STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISON
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO

20 May 1987

EXAMINER HEARING

IN THE MATTER OF:

Application of Anadarko Petroleum Corporation for amendment of the special rules and regulations of the Foster-San Andres Pool, Lea County, New Mexico. CASE 9137

BEFORE: Michael E. Stogner, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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I N D E X

E X H I B I T S

MR. STOGNER: This hearing will come to order.

We will call next Case Number 9137.

MR. TAYLOR: The application of Anadarko Petroleum Corporation for amendment of the specials rules and regulations of the Foster-San Andres Pool, Lea County, New Mexico.

MR. STOGNER: Call for appearances.

MR. KELLAHIN: If the Examiner please, I'm Tom Kellahin of Santa Fe, New Mexico, appearing on behalf of the applicant, and I have one witness to be sworn.

MR. STOGNER: Doesn't look like there are any other appearances.

Will the witness please stand at this time and be sworn?

(Witness sworn.)

MR. STOGNER: Mr. Kellahin.

JOHN H. BEAIRD, III,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Beaird, for the record would you please state your name and occupation?

A My name is John Beaird. I'm a senior reservoir engineer with Anadarko Petroleum Corporation and have served in that capacity for five years.

Q Mr. Beaird, as an engineer for Anadarko, have you made a study of the facts surrounding Anadarko's application to increase the gas/oil ratio for the Foster-San Andres Pool that's docketed as Division Case 9137?

A Yes, sir, I have.

Q And have you previously testified on other occasions before the Division Examiner as an expert witness?

A Yes, sir, I have.

MR. KELLAHIN: We tender Mr. Beaird as an expert witness, Mr. Examiner.

MR. STOGNER: Mr. Beaird is so qualified.

Q Mr. Beaird, to orient the Examiner as to

what Anadarko is seeking to accomplish, let me ask you take what is marked as Exhibit Number One, and first of all locate and identify each of the three wells that compose the producing wells in the pool.

A Exhibit Number One is a structure map on the Foster-San Andres Field. The scale of the map is 1-to-2000. The contour intervals are 25 feet.

The producing wells in the Foster-San Andres Field are shown in the red dots and there are labels for each of the three, showing who the operator is.

Q Can you identify for us the order in which the wells were drilled?

A Martindale Petroleum's well, located in Section 5, was the first well drilled in 1957, the discovery well of the field.

Texas American drilled their well next and then Anadarko drilled their Harvard No. 1 in April of 1984.

Q Would you identify for the Examiner the significance of the acreage that's outlined in yellow?

A That is the pool boundary as set by the Commission for the Foster-San Andres Pool. The red colored area is Anadarko acreage and then the cross hatched in black is the proration schedule for the Harvard No. 1 -- proration unit, I'm sorry.

Q Would you describe for the Examiner what, in your opinion as an expert the drive mechanism is for the reservoir?

A It is a solution gas drive reservoir.

Q The current rules for the Foster-San Andres Pool with regards to the gas/oil ratio limittion are identified on Exhibit Number Two?

A Yes, sir, they are.

Q Let's turn your direction (sic) to Exhibit Number Two, Mr. Beaird, and have you give the Examiner the current status of the rules for the gas/oil ratio limitation.

A In October of 1985, after reviewing the field performance, Anadarko determined that the 2000-to-1 statewide GOR was inappropriate for the Foster-San Andres Pool and that the field could be produced at a higher GOR without causing waste and without violating any correlative rights of the operators in the area.

At that time we applied with the Commission to increase the limiting GOR from 2000-to-1 to 5000-to-1.

The -- after reviewing the facts, the Commission granted the 5000-to-1 limiting GOR and granted the order effective July 1st, 1985.

Exhibit Two is a copy of that order, Or-

der No. R-8113.

Q The order as depicted on Exhibit Number Two shows that the hearing was held on October 9th, 1985?

A Yes, sir, it does.

Q And the Commission approved the applicant's request to make the change in the gas/oil ratio limitation effective --

A July 1st.

Q -- on July 1st. So it was made retroactive for a few months.

A Yes, sir, it was.

Q What was the purpose of doing that, Mr. Beaird?

A To cancel out overproduction.

Q Okay. The current rules, then, commencing on July 1st of '85, provided for a 5000-to-1 gas/oil ratio.

A Yes, sir, they did.

Q Do you have an opinion as to whether that limitation on thke gas/oil ratio is still necessary or justified?

A I do not think it is. I believe that from the data that we've seen that you could produce the field at 10,000-to-1 limiting GOR without causing any waste and without violating correlative rights.

