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. 10719

APPLICATION OF ANADARKO PETROLEUM CORPORATION

REPORTER'S TRANSCRIPT OF PROCEEDINGS

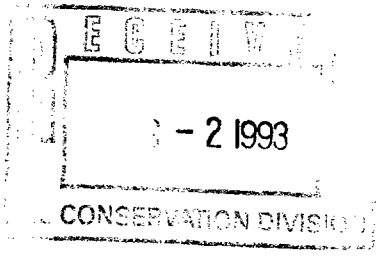
EXAMINER HEARING

BEFORE: David R. Catanach, Hearing Examiner

June 17, 1993

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Division on June 17, 1993, at the Oil Conservation Division Conference Room, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Deborah O'Bine, RPR, Certified Court Reporter No. 63, for the State of New Mexico.



ORIGINAL

I N D E X

June 17, 1993
Examiner Hearing
CASE NO. 10719

E X H I B I T S

EXHIBITS FOR ANADARKO PETROLEUM CORPORATION:

EXHIBITS FOR ENRON OIL & GAS COMPANY:

A P P E A R A N C E S

FOR THE DIVISION:	ROBERT G. STOVALL, ESQ. General Counsel Oil Conservation Commission State Land Office Building 310 Old Santa Fe Trail Santa Fe, New Mexico 87501
FOR THE APPLICANT:	KELLAHIN AND KELLAHIN 117 N. Guadalupe Santa Fe, New Mexico BY: W. THOMAS KELLAHIN, ESQ.
FOR ENRON OIL & GAS COMPANY:	CAMPBELL, CARR, BERGE & SHERIDAN, P.A. P.O. Box 2208 Santa Fe, New Mexico 87504 BY: WILLIAM F. CARR, ESQ.

EXAMINER CATANACH: At this time we'll call the hearing back to order, and, Bob, would you please call Case 10719.

MR. STOVALL: Application of Anadarko Petroleum Corporation for directional drilling and an unorthodox bottom hole gas well location, Eddy County, New Mexico.

EXAMINER CATANACH: Are there appearances in this case?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing on behalf of the applicant, and I have two witnesses to be sworn.

EXAMINER CATANACH: Additional appearances?

MR. CARR: May it please the Examiner, my name is William F. Carr of the Santa Fe law firm Campbell, Carr, Berge & Sheridan. I represent Enron Oil & Gas Company, and I have three witnesses.

EXAMINER CATANACH: Additional appearances?

Will the five witnesses please stand and be sworn in.

(Witnesses sworn.)

MR. KELLAHIN: Mr. Examiner, we're ready to

proceed.

EXAMINER CATANACH: By all means, do so.

MR. KELLAHIN: All right, sir.

CHRISTOPHER CLARK,

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

EXAMINATION

BY MR. KELLAHIN:

Q. Would you please state your name and occupation.

A. Yes. My name is Christopher Clark, and I'm a staff geologist with Anadarko Petroleum Corporation in Houston.

Q. Mr. Clark, would you summarize for us your education?

A. Yes. I have a master's degree in geology from the University of Missouri. Do you want me to --

Q. In what year?

A. In 1970.

Q. Where is your undergraduate degree?

A. Also at the University of Missouri.

Q. Subsequent to obtaining your master's degree, would you summarize your employment experience as a geologist?

A. Yes. After graduating, I was hired by

Texaco and worked in Houston for approximately three years, working the Gulf Coast area, onshore and offshore.

After that I worked for Kerr-McGee Corporation for seven years in Oklahoma City, working the Mid-Continent and Rockies, various parts of the country, both mineral and oil and gas exploration.

And then in 1980, I was hired by Anadarko Petroleum as an exploration geologist, and I continue to work with them since then, both exploration and development.

Q. Mr. Clark, you're soft spoken.

A. Yes.

Q. Would you raise your voice so we can hear you?

A. I'll try.

Q. Give us a general sense of what your background and involvement has been with regards to Morrow exploration or exploitation.

A. I've worked Morrow in the Texas Panhandle and the Anadarko Basin of Oklahoma. Commencing about ten months ago, I was transferred from Oklahoma City to Houston with responsibilities for the Permian Basin, primarily southeast New Mexico. And I took over this project of Anadarko's in Eddy County

approximately October, November of last year, and I've worked with it since then.

Q. Does the geologic presentation we're about to look at represent your own personal work product?

A. Yes. And in addition, the first geologist that started the project, Raymond Sorenson, his name is on the maps also, I took over after he was transferred to a different area, the Oklahoma Panhandle. And so I finished up the project. I carefully checked and reviewed his work, and I agree with it 100 percent, and I've worked with the data myself, and I feel comfortable as to its quality.

MR. KELLAHIN: We tender Mr. Clark as an expert petroleum geologist.

EXAMINER CATANACH: Any objection?

MR. CARR: No objection.

EXAMINER CATANACH: Mr. Clark is so qualified.

Q. (BY MR. KELLAHIN) There are various parts of this case I'd like to address with you as a geologist, Mr. Clark. Let's start first, I think, with some nongeologic issues, and that has to do with the component in this case that has caused Anadarko to seek a directional drilling.

A. Yes.

Q. Of this well. Let's turn to that topic first. Let me have you identify for us what is marked for introduction as Anadarko's Exhibit 1. What is that, sir?

A. That is copy of a USGS topographic map, covering the area of the Morrow Unit that we're applying for. The Power Federal Unit, the 320 acres stand-up Morrow Unit, is shown by the dashed black outline in the east half of the Section 26. And a standard drilling location box is shown as a square in the middle of the map, 320-acre rectangle.

A plugged and abandoned Upper Morrow well is shown in the lower part of that square and is then identified as the Power Federal 1 "Y" Well. The new proposed Lower Morrow well, the surface location is shown as the red circle with the identifying number 2 beside it. The directional portion of the hole is shown by the dashes, and the bottom hole location is shown by the cross, ending up in a topographic low known as Cedar Lake, a dry lake in the area.

Q. What is the targeted formation that you're attempting to locate this well in and produce gas from?

A. It's from the Morrow formation, which is gas productive in this area.

Q. Is this identified, to your knowledge, as the Cedar Lake Morrow Gas Pool?

A. Yes, it is.

Q. Currently, what wells are producing from that pool in this vicinity that are of concern to you as a geologist?

A. There are a number of wells in the pool, but of immediate concern to us is the Enron well located immediately south of the Power Federal Unit. You can see on this topographic map a gas symbol identified as the Enron Cedar Lake Federal No. 1 in the northeast quarter of Section 35.

For reference, immediately west in Section 34 is the Anadarko-operated Arnold Federal No. 1, another Morrow gas well producing out of the same unit.

Q. Were you able to reach a conclusion geologically of the optimum place in which to locate this well in the reservoir for the east half spacing unit for this section?

A. Yes, I was. After carefully studying all of the available subsurface control in the area, I feel that there is a northeast-oriented channel that is areally restricted, and it only covers approximately the south half of the Power Federal

Unit. Consequently, for an optimum location in order to drill sufficient sand, we have to locate the well approximately 660 feet from the south line, 660 feet from the east line.

Q. We'll come back in a minute to the reasons that got you to that conclusion, but let's take that conclusion now, and tell us how you propose to get there from a surface location.

A. Anadarko would drill vertically at the surface location down to a depth of about 8,000 feet. They would then kick-off and build angle at approximately 1-1/2 degrees per 100 feet.

Q. Why are you precluded from using a surface location that lies above the bottom hole location you're seeking to achieve?

A. The surface location is a dry lake, and it is archeologically restricted by the Bureau of Land Management. So we can't enter onto that surface location.

Q. Have you chosen a surface location that meets the necessary surface requirements for the utilization of the surface by which to drill this well to the target that you've chosen?

A. Yes, I have. Our field people have scouted the area and surveyed in the location that would be

acceptable. It would be 1400 feet from the south line and 660 feet from the east line.

Q. Let me direct your attention now to Exhibit No. 2. Identify and describe that display for us.

A. This is a plat at a scale of 1 inch to 1,000 feet of Section 26. The east half of the section has been broken out to show it as the subject spacing unit of 320 acres. The standard drilling box is shown as the square in the middle.

The proposed surface location with the Power Federal No. 2 is the circle and lettered No. 2 above it, and that is referenced as 1400 feet from the south line and 660 feet from the east line of that section. The proposed bottom hole location is shown as the X with a distance of 660 feet from the south line, 660 feet from the east line.

Q. Do you have a display that shows an illustration of how you propose to get from the proposed surface location to the bottom hole target?

A. Yes. This would be Exhibit No. 3, which is a schematic vertical section for drilling the Power Federal No. 2 Well.

On the left side is the true vertical depth. On the lower right side would be the deviation in feet, hundreds of feet. And you can see that the

well would be vertically drilled from the surface location down to a measured depth of 8,000 feet, at which point they would kick off and start building angle at a rate of 1-1/2 degrees per 100 feet, and continue that rate of buildup until they get just past 9,000 feet, when the angle would be 15.6 degrees, at which point they would keep that angle constant and drill to a total depth.

And at approximately 11,275 feet measured depth or 11,180 feet true vertical depth, the well would have deviated to the south by 740 feet, which would place us at our targeted location of 660 feet from the south line, 660 feet from the east line.

Q. Do you have a recommendation to the examiner as to the radius within which you can target the bottom hole of this well?

A. Yes. We would ask permission for a radius of 75 feet, considering the depth at which we have to try and hit this target.

Q. Have you verified with your drilling engineers that that is a reasonable radius to use for wells drilled directionally to this depth?

A. Yes. They're the ones that actually suggested that radius.

Q. Let's turn specifically to the topic of

your expertise. And have you described for us the method you go through as a geologist in order to evaluate the prospects for Morrow production on your spacing unit, the east half of this section?

A. Yes. First of all, the most critical thing is to have all the available subsurface control that you can have, all the available logs, which we do have and that I've looked at.

The second thing is to carefully correlate all the zones that you're interested in from well to well. And that then allows you to accurately construct, first, a structure map to give you the structural position of the formation and see whether or not there is any structural component to the trapping, which in this case there isn't; it's all stratigraphic.

Once you correlated the logs, it's helpful to build cross-sections to visually represent the targeted sands that you're going after. And then you measure sand thicknesses, both gross and net, to determine what sands would be potentially productive. And you place all those on a map and contour them to see the sand orientations.

Q. How comfortable are you as a geologist that you had adequate geologic data and control points from

which to prepare accurate and reliable geologic interpretations?

A. Well, we're fortunate that this area is quite developed for the Morrow. So we do have a lot of subsurface controls. In fact, I would characterize all of these wells at present, and the well that we hope to drill, as development rather than exploratory. And, consequently, the accuracy of the data, the limits of the data, I think are very reliable.

Q. Are you using modern well logs and geologic technology to analyze the relationship or the size and shape of the reservoir in this area?

A. Yes, I am. Most of the wells have modern neutron density logs, lateral logs for resistivity. I believe one or two wells were 1960's or early '70's vintage that had sonic logs, but you could still accurately study those, analyze them.

Q. Let's turn now to Exhibit No. 4 and have you illustrate for us some of the data points that you had available to you for analyzing the geology.

A. Yes. That is nine-section production plat centered on Section 26 with the 320-acre spacing unit outlined in red and the proposed surface location as the circle with an arrow beside it. The bottom hole

location has the X near the dry hole. All of the producing formations are color-coded, and you can see that by far, most of the wells in the area are shallow, upper Permian wells.

To the north in Sections 22, 23, 24 is slightly deeper Abo production. The Power Federal No. 1 "Y" in Section 26 has a blue color to indicate that at one time it produced from the Cisco Canyon, and it's currently plugged and abandoned.

In the west half of Section 26, Yates Petroleum has an Atoka well, the only one in the immediate area.

And then the yellow indicates all of the Morrow production. Again, the Power Federal 1 "Y" well in the east half 6 Section 26 was originally an Upper Morrow well. The Yates Petroleum well in the west half was drilled as a Morrow, did not find productive sand there. The dry hole in the extreme south half of Section 27 is a General American Oil Company of Texas dry hole drilled in 1982, also a Morrow test.

In the northeast quarter of Section 34 is the Anadarko-operated Arnold Federal No. 1, which is a basal Lower Morrow well completed in 1982. And the northeast of Section 35 is another Morrow well, the

Enron No. 1 Cedar Lake Federal, which was completed in June of last year and is also currently producing out of the basal Lower Morrow.

And in the extreme northeast of Section 36 is the oldest Morrow producer in the area, the Odessa Natural Gas No. 1 El Paso State, which was drilled in 1961. And that was completed out of the Upper Morrow sand.

Q. In order for you as a geologist to evaluate the opportunities for a Morrow well on your spacing unit, what is the first type of investigation that you undertake in making that ultimate conclusion about your acreage?

A. Well, first you have to have, as I said before, sufficient data to work with, and we have all the logs in the immediate area.

Secondly, you have to have some feeling for the quality of the reservoir. And from the available data on both the Anadarko-operated well in Section 34, the Arnold Federal and the recently completed Enron well in Section 35, we feel that these two wells have identified a northeast-trending channel sand that is of extremely high quality compared to all the other Morrow wells in the area, which are predominantly Upper Morrow producing wells where the sands are not

as good quality.

Q. With this available information, what is the first type of geologic interpretation or display that you prepare?

A. Generally, I would work up a structure map to get an idea of the orientation of your horizons in the area and see whether or not there's a structural component to the trapping.

Q. And did you do that in this case?

A. I did.

Q. Has that been reduced to the form of an exhibit for introduction today?

A. It is. It's Exhibit No. 5.

Q. Before we discuss the conclusions from the structure map, identify for us what portion of the Morrow you place this structure, what's your structural control point.

A. As the legend indicates, this is a structure map built at the top of the Lower Morrow, which is a recognizable marker within the Morrow. The contour interval for this map is 100 feet. All of the Morrow penetrations are indicated by circles. Any Morrow producing well is color-coded yellow, and this includes Upper and Lower Morrow.

Q. What are your conclusions as a geologist

from the structure map?

A. The primary conclusion is that for Section 26 and the Power Federal Unit, there is no component of structural trapping. In other words, this is a stratigraphic trap.

