those leases 100
19 percent, sir.

20 Q. Okay. So that cost won't be affected to the
21 working interest that you're showing? Okay, hold it, I'm
22 sorry. I'm reading -- I got ahead of myself, sorry about
23 that.

24 A. That's no problem.

25 Q. Have you approached the BLM concerning this

1 matter?

2 A. We've sent notice to them.

3 Q. Is that notice covered in Exhibit Number 3?

4 A. Yes, sir.

5 EXAMINER STOGNER: Any other questions of this
6 witness?

7 MR. BRUCE: No, sir.

8 EXAMINER STOGNER: You may be excused.

9 MR. BRUCE: Call Mr. Dillman to the stand.

10 GEORGE J. DILLMAN,

11 the witness herein, after having been first duly sworn upon
12 his oath, was examined and testified as follows:

13 DIRECT EXAMINATION

14 BY MR. BRUCE:

15 Q. Would you please state your name?

16 A. George Joseph Dillman, of Midland, Texas.

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

18 A. I work with Pogo Producing Company as a division
19 geologist.

20 Q. Have you previously testified before the
21 Division?

22 A. Yes, I have.

23 Q. As a petroleum geologist?

24 A. Yes, I have.

25 Q. And were your credentials as an expert geologist

1 accepted as a matter of record?

2 A. Yes, they were.

3 Q. And are you familiar with the geology involved in
4 this area?

5 A. Yes, I am.

6 MR. BRUCE: Mr. Examiner, I tender Mr. Dillman as
7 an expert petroleum geologist.

8 EXAMINER STOGNER: Mr. Dillman is so qualified.

9 Q. (By Mr. Bruce) Mr. Dillman, would you identify
10 Exhibit 4 for the Examiner and discuss Delaware geology in
11 this area?

12 A. The exhibit is a structure map drawn on the top
13 of the 14-percent density porosity in the basal Brushy
14 Canyon BC4 sand of the Delaware Mountain Group. And the
15 map also has identified two cross-sections, A-A' and B-B'
16 on the map.

17 The structure map is representing the orientation
18 of the primary reservoir for this pilot pressure-
19 maintenance project in which you see a trending northeast-
20 southwest through the leases under consideration.

21 Q. Okay. Why don't you move on to your Exhibit 5
22 and discuss the primary zone a little bit more?

23 A. The next exhibit is an isopach map of the net
24 porosity greater than 14-percent density of the same BC4
25 sand of the Delaware Mountain Group, and it shows a similar

1 northeast-southwest trend moving through the project area
2 with the overall porosity interval being between 30 and 40
3 feet of net porosity for the reservoir under consideration.

4 Q. All of the wells pretty much have the same
5 thickness?

6 A. Fairly so. In this area through the core of the
7 producing field they tend to be fairly even thickness.

8 Q. Okay. Well, why don't you move on to your
9 Exhibits 6 and 7, and we'll introduce them together at the
10 same time, Mr. Dillman, and discuss the Delaware zones in
11 this area.

12 A. The next two exhibits are cross-sections A-A' and
13 B-B'.

14 EXAMINER STOGNER: Let me get it unfolded here
15 first.

16 Q. (By Mr. Bruce) Mr. Dillman, before we begin, you
17 -- On these maps you labeled Brushy Canyon 4 sand, 3 sand,
18 et cetera. Are those internal Pogo designations?

19 A. Yes, they are. The correlations made on the
20 cross-section, as well as used on any of the mapping
21 projects and maps that were presented here are Pogo-
22 producing identified mapping horizons.

23 The Delaware Mountain Group -- in this particular
24 case, this is a field producing from the Delaware Mountain
25 Group -- is commonly subdivided into, from shallow to deep,

1 the Bell Canyon, the Cherry Canyon and the Brushy Canyon.

2 In particular, the majority of completion
3 activity in the West Red Tank-Delaware field has been
4 related to the lower part of the Delaware Mountain Group,
5 or commonly referred to as the basal Brushy Canyon section.

6 The subdivisions of BC1 through -6, all within
7 what is referred to as the A interval, are all internal
8 Pogo Producing designations. The same internal
9 designations have been presented previously to the
10 Commission in other cases brought forward.

11 This three-well cross-section, A-A', is an east-
12 west cross-section with the proposed injection well, the
13 Prize Number 4, positioned in the center of this cross-
14 section.

15 The reference datum is the Brushy Canyon 4 sand,
16 in which you see denoted on the well "proposed injection
17 zone" as the primary injection zone for this pressure-
18 maintenance project.

19 This reservoir, you can see, is fairly consistent
20 from well to well through this area, and that in general
21 mapping some of the local markers here in the immediate
22 area is very consistent.

23 The reservoir has porosity generally better than
24 14-percent density where very well developed. There are
25 extensions of this reservoir within this interval that do

1 not have that high a porosity. That may contribute to
2 reservoir performance but in general do not display the
3 necessary permeability for fluid transmissivity.