Q What is the basis upon which you've reached that opinion, Mr. Beaird?

A We've looked at the performance curve of the field, specifically the field producing GOR to the life of production, and the relationship between the old defined rates and the gas/oil ratio.

There's no indication that the field cannot produce at 10,000-to-1 without causing any waste or violating correlative rights.

Q All right, let's turn to the specific reasons that cause you to reach that opinion. Let me direct your attention to the display that is marked as Exhibit Number Three. Is this an exhibit that you caused to be prepared, Mr. Beaird?

A Yes, sir, it is.

Q Take a moment and simply identify for us how to read and understand the exhibit.

A Exhibit Number Three is a semilog plot of producing rates versus time.

Oil production is shown in green with a scale on the lefthand margin. The production in 1957 is roughly 420 barrels a month through that year.

Gas production is shown as GOR. It's shown in red and its scale is on the righthand margin of the graph with the production in 1959 being roughly 1700-to-1

GOR.

Q This is a three-well field summary?

A Yes, sir, it is.

Q Let' find the point on the display where we have production from the original discovery well up to the completion of the second well. What portion of the display corresponds to production from the discovery well?

A Martindale's well was produced by itself as the only well in the Foster-San Andres Field from 1957 until the middle of 1981, when Texas American drilled their Foster No. 1.

Q You've indicated on the display then the -- just above the red triangle, Texas American Foster 1?

A Yes, sir, I have.

Q And that corresponds to the approximate date at which we have production, then, from two wells in the field.

A Exactly.

Q How do we read the display to find out the point at which Anadarko Harvard No. 1 started contributing production that was credited to the field?

A Anadarko's well was completed in 1983 and it's labeled right above that year on the GOR curve.

Q The analysis of this information as depicted on this display has caused you to reach the opinion

that an increase in the gas/oil ratio for the field to 10,000-to-1 will not cause waste.

A Exactly.

Q Will you tell me how you read this and interpret it to support that conclusion?

A If you look at the initial performance of the field before Texas American drilled their well, there was no gas production in 1957 or '58. The first GOR reported was about 1700-to-1 for the year 1959.

By 1962 the field was producing at over 12,000-to-1 and the GOR increased through time up to over 20,000-to-1 by 1979 amd did not drop until Texas American and Anadarko drilled their wells.

The full decline rate through the time that Martindale produced their well at from 10-to-20,000-to-1, is a constant decline of roughly four to five percent. The increase from 1973 to 1979 GOR of 20,000-to-1, the decline rate didn't vary any as it did and was the same as the decline rate prior to that.

Q If we were seeing a reservoir that was responding to increased gas/oil ratios in a negative fashion, in other words the graph would show us something to cause us to believe that we could not increase the gas/oil ratios, how would the curves be displayed?

A If you were producing at a GOR that was

causing waste in the reservoir and it hadn't been before this, then your decline rate would steepen and you'd be able to see that you were leaving reserves in the ground.

Q The oil decline rate would steepen?

A Yes, sir, it would.

Q And do you see that in this reservoir?

A No, sir, you don't.

Q Would you give the Examiner some of the information you have with regards to the stage of life of this reservoir and what pressure information that you have?

A When Anadarko drilled their well our DST upon completion showed the field to have a bottom hole pressure of only 420 pounds.

Q This is in 1980.

A Yes, sir, it was 1980.

Q All right.

A There's no record of what the initial discovery pressure was but I'd assume it would be around 1600 pounds for this depth.

So the field is in its late stages of depletion right now.

Q In comparing the historical gas/oil ratio used in the field to the requested 10,000-to-1 gas/oil ratio, can you draw any comparisons?

A The producing GOR that we're asking for

is less than what's been produced historically in the field. If you'll note at the curve, since Texas American and Anadarko have been operating in the field, the oil production rate is the highest it's been since the field was discovered and the current producing GOR is only 12,500-to-1, which is the lowest it's been since 1966.

So it's not -- we're not asking for anything that hasn't been done previously.

Q All right, sir, let's turn now to Exhibits Four and Five and use them in relation to the information depicted on Exhibit Number Three, which is your display of field summary performance.

In looking at Number Three we see that there is, after the completion of the Anadarko well, a continuing increase in the oil producing rates on a monthly basis. What is the reasons you have discovered that explain to you the increase in field oil producing rates from that period of time forward to the current date?

