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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
May 26, 1976

EXAMINER HEARING

IN THE MATTER OF:)

Application of Anadarko Production) CASE
Company for a waterflood project,) 5686
Eddy County, New Mexico.)

BEFORE: Richard L. Stamets, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the New Mexico Oil Conservation Commission: William F. Carr, Esq.
Legal Counsel for the Commission
State Land Office Building
Santa Fe, New Mexico

For the Applicant: Jason W. Kellahin, Esq.
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I N D E X

DAN KERNAGHAN

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1 MR. STAMETS: The hearing will please come to order.
2 We will call next Case 5686.

3 MR. CARR: Case 5686, application of Anadarko
4 Production Company for a waterflood project, Eddy County,
5 New Mexico.

6 MR. KELLAHIN: If the Examiner please, Jason
7 Kellahin of Kellahin and Fox, Santa Fe, appearing for the
8 applicant and we have one witness to be sworn.

9 (THEREUPON, the witness was duly sworn.)

10

11 DAN KERNAGHAN

11

12 called as a witness, having been first duly sworn, was
13 examined and testified as follows:

14

15 DIRECT EXAMINATION

15

16 BY MR. KELLAHIN:

17 Q Would you state your name, please?

18 A My name is Dan Kernaghan.

19 Q How do you spell that, Mr. Kernaghan?

20 A K-e-r-n-a-g-h-a-n.

21 Q By whom are you employed and in what position?

22 A I'm employed by Anadarko Production Company as

23 Division Evaluation Engineer.

24 Q Have you testified before the Oil Conservation

25 Commission or one of its examiners and made your qualifications

1 as an engineer a matter of record?

2 A. Yes, I have.

3 MR. KELLAHIN: Are the witness's qualifications
4 acceptable?

5 MR. STAMETS: They are.

6 Q. (Mr. Kellahin continuing.) Mr. Kernaghan, are
7 you familiar with the application of Anadarko Production
8 Company in Case 5686?

9 A. Yes, I am.

10 Q. What does the Applicant propose in this case?

11 A. We propose to enter our well, our Federal "L" No. 2
12 Well and convert it for water injection for the purposes of
13 waterflooding these leases.

14 Q. Would you give a history of this area; has there
15 not already been a waterflood in this area?

16 A. Yes, sir.

17 Q. Would you outline what has occurred here?

18 A. Yes, these two, Anadarko's Federal "L" and "M"
19 leases were part of a waterflood cooperative project made up
20 of all of Section 31. This project was a waterflood of the
21 Loco Hills sand only. It was authorized on July 13, 1961
22 by Order Number R-2032. It gave permission for numerous
23 injection wells in that section and provided for the injection
24 of water into the Loco Hills sand which occurs at a depth of
25 approximately twenty-eight hundred feet below the surface.

1 Q Now, the sand you propose to flood is also in the
2 Loco Hills Pool?

3 A That's right, it is within the vertical limits of
4 the Loco Hills Pool but it is the Premier sand which occurs
5 some two hundred feet down the hole from the Loco Hills sand.

6 Q Since the other order only authorized injection in
7 the Loco Hills sand a hearing was necessary for this one?

8 A We felt this was true, yes. This project, the
9 Loco Hills flood was developed soon after the initial order
10 in 1961. It was a successful flood but over the past several
11 years it has declined to the point where it is no longer
12 economic and we are recompleting wells into the Premier sand.
13 The wells in the area were originally completed for primary
14 purposes in both the Loco Hills and the Premier. The Loco
15 Hills was separated for operational purposes for the initial
16 project.

17 Q Now, referring to what has been marked as Applicant's
18 Exhibit Number One, would you identify that exhibit?

19 A Exhibit One shows the area surrounding the water-
20 flood project. The "L" and "M" leases are outlined in yellow
21 and the well which we are asking permission to inject into
22 is shown with the red circle.

23 Q Referring to what has been marked Exhibit Number Two,
24 would you identify that exhibit?

25 A Exhibit Number Two is another plat showing this

1 project in somewhat more detail. The red circles are wells
2 which have been recompleted in the Premier sand. The red
3 arrow indicates the well which we propose to convert for
4 injection purposes into the Premier.