4 This reservoir is routinely fracture-stimulated
5 and propped with sand. It is the fracture-stimulating that
6 allows the reservoir here to be commercially productive.

7 Other attempts at completions uphole in the
8 wellbore are originated on a case-by-case scenario, sand
9 lens by sand lens. Some of the lenses can be mapped as
10 more continuous than others. Other ones may appear only
11 singularly in a particular well.

12 When drilling through those particular sand
13 lenses -- all of which are in the Delaware Mountain Group,
14 whether it's the Bell Canyon, the Cherry Canyon or the
15 Brushy Canyon section -- we attempt to record the mudlog
16 information with mudloggers on location looking for
17 potential pay horizons.

18 Once that information is recorded and we
19 determine that it's economically pertinent in that
20 particular wellbore, we may attempt future completions.
21 And our typical scenario is to perforate, acidize that
22 interval and swab-test that interval.

23 If the initial results of the acidizing treatment
24 and swab-test results warrant fracture-stimulating that
25 zone, then we will forward to fracture-stimulate that zone

1 to allow for substantial fluid transmissivity or fluid
2 entry into the wellbore, and as an attempt to make a
3 commercial completion in that particular reservoir.

4 You will notice on future exhibits, which is why
5 I'm going into some more detail here, is that there are
6 perforations in wellbores in the area which may have only
7 been only perforated and acidized, no fracture-stimulation
8 performed. When they are simply acidized, the entry rate
9 to the wellbore is minimum and, appropriately, the ability
10 to put fluid back into that reservoir is also very minimal.

11 When we have a reservoir that is continuous like
12 the Brushy Canyon 4 sand, as designated here, and we have
13 fracture-stimulated that reservoir and have produced
14 substantial volumes of fluid from it, we know we have a
15 reservoir which should be able to accept injected fluids,
16 which is why we're bringing forth this pilot pressure
17 maintenance program, in an effort to enhance the overall
18 recovery from this reservoir.

19 Q. And once again, in this area, what will be the
20 project area, the initial project area? The --

21 A. The initial --

22 Q. -- BC4 sand will -- is continuous?

23 A. Yes, it is. The BC4 is our most continuous
24 reservoir. It is the primary focus of this pilot pressure-
25 maintenance project.

1 As outlined earlier, the surrounding wells in
2 each 40-acre proration unit are the initial project area
3 for this well, for this area.

4 Q. And the next witness will have a little schematic
5 that shows some of these other zones and what is open in
6 those zones; is that correct?

7 A. That is correct.

8 Q. Is there any freshwater-bearing zone in this
9 area?

10 A. The nearest freshwater well is a BLM-maintained
11 well approximately two miles north in Section 14 of
12 Township 22 South, Range 32 East. Water is produced from
13 the Santa Rosa sandstone, as reported, at a depth of
14 approximately 360 feet.

15 There were two attempts in this immediate area by
16 Pogo previously to find fresh water, one in Section 26, one
17 in Section 27, but both were unsuccessful.

18 Q. Are there any faults in this area which would
19 connect the freshwater zone with the injection zone?

20 A. None that I am aware of.

21 Q. One final thing, Mr. Dillman. You did mention
22 that there are a number of zones in the Delaware Mountain
23 Group. Would you refer to your Exhibit 8 and maybe go into
24 that a little bit more for the Examiner?

25 A. The last exhibit to discuss is a log of the

1 proposed injection well, which I have annotated from top of
2 the Delaware to the top of the Bone Spring, the pertinent
3 mapping horizons accepted by Pogo and in general by many of
4 the other operators in the area.

5 At the very top of the section you see the lowest
6 part of the basal anhydrite, which essentially caps the
7 Delaware Mountain Group. Underneath of it is typically a
8 thin interval, commonly referred to as the Delaware lime.

9 Just below the Delaware lime, you intersect the
10 very top of the Delaware Mountain Group, referred to as the
11 Bell Canyon. The uppermost sand in the Bell Canyon, where
12 developed with porosity and permeability, is usually
13 referred to as the Ramsey sand. In this particular well
14 it's not developed, but Ramsey sand production is present
15 in the immediate area, as well as throughout the Delaware
16 Basin.

17 In general, the rest of the Bell Canyon group is
18 fairly nonproductive, although it contains the same sand-
19 shale-silt section.

20 The next major mapping marker is referred to as
21 the Cherry Canyon. It too contains similar sands, shales
22 and siltstones, but also shows an increase in limestone
23 interbedded. There's a regional marker, referred to
24 commonly as the Manzanita marker, on display. There's a
25 local pick, which Pogo refers to as the middle Cherry

1 Canyon, which identifies some producing intervals,
2 primarily east of here.

3 Then the lowest part of the Cherry Canyon, Pogo
4 Producing picked two intervals, one called the lower Cherry
5 marker, and then a second one referred to as the basal
6 Cherry, or referred to south of here as the Williamson
7 sand.