A All the increases seen on both Exhibit Three and on Exhibit Four, being the field summary curve and Anadarko's Harvard No. 1 performance curve, were due to mechanical changes in the operation of the well. Although the bottom hole pressure was only 420 pounds, the reservoir does have a high permeability and small changed in the way you operate as far as the kinds of units you have on the

well and how you get it pumped off, makes a significant difference in the amount of oil production you can have.

On Exhibit Four on the bottom of the graph you'll see one through six labels. It shows different points in time and what we've done, money that we've spent to try to increase the oil rate from the well.

Q Let's turn now, sir, to Exhibit Number Six, I believe, which is the production totals?

Would you identify and describe that exhibit for me?

A The production totals for the Foster-San Andres Field Harvard No. 1 from July of 1986 through April of 1987 showing production of both oil in barrels for the month, the gas production for that month, gas allowable, based on days, any overproduction we had based on a 5000-to-1 limiting GOR, and then the cumulative overproduction, and then the last colum shows the actual days the well was produced for that month.

Q Have you caused the offset operators, the other interest owners in the pool to be notified of Anadarko's request to increase the gas/oil ratios in the pool and make those increases retroactive to a certain date?

A Yes, sir, we have.

Q In a response to that notice have you received any inquiries or correspondence from any of those

companies or individuals?

A Yes, sir, we have.

Q And what have you received?

A I received a letter from David Miller, the Manager of Operations for Texas American Oil Corporation.

Q And that's marked as Exhibit Number Seven?

A Yes, sir, it is.

Q And what is Texas American's position with regards to the Anadarko application?

A They support the application submitted by Anadarko to increase the gas/oil limitation to 10,000-to-1.

Their -- they believe that the performance of their well indicates that this is also a mature solution gas drive reservoir that requires an increase in allowable GOR to maintain economic production.

Q Let's take a moment, Mr. Beaird, and talk about the economics of production.

Have you given consideration to calculating or trying to determine the effects on ultimate oil recovery of a change from 5000 gas/oil ratio to a 10,000 cubic feet of gas to 1 barrel of oil?

A Yes, sir, I have.

Q And what have you concluded?

A Just on the basis of the GOR alone the extra revenue generated by a 10,000-to-1 GOR would allow a 25 percent reduction in the economic limit and that translates, based on the operating cost and the product prices we're getting in this area, of over 6000 barrels of oil that would be left in the ground without 10,000-to-1 limiting GOR order.

Q Based upon your calculations then, an increase in the gas/oil ratio in your opinion would allow the reservoir to produce an additional 6000 barrels of oil that would not otherwise be recovered at the 5000-to-1 rate?

A Yes, sir, on a per well basis.

Q Oh, that's on a per well basis?

A Yes, sir.

Q All right, so for the reservoir with the three wells we're looking at 18,000 barrels.

A That's almost ten percent of the average expected ultimate recovery of the wells.

Q All right. Let's talk about the problems, if any, that may occur with the additional gas production from the reservoir.

Do you have a market for the additional gas that would be produced if the gas/oil ratio is increased?

A Yes, sir, I do.

Q Let me direct your attention, Mr. Beaird, to Exhibit Number Eight and have you identify that exhibit.

A Exhibit Seven?

Q I believe it's Eight.

A Eight, Exhibit Eight is a letter from Phillips 66 from Christopher Wren, the Manager of Gas Contracts. I contacted him concerning our application and asked him if there'd be any problem with Phillips taking the gas that we produced. This is just a letter stating that they had -- didn't anticipate any problems at this time in purchasing, processing, and/or marketing additional gas production from that lease.

Q The application requests that the Division Examiner recommend to the Director that the gas/oil ratio increase be made retroactive to a particular date. Have you made a determination of what the effective date of the rule change would be?

A Yes, sir, I have.

Q And what date would you recommend to the Examiner that the rule change be effective?

A December 1st, 1986.

Q And what is the basis for using December 1st, 1986, as the effective date?

A We had no opposition --

Q Well, let me ask you, what does it accom-

plish? What is the effect of making the date December 1st?

A It will cancel out any overproduction from the Harvard No. 1.

Q All right. Is there any advrse consequences to any of the operators or interest owners if it is made retroactive to December 1st, to cancel the overproduction?

A No, sir, there's not.

Q Why not?

A The -- from talking to Texas American, they feel the same way we do, that there will be no violation of correlative rights. There has not been and therefore there shouldn't be any reason for us to be penalized for that production.

We had a market for the gas so the gas wasn't wasted.

There was no reason to penalize us for that.

It's been done before. In fact in this pool on the previous order the limiting GOR was set retroactive to the date of first overproduction.