5 Q Now, under the old project is the water still being
6 injected into the Loco Hills sand?

7 A It is, into Well No. 6, which is location "J" of
8 Section 31. There are also active injection wells on Newmont's
9 Brigham "A" lease, the east half of the southeast quarter of
10 31.

11 Q As to the other injection wells shown on the
12 exhibit?

13 A They have been abandoned.

14 Q They have been abandoned?

15 A Yes, sir.

16 Q Now, referring to what has been marked as Exhibit
17 Number Three, would you discuss that exhibit, please?

18 A Exhibit Number Three gives the production history
19 of the first three pages of the production history of our
20 Loco Hills waterflood. It shows that it starts at or near the
21 peak producing rate of that flood in 1964 and it shows the
22 history from then until the present time, indicating that it
23 has gone from seventeen, eighteen thousand barrels a month in
24 January of '64 down to approximately fifty barrels a month in
25 April of this year.

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1 The last page of that exhibit shows the production
2 from the Premier sand completions only on our Federal "L"
3 and Federal "M" leases. The initial recompletion into the
4 Premier after the waterflood was in 1972. That was the
5 Federal "L" No. 2 Well. It produced for about two years and
6 we completed the Federal "L" 4 and the Federal "M" No. 5.

7 Q. Now, has the production steadily declined in the
8 Premier sands?

9 A. Yes. Any individual well, yes, it has. The increase
10 is due to new recompletions.

11 Q. So, you have more wells producing in 1976 than you
12 had initially, is that correct?

13 A. That's correct.

14 Q. In your opinion is it reaching an advanced stage
15 of depletion?

16 A. Yes, it is. The sand was depleted for primary
17 production before the Loco Hills waterflood was initiated and,
18 you know, it is still in the same stage of depletion as it was
19 back in '61 when we moved out of it and completed in the
20 Loco Hills zone. Yes, it has had many, many years of primary
21 production prior to the first waterflood.

22 Q. In effect, this is actually just another step in
23 the same waterflood, isn't it?

24 A. That's correct.

25 Q. Now, referring to what has been marked as Exhibit

1 Number Four, would you identify that, please?

2 A. Yes, Exhibit Four graphically represents the data
3 shown tabulated in Exhibit Three. It is the production curve
4 of the Loco Hills sand waterflood and the Premier sand comple-
5 tion.

6 Q. Now, again on the Premier sand completions, marked
7 increase in 1974, is that due to additional wells?

8 A. That is correct.

9 Q. Not to any increase from the individual wells?

10 A. That is correct, it is due to the recompletion of
11 the Federal "L" 4 and the "M" No. 5.

12 Q. Now, referring to what has been marked as Exhibit
13 Number Five, would you identify that exhibit?

14 A. Exhibit Five is a schematic diagram of our proposed
15 completion for injection purposes for our Federal "L" No. 2
16 Well.

17 It shows that we intend to inject down plastic-
18 lined tubing set on a packer just above the producing horizon
19 of the Premier zone. It shows that the Loco Hills perforations
20 above that have been squeezed and that the packer will be
21 set below that. It shows that we are estimating a surface
22 injection pressure of about fifteen hundred pounds which is
23 half a pound per foot.

24 Q. And then what volume of water will you inject?

25 A. We anticipate ultimately three hundred barrels

1 a day of a fresh, produced water mixture. Initially we do
2 not intend to inject to make up any fresh water. We will
3 inject the produced water from the two leases until we have a
4 chance to recomplete some additional wells into the Premier
5 sand and further develop these leases. As we recomplete
6 these wells we will have more produced water to dispose of.

7 Q Then you propose to re-inject that water, is that
8 correct?

9 A Yes, that is correct.

10 Q And in the event that you continue to flood, will
11 you use fresh water?

12 A Yes, we will.

13 Q What is the source of that water?

14 A Well, it will be from one of the commercial sources
15 in the area. The Loco Hills sand flood had a contract with
16 Double Eagle, I believe it was, to secure water, but the
17 status of that contract is unknown really right now.