8 And then at this point is where Pogo identifies
9 the top of the Brushy Canyon section, which is not
10 necessarily the same as other operators. Some still refer
11 to it as Cherry Canyon at this level. We give this the
12 first alphabet notation of G, the Brushy Canyon G, and then
13 the major mapping subdivisions descend through the
14 alphabet, F, E, D, C, B, and then the more common Brushy
15 Canyon A marker.

16 Below that A marker on the log, you see
17 subdivided some of the intervals of the Brushy Canyon 2,
18 the 3, the 4 and the 5 in this particular project area.
19 Again, these are reference horizons used by Pogo Producing
20 for mapping purposes, and they all fall within the Delaware
21 Mountain Group.

22 Q. Mr. Dillman, were Exhibits 4 through 8 prepared
23 by you or under your direction?

24 A. Yes, they were.

25 Q. And in your opinion, is the granting of this

1 Application in the interests of conservation and the
2 prevention of waste?

3 A. Yes, it is.

4 MR. BRUCE: Mr. Examiner, I'd move the admission
5 of Pogo Exhibits 4 through 8.

6 EXAMINER STOGNER: Exhibits 4 through 8 will be
7 admitted into evidence.

8 EXAMINATION

9 BY EXAMINER STOGNER:

10 Q. In referring to Exhibit Number 8, page 3 and 4,
11 there appear to be some dots. Are those indication of
12 those perforations?

13 A. In this wellbore, that is correct. Those
14 indicate where some perforations have been made in this
15 particular wellbore. One interval is the basal Cherry
16 Williamson at approximately 6830, another one at about
17 6915, and a third one at about 7470. Those indicate three
18 zones in this wellbore which were perforated, acidized,
19 swab-tested, determined to not have commercial quantities
20 of hydrocarbons worth fracture-stimulating. Therefore
21 those are open perforations that have been treated simply
22 with acid.

23 Q. Do I understand that this well is presently
24 producing?

25 A. Yes, it is. It is an active oil well at this

1 time.

2 Q. How about the BC4 in this -- or what you're
3 indicating as the Brushy Canyon 4 sand --

4 A. Yes, sir.

5 Q. -- in this particular well? And there again,
6 referring to Exhibit Number 8. Were those perforations
7 just open, acidized, or were they fractured down in that
8 BC4?

9 A. Those perforations were fracture-stimulated.

10 Q. Okay, what's the matrix immediately to the top
11 and bottom of the BC4?

12 A. It is a limy siltstone section that is
13 interlayered between these primary fine-grained sandstone
14 beds.

15 On that exhibit, the column furthest to the right
16 is a dotted curve which, if you look at the curve
17 identification at the very top page, it is the PE, the
18 photo-electric curve. That was included just to indicate
19 where there are increases in lime or limestone in the
20 formation, and it helps identify where your primary sand
21 reservoirs terminate, and then you have these low-
22 permeability, limy to limestone caps separating reservoir
23 properties.

24 Q. And the actual BC4 is a sandstone, or how would
25 you classify that?

1 A. Yes. It is representative of most of the
2 Delaware mountain sandstones in that it is a very fine-
3 grained mixture of rock fragments and quartz grains, with
4 some intervening clay particles as well.

5 In overall quality, the Delaware mountain
6 sandstones are generally poor-quality sandstones.

7 Q. When you fracture this BC4, what happens to that
8 fracture when it encounters this limy siltstone up above
9 and below? Does it fracture it too, or is it going to just
10 bypass it and stay confined in the BC4?

11 A. It is generally accepted that an immediate
12 bounding unit to the BC4 here will also be fractured and
13 that the fracture will grow through that immediate
14 interval, depending on design of the fracture.

15 The model suggests that if you attempt to create
16 a fracture that will progress 100 feet from the wellbore,
17 that in general it progresses in a radial fashion.
18 Therefore it may move 100 feet up and 100 feet lower in
19 that wellbore as it advances 100 feet away from the
20 wellbore.

21 Many efforts are made by different completion
22 companies to try to design fractures or fracture-
23 stimulation treatments that are contained within a
24 reservoir, and to a certain extent there is success
25 associated with that.

1 But in the most conservative point of view,
2 radial growth of a fracture on fracture-stimulation is the
3 accepted model.

4 Q. Where you instrumental in designing of the
5 fractures on these wells out here?

6 A. My activity in designing the completion is that I
7 select the interval to be perforated. Then secondarily, if
8 I determine that the next sand above a limy boundary may
9 also have minor amounts of hydrocarbons associated or good
10 quantities of hydrocarbons associated with it, I will visit
11 with a consulting fracture engineer and tell him that I
12 think that interval is productive and to make his best
13 efforts to stimulate with the appropriate quantity of
14 proppant to adequately bring that reservoir into
15 communication with the wellbore.