I would like to point out, however, that there is a structural nosing which is part of a regional trend, a ridge that's trending approximately southeast, passing through Sections 26 and 35 and on to the southeast. And on the side of this nose is a fairly large fault, indicated as cutting through the northeast quarter of Section 34 and down to the west.

It has a throw of approximately 200 feet. And we can verify that by the very closely spaced wells in Sections 34 and 35, Sections 2 and 3, and they all are consistent, showing slightly more than 200 feet of throw. And this is important in the sense that it separates the Lower Morrow sand into two separate reservoirs.

The Arnold Federal is approximately ten years old and nearing a state of depletion from the Lower Morrow sand and has produced on the order of 7-1/2 Bcf. And in contrast, the Cedar Lake Federal No. 1, which is producing out of correlative sand, encountered virgin pressures last year, again

indicating that this would be a sealing fault separating the sand into two separate reservoirs.

Q. Do you have an estimate of the current cumulative production out of the Enron Cedar Lake Federal No. 1 Well?

A. I have an approximate cum. Our engineer, I believe, has a little more data than I had at the time I prepared this plat. As you can see from Exhibit No. 4, where the cumulative production is shown for the Cedar Lake Federal No. 1, approximately 67.7 thousand barrels of oil have been produced, and 1.6 Bcf.

I believe this cum is out of date, and our engineer has more up-to-date information. And that's been produced in less than a year's time.

Q. Having completed your study of the structure in the Lower Morrow, what's the next thing you do?

A. Generally, I'll build some sort of isopach map to show the relationships of selected intervals of sands or stratigraphic units. And to clearly show this, I would like to introduce the two cross-sections, just so that the examiners will clearly understand what units my isopach maps will reflect.

Q. All right, sir. Let's go to the

cross-section, I think it's B-B'.

A. Yes. Cross-section B-B' is a stratigraphic cross-section hung on the --

Q. Does your Exhibit 6 have an index map that shows you the line of cross-section?

A. Yes, it does. It's trending approximately from southwest to the northeast. And the proposed Power Federal No. 2 Well is projected into the cross-section, the location again shown in the southeast quarter of Section 26.

Q. What was the method you used to select the wells to put on the B-B' cross-section?

A. These basically would be wells that are trending approximately down the channel as we interpret it, and they are also meant to show the correlation between the two Morrow producing wells that are producing out of what I term the basal Lower Morrow-Arnold sand, since the Anadarko Petroleum No. 1 Arnold well in the northeast quarter of Section 34 was the first well in the area to find this sand ten years ago when it was drilled.

Q. Is the line of cross-section for B-B' one that is applying conventional geologic choices?

A. Oh, yes.

Q. Nothing unusual about the selection of

wells?

A. No. It's just for showing the correlation of the wells. They are the closest ones that are available to show the trend.

Q. What's the conclusion from the cross-section?

A. First, I want to show that it is a stratigraphic cross-section rather than a structural cross-section, and that it's hung on a regional marker which is colored green, a Middle Morrow shale, and below that outlined in yellow would be the Arnold sand.

And you can see from the two middle wells, the one on the left labeled "Arnold," and the one on the right labeled the "Enron Cedar Lake Federal No. 1," that the stratigraphic position of the Morrow sand that's currently being produced out of both wells is correlative. They are both at the same stratigraphic level.

Another thing I'd like to point out is that this is the lowest stratigraphically developed Morrow sand on the cross-section, and that it's immediately above the post-Mississippian unconformity that is cut down into the Barnett shale, shown by the squiggly line beneath the Morrow sands. And we feel that this

unconformity is what developed the channel in which the sands were later deposited.

In terms of my succeeding exhibits, which are isopach maps, I'd like to point out that I have mapped the interval from the top of the Lower Morrow where the datum is located down to the unconformity. So this would be an interval isopach map of one stratigraphic package, if you will.

Another isopach will then be a gross sand isopach, and that would be the summation of all the clean sand out of this basal Lower Morrow sand, which would be colored yellow on the exhibit and identified as the Arnold sand.

Secondly, my net sand isopach map would be using an 8 percent cutoff on the neutron density porosity logs, and that would give us an indication of what would be the effective producing sand area.

Q. As Enron and Anadarko compete with each other for the recoverable gas reserves underlying each tract, is there a structural advantage for either company?

A. I wouldn't say any significant structural advantage. If you refer back to the structure map, you'll see that our location for the proposed well is approximately on strike or possibly even slightly

downdip from the Enron well in Section 35. So there wouldn't be any extreme advantage one way or the other.

Q. In balancing correlative rights between the two companies as relates to their spacing units, structure then is not a component of that balancing?

A. That's correct.

Q. The target sand in the Morrow that the Enron well is producing from, was that identified on your cross-section?

A. Yes, it was.

Q. And what is that interval then that they are currently producing from?

A. On the cross-section, the perforated interval in the Enron well is shown in the depth column at approximately around 11,200 feet, where the small rectangle outlined in red with circles would end. That would be the perforated interval, and that's what I'm calling the basal Lower Morrow-Arnold sand.

Q. In your opinion, did they adequately perforate that Morrow sand that you're looking for?

A. Yes, they did.

Q. You don't see any other opportunity in that well for additional perforations in that Morrow zone?

A. If you come up 20 feet or so, there's some indication in the upper part of the Lower Morrow, which is colored orange. It appears on the neutron density log that there's some porosity development. It appears to be thin. That might represent some additional pay.

And further up the hole several hundred feet approximately between 10,900 feet and 11,000 feet, there appear to be several thin Upper Morrows or, excuse me, Middle Morrow sand that possibly could be tested.

Q. The Morrow zone that Enron is currently perforated in, you characterized it with a name. What did you call it?

A. I called it the Arnold sand, since the Anadarko Arnold Federal No. 1 Well in the adjoining Section 34 was the first well to encounter that sand, which is stratigraphically the lowest Morrow sand developed in the area.

Q. Have you mapped that Arnold sand to determine whether it extends into your east half Section 26 spacing unit?

A. Yes, I have.

Q. How did you do that? By means of isopachs, I assume.

A. Yes. And I'd like to go on to the final cross-section, A-A', just to --

Q. The B-B' cross-section took us up the channel?

A. Up the channel, approximately. The cross-section A-A', which is Exhibit No. 7, is trending north-south and would cut across the channel.

Q. Let's take a moment and unfold those displays and talk about the A-A' cross-section.

MR. STOVALL: I have a question about B-B' before we go on so I have some understanding, not that it makes a whole lot of difference, but the last well, the right-hand well?

THE WITNESS: The (Max Frees Federal No. 10 Well)?

MR. STOVALL: Is that it?

THE WITNESS: In Section 19?

MR. STOVALL: Yeah, it's the one in -- I can't read the -- yeah, right, that's it. The depth track throws me a little bit.

THE WITNESS: Yes, it's poorly developed. Near the bottom of the well, you can see a depth. It shows 1,500, but the 10,000 part didn't develop. So that would be 11,500 feet. So you'll have to estimate from the 100-foot markers above that.

MR. STOVALL: And it added another 10,000 feet to this thing; is that what you're --

THE WITNESS: Well, yeah, I guess you would--

MR. STOVALL: Kind of correlate to --

MR. KELLAHIN: Talk one at a time. We've got enough trouble with rattling the paper; so don't talk over the question.

THE WITNESS: Yes, those would -- you would have to add 10,000 feet. For some reason, the 10,000 depth is not --

MR. STOVALL: As long as I know what number to add, that's fine, where the digit was missing. That's fine.

THE WITNESS: Yes. There's not that much structural relief.

MR. STOVALL: It's not a real big 10,000 foot throw on the fault; right?

THE WITNESS: Correct.

Q. (BY MR. KELLAHIN) Are you ready to turn to the A-A' cross-section?

A. Yes. A-A', Exhibit No. 7, is, again, a stratigraphic cross-section in contrast to a structural cross-section. So that means it's hung on a datum of the Lower Morrow, the top of the Lower

Morrow, which is beneath the green shale marker.

There are five wells shown on this. Starting on the left side is the Yates Cedar Lake ADI Federal No. 1, located in the west half of Section 26. And you can see that there's hardly any Morrow sand developed in that well. There's a Middle Morrow sand that's colored yellow, has a little bit of neutron density crossover shown in red, but in the Lower Morrow, no sands are developed. This well was completed in the Atoka.

You can clearly see, however, that the post- Mississippian unconformity is developed on the top of the Barnett shale, and that the Lower Morrow interval is fairly thin.

As you proceed southward to the second well, the Anadarko Power Federal No. 1 "Y," which was the original well drilled in the east half of Section 26, you can see from the combined display that I have a neutron density log that does not reach to total depth. They had logging problems. And so I have added the corresponding mud log that does show the total depth of approximately 11,380 feet.

That well was completed in the Upper Morrow for a small well. It had an initial potential of 1,000 cubic feet per day, but it only produced for

about three years, and the Morrow cum was 137 million cubic feet of gas and 4,000 barrels of oil. In other words, it was an economic failure for the Morrow, and, consequently, in 1981, it was worked over in the Cisco and produced for four years, making a small amount of oil and gas before it was finally plugged and abandoned in 1985.

Q. While we're on this well --

A. Yes.

Q. -- this is the Power Federal 1 "Y"?

A. Yes.

Q. -- just north of your location?

A. Correct. And so this is an important well to show that the Arnold sand has a limit to it, to the north.

Q. What did you do as a geologist with this data when it came to isopaching the Arnold sand?

A. Since the electric log, the neutron density log, did not reach total depth, I had to rely on the mud log. So you have to carefully correlate the electric log with the mud log and the neutron density log over the portions of the hole where they do cover each other.

And you can see that the Upper or Middle Morrow sands on the neutron density log that are

colored yellow and have some neutron density crossover colored red correlate fairly well with the mud log where you have drilling breaks, the curve on the extreme left of the mud log, and those are colored in yellow, and you have corresponding gas shows that I've colored in red just to denote the peaks on the gas shows.

Coming down a little bit further, you see that there's at approximately 11,136 feet or so, there's an interval of green which correlates to the Middle Morrow shale marker that I've used to hang the cross-section on. So from that point on down, you have to then refer to the mud log in order to get, first, the interval isopach value, which represents the thickness of the Lower Morrow from your datum, down to the top of the Barnett shale where the unconformity development on which the succeeding Morrow was deposited. And I interpret that point to be where your drilling profile on the mud log slows down significantly.

And near the base of the Morrow, you can see that there's a slight 10 foot drilling break at approximately 11,270 feet down to 280 feet. The mud logger has in the lithology column in the middle of the mud log indicated some sand in that zone; however,

there's no corresponding gas increase. And so I feel that would be nonproductive sand, and even though we have 10 feet of gross sand, we would not have any effective producing sand at that point. So that would be a critical limit to how far north the net sand could extend.

And as you see, that drilling break continues on to the next well to the south and correlates with what I'm calling the Arnold sand. And it's the same log as in the first cross-section, B-B'.

Q. Would this data allow you as a geologist to draw the zero line on the Arnold isopach sand north of this well?

A. No, not for the net. The gross sand, which will be one of my exhibits, will show that the Arnold sand has a thickness of 10 gross feet at this Power 1 "Y" location.

Q. When you take this information, how does it affect the construction of the net pay map?

A. The net pay, by definition, has to be less than or equal to your gross sand thickness. In other words, you can't have net pay any greater thickness than your gross sand. Since the net pay is taken on an 8 percent cutoff, generally you're going to have some sand thickness that's less than 8 percent

porosity and not effective pay.

Q. Did you carefully analyze all the well data then to develop the gross isopach of the Arnold sand?

A. Yes, I did.

Q. To result in your best judgment about the size and the shape of that container?

A. That's correct.

Q. Let's turn to the gross map and take a look at that.

A. May I show one last thing on this cross-section?

Q. Yes, sir.

A. This cross-section is cutting across the channel, and you can see that clearly on this as the unconformity that developed on the Barnett shale. As you go from north, where it's thin and the Yates well, it gradually thickens to a maximum beneath the Enron well, which would be approximately near the axis of the channel. And then as you continue further south, the unconformity comes up, and the Lower Morrow interval thins again. So this on the cross-section is a visual representation of the downcutting of the valley that developed the channel and the later infilling of the Morrow sand.

Q. Are you satisfied as a geologist that you

have adequate data from which to contour both the north and the southern limits of this channel?

A. Yes, I do.

Q. Particularly as it crosses through the Enron tract and the Anadarko tract?

A. Yes. As you can see on this cross-section, there's indication of the maximum thickness of the sands, for the Lower Morrow sand called the Arnold sands. In the Enron well, immediately to the south, there is no sand in that well, which is the Phillips Atalaya Federal No. 1. And so you have a southern boundary, a 0 limit to the sand development between those two wells. So that's one nearby control point.

The Power Federal 1 "Y", as the mud log indicates, there is a trace of sand 10 feet thick. That gives you another control point. And even further north in the Yates well, the sand is totally absent; so that would be a 0 control point.

Q. In attempting to come to a conclusion about productive acreage between the Enron tract and the Anadarko tract, what is your level of confidence in the amount of data in which to make good judgments as a geologist on that issue?

A. Well, fortunately, we have close control nearby; so I feel quite confident that the orientation

of the channel is pinned down very well in the immediate area.

Q. All right, sir. Would you turn now to the next exhibit?

A. Yes. This is Exhibit No. 8. And this is the first of three isopachs that I would like to show to you, and it represents the gross interval of the Lower Morrow.

If you recall from the two cross-sections, we're going from the top of the Lower Morrow down to the base of the Lower Morrow. And so the value for each well is annotated on this map, and you can clearly see that the contours are trending from northwest to southeast -- and let me point out that the contour interval is 20 feet, and that you have on the northeast part of the map thin isopach values.

For example, in the Yates well in the west half of Section 23, you have a 65. Further to the east in Section 19, you have a 45. And just to the south in Section 30, you have a 51. These are relatively thin.

And I might point out that regionally, the Lower Morrow is truncated -- I shouldn't say truncated. It disappears just a few miles to the north. It goes to 0. So we're near the sub-crop

limits of the Lower Morrow as it was deposited.