18 Q Now, you are utilizing a plastic-coated tubing,
19 are you not?

20 A Yes, we will.

21 Q And you will have a pressure gauge at the surface?

22 A We'll have a pressure gauge or a flow monitor of
23 some sort. We would prefer to leave the annulus open so that
24 we can detect a water flow.

25 Q And that is what you propose to do in this case?

1 A. Yes.

2 Q. Will you fill the casing-tubing annulus with an
3 inert fluid?

4 A. Yes, we will.

5 Q. Now, referring to what has been marked as Exhibit
6 Number Six, will you identify that exhibit, please?

7 A. This is a Dresser-Atlas sonic log of the proposed
8 injection well, showing the formations of interest and the
9 perforations in this well from three thousand and two to
10 three thousand and twelve feet.

11 Q. Mr. Kernaghan, in your opinion will approval of
12 this application result in the recovery of oil that would not
13 otherwise be recovered?

14 A. Yes, in my opinion it will.

15 Q. Do you have any estimate of what the recovery might
16 be as a result of this waterflood?

17 A. We don't at this time, since the two leases are
18 not fully developed, we are still in the process of recompleting
19 these wells. The next well we intend to work on is the "M" 6
20 which is our current injection well that we are using to
21 dispose of the produced water into the Loco Hills sand, so we
22 feel that it is a little early to give an estimate of what
23 the potential might be.

24 Q. But you do feel that there is unrecovered oil
25 remaining in the Premier sand?

1 A. Yes.

2 Q. That can be recovered as a result of the waterflood?

3 A. Yes, I think so.

4 Q. Will the proposed waterflood fully protect correlative
5 rights of the interest owners in the area?

6 A. Yes, I believe it will.

7 Q. In your opinion will it prevent waste?

8 A. Yes.

9 Q. Were Exhibits One through Six prepared by you or
10 under your supervision?

11 A. Yes, they were.

12 MR. KELLAHIN: Mr. Examiner, I would like to offer
13 into evidence Exhibits One through Six.

14 MR. STAMETS: These exhibits will be admitted.

15 (THEREUPON, Applicant's Exhibits One through
16 Six were admitted into evidence.)

17 MR. KELLAHIN: That completes our examination of the
18 witness, Mr. Stamets.

19

20 CROSS EXAMINATION

21 BY MR. STAMETS:

22 Q. Mr. Kernaghan, are there any other Premier floods
23 in the area shown on your Exhibit Number Two at the present
24 time?

25 A. To my knowledge, no. The Newmont West Loco Hills

1 Unit which encompasses the west half of Section 1 and the
2 acreage around there shown in the cross-hatched outline is
3 an active unit but it is flooding the Loco Hills sand.

4 Q. And I believe in your application you requested
5 administrative procedure for the expansion of the flood on
6 these two leases?

7 A. That is correct. As we recompleate additional wells and
8 proceed with this project we anticipate adding injection wells.

9 Q. This would be the typical type of expansion procedure
10 that the Commission puts in its orders?

11 A. Yes.

12 Q. How fast do you plan to recompleate these wells into
13 the Premier?

14 A. Well, we have plans for recompleating the "M" 6 just
15 as soon as we can convert the "L" 2 to injection.

16 Q. What about General American, do you know if they
17 have any plans to recompleate any closer wells in the Premier,
18 assuming that they are the owner of the southwest quarter of
19 31?

20 A. They are the owner. I know of no definite plans
21 though they have, as you can see, recompleated their "F" 15, the
22 Beeson "F" No. 2 in the far southwest corner of Section 31 which
23 produced only water on recompleation, so that delayed some of
24 their activity in that southwest quarter but this project is
25 known to them also and I see no reason why they wouldn't

1 proceed with it if, you know, based on favorable results
2 on our property.

3 Q At what depth will the packer be set in this well?

4 A We would like to set it at approximately a hundred
5 feet above the perforation or at twenty-nine hundred feet
6 to allow an interval in there in which to get a zero
7 temperature line on our temperature log. Recently we have
8 presented this as a request in other applications and we
9 feel that it gives more flexibility at a later date when we
10 go to survey the well.