16 So it may occur on occasion, on a well-by-well
17 basis, that I will ask and request that a fracture
18 treatment be done and performed with the design in mind
19 just for that reservoir which is perforated, or secondarily
20 to design it with the extent that 50 feet above or 50 feet
21 below is another potential producing reservoir from which
22 we will attempt to recover the oil in that zone with a
23 single fracture-stimulation treatment.

24 Q. Okay, when I look at the perforations on Exhibits
25 6 and 7, these particular wells, for the most part, they're

1 confined. However, I do see the one furthest to the -- I
2 believe to the north, on Exhibit Number 7 included some
3 perforations up into the Brushy Canyon 5 sand --

4 A. That is correct.

5 Q. -- and that's that limy area. Did you feel there
6 was some indication of hydrocarbons upzone?

7 A. Just across the limy interval is a porous sand in
8 that BC5 section, which in that particular well
9 demonstrated a hydrocarbon mudlog show, which we felt
10 worthy of putting perforations directly across from that.

11 Q. What's the proppant agent for these wells out
12 there?

13 A. The actual proppant is usually Ottawa sand.

14 Q. And what's the size of the grains, or the --

15 A. There were probably two different sizes used in
16 field development. One would be 20-40, the other one would
17 be 10-30.

18 Q. And when were these wells drilled and stimulated?

19 A. These wells have all been drilled within the last
20 five years, and so they're all fairly recent drilling and
21 casing and completed wells.

22 Q. And they were all drilled at the same --
23 essentially the same time period?

24 A. Yes, sir. This has been a continuous development
25 program up till today.

1 Q. Up until today. What did you do, reach
2 outside --

3 A. Well, there are locations still to be developed
4 in this field to the west and to the south of this project
5 area, and so as we continue to drill new wells, bring them
6 online with similar completions, determine the economic
7 viability of additional proration units, we are still in a
8 development mode in this field.

9 Q. Is there going to be any need for additional
10 stimulation to any of these eight producing wells prior to
11 injection?

12 A. No, sir. All of the wells that are identified in
13 this initial program, all have been fracture-stimulated in
14 the BC4 reservoir.

15 Q. And how about any additional perforations?

16 A. There may be additional perforations in some of
17 the wells.

18 If I can defer to Mr. Burkett's next exhibit that
19 he'll bring forward, he has one which will demonstrate
20 potential or probable producing zones, which will be
21 analyzed in the same method as I've described earlier by
22 perforating, acidizing and swab testing, and evaluating
23 them on their individual merit.

24 Q. What was, essentially, the environment when the
25 BC4 was laid down?

1 A. It's generally agreed that this lower part of the
2 Delaware Mountain Group is a very deep-water sand
3 environment.

4 There are technical arguments as to whether it's
5 a turbidity flow or grain flow, all of which, in general,
6 deliver very fine-grain sand, silt and clay out into a
7 deep-water basin, in which they may be partially
8 channelized, very channelized, or have the opportunity to
9 disperse evenly and create lobate-type sandbodies.

10 Q. Do you feel that this is a turbidity flow out
11 there in this kind of particular area?

12 A. Yes, I do, and I think that the particular
13 reservoir trend which you see mapped on the isopach map
14 presented earlier indicates that there was supply and
15 transport from the northeast to the southwest, and in this
16 particular case, the Red Tank field is in a slightly more
17 channelized area where the better-quality, although poor-
18 quality, sand was able to accumulate.

19 EXAMINER STOGNER: Any other questions of this
20 witness?

21 MR. BRUCE: No, sir.

22 EXAMINER STOGNER: You may be excused. Thank
23 you, sir.

24 THE WITNESS: Thank you.

25 MR. BRUCE: Call Mr. Burkett to the stand.

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MARK A. BURKETT,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Would you please state your name for the record?

A. I am Mark Allen Burkett, and I live in Midland, Texas.

Q. What is your occupation and by whom are you employed?

A. I am a -- I am the division petroleum engineering manager for Pogo Producing Company in the Midland Division.

Q. Have you previously testified before the Division?

A. Yes, I have.

Q. And were your credentials as an engineer, as an expert engineer, accepted as a matter of record?

A. Yes, they were.

Q. And are you familiar with the engineering matters involved in this Application?

A. Yes, I am.

MR. BRUCE: Mr. Examiner, I'd tender Mr. Burkett as an expert petroleum engineer.

EXAMINER STOGNER: Mr. Burkett is so qualified.

Q. (By Mr. Bruce) Would you please refer to your

1 first exhibit, Number 9, and describe what it shows and the
2 initial -- and the pattern involved in this project?