Q. If we're trying to focus in on the net productive acreage in this Arnold sand from which the Enron well is producing, how is this isopach of the Lower Morrow of any use to you?

A. All right. The sands of the Lower Morrow are fluvial channel sands. And so they were deposited in channels that were developed in the valleys. From the cross-sections, you saw the clear evidence of the valleys cut into the Barnett shale by the post-Mississippian unconformity. And this isopach, in turn, is showing you the valley fill, of which the Morrow sands are going to be a part of.

Q. The Arnold sand as part of the valley fill has got to be consistent then with the Lower Morrow isopach?

A. Right. We wouldn't expect a channel to be very thick up on a high that was present at the time. And so this isopach is showing the gradual thickening from northeast to southwest of that Lower Morrow interval. You go from less than 60 feet in the northeast to over 200 feet down in Section 8 of Township 18 South, Range 30 East, where there's a well with a value of 211 feet.

And as you can see, there is a marked

narrow thick that is projecting from the southwest to the northeast. And this is what I interpret to be the part of the valley fill of the Lower Morrow stratigraphic interval, of which the Lower Morrow sands have to be a part of.

And this continues on through the Anadarko Arnold Federal No. 1 in the northeast quarter of Section 34, where I've outlined it in red, just to emphasize that this is producing from the Lower Morrow rather than any other Morrow that surrounding wells might produce from.

And this thick trend continues on into the northeast quarter of Section 35, where the Enron Cedar Lake Federal Well has 162 feet of gross interval. And that projects on to the northeast. And as you can see in the east half of Section 26, the Power Federal 1 "Y" has a value of 122 feet in contrast to the Yates well in the west half of Section 26 that has a value of 65.

So there's a rapid increase in thickness, indicating you're going into the channel just from the west half to the southeast part of Section 26.

Q. I'm concerned about the relationship in the channel of the east half of 26 and the north half of 35, which is the Enron spacing unit.

A. Yes.

Q. Is there an opportunity, in your opinion, for a material change in the orientation or the size and the shape of the channel with this kind of control?

A. No. You're, what, just three quarters of a mile apart between the Power Federal 1 "Y" in the east half of Section 26 and the Cedar Lake Federal No. 1 in the northeast quarter of Section 35, and in the southwest quarter of Section 35 is the Phillips Atalaya No. 1 with a value of 117 feet.

So in a distance of about a mile, you have three wells that cover that channel. For Morrow, that's fairly good control.

Q. From the isopach of the Lower Morrow, how do we evolve into the rest of the analysis?

A. You then proceed to a gross sand map of the Arnold sand, which is Exhibit No. 9. This gross sand isopach, let me repeat, is just an individual sand that I've correlated throughout the area and is productive in only two wells.

Q. This Arnold sand, though, is the target sand that you're seeking to produce from?

A. Exactly.

Q. Other sands in the Morrow are not the focus

of the issue, are they?

A. No, they're not. We've already identified from the first well drilled in the east half of Section 26 that the rest of the Morrow is uneconomic.

Q. And this is the Morrow sand, the Arnold sand, that the Enron well is producing from?

A. Yes.

Q. All right. Describe this display.

A. All right. This is the gross sand isopach, and it's using a contour interval of 10 feet. And you can see that the well in the northwest quarter of Section 26 has a value of 0; in other words, no sand at all within this interval. And that log was on the cross-section, and I pointed out that there's no sand development there.

As you proceed to the Power Federal 1 "Y," which was on the cross-section, you have 10 gross feet, but there was no associated mud log show there; so I interpreted that to not have any net effective pay.

The thickest value encountered is in the Cedar Lake Federal No. 1 that Enron operates in the northeast quarter of Section 35, and I counted a gross thickness of 52 feet in that well.

As you progress into Section 34 to the

Arnold Federal, you see somewhat less sand but still quite thick, 46 feet. And if you go to the north in Section 27, there's a dry hole with 4 gross feet. So that is another edge well showing that the edge of the sand is close by that dry hole.

And with that thin an interval on the neutron density log, there was no net sand development, nothing over 8 percent porosity. So that has no effective pay.

What I'm representing here with 4 feet is just the gross interval of the sand.

There is no further well control to the southwest until you get into the west half of Section 4 where that well has 4 gross feet. And proceeding into the southeast of Section 5, a well with 10 feet, and then in the northeast quarter of Section 8 another well with 10 feet of gross sand.

And as you look around -- let me come back up to Section 3. In the northwest quarter of Section 3 is a well, it had no sand. You can see the 0 there. So that's another control point. In just a little over a mile, we go from 0 sand in Section 3 to 46 feet in Section 34, and then further north in Section 27, a total of 4 feet. So we have very clear control here as to the approximate thickness of this

sand-filled channel.

And as I pointed out before in Section 35, you go from a well with 0 sand in the southwest quarter of Section 35 to 52 feet in the Enron well in the northeast of Section 35. So in a space of a half mile, you get over 50 feet of sand, and then in another three quarters of a mile, it grades out to 0 to the north.

Q. In analyzing the relationship between the Enron spacing unit and Anadarko's in terms of the gross sand in the Arnold member --

A. Yes.

Q. -- in your opinion, will it materially change that relationship if there are wells drilled in 25 to the northeast that are inconsistent with the way you've made that interpretation for that section?

A. No. The relationship between Section 26 and 35 is closely related. They're tied down. They're correlated well. You lack control in Sections 25 and 24. It isn't until Sections 19 and 30 where you have Morrow penetrations. So there could be some variation in the sand trend there.

But going back to my gross interval map, where we do have values, those control the orientation of the channel. And that's why the gross sand trend

matches the gross interval isopach. In other words, the sand trend is going to fall near the axis of the gross interval isopach.

Q. What's the criteria you use to take the gross Arnold sand map and reduce it to a net pay map?

A. All right. The gross sand is taking any indication of sand from the logs, and then you apply an 8 percent cutoff from the porosity logs in order to develop how much of the sand would be net pay.

Q. Why did you use 8 percent?

A. 8 percent is commonly used in analyzing the Morrow. Anything less than that is not considered to be effective pay and not productive.

Q. Let's look at Exhibit 10. Does the orientation and shape of the net pay map, Exhibit 10, agree or disagree with the gross map, 9?

A. It agrees. They follow closely one another. In other words, the net sand map has to be within contours of the gross sand. It cannot overlap -- I mean, it can't extend further than the gross sand.

It has the same orientation, and you can see that it, particularly to the southwest, it has no obvious extension. In other words, the logs on the wells in Sections 4, 5, and 8 did not show any net

sand, and so I had to close off the contours at that point.

Using an 8 percent porosity cutoff, you can see that the Arnold Federal has 41 net feet. And continuing on to the east, the Enron Cedar Lake Federal has 45 gross feet -- excuse me -- net feet. And as the sand continues on to the northeast, I'm projecting an estimated 37 feet of net sand at the bottom hole location of the proposed well.

Q. Thirty-seven feet?

A. Thirty-seven feet.

Q. At your unorthodox location?

A. Yes. And continuing on to the plugged and abandoned Power Federal 1 "Y,", you can see that that is a 0 value. In other words, from the mud log we saw a gross value of 10 feet, but there was no associated gas show. So I interpret that as meaning it has no pay. And so that would be a 0 control point.

So the nearby Morrow wells very carefully define the trend of this channel sand. And it's trending from southwest to northeast through a part of the southeast quarter of Section 26. And that is what is guiding Anadarko in requesting permission to drill an unorthodox location.

Q. What's your degree of confidence that the

reservoir engineer can use your net pay isopach from which to calculate gas in place in between the two spacing units?

A. I personally feel that the confidence level would be high because of the close control.

Q. In your opinion, would this be an accurate way by which the reservoir engineer can allocate correlative shares of recoverable gas between the two operators in each of these spacing units?

A. Yes, it is.

MR. KELLAHIN: That concludes my examination of Mr. Clark. We move the introduction of his Exhibits 1 through 10.

EXAMINER CATANACH: Exhibits 1 through 10 will be admitted as evidence.

Mr. Carr?

EXAMINATION

BY MR. CARR:

Q. Mr. Clark, if we go to -- I think start with your Exhibit No. 2?

A. Yes, sir.

Q. Do you have that, sir? If I understood your testimony, this exhibit shows the proposed bottom hole location 660 feet from the south and east lines of Section 26; correct?

A. Yes, sir.

Q. That is your -- but you have a target area. That means you intend to bottom the well within 75 feet of that point; is that right?

A. The target would be 660 feet from the south line, 660 feet from the east line. Due to drilling risk and depth and everything, we're asking for 75 foot radius of error.

Q. So it is possible that you could be 75 feet farther south of the 660 location, only 585 feet from the Enron property?

A. Yes, sir.

Q. And, if so, that would be within the target area, and that's what you're asking for?

A. Yes, sir.

Q. Do you know if you're going to be running deviation surveys on the well?

A. Yes, sir.

Q. Would you make those available to Enron at the same time you do to the OCD?

A. Certainly.

Q. If we now go to your Exhibit No. 4, in terms of the well control that you have on the Arnold sand, you only have actually two electric logs, do you not, that actually show this sand body?

A. No, sir. I have several wells. As you can see from Exhibit No. 9, the gross sand isopach, starting in the east half of Section 26, the Power Federal 1 "Y."

(Thereupon, there was a brief interruption in the proceedings.)

Q. (BY MR. CARR) My question was how many electric logs, if you could just point those out to me, that actually show the sand. I'm sure you told us, but I missed them.

A. Yes, sir. Starting with the Enron well in Section 35, the Anadarko Arnold Federal Well in Section 34, and then immediately north of it in Section 37 is the General American Texas Well. And then further down to the southwest in Section 4 is a well in the southwest quarter of Section 4. It has 4 gross feet. And then in the southeast quarter of Section 5 is another well with 10 feet.

Q. Let me see. Okay.

A. And in the northeast quarter of Section 8 is a well with 10 feet. So from my count, that would be one, two, three, four, five, six wells that show the sand.

Q. And this plus the mud log on the Power Federal 1 "Y" --

A. Makes seven.

Q. -- are the logs from which you've been able to interpret the orientation of this pay?

A. -- the sand trend of this particular sand, yes, sir.

Q. We're going to have to talk one at a time or we'll get in trouble.

A. Excuse me.

Q. Okay. I'll try and do that, too.

But it's the data from those logs that you use to interpret the sand trend?

A. In conjunction with the remaining well logs in the entire area that show no sand in that interval.

Q. And your work in this area as a geologist has been based on well data; is that fair to say, or have you integrated seismic or something else into your interpretation?

A. The structure map, I did have access to seismic data also that showed the fault orientation that separates the Arnold Federal from the Enron well. The seismic quality is not sufficient to show the sands, however.

Q. If we talk about the faults, and we go to your structure map, your Exhibit No. 5, I think you've indicated that -- tell me if this is correct -- was

structure important as to the proposed bottom hole location for the well that is the subject of this hearing?

A. Are you asking in terms of a structure trap?

Q. Yes.

A. In other words, you have to have a structural closure in order for it to be perspective?

Q. I'll ask you a different way. What part did structure play in actually deciding you needed to locate 660 out of the southeast corner of 26? Did it have anything to do with that?

A. No, sir.

Q. It merely has significance in terms of the general interpretation of the formation; is that right?

A. Yes, sir, just to show the regional dip to the southeast and the importance of the fault in separating the sand trend into two separate reservoirs, because, as I indicated, the Arnold Federal is near depletion, and yet the Enron well encountered virgin pressures.

Q. If we go from your structure then into your cross-sections, it's fair to say, is it not, that the primary objective in your well and in this area is in

fact that lower Arnold sand; is that right?

A. Yes, sir.

Q. There are some secondary objectives perhaps up the hole?

A. Very minor, I would say. They're not important, I would say.

Q. So we're really talking about the Arnold sand?

A. Yes, sir, that one sand, which, I might add, took ten years of drilling before anyone else ever found it after Anadarko drilled it.

Q. If we go to your cross-section B-B', that's the well that has the log on the Power 1 "Y" on it?

MR. STOVALL: Give him a minute to unfold it.

MR. CARR: Yes.

A. No, sir. Isn't it A-A' that has --

Q. I'm sorry, it's the A-A' that's your Exhibit --

MR. KELLAHIN: 7.

Q. (BY MR. CARR) When we look at the logs you've presented on the Power 1 "Y," you didn't have an electric log through the Arnold sand; correct?

A. Correct.

Q. And so that's why you went to a mud log?

A. Yes, just to show you the interpretation.
Q. And a mud log is an interpretation of other data; correct?
A. Yes, sir.
Q. And you've looked at drilling breaks?
A. Yes, sir.
Q. And whatever the person on the rig sees come up?
A. Yes, sir.
Q. And you are projecting --
MR. STOVALL: You referred to the wrong cross-section, Mr. Carr. We got out B-B'.
MR. CARR: Now are you with us, Mr. Stovall?
MR. STOVALL: Now we have got the one that you meant, not the one that you said.
Q. (BY MR. CARR) Now, when we go to the mud log, and we take a look at the mud log, you are using this to interpret 10 feet of gross sand in this well?
A. Yes, sir.
Q. And that's based on drilling breaks and sand that was determined at the surface?
A. Yes, sir.
Q. With that information, how do you know that it's 10 feet, not 8?

A. Well, I'm just going by the drilling break on the mud log and what the mud logger indicated on the lithology column near the middle of the mud log, which I colored yellow. Can you see that?

Q. Yes.

A. And I just counted that up as 10 feet.

Q. And that's how you get the 10 feet figure?

A. Yes, sir.

Q. And you are interpreting that as a sand show; correct?

A. As a sand.

Q. Sand. If we go up this log, and I don't know how to describe it except slightly to the left of the break we were talking about, there's some areas shaded in orange. Do you see that?

A. Yes, sir.

Q. Is that also a sand show?

A. I colored in the drilling breaks orange there so that you can visually correlate them across the cross-section with the other logs. And from the lithology descriptions, you vary anywhere from sandstone to limestone, but I would interpret probably most of those would be sandstone.

