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

9 April 1986

COMMISSION HEARING

IN THE MATTER OF:

Application of Monsanto Company for an unorthodox gas well location, dual completion, and simultaneous dedication, Eddy County, New Mexico. CASE 8758

BEFORE: Richard L. Stamets, Chairman
Ed Kelley, Commissioner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division: Jeff Taylor
Legal Counsel to the Division
Oil Conservation Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant: Owen M. Lopez
Attorney at Law
HINKLE LAW FIRM
P. O. Box 2068
Santa Fe, New Mexico 87501

For the State Land Office: Louhannah M. Walker
New Mexico State Land Office
P. O. Box 1148
Santa Fe, New Mexico 87504-1148

A P P E A R A N C E S

For Amoco Production: William F. Carr
Attorney at Law
CAMPBELL & BLACK P. A.
P. O. BOX 2208
Santa Fe, New Mexico 87501

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MR. STAMETS: We'll call Case 8758, application de novo Monsanto Company for an unorthodox gas well location, dual completion, and simultaneous dedication, Eddy County, New Mexico.

We'll call for appearances in this case.

MR. LOPEZ: Mr. Chairman, may it please the Commission, my name is Owen Lopez with the Hinkle Law Firm in Santa Fe, New Mexico, appearing on behalf of Monsanto Oil Company, and I have three witnesses to be sworn.

MS. WALKER: May it please the Commission, I'm Louhannah Walker. I represent the Commission of Public Lands, Santa Fe, New Mexico, and I have two witnesses to be sworn.

MR. CARR: May it please the Commission, my name is William F. Carr, with the law firm Campbell & Black, P. A., of Santa Fe.

We represent Amoco Production Company in opposition to the application of Monsanto, and we have one witness.

MR. STAMETS: Any other appearances in this case?

I'd like to have all of those

who are going to be witnesses stand and be sworn at this time, please.

(Witnesses sworn.)

MR. LOPEZ: Mr. Chairman, as a preliminary matter, I would like to call to the Commission's attention and for the record that as of March 31st Monsanto Oil Company amended its corporate title and with the Secretary of State of the State of Delaware, changing its name to BHP Petroleum Company, Inc..

MR. STAMETS: To who?

MR. LOPEZ: BHP Petroleum Company, Inc., which is a wholly owned subsidiary of Growth Infill Proprietary, Limited, an Australian corporation.

MR. STAMETS: Effective what date?

MR. LOPEZ: March 31st.

So if you feel this will need readvertisement, I'll leave that to the Commission, but the change in operator forms and all the rest have not begun to be in the process of transferring --

MR. STAMETS: Is what we have here simply a name change, still the same corporation?

MR. LOPEZ: It's still the same

corporation that belongs to a new company. (Not clearly audible.)

MR. STAMETS: I personally do not see any problem with that, so unless there is an objection we will proceed.

MR. LOPEZ: And there's one other housekeeping matter, if it please the Commission.

The advertisement with respect to simultaneous dedication was incorrect and to the extent it's necessary we withdraw that because that's not an issue.

MR. STAMETS: Okay.

KEVIN T. PFISTER,

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

DIRECT EXAMINATION

BY MR. LOPEZ:

Q Would you please state your name and where you reside?

A Kevin T. Pfister. I reside at 3804 Willingham, Midland, Texas.

Q By whom are you employed and in what capacity?

A I'm employed by BHP Petroleum Company,

Inc., in Midland.

Q Have you previously testified before the Commission and had your credentials as an expert landman accepted as a matter of record?

A I testified in the previous hearing on this case at the Examiner level.

Q Would you, then, briefly describe your educational background and work experience?

A All right. I have a Bachelor of Arts in zoology, which I obtained in 1975.

I also have a Bachelor of Science obtained in 1975 in education from the University of Wyoming.

In 1978 I received my law degree from the University of Wyoming.

In 1979 I began working as a landman for Cities Service in Tulsa and was transferred to Midland six months later.

I've been with Monsanto Oil Company now for close to six years, which is now BHP.

And I'm presently a Senior Landman with that company.

Q Are you familiar with the application of Monsanto in Case Number 8758?