3 A. Okay, Exhibit 9 is just showing our proposed
4 pilot project area. I have drawn on here an inverted
5 ninespot. We're planning on injecting water into the
6 Delaware formation, and the injection well is noted with
7 the red arrow.

8 There will be eight producing wells surrounding
9 the project area that we plan to monitor, and all of this
10 is shown on Exhibit 9.

11 Q. And those are the ones connected by the line?

12 A. That is correct.

13 Q. Okay. Let's discuss your injection operations.
14 Please identify Exhibit 10 for the Examiner.

15 A. Okay. Exhibit 10 is a Form C-108 that was filed
16 for this well. We've numbered the pages in the lower
17 right-hand corner. We'll be referring to several of these
18 pages as we go along.

19 Q. Now, once again, the injection well is an
20 existing well?

21 A. That is correct. It is producing today only
22 about 11 barrels a day from the Delaware.

23 Q. Would you refer to page 3 and describe a little
24 bit the re-injection well?

25 A. Okay. Page 3 is a schematic of this well, and

1 it's showing perforations, as were mentioned previously,
2 from 6832 to 8388.

3 Q. Is the well properly cased and cemented?

4 A. Yes, this well -- And probably this is a very
5 typical well out there. As George mentioned earlier, most
6 of these wells have been produced in the last -- or
7 completed in the last five years. The typical -- We can
8 get into that, but this is properly cased.

9 Q. Yeah, and you do not see any problem with
10 injected water escaping to any other zone?

11 A. No, sir.

12 Q. Okay, let's get on to those additional wells. If
13 you'd refer to, first of all, page 5 of the exhibit, that
14 shows the area of review for this project?

15 A. That is correct.

16 Q. And how many wells are in the area of review?

17 A. There are 17 wells in the half-mile review area.

18 Q. Are they all Pogo-operated wells?

19 A. Yes, sir, they are all Pogo-operated.

20 Q. Okay. Would you -- The data on those wells is
21 given on pages what? Six through ten?

22 A. That is correct.

23 Q. Could you discuss, maybe, a typical completion
24 and the cementing, et cetera of these wells?

25 A. You can look at all of these, and what seems to

1 be a pattern out there, what's very typical is, the surface
2 casing is set to 800 feet, roughly, cement is circulated to
3 surface, so it should isolate any freshwater zones.

4 Secondly, the intermediate casing is set around 4500
5 feet, again is circulated to surface on most wells, and I
6 believe probably all wells in this review area. And then
7 in the long string, typically these are cemented with the
8 top of cement up to around 2000 feet, so they have tied
9 back into the intermediate casing.

10 One thing I do want to point out on this exhibit,
11 the top of cement is -- we noted some were picked by a
12 cement bond log, others we did not designate. On this
13 exhibit, all tops of cement were chosen from a cement bond
14 log.

15 Q. So even where it doesn't say CBL next to it, it
16 should be there?

17 A. It should be there, that is correct. And these
18 are all Pogo-operated wells.

19 Q. Are any of these wells plugged and abandoned?

20 A. No, sir.

21 Q. And are the producing wells in the area of review
22 properly completed, and will they prevent the movement of
23 fluids to other zones?

24 A. That is correct.

25 Q. Okay.

1 A. Yeah.

2 Q. Referring to Exhibits -- excuse me, pages 11 and
3 12, could you summarize the proposed injection operations?

4 A. We are expecting to inject around 4000 barrels of
5 water per day. Again, this is a pilot. We're really not
6 sure what to expect there, but we are just anticipating
7 that.

8 We are also expecting to inject water at around
9 850 p.s.i. We do not expect to exceed the Railroad
10 Commission gradient of .2 p.s.i., which would equate to a
11 maximum of 1366.

12 EXAMINER STOGNER: I'm sorry, whose pressure?

13 THE WITNESS: We do not plan to exceed 1366.

14 EXAMINER STOGNER: Oh, okay, thank you.

15 MR. BRUCE: Slip of the tongue there, Mr.
16 Examiner.

17 Q. (By Mr. Bruce) The 1366 is the .2-p.s.i.-per-
18 foot limit of the Division; is that correct, Mr. Burkett?

19 A. That is correct.

20 Q. And this came up with the last witness. Is there
21 a proposed stimulation program for the injection well?

22 A. Not at this time. The BC4 has been fractured,
23 and on a subsequent exhibit I will show some zones that
24 have been acidized. We may in the future do some of that
25 to improve our injection profile, but not at this time.

1 Q. Okay. Now, Mr. Dillman identified the only
2 freshwater well in the area. Is an analysis of that water
3 given on page 16?