Q. If we look at that, and then we move over to the log on the Enron well in 35, those orange areas

basically correlate with an area you've shaded in orange on that well; is that not true?

A. Yes, sir.

Q. But we don't have any porosity showing on the mud log, do we, on the Power 1 "Y"?

A. Well, sir, mud logs --

Q. Wouldn't show that?

A. -- don't show directly porosity.

Q. Is there any way on the mud log to know if we have it or not?

A. All you've got are the drilling breaks, the sample descriptions, and the gas shows. And there are no gas increases, which are the curves on the extreme right.

Q. Right.

A. And just as examples, I've colored in several hundred feet higher in the Middle Morrow in red where you do have gas shows that correspond to the drilling breaks colored in yellow on the left.

Q. Isn't it fair to say, though, that we don't even find porosity until we get all the way over to the Enron well in 35 in that interval that we're talking about that's shaded orange on the mud log?

A. I think that would be a fair statement, yes.

Q. So we really don't know between those two where we would first encounter porosity, do we, in that interval?

A. No, sir.

Q. And wouldn't it also apply in this 10 feet that you're indicating as Arnold sand, we really wouldn't know between that 10 feet you've shown on the mud log and the Enron well in 35 where in fact we'd actually get into a porosity zone that could produce?

A. All I could say is that it's going to be somewhere between those two wells, and I would anticipate that it would be near the Power Federal 1 "Y."

Q. But we don't know exactly where?

A. Yes, sir.

Q. You indicated, I thought you just said, there were no gas shows in the area that we've indicated with the mud log as Arnold sand; is that right?

A. In the Lower Morrow?

Q. Yes, sir.

A. None that would -- unless you considered the slight gas increase at a depth of approximately 11,184 to 11,200. You have possible reverse -- well, you have a reverse drilling break, it looks like, and

in the notation of the sample description, it indicates sandstone. So you could consider that possibly as productive sandstone. It's a small show.

Q. Anadarko actually drilled the well, did they not?

A. Yes, sir.

Q. If they considered that a sand show, wouldn't you think they would have run a case hole log on the well?

A. This was before my time. I'm not sure how they evaluated the log. This was drilled in 1978. I'm not sure what criteria they used.

Q. If I understood you, you said you thought the porosity in the Arnold sand would be somewhere between the Enron well in 35 and the Power 1 "Y" in 26; correct?

A. Yes, sir.

Q. And you said you thought it would probably be closer to the 1 "Y"?

A. Yes, sir.

Q. If that's the case, why couldn't you locate a well closer to the 1 "Y"?

A. Because you just would encounter a thin sand, more than likely, and there is a risk that it could be tight.

Q. Let's go now to your -- I'll try and get the right exhibit here -- the gross sand isopach. This is your Exhibit No. 9.

A. All right.

Q. If we compare that to the gross interval isopach, which was your Exhibit No. 8, I thought I understood your testimony to be that there really shouldn't be a material change between the two. Was that correct? Should one be basically reflective of the other?

A. I'm not sure exactly how I characterized it, but I would say that the gross sand would have to fall within what the gross interval isopach indicates to be in the channel. And I would anticipate that the axis of the two thicks would be fairly close.

Q. If I look at these, and I compare the contouring across the east half of Section 26 on the gross interval isopach with the contouring on the gross sand isopach, Exhibit 9, the contours have been turned toward the northeast?

A. Yes, sir.

Q. Can you tell me why you did that?

A. Yes, sir. You'll see that in the northwest quarter of Section 26 is the Yates well with a value of 65, on the gross interval map, and over in Section

19 to the east is a well with 45 feet, and a mile south in Section 30 is a well with 51 feet. So that 60-foot contour interval is going to have to reflect those values. And so it trends northeastward.

Q. And that's the reason you pulled it northeast?

A. Yes, sir.

Q. Do you know that that trend takes place across the south half of Section 26?

A. Yes.

Q. So, in your opinion, it would turn northeast at that point in time?

A. Yes, because it's continuing the trend from the -- the thick trend, it's continuing from the southwest, the wells in Section 8, coming through Section 4, coming through Section 35, through Section 35, through the southeast of Section 26, and it's just a natural progression carrying those on to the northeast.

Q. With all the control that you have with the Arnold sand, you have none of the actual control on the Arnold sand to the east of 26?

A. For the sand, yes. That's why this gross interval isopach where we do have values for the wells to the east in Sections 19 and 30 is important in

indicating the direction of the channel trend.

Q. From the information that you have, does the channel necessarily extend into Section 25, as you have projected it?

A. That's my interpretation.

Q. There's no actual control, though, over there that would establish where that sand ends?

A. Correct.

Q. Is it possible based on the information that you have that it doesn't extend to the northeast as it does into Section 24?

A. Yes. I have no controls. So yes, that would be a fair statement.

Q. So what we basically have here with the net sand isopach is the general shape, as you see it from this data of this sand body?

A. Yes, sir.

Q. And the actual limit of that sand body could change if there was additional drilling?

A. Definitely.

Q. And the contour that goes just south of the Power 1 "Y" might be there, it might be further south, depending on where we actually encounter porosity?

A. Yes, sir. That's the risk that Anadarko has to take.

Q. And that is the reason you're trying to move to a 660 location instead of drilling at a standard location; is that correct?

A. Correct. We already have a well, the abandoned Power Federal 1 "Y," that tested that.

Q. Because if the sand was exactly as you have mapped on your net sand isopach, in fact there would be a standard location within the sand body, albeit thinner than where you're projecting the well?

A. Would you repeat that?

Q. You could drill 660 from the east line and 1,980 from the south and still be within the area that you've mapped as being the net sand isopach?

A. You're referring to the net sand map?

Q. Yes, I'm sorry, Exhibit 10.

A. You're saying that on Exhibit 10 of the net sand isopach, if we were to drill a well 660 from the east line and 1,980 from the south line, we would have sufficient sand --

Q. I'm saying, you would be within the net sand as you've mapped it?

A. Yes, sir.

Q. So what you're doing is trying to move to the south?

A. Yes.

Q. To get a thicker portion of the sand?

A. Yes, sir, and to minimize the risk, as you understand it, the thickness of the sand.

Q. If you drilled a straight hole at a standard location, it's possible you wouldn't encounter the sand at all; isn't that true?

A. Yes.

MR. CARR: That's all I have.

EXAMINER CATANACH: I have no questions. Anything else, Mr. Kellahin?

FURTHER EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Clark, let me go back to the data for 9 and 10 with regards to the Anadarko Power Federal 1 "Y"; okay?

A. Yes, sir.

Q. When you look at Exhibit 9, you have placed the 1 "Y" at a position in the reservoir where you have 10 feet of gross sand?

A. Yes, sir.

Q. What's the basis for doing that?

A. The only available information that we have, which is the mud log.

Q. And that mud log shows to you what, sir?

A. Ten feet of gross sand.

Q. And when you put the 0 line just to the south then of the 1 "Y," what's the basis for doing that?

A. On the net?

Q. Yes, sir.

A. My interpretation is that the Power Federal 1 "Y" has no net pay in that sand. Therefore, it's a 0. Therefore, my contour -- 0 contour has to be south of that point.

Q. How far south can you move that 0 line in your spacing unit and still be consistent with the data that you've interpreted?

A. You could move it several hundred feet, I imagine, and that would make the sand body even thinner. This is an interpretation, the best of my ability, to show the extent of the sand, showing all the data available.

Q. And to the best of your ability, you've shown that 0 line slightly to the south of the Power 1 "Y," and that's your best interpretation?

A. Yes, sir.

Q. Based upon that information, are you still satisfied that the relationship of the net pay in the Arnold sand between the Enron spacing unit and the Anadarko spacing unit can be reasonably fixed based

upon this interpretation?

A. Yes. It's all consistent. It all fits together.

MR. KELLAHIN: No further questions.

FURTHER EXAMINATION

BY MR. CARR:

Q. To follow up on that, if I understood you, Mr. Clark, you said you could move that 0 contour line to the south as much as perhaps several hundred feet?

A. Yes, sir. We're realizing that this is an interpretation and that we're taking a risk in drilling.

Q. If you did that, wouldn't that mean that there was less gas under the east half of Section 26?

A. Yes, sir.

Q. Would you be the proper person for me to discuss penalty with, or will you call an engineering witness on this?

A. The engineer would be the appropriate person.

MR. CARR: All right. Save those. Thank you.

MR. KELLAHIN: Ready for the next witness?

BRAD MILLER,

the witness herein, after having been first duly sworn

upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Miller, would you please state your name and occupation.

A. Brad Miller. I'm a senior reservoir engineer with Anadarko Petroleum Corporation.

Q. Mr. Miller, WHEN and where did you obtain your degree?

A. I obtained a degree in 1985 from the University of Oklahoma, a Bachelor of Science.

Q. Summarize for us your employment experience as a reservoir engineer.

A. As a reservoir engineer, I have worked as a reservoir engineer in the Mid-Continent, south Texas, north Texas, and Permian Basin since 1989.

Q. What has been your particular involvement in this case for your company?

A. I'm assigned an area in the Permian Basin which handles New Mexico and also additionally handles the Morrow. That is based upon some of my experience with the Morrow in Kansas, Texas, and somewhat in New Mexico since October of last year.

Q. In performing your duties, do you on a regular occurrence perform engineering calculations to

determine gas in place underlying Morrow spacing units?

A. Yes.

Q. And have you done so in this case?

A. Yes.

MR. KELLAHIN: We tender Mr. Miller as an expert reservoir engineer.

MR. CARR: No objection.

EXAMINER CATANACH: Mr. Miller is so qualified.

Q. (BY MR. KELLAHIN) Mr. Miller, let me direct your attention to Exhibit No. 11. As part of your duties as a reservoir engineer, what methods were available to you in determining gas in place for the spacing units that are the subject of this hearing?

A. The information that was available were the net maps that Mr. Clark had put together and what you see in front of you, also the size of the spacing unit; additionally, data from our Arnold Federal Well was used to do most of the calculations. And just lately in the past several days we got data on the Enron well, and we tried to incorporate that data into our interpretation, also.

Q. To the best of your knowledge, have you had access to all the production information from the

wells in the immediate vicinity that would be useful to you as a reservoir engineer?

A. Yes.

Q. Before we talk about the specifics of what you've accomplished, tell us what your end conclusions are with regards to this study. What did you determine?

A. Looking at this volumetrically and also on a rate allocation decline basis, it appears, based upon the amount of gas in place for recoverable gas underneath both of the units, that Enron's production -- by October 1, with Anadarko coming on with a well hopefully is our target date of October 1 -- with no penalty, Enron will be capturing more reserves under our portion of the acreage, or from this interpretation, all of the reserves under their acreage, and by the time of abandonment, some of the reserves under Anadarko's acreage also, to the tune of about 600 million cubic feet.

Q. In making your analysis, does it matter as to where your well is specifically located within its spacing unit?

A. Yes, it does because we have related back, fee H is a -- or porosity feet is very important to look at initial rates on a well. If we end up getting

a very thin well, that would reduce our rates significantly more; therefore, Enron capturing additional reserves underneath Anadarko acreage.

Q. In order to arrive at an equity so that Enron can recover its share of the recoverable gas and thereby protect its correlative rights, but yet afford Anadarko the opportunity to do the same, what are you proposing the examiner do?

A. He approve the location of 660-660 with no penalty.

Q. Does it matter to you materially as a reservoir engineer if Mr. Clark's net pay isopach has the 0 contour line that we've recently discussed 100 or 200 feet one way or another within that spacing unit?

A. If it is moved south to reduce our reserves, yes, because they're going to capture more of our reserves under our acreage, and, again, that will make it harder to justify drilling that well, making it significantly smaller to the south.

But really it's a proportionate thing, and Enron is still producing their well and has such a lead time on their rate and their cumulative production, that by the time we get ours on and produce ours, I don't think it will make any

difference; they're still going to capture a certain amount of reserves under our acreage.

Q. What have you calculated to be the gas in place underlying the Enron spacing unit, the north half of 35?

A. I calculated a recoverable reserve of 8.5 Bcf.

Q. Excuse me. 8.5 Bcf, and that's the north half of 35, and that's recoverable gas?

A. I'm sorry. That is the total unit. If we look at just the north half of 35, that's 6.3 Bcf recoverable.

Q. Okay. 6.3 Bcf recoverable for Enron in its spacing unit?

A. Yes.

Q. Out of a container that's holding 8.5 Bcf?

A. That's right.

Q. What is your share then, the difference?

A. 2.2 Bcf.

Q. Okay. Out of Enron's share of 6.3 Bcf, how much have they already recovered?

A. They've already cum'd approximately 3 Bcf. And from decline analysis, based upon initial rates as of May, the end of May through October 1, it looks like they'll have cum'd, if they don't curtail their

wells, about 5 Bcf out of the 6.3 that is underneath their acreage.

Q. By when?

A. By October 1.

Q. By October 1, their total will be what now, 5. --

A. 5 Bcf.

Q. And that would leave them left only 1.3 Bcf in their spacing unit?

A. That's correct.

Q. And anything more than that is more than their share?

A. Exactly, based upon this interpretation.

Q. The end result of that analysis then is you recommend no penalty?

A. No penalty.

Q. What happens if there is a penalty?

A. Anadarko will lose an additional portion of those reserves, affecting our ability to possibly drill that well.

Q. Let's go through the analysis and show how you got to that point. Let's start with Exhibit No. 12.

A. Exhibit 12 is a volumetric reserve determination. This volumetric reserve determination

is just underneath our lease and Enron's lease. That would be the bottle size or the container size at this point.

If we look at the bottom of the page, under both those units, 640-acre units, our interpretation says there's 403 acres of recoverable, and that would be 8.5 Bcf, as we said earlier.

Underneath Anadarko's again, it's 2.2 Bcf. And underneath Enron's that would be 6.3 Bcf, Anadarko having 123 acres, Enron having 280 out of the 320 acres.

Q. Do you have a display that shows us the reservoir parameters that you used in making your volumetric calculation?

A. Yes, Exhibit 13. If we move to Exhibit 13, what I've put together here are the assumptions for the Cedar Lake, Power Federal, and also trying to incorporate some interpretation of the Arnold Federal into what we're looking at.