Q Is this reservoir the type of reservoir with a drive mechanism necessary that you must preserve and conserve the gas produced, so that you have to leave the gas/oil ratio limitation at 5000-to-1?

A No, I don't believe that this field is that sensitive.

I think we could produce it at 10,000-to-1 without causing any damage to the reservoir.

Q Except for the correspondence which you have identified, were Exhibits One through Eight prepared under your direction and supervision?

A Yes, sir, they were.

MR. KELLAHIN: In addition, Mr. Examiner, Exhibit Number Nine represents a certificate which we have attested to the fact that we have notified all the offset operators and the working interest owners and operators within the pool boundary.

We would at this time, Mr. Examiner, with your approval move the introduction of Exhibits One through Nine.

MR. STOGNER: Exhibits One through Nine will be admitted into evidence.

I notice on Exhibit Number Nine that you show that the hearing was set for May 21st, 1987. I suggest we keep the record open until tomorrow just in case something does come up.

MR. KELLAHIN: Let me see if that is a typo or if we really intended to say the 21st as opposed to the 20th, Mr. Examiner.

That's a typographical error on my part, Mr. Examiner. If you'll allow me to initial a change I will correct that on the original.

The certificate was simply signed by me yesterday to indicate that on the 28th of April that we had these notices sent out to all parties. The 28th will correspond to fall within the required 20-day period with the hearing set on today's date.

MR. STOGNER: Okay. Was -- do you have a copy of that actual notice that was sent out to all these people?

MR. KELLAHIN: Yes, sir, I believe I do. What they received was a cover letter, copy of the cover letter to the Commission filing the case along with a copy of the actual application.

MR. STOGNER: Let's mark this Exhibit Number Ten and have you submit that.

MR. KELLAHIN: All right.

MR. STOGNER: Let the record show that Exhibit Number Nine has been amended to reflect the correct date of the hearing and at this time we will enter into evidence Exhibit Number Ten, which is a copy of the cover letter sent to all the working interest owners, a letter that's described in Exhibit Number Nine.

CROSS EXAMINATION

BY MR. STOGNER:

Q Mr. Beaird, as far as the perforations and the production interval with your Harvard Well No. 1 as compared to the other two wells in the pool, is there any difference or are they all from the same zone?

A We have San Andres perforated and we also have some perforations in the Premier, which is the bottom zone in the Grayburg.

Q You have some perforations in the Grayburg?

A In the Premier, yes, sir.

Q What is the vertical limits of the Foster-San Andres Pool?

A I do not know. The perforations were -- the well was tested in the end of 1984 and when we came to the Commission for the 5000-to-1 hearing, it was brought out then, so I didn't think there was any problem with the two being produced at the same time.

We tested that interval and there was no indication of any fluid entry into the wellbore from the Premier and we got verbal approval not to squeeze those perforations off, Mr. Examiner.

Q Who did you get verbal from?

A I could not tell you who it was. That's

just from the transcript of the last hearing. That's the only way I know that.

Q And you're referring to the hearing held in Case Number 8726?

A Yes, sir, the 5000-to-1. It was entered as testimony there. That's the only way I know that.

MR. STOGNER: I'm going to take administrative notice of Case Number 8726.

MR. KELLAHIN; Mr. Examiner, I hand you a copy of the log for the Anadarko Foster No. 1, in which are identified the perforations in the San Andres and then those perforations in the Premier that are not contributing production.

MR. STOGNER: When you say they're not contributing production, are they -- is anything coming out of it --

A No, sir.

Q -- salt water or anything?

A No, sir. We perforated the San Andres and then we set a bridge plug above those perforations; perforated the Premier, acidized, swabbed it back, and we're getting no fluid entry. We removed the bridge plug and then produced the San Andres and the Premier open, knowing that the Premier wasn't produce anything, and like I said, we got verbal approval of it. I can't tell you who from, from the

Comission not to squeeze those perforations off.

MR. STOGNER: Mr. Kellahin, this log you give me, is that a part of the record in Case 8726?

MR. KELLAHIN: Just a moment and I'll tell you.

A Is that the previous hearing?

Q Yeah.

A Yes, sir, it is.

MR STOGNER: It is. Okay.

A The same type log.

MR. STOGNER: I'll let you have that log back then.

MR. KELLAHIN: It will appear as Exhibit Two in Case 8726, heard on October 9th, 1985.

MR. STOGNER: Thank you. As I said previous, I'll take administrative notice of that.

Q So all the production attributed to your Harvard Well is from the lower perforations.