11 Q Do you have a water analysis on the produced water
12 yet?

13 A No, I don't.

14 Q Would you submit one at the time water injection
15 commences?

16 A Okay, we certainly will.

17 Q Now, Mr. Kernaghan, on the recent orders the
18 Commission has tended to limit the pressure on injection wells
19 so that the bottom-hole pressure does not exceed seventy
20 percent of the depth of the well to the perforations. Just
21 some rough calculations on this it appears to me that would be
22 a surface pressure of something on the order of six hundred
23 pounds. Would that be sufficient pressure on this well to
24 allow you to inject?

25 A I don't think it would be sufficient to allow us to

1 inject three hundred barrels a day. I think it would severely
2 hamper our operation here. A pressure of four-tenths to
3 five-tenths pounds per foot at the surface is, generally
4 speaking, what it would take in this area, I believe, to inject
5 sufficient quantities of water.

6 Q Do you have any evidence to indicate that this
7 pressure would not lead to fracturing of the formations in
8 this area, fracturing to the point where water could escape?

9 A No.

10 Q Is there any fresh water in the vicinity?

11 A Not to my knowledge.

12 Q That would be all of the area shown on your Exhibit
13 Number Two, to your knowledge there is no fresh water in the
14 vicinity?

15 A Not to my knowledge there is no fresh water. It
16 is off the caprock several miles and I know of no fresh water
17 wells in the area.

18 Q The community of Loco Hills up there, have they
19 been getting their water piped in off the caprock for a
20 number of years?

21 A I cannot say. I'm not personally familiar with
22 that.

23 MR. STAMETS: Are there any other questions of
24 the witness?

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CROSS EXAMINATION

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BY MR. RAMEY:

Q Mr. Kernaghan, what has been the injection pressure of the Loco Hills sand flood? Has it been comparable to the half a pound per square foot?

A I think it has been less but it has been so many years since we have had full injection on that project, it was prior to the time that I came with Anadarko that we had full injection. Why don't I research that and write a letter, just drop a note saying what it was because I cannot.

Q You have no indication of fracturing or channeling of waters out of your injection interval?

A No, none that I know of.

Q I do want to complement you on your taste in neckties.

MR. STAMETS: Mr. Kernaghan, along that same line, not about neckties, but Loco Hills, is the Loco Hills zone a more uniform zone, a little easier to flood than the Premier?

THE WITNESS: Yes, it is. It is a much more blanket deposit across the area. The Premier is a more erratic deposit.

MR. STAMETS: What about the cementing on this well, was this carried out late enough that you are confident that you have got a good cement job on the injection well?

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1 THE WITNESS: This well was drilled in 1941. The
2 liner was set at a later date when we initiated the Loco Hills
3 flood. We are pretty confident about the cementing job on
4 the liner. The original well was not drilled by us and like
5 I say, it was back in 1941. I think it would be pushing us to
6 say that we are that confident of it.

7 MR. STAMETS: But you are confident the liner for
8 the injection will be?

9 THE WITNESS: Yes, that was worked out by Ambassador
10 and we feel that it will sufficiently protect it.

11 MR. STAMETS: Are there any other questions of
12 the witness? He may be excused.

13 (THEREUPON, the witness was excused.)

14 MR. STAMETS: Anything further in this case. We
15 will take the case under advisement.

16
17 MR. STAMETS: Just for the record in this case, we
18 would note that the Loco Hills was squeezed, the squeezed
19 pressure was three thousand pounds.
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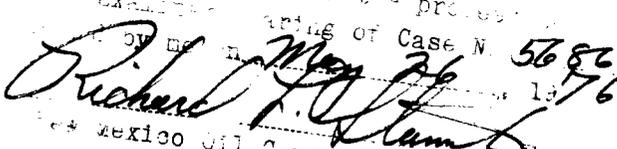
REPORTER'S CERTIFICATE

I, SIDNEY F. MORRISH, a Certified Shorthand Reporter,
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Sidney F. Morrish, C.S.R.

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