Productive sand thickness on the Cedar Lake Federal, Enron's well, is 45 feet. We predict on the Anadarko well to have approximately 37 feet.

Using the calculations for porosity, based upon basic arching equations, that is a 9 percent porosity average is what we've seen in the Enron well

with a 30 percent water saturation. That was also used on the Power Federal well, additionally.

If we look at our Arnold Federal well, we have 41 feet in that well and 11 percent porosity and about a 15 percent water saturation.

Other assumptions made were the initial pressure on the Arnold Federal well was approximately 5,100 pounds. And currently the Arnold Federal well is down to about 600 pounds shut-in pressure. And that was as of the first part of this year.

Looking at four-point data on the Cedar Lake Federal well, they are currently, or they were upon completion last unit approximately 5,100 pounds. Again, that would be virgin pressure.

Looked at abandonment pressures, which affects -- this is your recovery efficiency of approximately 500 pounds, saying that no compression would be put on the wells. That's the basic data that was used to come up with the volumetric data.

Q. Are you satisfied that you had reliable data from which to select those reservoir parameters for the volumetric calculation?

A. Yes. In looking back at -- doing work initially on the Arnold Federal and then getting some information on the Cedar Lake Federal and comparing

them, they were very close. It looks very good.

Q. Have you undertaken any decline curve analysis?

A. Yes.

Q. On the reservoir production?

A. That would give us the basis for what we see on -- what we anticipate for cumulative production in the future. We take our volumetric --

Q. That's on Exhibit 14, is it?

A. Excuse me, that is going to Exhibit 14.

Q. Okay.

A. We take our volumetric data, and then we can come back and look at a decline curve or a rate allocation scenario.

Looking at what the Cedar Lake Federal will produce by the time Anadarko brings its well on, based upon the reservoir volume that we see, again, just underneath these two units, and that's what we feel can be recovered by each one of the parties -- looking at that, we anticipate by October 1, which we anticipate Anadarko's well to be on production by, would be 5 Bcf by the Enron well, at a total of 8.5 Bcf.

That would be at initial rate currently from current production till October, from 17.4

million a day, which in May, that's what the Enron well averaged, till October, we anticipate to have about 10.8 million a day on a decline, and then Anadarko's well coming on based upon that.

How I came up with Anadarko's initial rate is with Enron's estimated rate of 10.8 million a day, by October we have a thickness that is 82 percent of what the Cedar Lake Federal is. So saying that you relate thickness to rate, which we feel is a good scenario, and I'll show you in just a minute, that we have an initial rate for the Anadarko well, 82 percent of 10.8 or 8.8 million a day.

And then we can take both wells, put them on a decline, and recover the remaining 3.5 Bcf. And that would be taking the total of the two wells, 19.7 million a day for the total production to recover the remaining 8.5 Bcf. Then I can divide that up based upon the initial rates of the Cedar Lake Well and the Power Federal Well and divide up the reserves.

Based upon that interpretation, the Cedar Lake Well will produce an additional -- from October 1, of the 3.5 Bcf left, they'll produce 1.9 of that. Anadarko will produce 1.6.

Again, we want to refer back to our volumetrics where we're showing that Anadarko has 2.2

Bcf underlying its reservoir. So that would indicate to us that Enron is going to take their share plus an additional 600 of what Anadarko would potentially have.

If we look at Exhibit 15 -- I'm just trying to --

Q. I'm not sure I followed you. When you look at the 1.6 Bcf --

A. Yes.

Q. -- that's what's left available to Anadarko as of October 1?

A. As of October 1.

Q. Out of its original 2.2 Bcf of recoverable gas?

A. Exactly.

Q. Now, the calculation shows a net pay, but the net pay is specific as to the well location?

A. Yes.

Q. So you've used 37 feet for the Anadarko well, and the 41 feet at the Cedar Lake Federal well?

A. That's correct.

Q. All right, sir.

A. If we move on to Exhibit 15, this is just to reinforce how we determined the H in this particular situation, or formation thickness can be

related back to rate. If we take the Cedar Lake well, we saw a maximum rate of 17.4 million a day on that, and that was back in May.

Also, if we take, looking at their initial four-point test, they had a test of around 17.5 million a day.

Let's jump down to the Arnold Federal where we had a test at back pressure, not on a four point, but a test that we'd run previously, our best rate was 16 million a day. And we have 41 feet. They have 45 feet of net pay. That works out very close to that 91 percent.

So we felt that those two were close enough to let us say that 82 percent or 37 feet net for the Power and 45 for the Cedar Federal would give us 82 percent; so we can come up with our initial rate of about 8.9 million a day. So that's where I came up with my initial rates.

If we look at Exhibit 16, Exhibit 16 is the decline curve that I did the predictions on. If you notice, our last mark is in May, and we have a decline that would capture -- the Cedar Lake Federal Well would capture all of the 8.5 Bcf if it stayed on that decline, but we notice at October 1 or the end of September, October 1, that it goes on a steeper

decline because we have the second well on there.

The blue line is the indication of both wells on there. So what this really tells you, if you take the area under the red curve, that's what Enron is going to produce. If you take the area between the red line and the blue line, that's what Anadarko will produce. And, again, that's 1.6 Bcf, and the Enron Federal making approximately 6.9 Bcf.

Q. If the location of the Anadarko well is approved as requested, and no penalty is imposed on that location, will Anadarko be able to produce more than its correlative share of the recoverable gas underlying its spacing unit?

A. Not based upon the bottle size of these two units, no.

Q. Exhibit 16 that is showing this cumulative total, this is the 8.5 Bcf?

A. Yes.

Q. When you look at the combined total of both lines --

A. Um-hm.

Q. -- when the Anadarko well comes on line, there's a slight change in slope of the initial well, which is the red line?

A. That's correct. That just indicates that

we're moving the reserves more rapidly.

Q. You have two straws in the container at this point?

A. That's right.

Q. So both wells are competing with each other?

A. Exactly.

Q. What's your recommendation, Mr. Miller?

A. That the Power Federal No. 2 should be approved at the 660 location with no penalty so Anadarko can have a chance to recover as much of the reserves as will be remaining at the time.

Q. And those reserves are attributable to their tract and not to taking gas away from Enron?

A. That's correct.

MR. KELLAHIN: That concludes my examination of Mr. Miller. We'd move the introduction of his exhibits 12 through 16.

EXAMINER CATANACH: Exhibits 12 through 16 will be admitted as evidence.

Mr. Carr?

EXAMINATION

BY MR. CARR:

Q. If I understand your testimony, you have concluded there are 8.5 Bcf. Is that recoverable gas

in the reservoir?

A. Yes, that's correct.

Q. If I look at any one of the plats here, Exhibit No. 11, when you talk about 8.5 Bcf, what are you talking about? Are you talking about everything east of the fault that comes across 34?

A. Just underneath our units, Anadarko's units, Enron's units.

Q. So you haven't included that little wedge of production on 34 in your calculation?

A. No, I haven't.

Q. And what you've come up with is a total of 8.5. Is that what was originally there?

A. Yes.

Q. And so you are suggesting that to protect your correlative rights, you should get your share of what was originally under the tract?

MR. KELLAHIN: I think that's not correct. 8.5 is recoverable gas, not original gas.

THE WITNESS: Not original gas in place, recoverable gas.

Q. (BY MR. CARR) Was 8.5 what was initially recoverable from these two units?

A. Yes, that's correct.

Q. And so based on your calculations under the

north half of 35, there are 6.3, or were the day the first well hit the Arnold sand -- there were 6.3 Bcf recoverable reserves under the north half of 35?

A. Yes.

Q. And that's what Enron is entitled to receive?

A. Yes.

Q. And you then have, Anadarko has, the balance or 2.2 Bcf?

A. That's correct.

Q. And they had that the day the Cedar Lake Federal No. 1 Well was completed or first produced by Enron?

A. Yes.

Q. Now, based on your recommendation, it is that by letting your well produce, unrestricted at the proposed location, you will eventually come out close to receiving or producing your fair share of the reserves?

A. Well, not close. It's over 25 percent less than what is our fair share of the reserves.

Q. But you're basing that estimate on what was recoverable the day the reservoir was first produced?

A. Yes. And that is what is entitled to Anadarko underneath their acreage.

Q. You had an opportunity to drill a well in 26 two months ago, did you not?

A. I'm not sure on that.

Q. If you had drilled a well and completed it in this reservoir on the same day that Enron drilled and completed it's Cedar Lake Federal Well No. 1 in 35, then you would have both been in the reservoir at the same time?

A. That's correct.

Q. And at that moment, there would have been, based on your calculation, 6.3 Bcf recoverable under Enron?

A. Yes.

Q. And 2.2 Bcf recoverable under the Anadarko tract?

A. Yes.

Q. But how long ago was the Enron well completed?

A. June of last year; so a year ago.

Q. So a year later, you're suggesting that we still use recoverable reserve figures a year back?

A. I would say that's not a year back. That's what is actually was in the bottle and is underlying Anadarko's acreage.

Q. When you talk about your correlative share,

you're talking about what was there initially, absent what has been drained from the reservoir in this last year in terms of recoverable reserves?

A. That's correct. But also Enron's is 6.3 Bcf based upon a year ago.

Q. Suppose you waited another year to drill a well; okay? And at the time you appeared before the Commission, Enron had produced 6.3 Bcf. Would you think they should just shut their well in at that time?

A. No. I think that at that time we would be too far behind, and Enron should be allowed to continue producing, and Anadarko produce whatever it can produce from that location.

Q. When does an operator, in your opinion, get too far behind?

A. When they're not able to produce all of their reserves.

Q. The original reserves?

A. Exactly.

Q. What if your estimate is wrong, and instead of, say, 8.5 Bcf, there's twice that, would you think at that point in time a penalty would be appropriate?

A. If that were the case, it would be proportional. Anadarko would have a larger share

under their reservoir also. And so a penalty would not be appropriate because that's going to be a fixed number. So it's just going to be proportional.

Q. So it's a fixed ratio?

A. Basically.

Q. Let me ask you, if I look at your Exhibit No. 11, it looks to me like the sand extends into Section 25, does it not?

A. Yes, it does.

Q. And who owns 25?

A. I'm not sure the lease owner.

Q. Does Anadarko?

A. No, we don't.

Q. Who's going to get the reserves in 25?

A. They will when they drill it.

Q. Would you think it would be appropriate that if your well was drilled and completed, and at some point in time you produce 2.2 Bcf, we ought to require that Anadarko shut its well in?

A. No. But I'm not asking Enron shut theirs in either.

Q. There was nothing that would have prevented Anadarko from drilling prior to this time; correct?

A. Based upon our interpretation and our work, we've moved ahead as prudently as possible.

Q. In your calculations did you factor in or take condensate into account?

A. Yes, I did. I figured that into the water saturation, just saying that that was part of the pore volume that was taken up and not gas.

MR. CARR: I have nothing further

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Miller, is a south-half dedication possible in Section 26?

A. I'm not sure. I think for our particular acreage position in the current unit that is already set up, that's why we're setting up our unit that way.

Q. Is the Enron well located at a standard location in Section 35, do you know?

A. Yes, it is within a standard location.

EXAMINER CATANACH: I don't have anything further of this witness.

MR. KELLAHIN: Nothing further, Mr. Examiner.

MR. CARR: Nothing further of the Anadarko's witnesses. I do have some witnesses.

MR. KELLAHIN: Do you want to take a break?

EXAMINER CATANACH: Yes, let's take a break

here, ten minutes.

(Thereupon, a recess was taken.)

EXAMINER CATANACH: Call the hearing back to order and turn it over to Mr. Carr.

MR. CARR: May it please the examiner, I do not intend to call a land witness. I will call our geological witness, Mr. Barry Zinz.

BARRY ZINZ,

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

EXAMINATION

BY MR. CARR:

Q. Will you state your name for the record, please.

A. Barry Zinz.

Q. Where do you reside?

A. Midland, Texas.

Q. By whom are you employed and in what capacities?

A. Enron Oil & Gas. Geologist.

Q. Have you previously testified before this Division?

A. Yes, I have.

Q. At the time of that testimony, were your credentials as a petroleum geologist accepted and made

a matter of record?

A. Yes, they were.

Q. Are you familiar with the application filed in this case on behalf of Anadarko Petroleum Corporation?

A. Yes, sir.

Q. Have you made a geologic study of the area which is involved in this particular case?

A. That's correct.

MR. CARR: Are the witness's qualifications acceptable?

EXAMINER CATANACH: They are.

Q. (BY MR. CARR) Mr. Zinz, could you tell us, is the Enron well in the north half of Section 35 drilled at the standard location?

A. It's unorthodox.

Q. How is it unorthodox?

A. It's 1240 off the north line. Surface problems, I believe, made us move away.

Q. But it is not encroaching on an offseting operator; it's just toward the center?

A. That's correct.

Q. Have you prepared certain geological exhibits for presentation here today?

A. Yes, sir.

Q. Could you refer to what has been marked Enron Exhibit No. 2, identify this exhibit, and review it for Mr. Catanach?

A. This is a Lower Morrow structure map. It's a 1 inch to 2000, contour interval, 100 feet. You see on the structure map several faults. These faults do not really pertain to the unorthodox location that Anadarko is seeking. They're on there just to show the relationship of the structure in that area.

Q. The acreage that is outlined with a yellow line, do you know what that happens to show?

A. It's our acreage that we have interest in.

Q. Just because it is outlined in yellow, that does not mean you have 100 percent of the interest?

A. That's correct.

Q. Let's move to what has been marked Enron Exhibit No. 3. Would you identify that, please.

A. This is a cross-section. And if you look at the structure map, you see cross-section A-A' runs from the Anadarko Arnold Well through the Enron Cedar Lake Well down to the Mewbourne Cedar Breaks Well.

And we see on this cross-section the Arnold sand named in honor of the Anadarko well which first found it. I have used the same terminology in the area. And the correlation also shows -- the

structural section also shows the fault that I show separating those two wells, making them separate reservoirs.