4 A. That is correct.

5 Q. Okay. Now, regarding the injection water that
6 you will be using in your project, what is the source?

7 A. It will be Delaware. It will be produced water
8 from the Delaware.

9 Q. And are the analyses of the Delaware water given
10 at pages 14 and 15?

11 A. That is correct. There are two separate
12 analyses. They are --

13 Q. One from each lease, it appears, and they --

14 A. That is correct.

15 Q. Yeah. Because it is -- this is -- the injection
16 water will be produced Delaware water; is that correct?

17 A. That is correct.

18 Q. As a result, do you anticipate any compatibility
19 problems between the injection and formation water?

20 A. Not at all.

21 Q. Okay. Mark, let's move on to your next exhibit,
22 Exhibit 11, and discuss the wells in the project area and
23 what zones are open, et cetera.

24 A. Okay. Exhibit 11 is kind of a cross-section
25 diagram. It's 11 by 17. It's just showing probably real

1 simplified cross-sections of zones that have been
2 perforated, zones that we feel are potentially productive,
3 and then the current oil, gas and water rates.

4 You can see down at the bottom the current rates.
5 These wells range from, on the left side, 22 barrels a day,
6 the next one is 6 barrels a day. The well right in the
7 middle is our injection well or the well that we are
8 proposing for injection. You can see it's currently making
9 11 barrels of oil per day, 50 barrels of water per day and
10 40 MCF per day.

11 Below that is the cumulative production that each
12 of these wells have made as of January 1, 1998.

13 You can also see the zones that we have
14 perforated in these wells, as wells zones that are, we
15 feel, potentially productive. The potentially productive
16 zones are open rectangles, whereas the perforations are
17 cross-hatched rectangles.

18 Q. Looking at that, really the only continuing --
19 the Brushy Canyon A zone is the most continuous across this
20 area, is it not?

21 A. That is correct, the others --

22 Q. And all of those wells have been fractured?

23 A. They all have been fractured previously, that is
24 correct.

25 The -- I'd like to point out on this exhibit, on

1 the Pogo Producing Prize Number 4, our proposed injection
2 well, we have fracture-stimulate the A zone, and you can
3 see three additional zones that have been perforated, but
4 these have only been acidized. We do not expect these to
5 take a lot of water during the injection process, typically
6 because we have not created a great conduit to the
7 reservoir. However, we would like to include them in the
8 injection well because we feel that we may see some
9 response in some of the offset wells, or connected. It
10 will be our best method of managing the reservoir.

11 Q. And these potentially productive zones, the
12 decision as to perforating those will be made on a case-by-
13 case basis?

14 A. That is correct. This is a little bit of a
15 complex area, and what we're wanting to do is optimize or
16 maximize the recovery out here, and before we start
17 completing these other zones, we would like to initiate a
18 pressure-maintenance project to make sure we optimize the
19 recovery on the A zones.

20 Q. Looking at the current rates, overall are these
21 wells stripper wells?

22 A. No, sir.

23 Q. Okay. What is Exhibit 12, Mr. Burkett?

24 A. Exhibit 12 is a production plot of the nine wells
25 in the project area. You can see production began in early

1 1994, and that is a combination of all produced oil, gas
2 and water rates.

3 You can also see today that the current rates for
4 the project area are about 200 barrels of oil per day.
5 These are in barrels per day. They're monthly volumes
6 divided by 30.

7 The gas today, we're making somewhere in the
8 neighborhood of 500 MCF per day. And we're making around
9 700 barrels of water per day.

10 These -- I've drawn our projection of what we
11 expect, without the pressure maintenance project, what
12 would happen. That would be, with the oil, we have an
13 ultimate recovery of 634,000 barrels, without pressure
14 maintenance.

15 Since this is a pilot project and we really don't
16 know what to expect out here, there are no analogues to
17 estimate from, I've assumed a .5 p.s.i. to 1 secondary-to-
18 primary ratio, for the Brushy Canyon A zone only, which
19 adds another 255,000 barrels to this project, assuming a
20 .5-to-1, which basically will increase reserves from the
21 Brushy Canyon A from 634,800 to 889,000.

22 Q. In your opinion, will the pressure-maintenance
23 project result in an increase in the amount of crude oil
24 that will ultimately be recovered from the pool?

25 A. I believe it will. Actually, we have another

1 pilot project west of here, and we have seen positive
2 response from that one as well.

3 Q. What was the name of that project?

4 A. It was the Livingston Ridge, the Neff area. I'm
5 not real familiar with the project area, but it's the
6 Livingston Ridge field.

7 Q. Now, from the injection do you anticipate any
8 harm to the offset operators?

9 A. No, sir, we do not. In fact, we have structured
10 the pilot so that we can continue development and not harm
11 any other operators, and maximize the recovery for Pogo's
12 leases.

13 Q. In fact, if it benefits your wells, it would also
14 benefit the offsets, would it not?

15 A. That is correct.

16 Q. Referring to Exhibit 13, what are the project
17 costs and anticipated recoveries?

18 A. Exhibit 13 shows the cost for this pilot project,
19 which we feel -- I feel will be pretty minimal, really.

20 The first cost, first line there, is to convert
21 the Prize Federal Number 4 to a water injection well. We
22 will need to install some type of coated tubing. In doing
23 so, we will be able to recover pumping equipment to the
24 tune of about \$40,000.