A Yes, sir, from the San Andres formation.

Q Okay, and how are those perforations -- do they correspond with the other perforations in the --

A Yes, sir, they do. They do.

Q Okay. Are these the ony three wells that have ever produced from this pool?

A Yes, sir.

Q I notice on your map that there is a dry hole in Section 32 just due north of the Foster Well No. 1. Do you have any information on that well? Did it test in this zone?

A It did penetrate the San Andres. It has a top marked at -8846. It could possibly have been wet. I don't have the completion ticket with me.

Q Now when I refer to Exhibit Number Three, if I look from 1959 to 1980, that was when the only well producing out there was the Martindale Foster Well No. 1. Do you know if the oil production was such that we had over-production of gas?

A No, sir, we didn't. That's --

Q And this only occurred in your well within the last year?

A The overproduction at 5000-to-1?

Q Yes.

A Yes, sir, since September.

Q How are the other two wells compared to production presently as yours, are they experiencing over-production?

A They're not experiencing overproduction. They're not producing at a high enough oil rate.

They are producing a GOR over 5000-to-1

but their oil rate is not such that they have a overproduction problem at that limiting GOR.

Q Now I see from 1981 that there was -- I'm looking at the green line --

A Yes, sir.

Q -- that there -- this field experienced an increase in the production.

A Yes, sir, from 1983 to 1986.

Q And the Texas American Foster Well No. 1, of course, I assume was the result then of an increase in production until your Harvard Well No. 1 came along.

A Yes, sir. When Texas American drilled their well it was -- it was in the middle of the year, so you get a half a year of its production, so it stayed into that average.

The next year you have a full year of its production. That's why it looks like a step up, so it's actually, if it had been plotted on a month by month basis, there would have been a wedge in the middle of 1981 and then a decline down till our well was drilled.

Q Oh, I see, okay. But any actual increase in production after the mid-year of '83 was a resultant (sic) of your well.

A Yes, sir, due to mechanical things that we've changed in the well, the way we've operated it.

Q Now is this well, the Harvard Well, presently producing?

A Yes, sir, it is.

Q And hasn't been shut in to make up any overproduction?

A No, sir, not yet.

Q What kind of reservoir is this? What kind of drive mechanism?

A Solution gas drive reservoir?

Q In a solution gas drive such as this one in here, do you expect that we'll see more gas production or less?

A Through time you'd expect to see a higher GOR but it appears that the field is itself stabilized at around 20,000-to-1 through the mid-seventies and you can tell now that the additional wells were down to around 12,500-to-1.

Q Do you expect whenever this 20,000-to-1 is reached that the oil production will have decreased by then or do you -- how long do you expect to see this increase in the oil production?

A I don't think -- I don't know of anything that we can do mechanically to the well to get more oil out of it.

Q So you --

A We have --

Q You're expecting to see a decline?

A Yes, sir.

Q At this point. What effect would it have on this well if the December 1st retroactive date was not granted?

A We would have to make up overproduction of 17.6-million cubic feet of gas.

Q And how long do you think this well would have to be shut-in so that make-up could occur?

A Is that based on 5000 or 10,000-to-1?

Q Oh, let's go with 10,000-to-1.

A 10,000-to-1 you can produce 24-million in one month, so it would take about half a month shut-in to cancel off that overproduction.

Q And how about at 5000-to-1?

A It would take twice as long, a month; a little over a month.

Q How much oil production would you lose if it was shut-in either half a month or a month and a half?

A 500 barrels.

Q And would that be a half a month shut-in or --

A Yes, sir. The last production we're showing is about 1000 barrels in March.

Q So if we shut down for a month and half at 5000-to-1 that would be about 1500 barrels?

A For a month and a half, yes, sir.

Q Okay. I notice on the advertisement that we advertised the retroactive date of September 1st, 1986, and at this time you're requesting December 1st, 1986.

A Yes, sir, that was an error on my part.

Q Okay. There won't be no problem since the advertisement requested more than what is being requested today.

MR. STOGNER: I have no further questions of Mr. Beaird.

Are there any other questions of this witness?

MR. KELLAHIN: No, sir.

MR. STOGNER: Does anybody else have anything further of Mr. Beaird?

If not, he may be excused.

Mr. Kellahin, do you have anything further in this?

MR. KELLAHIN: No, sir.

MR. STOGNER: Case Number 9137 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 the foregoing Transcript of Hearing before the Oil Conseration 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. 9137, heard by me on 20 May 1987.

Michael E. Stogner, Examiner
Oil Conservation Division