Q. Would you agree with the testimony of Mr. Clark that in fact the Arnold sand is the particular portion of the Morrow that's at issue here today?

A. That's correct. It's prolific Lower Morrow channel sand that everyone loves to find out in this area. There are another zone or two within the Lower Morrow that produces. It's pretty insignificant, as does the Middle Morrow; it produces in the area. It's also pretty insignificant.

Q. In constructing a cross-section and selecting wells for the cross-section, why did you not include the Power 1 "Y" Well?

A. I didn't have the benefit of a log that went deep enough, and I didn't have the benefit of a mud log. So, therefore, I chose to leave it off the cross-section.

Q. Did you have an opportunity during the hearing, during Mr. Clark's presentation, to review the mud log that was presented?

A. Yes, sir.

Q. And would you concur with him that it shows 10 feet of sand in the Arnold sand at the location of

the Power 1 "Y" Well?

A. No, I wouldn't. I had a difficult time visualizing 10 feet. On the mud log, it looked like the logger had logged 10 percent sand, 10 percent lime, and 80 percent shale on the basis of 100 percent samples that comes up, which doesn't indicate to me that there was just a tremendous lot of sand within that interval. And the drilling break was not what I would consider a significant drilling break.

Q. Mr. Zinz, let's move to Enron Exhibit No. 4. Would you identify that?

A. Yes, sir. This map is a net sand isopach map of the Lower Morrow-Arnold sand. And as you can see, it ties the two wells that have penetrated the sand, being the Anadarko Arnold and the Cedar Lake well that Enron drilled in the area. And it depicts a northeast-southwest direction of flow.

Q. And this was constructed like Mr. Clark's work, in reliance on well control information?

A. That's correct.

Q. How would you characterize this interpretation of the sand body as it extends into the east half of Section 26?

A. I felt like I was pretty generous with moving the sand up in the area. I do feel a little

bit better now even after looking at the mud log on the Anadarko well.

Q. Let's move now to Enron Exhibit No. 5, and what is it?

A. All Exhibit No. 5 is, it's a cum map that shows a producing zones. The wells are color-coded and the production out by it. As you can see, the two wells that stand out significantly are the Anadarko Arnold well, which, as was previously said, is just about gone. That well has cum'd, as far as my information, 7.4 Bcf, 131,000 barrels of condensate. Through May, the Enron Cedar Lakes well has produced 3.3 Bcf and 148,000 barrels of condensate.

Q. Mr. Zinz, what conclusions have you been able to reach based on your geologic study of this area?

A. What I've concluded is the fact that the Arnold sand reservoir is a small reservoir. And most of the reservoir is found in the north half of Section 35 on Enron's acreage.

Q. Will Enron also call an engineering witness to review engineering calculations based on this information and make recommendations to the examiner concerning penalty?

A. Yes, we will.

Q. Were Exhibits 2 through 5 prepared by you?

A. Yes, sir.

MR. CARR: At this time, Mr. Catanach, we move the admission of Enron Exhibits 2 through 5.

EXAMINER CATANACH: Exhibits 2 through 5 will be admitted as evidence.

MR. CARR: That concludes my direct examination of Mr. Zinz.

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Zinz, when I look at your Exhibit No. 4 --

A. Yes, sir.

Q. -- have you used a porosity cutoff for the net pay map -- the net sand, I mean?

A. This map shows a net sand map, isopach map, which I took off of a gamma ray cutoff, a 50 percent gamma ray cutoff. In this instance, however, the log in the Cedar Lake well, as well as the log in the Arnold well, exhibits almost exactly the same thickness, using an 8 percent cutoff on the logs.

Q. I want to find out from you what differences I have in methodology between you and Mr. Clark when you do the net sand map.

A. When I did the net sand map?

Q. Yes, sir. You've used the gamma ray 50 percent ATI unit cutoff?

A. Yes, sir.

Q. And he's got an 8 percent porosity?

A. Yes, sir.

Q. Help me understand if there's a material difference between the two when you contour the net sand, using those different values.

A. Like I said, essentially in this case, there would really be not much of a difference at all because both values, if you used an 8 percent cutoff --

Q. Okay.

A. -- like I said, the thicknesses are very close to the same, net sand-wise using the ATI cutoff as opposed to if you just used an 8 percent crossover.

Q. So that's not a point of material difference between the two of you that will explain the differences in the map?

A. Yeah.

Q. Okay. Are you using a different interval, or have you agreed with Mr. Clark that you have got the right interval map for the Arnold sand?

A. I think so. From what I've seen, it looks like we're pretty close.

Q. So that's not going to be a difference?
A. No.
Q. On Mr. Clark's map, he shows 41 feet of net pay in your well. Up in his proposed location, he's got 37 feet on his map.
A. Um-hm.
Q. We move down to your map, and what do we have for the net thickness at your well location?
A. Forty-nine.
Q. The 49 applies to the well, then?
A. Yes, sir.
Q. When you go up to the Anadarko proposed unorthodox location, that looks to be approximately on the 50-foot contour line?
A. Yes, sir.
Q. So at least as to that contour point for thickness of each of the wells, you're showing about the same for each of the wells?
A. Yes, sir.
Q. What's the basis for having this saddle, if you will, to the south of your well in Section 35? Why does it have that shape to the south?
A. That's just, I guess, a contouring style or whatever that I used.
Q. Your control points for doing that were

what, sir?

A. There's no wells to the south that have the sand.

Q. So you went to the nearest well that had 0 sand?

A. Yes.

Q. And do you draw the 0 line halfway between the two wells?

A. Oh, I wouldn't say it was halfway between. I'd say it was a little less maybe than halfway. But I guess what I was doing there is just, from what I know about the Lower Morrow channels, they're not really going to be, you know, really really wide. And so it was just kind of a rule of thumb, I guess.

Like I say, basically just a contouring style, probably.

Q. Your control point in the north half of 35 for the Enron well shows a net pay of 49 feet?

A. Net sand of 49 feet.

Q. Net sand of 49 feet? Within that section, there's nothing else to control any greater thickness than 49 feet, is there?

A. That's correct.

Q. What's the basis for the contour line that appears to show a little pod south of the Enron well

that's 60 feet thick? Where does that come from?

A. There again, just a contour option, contour style.

Q. As opposed to relying upon data?

A. Well, there's no data down in that direction. So, like I said, it was just the way I contoured it up.

Q. There's no justification on this map for any reservoir thickness greater than 50 feet, is there?

A. That's a fair statement.

Q. What determined for you the location of the 0 contour line on the north side of the pod that cuts across the southern portion of Section 26?

A. Like I said, I knew that the well in 26 did not -- was not completed in the Lower Morrow, and not having the benefit of any information there, I assumed there was no sand there. This is the way I interpreted it, no sand, and that's where I just arbitrarily put the 0 contour line.

MR. KELLAHIN: No further questions.

FURTHER EXAMINATION

BY MR. CARR:

Q. Mr. Zinz, there were a number of similarities that you've just noted between your

interpretation and that of Mr. Clark in terms of the thickness of the sand at particular wells?

A. Um-hm.

Q. Would you concur with Mr. Clark that no matter what your best interpretation is, it's possible you could move that 0 contour to the south, 200, maybe 300 feet?

A. Yes.

Q. What would happen to the reserves under the tract or the reservoir if that occurred?

A. Well, all I know is it would make the reservoir smaller.

Q. And what would that do to the reserves under Section 26 or the producible sands under Section 26?

A. Make that smaller, too.

MR. CARR: That's all I have.

FURTHER EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Zinz, is it equally probable that with additional data, you could move it farther north?

A. With additional data?

Q. Yes, sir.

A. With the data that I've seen, based on his mud log there, I would interpret that as -- I would

say no.

Q. If it goes farther north, then the reservoir size is bigger, isn't it?

A. If it did go further north. If it did.

Q. You told me the basis of picking the 0 line south of the 1 "Y" well was arbitrary on your part?

A. Well, I thought I was being pretty generous, considering that there was no sand, based what I knew on the well.

MR. KELLAHIN: No further questions.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Zinz, with the benefit of the mud log, would you contour your 0 line any different in Section 26?

A. Would I contour it any different in Section 26?

Q. Yes. Would you move it at all?

A. I would see any need to move it to the north at all based on what I saw on the mud log. As a matter of fact, you might could move it to the south.

EXAMINER CATANACH: I have nothing further.

MR. CARR: May it please the examiner, at this time we call Randy Cate.

RANDALL CATE,

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

EXAMINATION

BY MR. CARR:

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

A. It's Randall CATE, C-A-T-E.

Q. Where do you reside?

A. I live in Midland, Texas.

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

A. I work for Enron Oil & Gas as Project Reservoir Engineer.

Q. Have you previously testified before this Division?

A. Yes, I have.

Q. At the time of that prior testimony, were your credentials as a reservoir engineer accepted and made a matter of record?

A. Yes, they were.

Q. Are you familiar with the application filed in this case on behalf of Anadarko?

A. Yes.

Q. Have you conducted an engineering study of the general area and are prepared to make

recommendations concerning a penalty on the Anadarko well?

A. Yes.

MR. CARR: Are the witness's qualifications acceptable?

EXAMINER CATANACH: They are.

Q. (BY MR. CARR) Mr. Cate, could you refer to what has been marked as Enron Exhibit No. 6, please.

A. Yes. This is a well production and pressure data tabulation for our Cedar Lake 35 Federal No. 1 Well that is producing out of what we both call the Arnold-Lower Morrow sand.

The significance is that through May, with an estimate of production there, but it should be very close, it shows the well has produced to date 3.3 Bcf and 148,000 barrels of condensate.

Additionally, the three pressure points that we have, one being initial in June of '92, in December of '92 we did a bottom hole pressure buildup, and in May of this year, we just did a bottom hole pressure buildup, the corresponding Z factors, the pressure also corrected for the Z factor in the corresponding production at the time that the pressure points were taken.

The significance is shown really on the

next exhibit.

Q. Let's go then to Exhibit No. 7, your P/Z plot. I'd ask you to review for Mr. Catanach what that exhibit shows.

A. Okay. The previously noted pressure points and corresponding production data is shown plotted here. I'll make -- well, it shows that a total original gas in place for the reservoir of the Arnold sand would be 16.7 Bcf.

Q. Is this recoverable gas in place?

A. No. This is just gas in place. And that is also corrected for the condensate that was produced. I did that according to how Craft and Hawkins engineering handbook says, and you convert the total stream to a higher specific gas gravity, and use the corresponding Z factors of a higher gas gravity. That gives you more volume, in effect, and that's really the proper way to do it.

So this will give you then a total gas in place, and then we can use that in our volume factors of acre-feet, knowing a recoverable -- not a recoverable but a gas in place on a Mcf per acre-foot, based on porosities and other volumetric calculations, and it will tell us the size of our reservoir.

Q. Are you talking about the size of the

reservoir, that being everything east of the fault, or are you talking about just the reservoir under the spacing units which are involved in this case?

A. You will therefore have a number that is -- the 16.7 Bcf will be all reservoir between the two faults. We're saying that each fault is a separating or bounding fault.

Q. Let's move then to what has been marked as Enron Exhibit No. 8, and I'd ask you to identify and review that, please.

A. This page summarizes the Arnold sand planimeter results.

Q. This is based on Mr. Zinz' geological interpretation?

A. That's correct. We wanted to verify their engineering data, knowing the amount of gas that's originally in place. We know that then gives us a way of verifying the size of the sand that Barry had mapped.

And we went through the planimetering of the sand area between the two faults, and I've broken those down for you. We've done it by acres and also by an acre-feet calculation, for a total reservoir basis, the southeast quarter of Section 26 basis, and then the north portion of Section 35 basis.

You then take a volumetric calculation, using porosity of 10 percent, saltwater saturations of 25 percent from our log calculations, formation volume factor initially is 285. You put that in your formula for original gas in place, the first one you see here on a Mcf per acre-foot basis. You receive 931.1 Mcf per acre-foot.

Now, you want to compare that to the P/Z. We put the 17,677 acre-feet, as shown by the planimetered area between the two faults, multiply it by the recoverable 931.1 Mcf per acre-foot -- excuse me -- not recoverable but gas in place, and that equals 16.459 Bcf, which is in very close agreement with what the P/Z data tells us of the size of the reservoir.

Q. So this, in effect, confirms the accuracy of the reservoir size?

A. That's exactly right.

Q. Now, are you prepared to make a recommendation to the examiner as to how a penalty might be imposed on this location?

A. Yes. If you go through the acreage, I've done it two ways, either by acres or by acre-feet. Productive acres on the southeast quarter of Section 26, as you can see, on acre-feet up at the top again,

we did have 2,215 acre-feet. That's not much different than what Anadarko showed. Theirs was 2,631. We show 74.3 acres of just productive acres is what we would anticipate versus the area down in Section 35, we have 345.3 acres or corresponding 12,793 acre-feet.

If you proportion those, the southeast quarter of Section 26, its acres or acre-feet, compare that to the total reservoir, if you wish, or just to the north portion of Section 35, which Enron owns, these are the percentages by that comparison that Anadarko should be -- or only should be allowed to produce to capture their fair share of the gas under place, if there is any.

Q. Mr. Cate, let me ask you, when you come up with these percentages, are you talking about what is there today or what was originally there?

A. These are based on original gas in place numbers. So we're being generous again.

If you go down to our penalty recommendation on the bottom, we understand there hasn't been any set way that the Commission would enforce or even call penalties. So we've made a couple of recommendations.

One, that the Power Federal No. 2 would be

restricted to no more than 15 percent of the monthly deliverability, to be witnessed at least every three months by Commission and/or at least Enron Oil & Gas. What would be easiest to enforce and would be more fair, in my opinion, is just a daily production limit of 2,550 Mcf per day.

Q. How did you get this number?

A. It is 15 percent of the 17 million a day producing rate of our Cedar Lake 35 No. 1. Now, that will ensure that as we deplete this reservoir, they are having their 15 percent of it. And then there are no questions as to who got more or less.

Q. And that approach would honor the reserves as they stand under each of those tracts today?

A. That's correct. I would predict at our well at 17,000 Mcf a day and theirs at 2,500 Mcf a day, that a 40 percent decline would then be seen. And at a 40 percent decline, they will recover 1.8 Bcf of gas, which actually gives them a 90 percent recovery factor.