25 We're expecting that we'll need additional

1 facilities, injection pumps, lines, of around \$100,000.

2 And then we do plan to remove four bridge plugs,
3 which are shown back on Exhibit 11, and these are noted
4 here as the Prize Federal 3, the Prize Federal 5, Prize
5 Federal 7, Prize Federal 8. It will just be a real simple
6 operation of knocking the bridge plugs out, for a total
7 cost of about \$160,000.

8 Q. And what do you estimate the value to be of the
9 incremental reserves?

10 A. I have predicted, again, based on the Brushy
11 Canyon "A" interval only, a .5 to 1, which yields reserves
12 of 255,000 barrels; gas, assuming a typical GOR and GOR
13 behavior that I would predict from a water- -- or a
14 pressure-maintenance project, of 301 million cubic feet.

15 Assuming \$13 per barrel oil and \$2.50 per MCF,
16 less severance, and an operating expense of \$6 per barrel,
17 estimate the total value of the incremental recovery to be
18 about \$2.3 million.

19 Q. What specific property does Pogo request to be in
20 the project area?

21 A. In Section 26 -- I may need to refer you back to
22 a map, possibly Exhibit 9.

23 In Section 26 we're asking for the west half of
24 the northwest quarter, also in 26 the northwest quarter of
25 the southwest quarter, and then in Section 27 we're asking

1 for the northeast quarter and then the north half of the
2 southeast quarter.

3 Q. What project allowable does Pogo request?

4 A. The depth bracket allowable for these wells is
5 230 barrels of oil per day, and we're asking that we have
6 that allowable for the nine wells in this project area are
7 2070 barrels per day.

8 Q. 230 times the nine quarter-quarter sections?

9 A. That is correct.

10 Q. From an engineering standpoint, is it prudent to
11 apply enhanced recovery techniques to increase the ultimate
12 recovery of oil from this pool?

13 A. Yes, we anticipate the declines will be halted
14 and probably even increased.

15 Q. Is the pressure-maintenance project economically
16 and technically feasible at this time?

17 A. Yes, it is. We feel it is.

18 Q. In your opinion, is the granting of this
19 Application in the interests of conservation and the
20 prevention of waste?

21 A. Yes.

22 Q. And were Exhibits 9 through 14 prepared by you or
23 under your direction?

24 A. Yes, they are.

25 Q. Actually, Mr. Burkett, we forgot one, the very

1 last exhibit, 14. This gets back to your issue or your
2 statement about where the water will go. Could you
3 identify this exhibit for the Examiner and explain what
4 you're trying to show here?

5 A. Yes, Exhibit 14 is a cartoon, and this is a
6 little bit of a complex reservoir to waterflood or to
7 maintain pressure, really to manage. And what this cartoon
8 shows is the way Pogo plans to operate the wells. We, with
9 the injector, plan to have a bottomhole pressure somewhere
10 around 3500 pounds. On our producing wells we plan to have
11 a bottomhole pressure somewhere in the neighborhood of 200
12 pounds.

13 So we feel that even if there's a zone that is
14 not being injected into, there will not be crossflow
15 because the flow will be toward the producers with the low
16 bottomhole pressure.

17 The initial reservoir pressure out there was
18 around 2800, so we should always have flow going toward the
19 producer.

20 Q. These wells will be pumped out?

21 A. They will be pumped off, that's correct.

22 MR. BRUCE: Mr. Examiner, at this time I'd move
23 the admission of Pogo Exhibits 9 through 14.

24 EXAMINER STOGNER: Exhibits 9 through 14 will be
25 admitted into evidence at this time.

EXAMINATION

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BY EXAMINER STOGNER:

Q. I wanted to make sure I got my figures right. Primary production from these nine wells has been 635,000 barrels; is that correct?

A. That will be the expected ultimate, yes, sir.

Q. The expected ultimate. So I'm assuming you're going to want to start injecting as soon as possible, so that figure is pretty accurate as of now?

A. That's right. What I've done, I don't have a cumulative figure here, but I took all the wells in the project area, shot a decline on each of them individually and added that expected ultimate, where I expect them to hit ultimate recovery.

I have an expected ultimate of 634,000 barrels without the pressure-maintenance project.

Q. Okay.

A. That would be the solid line shown on the production plot.

Q. Okay, I see where you're getting that figure. Okay.

What's your estimate -- Do you have an estimate on the ultimate recovery to date, or the primary recovery to date from those wells?