That's a very high factor for their acreage. So that would ensure their fair recovery of reserves.

Q. Did you review the net sand map presented by Anadarko in this proceeding?

A. Yes, I did.

Q. And did you look at Section 26 and estimate the number of feet of sand that would be available to them at a standard location 1980 from the south line and 660 from the east line of Section 26?

A. Say that again, as far as --

Q. Were you able to estimate from that presentation the number of feet of productive sand that would be found at a standard location 660 from the east side, 1980 from the south in Section 26?

A. Yes. They are talking off that map, their net map, they would be showing 10 foot of what they call net porosity.

Q. Do you have an opinion as to whether or not a well with 10 feet of net porosity, which would, I guess, be using an 8 percent cutoff, wouldn't they be able to make a well at that location?

A. Yes. Given today's technology, especially fracture treatments, 10 feet in a reservoir as permeable as this, our bottom hole pressure buildups have shown 40 millidarcies, and obviously by the producing rates, you can see it's got very high transmissibility. Ten feet -- five feet would probably produce fairly well-- very well, as a matter of fact.

Q. Mr. Cate, if the application is approved, and Anadarko is permitted to directionally drill and bottom its well within 75 feet of the location 660 from the south end, east lines of Section 26, is the penalty that you're recommending, either of them, necessary to protect Enron's correlative rights?

A. Yes. If there is not a penalty of this magnitude in force, Enron will be drained of their rightful reserves.

Q. Do you have anything further to add to your testimony?

A. No, I don't.

Q. Were Exhibits 6 through 8 prepared by you?

A. Yes, they were.

MR. CARR: At this time, Mr. Catanach, we move the admission of Enron's Exhibit 6 through 8.

EXAMINER CATANACH: Exhibits 6 through 8 will be admitted as evidence.

MR. CARR: That concludes my Direct Examination of Mr. Cate.

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Cate, your Exhibit No. 7 is P/Z versus Q plot?

A. Yes.

Q. This is for total recovery of the reservoir?

A. That's correct. It's total -- no, I'm sorry, it's not. It's total gas in place originally in the reservoir. There's no recovery factor included.

Q. You projected all the way down to 0 pressure?

A. Exactly, yes.

Q. Exhibit No. 8, see if I understand your methodology here. Volumetrically, you've taken the size and shape of the container the geologist provided you, and you get approximately 6.5 Bcf of gas within that size?

A. That's correct.

Q. And by P/Z versus production plot, you've determined there are 6.7 Bcf gas in place?

A. 16.7.

Q. I'm sorry, 16.7 Bcf of gas in place?

A. That's correct.

Q. So you have a pretty good handle on the size of the container?

A. Yes, that's right.

Q. You don't necessarily know the shape of that container?

A. With just these numbers, no.

Q. So the point of thickness could be different than your geologist has mapped it, and you can still have agreement on ultimate gas in place in the container?

A. Yes.

Q. In addition, we can change the location or position of that container and still have the same amount of gas in place?

A. Would you say that again?

Q. Yes, sir. If we move the isopach, the net pay isopach, if it's moved in one way or another, it's still going to have the same amount of gas, but it might be positioned differently?

A. Sure, yes.

Q. So the fact that you can volumetrically and by P/Z versus production come up with agreement in the range of 16.5 Bcf of gas does not tell you how much gas belongs to Enron or Anadarko?

A. Not that one number by itself. It lends credence and validity to what has been mapped by the geologist. And then you can planimeter, which we did, and break out each of the proration units or areas underlying each well and arrive at its share of the reservoir.

Q. Just as Mr. Miller's volumetrics are predicated upon what Mr. Clark has determined to be the size and shape of the container, so are your volumetrics predicated on your geologist's interpretation of the size and shape of the container?

A. Yes. Some of his methods were not what I would call proper engineering. You don't compensate for condensate in a saltwater calculation or something like that.

Q. That's not going to be a material difference in the net result of the volumes, is it?

A. It's turning out to be somewhere around 7 or 8 percent of the total volume, but to me it does reflect just the total accuracy of what's being done.

Q. The predicate for the penalty is based upon the assumptions of the reliability of Mr. Zinz' interpretations of the net pay isopach?

A. Yes.

Q. Tell me how the penalty works. Okay? Lead me through the calculation. What do you do? How do we get an 85 percent penalty? Did I read that right?

A. Yes, it's an 85 percent --

Q. 85 percent penalty?

A. That's right.

Q. All right. How did we get there?

A. Exhibit No. 6 shows that the Cedar Lake well is capable and actually is actually producing 17,000 Mcf per day. Under the Exhibit 8, the Power Fed penalty assessment determination in the middle of the page by acres, by acre-feet, that well is allowed, should be allowed of the reservoir less than 15 percent, but I decided to use 15 percent to be generous, a nice round number.

Q. Don't get too far ahead of me now. The 15 percent represents the north half of 35?

A. It represents the southeast quarter of Section 26, is what it represents. If you compare what that Anadarko well should be allowed to have, gas from the total reservoir either by productive acres or by acre-feet, it's under 15 percent. It is 13.94, and it is 12.53, but I used 15 as a number that could be enforceable and for calculation ease.

Q. Come back and make it simple for me. The ratio that you're reaching the percentage on is the ratio of acre-feet as compared between the southeast quarter of 26 versus the north half of 35?

A. Either that or compared to the total reservoir.

Q. All right. So if I compare it to the north half of 35, taking the southeast of 26, and using

acre-feet, it's the 14.76; right?

A. That's correct.

Q. And if I take the way your geologist has interpreted the reservoir to be, compare the southeast of 26 to the total reservoir, which is that area within the two fault lines, then it's 12-1/2 percent?

A. That's correct.

Q. So that's where the 15 percent comes from in the last paragraph on the exhibit?

A. That is right.

Q. What do you forecast to be the ultimate recovery from the Enron Cedar Lake 35-1 well?

A. It depends on several things, and I have not actually done that because it's dependent on whether an Anadarko well gets drilled here and is successful or not. A well in Section 25, the accuracy of the mapping, of course, it's not a exact science. So I have not done that specifically.

Q. Let's assume that you're the only well in the reservoir. What portion of the original 16.8 Bcf of gas are you going to get?

A. On a recoverable basis?

Q. Yes, sir.

A. It would probably be between 14 and 15 Bcf of gas equivalence. And then you have to back out

your condensate, which is about an 8 percent or so factor is what it adds to the volume. So you might then produce, say, 13 Bcf recoverable of gas and another 1 Bcf of equivalence in condensate.

Q. Okay. Have you tried to model by computer what happens if you introduce a second well into the reservoir?

A. No, I have not.

Q. What will happen in the reservoir if a second straw is introduced, as Anadarko proposes at this location? Is there not a pressure relationship between the two wells as they produce gas out of that reservoir?

A. Yes, assuming it finds the sand, I would say that they would be in communication, pressure communication.

Q. Yes, sir.

A. Is that what you're getting at?

Q. Yes, sir.

A. Yes.

Q. And if both wells are flowing at capacity, where is the approximate no-flow boundary between those two wells as they compete for the gas reserves in that reservoir?

A. Halfway in between.

Q. If we restrict the Anadarko well to only 15 percent, what happens to the no-flow boundary between those two wells?

A. It moves closer to their well.

Q. Do you know how much closer it moves?

A. No, no, I don't.

Q. Have you calculated or forecasted how much of the ultimate gas remaining to be produced in the reservoir would be produced by Enron if this penalty is applied against Anadarko?

A. I've got a -- based on a 40 percent decline, yes, that Anadarko would go on and produce 1.8 Bcf, and we would produce approximately 12 Bcf.

Q. How did you arrive at that conclusion?

A. It's strictly a 40 percent decline, and that gets me close, based on the total deliverabilities, to get to the gas in place.

Q. The minimum daily volume, the 2.5 --

A. Yes.

Q. -- what's the basis for that?

A. That is 15 percent of the Cedar Lake 35 No. 1 current actual deliverability and sales, production.

Q. That represents a minimum daily rate or the maximum?

A. That represents a maximum daily rate.

Q. That's the maximum daily rate. Do you have a recommended proposed minimum rate at which there is no penalty that will allow the well to be drilled?

A. No.

Q. And Anadarko to have a chance to recover its share of gas?

A. No, I don't have one.

Q. Are you familiar with the Division formulas that allow that opportunity in penalized situations?

A. I'm familiar with some of them, but I understand there is no set rule in how they are administered. And that's why I made this recommendation, feeling this would be easily enforceable, tangible, and has solid engineering and geologic basis for it.

Q. Do you have an example of where the Division has utilized this type of penalty in other cases?

A. No, I don't.

MR. KELLAHIN: No further questions.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Cate, your original gas in place figure seems to be considerably higher than the one arrived at by Anadarko. I realize that you've got the entire

reservoir done as opposed to just the proration units. Does that make the difference in those calculations?

A. We've got the pressure data that I don't believe they had. They were strictly going off volumetrics based on mapping without any validity or being able to prove it up with pressure data that would show the size of the reservoir.

Q. Is it a fact that you believe your calculations are more accurate?

A. Oh, yes, um-hm.

EXAMINER CATANACH: I don't think I have any others.

Mr. Carr, do you have any others?

MR. CARR: I'd like to give a brief closing.

EXAMINER CATANACH: Are you done with this witness?

MR. KELLAHIN: Sure.

EXAMINER CATANACH: The witness may be excused.

I'm going to allow brief closing statements. Mr. Carr?

MR. CARR: Mr. Catanach, Anadarko is before you, seeking authortiy to drill a well to the Arnold

sand as close as 580 feet from the boundary of the Enron tract. For the stand-up unit to be at an orthodox location, they would need to be 1980 feet back.

If we look at the Enron tract, we find that the Enron well because of surface problems is 1240 feet back from the common lease line. So, in fact, what Anadarko seeks is to be more than twice as close to the common boundary. If we listen to Mr. Kellahin's cross-examination of Mr. Cate and we project a no-flow boundary between the wells, they get a comparable well, the no-flow boundary is substantially on the property operated by Enron.

They stand before you, however, seeking no penalty, no penalty whatsoever. And they base it first on the geological presentation. Mr. Clark went through his geological study in great detail, and yet at the end in a question from Mr. Kellahin, he stated that you could move the 0 contour 300 feet to the south. You could do that.

That's interesting because when you couple that with their engineering witness, his testimony was that that probably wouldn't make any difference, even if you did move it that much to the south, because I guess things would be proportional between the two

operators on the two units.

But, Mr. Catanach, Mr. Kellahin in his cross-examination of Mr. Cate also talked about the shape of the container, and even though we may feel that -- Enron feels that the reservoir is larger, we don't know the shape of the container. And so any argument saying that we could maintain the 0 penalty just because if the reservoir was larger, it would be the same proportion in both tracts, it simply doesn't wash unless someone can show you the shape of the container.

They've come in and they've said there were originally recoverable reserves of 8.5 under the two tracts, and then they want to have you enter an order which would give them now their share of that original number. Mr. Kellahin hates for me to do this, but I have to remind you again that the OCD doesn't just sit here and try and mediate disputes. The Supreme Court finds you're a creature of statute, and your powers are defined and limited by the Oil and Gas Act. And one of the things in the Oil and Gas Act is a definition of correlative rights, and that's one of the two jurisdictional bases for your decision.

And, Mr. Catanach, the significant thing there is that the way we define correlative rights is

every single day, as to correlative rights, we wake up in a brand new world, because you are not here to guarantee to Anadarko any set volume of production from their tract. All you're required to do and all you're permitted to do is give them an opportunity to produce their fair share.

They had an opportunity to drill a well in 26 in June of 1992, in December, in March, now, or complete it in October, but we wake up in a new world the day that well is completed in October of this year. If you take any other tact, you've set a precedent whereby we never know what anyone is entitled to until the last well is drilled and the last unit of production obtained, and then we go back and adjust, I guess, unless we decide at some arbitrary point operators are too late.

It is our approach, what we've got is rules that govern the development of the Morrow in this area, and Anadarko is at least two thirds too close to us and a year too late. And when you factor those things in, the only thing you can do in honor of the definition of correlative rights as it stands in the statute is to impose a penalty. And the only penalty recommendations before you, if you act on the record, are 15 percent of deliverability or a production

figure.

Either one of those are generous because the 15 percent penalty isn't based on what we've got in October when they complete their well but what we originally had in the reservoir, or the production number is 15 percent. That's their share of the reservoir based on what we take out of based on this time forward. And it isn't a declining number. As our well declines, they still get to produce that if they can.

Those are the only things, I submit, that are before you as recommended penalties. We believe if you are to honor the Oil and Gas Act and act on the evidence before you, you can approve the application, but in so doing, you must impose a penalty to offset the advantage they are gaining on us. And the penalty, if it is going honor the data before you, should permit them to produce 15 percent of their deliverability.

EXAMINER CATANACH: Mr. Kellahin?

MR. KELLAHIN: Sounds like a smoke screen to me, Mr. Examiner. I don't see this case nearly as complicated or mystifying or unreasonable as Mr. Carr may see it.

I think what you need to do is judge the

reliability of the geologic information. We think Mr. Clark's work and detailed effort in this case is far superior to the Enron presentation. Once you make that judgment, then the case is very simple. What Mr. Carr seeks to do is to deny to Anadarko and apparently to anyone else in this small reservoir the opportunity to recover their share of the gas that underlies their spacing unit. It's a very clever strategy to get in the small reservoir and then to puff and scream that we should not have an opportunity to get our share.

What you do by imposing a penalty on us is simply use the police powers of the State of New Mexico and give our share of the recoverable gas to Enron. That's not permitted. It's not fair. And it should not be done.

We would request that you give us an opportunity to submit a proposed order to you that cuts through some of this smoke screen and articulates for you how you should resolve this case in our favor.

EXAMINER CATANACH: That's fine, Mr. Kellahin.

Mr. Carr, would you like to submit a draft order?

MR. CARR: We'd be delighted to.

EXAMINER CATANACH: Okay. Is there

anything further in this case?