A. That would -- I don't have it with me.

1 MR. BRUCE: Mr. Examiner, I think on Exhibit 11
2 the figures through January 1 are at the bottom of that
3 exhibit, so you could get a rough idea by totaling --

4 EXAMINER STOGNER: Okay, you're right.

5 MR. BRUCE: I can't do it in my head, but --

6 Q. (By Examiner Stogner) But that would tell me
7 what you --

8 A. Yes, sir.

9 Q. Okay.

10 A. What we've done to date. As of January 1, 1998.

11 Q. Referring to Exhibit Number 11, I want to make
12 sure that I'm reading this one right. The perforations --
13 the current perforations in all of these wells are the hatch
14 marks; is that correct?

15 A. Yes, sir.

16 Q. And what are the other perforated intervals shown
17 with the open rectangles?

18 A. Those are potentially productive pay zones. They
19 have not been perforated at this time, but we feel they may
20 be productive.

21 Q. And you're actually, perhaps, thinking about
22 coming in later and opening up additional injection zones?

23 A. That is correct. We made it at -- the challenge
24 here is that -- You know, we're trying to do everything
25 with pumping units, and so we try to limit the amount of

1 production to make sure that we can pump these off.

2 So at some point we -- I believe at some point we
3 will test every one of these noted with the open
4 rectangles.

5 Q. Okay. Now, you had mentioned that you want to be
6 essentially re-injecting produced water. The origin of
7 that produced water, are they from these leases, or are
8 they inclusive of other leases?

9 A. They are from these leases and other nearby
10 leases.

11 We have a fairly elaborate saltwater disposal
12 system out there, so we are looking for places to go with
13 water also, so this is a -- really, it's a win-win
14 situation.

15 Q. On the producing wells, will there be -- are you
16 going to run back a retrievable bridge plug for your tubing
17 to be seated in those producing wells?

18 A. You can see on the second well from the left, the
19 Prize 5, we have a retrievable bridge plug shown in the
20 wellbore, an RBP of 6973. That would be at the Brushy
21 Canyon G level.

22 We plan to remove that and continue -- Today that
23 well is only making about six barrels of oil per day. We
24 plan to remove that and start the A producing again. In
25 fact, we hope to do that early so that we can establish a

1 decline -- re-establish a decline to see response.

2 But we plan to remove that bridge plug as well as
3 bridge plugs in the Prize 7, 8 and 3 shown on that diagram.

4 Pogo has moved up testing these different zones.
5 We move up pretty quickly, and we'll test them, make sure
6 they're commercial and then move up, and it's just a method
7 of managing the reservoir.

8 And at some point -- That is one of the reasons I
9 would like to see us start the pressure-maintenance project
10 early, because it starts getting complicated; you add more
11 and more zones with time.

12 Q. What kind of a time frame are you looking at?

13 A. What we would plan to do upon approval would be
14 immediately remove the three -- the four bridge plugs and
15 commence injection as soon as possible. We would like --

16 Q. What I was getting at, physically able to start
17 injecting in what time frame from today?

18 A. Probably within the next two months. We would
19 like to see a response by the end of the year. I don't
20 know that that -- I think that's very ambitious, but we
21 would like to see that.

22 Q. That -- You referred to a Livingstone Ridge
23 nearby project. Is that within the same interval or
24 intervals as this one, that you know of? Or perhaps your
25 geologist might be the one to answer.

1 MR. BRUCE: Mr. Dillman.

2 MR. DILLMAN: Allow me to comment on that. That
3 project is active in the upper part of the Brushy Canyon in
4 the Pogo F mapping horizon, which is the primary producing
5 reservoir in the Livingston Ridge area.

6 EXAMINER STOGNER: Other than it being in a
7 different zone, it's essentially the same kind of a project
8 you're looking for today?

9 MR. DILLMAN: That's exactly correct.

10 Q. Was it a ninespot inverted also?

11 A. (By Mr. Burkett) Actually, it was a fivespot.
12 It was on the edge of the reservoir, and the number of
13 wells surrounding it were not very good. I can't say it
14 was the best pilot. But we did see a response, and I was
15 encouraged by that.

16 And today we're hoping to do a very good job on
17 this one and picked a good well and a good portion of the
18 reservoir.

19 EXAMINER STOGNER: Anything else of this witness?

20 You may be excused.

21 Mr. Bruce, anything else?

22 MR. BRUCE: That concludes our presentation, Mr.
23 Examiner.

24 EXAMINER STOGNER: Mr. Bruce, can you help me out
25 by presenting me a rough draft?

1 MR. BRUCE: We'll do that.

2 EXAMINER STOGNER: And hopefully we can get this
3 out of here as quick as possible.

4 If there's nothing further, Case Number 11,982 in
5 this matter will be taken under advisement.

6 Thank you, Mr. Bruce.

7 (Thereupon, these proceedings were concluded at
8 9:33 a.m.)

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Examiner


CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Steven T. Brenner, Certified Court Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Division was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL June 13th, 1998.



STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1998