MR. CARR: Nothing further.

EXAMINER CATANACH: There being nothing further, Case 10719 will be taken under advisement.

CERTIFICATE OF REPORTER

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

I, Deborah O'Bine, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that I caused my notes to be transcribed under my personal supervision, and that the foregoing transcript is a true and accurate record of the proceedings of said hearing.

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 29, 1993.

Deborah O'Bine

DEBORAH O'BINE
CCR No. 63

OFFICIAL SEAL
DEBORAH O'BINE
NOTARY PUBLIC-STATE OF NEW MEXICO
My Commission Expires Sept. 19, 1994

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10719, heard by me on July 17, 1993.

David R. Catanach, Examiner
Oil Conservation Division

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING)
CALLED BY THE OIL CONSERVATION)
COMMISSION FOR THE PURPOSE OF)
CONSIDERING:) CASE NO. 10719

APPLICATION OF ANADARKO PETROLEUM CORPORATION

REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING

BEFORE: William LeMay, Chairman
Gary Carlson, Commissioner
Bill Weiss, Commissioner
Florene Davidson, Senior Staff Specialist

November 10, 1993

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission on November 10, 1993, at Morgan Hall, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Deborah O'Bine, RPR, Certified Court Reporter No. 63, for the State of New Mexico.

CHAIRMAN LeMAY: Good morning. This is the Oil Conservation Commission. My name is Bill LeMay. On my left is Commissioner Bill Weiss, on my right Commissioner Gary Carlson, representing the Commission of Public Lands, State of New Mexico.

We will begin by calling Case No. 10719.

MR. STOVALL: The Application of Anadarko Petroleum Corporation for directional drilling and an unorthodox bottomhole gas well location, Eddy County, New Mexico.

Applicant has requested this case be continued to the January Commission hearing, January 1994.

CHAIRMAN LeMAY: Without objection, Case No. 10719 will be continued to the January hearing.

CERTIFICATE OF REPORTER

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

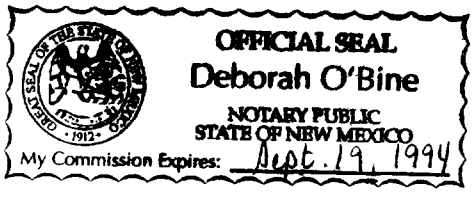
I, Deborah O'Bine, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that I caused my notes to be transcribed under my personal supervision, and that the foregoing transcript is a true and accurate record of the proceedings of said hearing.

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, November 10, 1993.

Deborah O'Bine

DEBORAH O'BINE
CCR No. 63



STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION FOR THE PURPOSE OF CONSIDERING: APPLICATION OF ANADARKO PETROLEUM CORPORATION	CASE NO. 10,719

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING

BEFORE: WILLIAM J. LEMAY, CHAIRMAN
WILLIAM WEISS, COMMISSIONER
JAMI BAILEY, COMMISSIONER

FEB 11 1994

January 13, 1994

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission on Thursday, January 14, 1994, at Morgan Hall, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

* * *

NEW MEXICO OIL CONSERVATION COMMISSION

COMMISSION HEARING

SANTA FE, NEW MEXICO

Hearing Date JANUARY 13, 1994 Time: 9:00 A.M.

NAME	REPRESENTING	LOCATION
Maurice Trimmer	Byram Co.	SF
Bruce D Stubbs	Armstrong Energy	Roswell, NM
Mike Boling	" "	"
Steve Seamer	Cambre Court Reporting	Santa Fe
William F Carr	Campbell, Carr, Berge + Sheridan	Santa Fe
W. Kellahin	Kellahin & Kellahin	Santa Fe
DAVE BONEAU	YATES PETROLEUM	ARTESIA
James Bruce	Hinkle Law Firm	SF
Grant Richardson	Yates Petroleum Corporation	Artesia
Brent May	" " "	"
Ernest L Carroll	Lowe Law firm	Artesia
Randy G. Patterson	Yates Petroleum	Artesia
Bill Brancheau	Read & Stevens	Roswell
John Mabry	Read + Stevens	Roswell
Tommy Roberts	Tansey Law Firm	Farmington
Kevin McCord	Robert L. Bayless	Farmington

NEW MEXICO OIL CONSERVATION COMMISSION

COMMISSION HEARING

SANTA FE, NEW MEXICO

Hearing Date JANUARY 13, 1994 Time: 9:00 A.M.

NAME	REPRESENTING	LOCATION

I N D E X

January 13, 1994
Commission Hearing
CASE NO. 10,719

* * *

A P P E A R A N C E S

FOR THE COMMISSION:

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Santa Fe, New Mexico 87504-2208
By: WILLIAM F. CARR

* * *

WHEREUPON, the following proceedings were had at 9:13 a.m.:

CHAIRMAN LEMAY: We shall now call Case Number 10,719.

MR. STOVALL: Application of Anadarko Petroleum Corporation for directional drilling and an unorthodox bottomhole gas well location, Eddy County, New Mexico.

CHAIRMAN LEMAY: Mr. Kellahin?

MR. KELLAHIN: Mr. Chairman, I'm Tom Kellahin of the Santa Fe Law firm of Kellahin and Kellahin, appearing on behalf of the Applicant.

MR. CARR: May it please the Commission, my name is William F. Carr with the Santa Fe law firm Campbell, Carr, Berge and Sheridan. I'd like to enter my appearance on behalf of Enron Oil and Gas.

CHAIRMAN LEMAY: Thank you, Mr. Carr.

Mr. Kellahin, you may proceed.

MR. KELLAHIN: Mr. Chairman, we're proposing on behalf of the Applicant to dispose of this appeal by having the Commission enter a modifying order.

It might help me expedite my explanation to share with you one of the hearing exhibits, not to have you draw any conclusion about the difference of opinion on the location of the reservoir on this isopach, but to show you the position of the parties with regards to that reservoir.

Let me show you what was Anadarko Exhibit 11.

When we presented this case to Examiner Catanach back in June, Mr. Carr and his client Enron opposed the Application.

What Anadarko was seeking to do was to avoid a surface problem. There was some surface feature in the east half of Section 35. I believe it was a small pond. Whatever it was, they had to start at a surface location and then directionally drill. They were proposing to directionally drill to an unorthodox bottomhole location to test the Morrow.

The effort was to offset Enron's well in that Arnold sand of the Morrow formation. And they were proposing to find a bottomhole target that was 660 out of the south and east corner of Section 26.

Examiner Catanach approved the directional drilling of the well. He imposed a production penalty on the well.

The Applicant then chose to do two things: One, to commence drilling of the well, and at the same time file for a *de novo* hearing to contest the level of penalty.

Mr. Carr's client sought an 85-percent penalty. Anadarko proposed no penalty. Examiner Catanach imposed a 66-percent penalty. And there was a lot of discussion about the penalty.

Anadarko commenced the well, drilled it, got to the Morrow formation and was unable to make a successful Morrow completion. They did find some uphole potential in the well and, with notification to the Division, elected to test the Strawn.

And there were letters issued by the Director of the Division with notice to Mr. Carr in which we got approval to conduct an initial test on the Strawn.

The initial four-point test, I believe, showed this to be a gas well in the Strawn. They subsequently produced it for a short period of time, and it in fact has turned into a high-GOR oil well.

With that background, then, what we're proposing to do today is to submit to you an order which will allow us to dedicate a 40-acre tract -- it's unit letter P -- to the Strawn oil pool for 40-acre oil spacing. This well at that depth is standard insofar as it is 330 setback from the side boundaries. I can give you the exact footage by looking it up.

And because there is a directional drilling component to the approval, we need to have you amend the Examiner Order to delete the Morrow findings and conclusions, because that is now moot, it is of no concern to us, and to modify that Order so that we might now produce this well, having drilled it directionally.

And this would then be a standard 40-acre oil well in the Strawn, and we're subject to the depth bracket allowable and the statewide 10,000-to-1 gas/oil ratio.

And so rather than take this back to an Examiner and reopen the Examiner case, we thought we might expedite the process by taking this opportunity to simply have the Commission amend the Order based upon that representation.

I've communicated this request back to Mr. Carr in mid-December, and I believe he's had an opportunity to discuss this with his client and provide you his point of view.

For reference, I have copies of the Examiner Order, and I have drafted and shared with Mr. Carr a proposed Commission modification of that Order which would accomplish what I'm asking you to do.

CHAIRMAN LEMAY: Mr. Carr?

MR. CARR: May it please the Commission, Enron Oil and Gas Company has no objection to, obviously, a standard well location in the Strawn oil formation, and we do not oppose Mr. Kellahin's suggestion that the Examiner Order be amended so that they don't have to go back and have an additional hearing simply for the directional drilling portion of the case.

The one thing I would like to emphasize on behalf of Enron is, if something should happen and this should

become a gas well, then it would be at an unorthodox location. At that time we would, of course, want to pursue the penalty question with you.

But with the well as an oil well at a standard location, we have no objection to an amended order being entered approving the directional drilling and this location for a Strawn oil well location.

CHAIRMAN LEMAY: Commissioner Weiss?

COMMISSIONER WEISS: I have just a question. Can this be handled at the District level?

CHAIRMAN LEMAY: You're not having any witnesses -- is that right? -- for --

MR. KELLAHIN: No, sir.

CHAIRMAN LEMAY: Would you accept some questions on behalf of the Commissioners that aren't familiar with the case?

MR. KELLAHIN: I'll do my best to answer the questions.

CHAIRMAN LEMAY: Okay. Mr. Weiss?

COMMISSIONER WEISS: Yeah, I don't understand the rules here. It seems to me like this could be handled at the District level.

CHAIRMAN LEMAY: At the Examiner level? I think --

COMMISSIONER WEISS: No, not even -- Before the

Examiner. Why do you have to have a hearing?

MR. KELLAHIN: The District would not have authority to amend the Division Order by which we have drilled the well, and which now we need to modify in order to properly produce it.

COMMISSIONER WEISS: You can't just do away with that Order and say it's --

MR. KELLAHIN: In effect, that's what I'm doing. I'm asking this Commission to --

COMMISSIONER WEISS: Is this the way you have to do it?

CHAIRMAN LEMAY: Yeah, because it's a valid order in place. What we have to do is either abide by that Order or, if there's a modification, modify the Order.

But because it's a Commission case now, the Commission has to modify the Division Order; is that correct?

MR. KELLAHIN: That was my recommendation to you. I think it's the most expeditious way to do it.

MR. STOVALL: I agree. I think that had it not been brought *de novo* before the Commission, it could have been --

CHAIRMAN LEMAY: -- with an Examiner.

MR. STOVALL: Once it was here, it made sense just to do that, and...

COMMISSIONER WEISS: Thank you.

CHAIRMAN LEMAY: I have a question only to probe this area a little further, anticipating what may happen in the future.

If you've got a -- In this particular area you have a high-GOR oil well, but you don't have enough information, maybe, to -- Could this be a retrograde condensate reservoir with maybe the possibility of 160-acre spacing, and then you're proposing 40-acres now?

MR. KELLAHIN: It may well be. But I think the process is that we are committed to 40-acre oil spacing until there's data, and then the Applicant needs to file a case before the Division and ask for the creation of a special pool, either a standard 160 gas pool or some type of retrograde gas condensate reservoir with special rules and special GORs.

But that then requires us to notify Enron, and we go to the Examiner hearing and we put on our technical case. And until that occurs, then, Anadarko is subject to the statewide 40-acre oil rules.

MR. CARR: We have no objection to what Mr. Kellahin is proposing. We just want to be sure we don't waive the right, if this becomes a gas well, to come back at a later date.

CHAIRMAN LEMAY: Well, it was mentioned 10,000 to

1. Aren't we operating with 2000-to-1 GOR, without a special hearing in that area?

MR. KELLAHIN: I believe that's the number.

CHAIRMAN LEMAY: I thought you just said 10,000 to 1, and I read 10,000 to 1.

MR. KELLAHIN: I may have misspoken. I think it's 2000 to 1, times the depth bracket, which is about 365 a day, I think, at more than 10,000 feet.

CHAIRMAN LEMAY: Right. So it's my understanding that with a modification of the Order, you will be operating under the standard 40-acre spacing, 2000-to-1 GOR limitations until you come before the Division with more information and a subsequent request to either reclassify this as a retrograde condensate reservoir or live with the 2000-to-1 GOR.

MR. KELLAHIN: Mr. Chairman, that's what I've advised my client.

CHAIRMAN LEMAY: And that's what both of you are stipulating to?

MR. CARR: Yes.

CHAIRMAN LEMAY: Are there any questions on that?

COMMISSIONER WEISS: Yes.

CHAIRMAN LEMAY: Yeah.

COMMISSIONER WEISS: What's the data, what's the criteria that you use to determine whether it's a gas or a

retrograde gas or an oil reservoir?

MR. KELLAHIN: Commissioner Weiss, usually the initial analysis by the reservoir engineers is to take fluid samples and have the laboratory do some PVT analysis on the fluids and the compositions of the hydrocarbons. And from that, then, they conduct their reservoir studies and use that as the predicate, then, for filing an application.

COMMISSIONER WEISS: Has that been done?

MR. KELLAHIN: It has not been -- I think fluid samples have been taken, Commissioner Weiss. I don't know the results of that effort.

COMMISSIONER WEISS: Thank you.

CHAIRMAN LEMAY: Yeah, I have no problem. I just would like to, I guess, state in the way of advice, follow Mr. Weiss's -- He's the engineer.

Get fluid samples, get as much information as you can, so that we can start off on the right track here, recognizing you've got the Lusk Strawn field very close by that is on 160-acre spacing, and it would behoove you as operators in the field to look at those -- that situation, so you start out right.

MR. KELLAHIN: I think all parties in this area are acutely aware of that concern and the need for the data, and I believe that data is being gathered.

CHAIRMAN LEMAY: Great, I think that's all we could ask for.

Thank you very much, Mr. Kellahin.

Is there anything more on this case? If not, it will be taken under advisement.

(Thereupon, these proceedings were concluded at 9:24 a.m.)

* * *

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 Commission 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 January 18th, 1994.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1994