A Yes, I am.

MR. LOPEZ: Are the witness'

qualifications acceptable?

MR. STAMETS: They are.

Q Mr. Pfister, I refer you to what's been marked Exhibit Number One and ask you to describe and explain it.

A Exhibit Number One is a land plat which denotes the area that we'll be discussing today. Primary focus is directed into the southeast part of it; that's where we'll be primarily discussing today.

The map denotes a section which has been outlined in red, Section 36, Township 21 South, Range 23 East. Within that section you'll note that there's a well there called the Lowe's State Well No. 1, which Monsanto is the operator of. That well has watered out.

In that section you'll see that there is some acreage that has been colored yellow. That acreage, as well as other acreage on the map which has been colored yellow, that's basically Monsanto's lease and it's a rather spread out lease and that's -- that's why the plat is so big here.

The other lease is a Maralo lease and, like I said, we are the operator of the unit.

Also on the map you'll see a red arrow. That denotes the location for our proposed replacement well, the Lowe State Well No. 2. That well is to be located 330

feet from the south line and 330 feet from the west line.

The second area I want to discuss is the acreage which lies around Section 36.

In Section 35, Township 21 South, Rang 23 East, is a lease that Amoco is the operator of. On that lease is the Federal "CS" Well No. 1.

I might go back, Section 36 is a State-owned section.

Section 35 is a Federal, Federal acreage.

In Section 2, Township 22 South, Range 23 East, there is a well located on the property called the Monsanto Conoco State Well No. 1. That unit consists of two State leases and in Section 1, Township 22 South, Range 23 East, ARCO is the operator of that unit. It is called the Smith Federal well. That well has also watered out.

That acreage is also Federal acreage.

At this time I'd like to discuss the spacing and the standard location requirements under the rule.

The standard gas pool units in the Indian Morrow Gas Pool, the Indian Basin Upper Pennsylvanian Gas Pool, is 640 acres.

The standard location for any well drilled within these formations is 1650 feet from the lease lines and no closer than 330 feet to any governmental quar-

ter quarter section.

Q Does that conclude your testimony?

A Yes, it does.

Q Was Exhibit One prepared by you or under your supervision?

A Yes, it was.

MR. LOPEZ: Mr. Chairman, I tender Monsanto's Exhibit Number One.

MR. STAMETS: The exhibit will be admitted.

MR. LOPEZ: That concludes our questions of this witness.

MR. STAMETS: Are there questions of the witness? Mr. Carr.

CROSS EXAMINATION

BY MR. CARR:

Q Mr. Pfister, what the two primary objectives in the proposed well?

A I think they're Morrow and Upper Pennsylvanian.

Q And your testimony as to the spacing would apply to each of those pools.

A Yes.

Q If I understood your testimony, if we

look at the proposed location, it's offset to the west by a tract that's Federal acreage.

A Yes.

Q To the south by Federal acreage and to the southwest by State acreage.

A That's correct.

MR. CARR: I have no further questions.

MR. STAMETS: Any other questions of the witness?

He may be excused.

MR. LOPEZ: Mr. Chairman, I now call Bill Morris.

WILLIAM J. MORRIS,

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

DIRECT EXAMINATION

BY MR. LOPEZ:

Q Will you please state your name and where you reside?

A My name is William J. Morris and I reside in Midland, Texas.

Q By whom are you employed and in what cap-

acity?

A I'm a petroleum geologist employed by BHP Petroleum Company.

Q Are you familiar with the application of Mansanto in Case Number 8758?

A Yes, sir, I am.

Q Would you briefly describe your educational experience and work experience, as well?

A I have a Bachelor of Science in mathematics from Superior State College.

I have a Bachelor of Science and a Master of Science in geology from Michigan State University.

I have seven and a half years of experience as a petroleum geologist, working in Midland, Texas, the last five years of which have been with Monsanto Oil Company.

Q Did you previously testify in the original hearing in this case and have your qualifications as an expert petroleum geologist accepted?

A Yes, sir, they were.

MR. LOPEZ: I offer Mr. Morris as an expert petroleum geologist.

MR. STAMETS: Without objection he's considered qualified.

Q Mr. Morris, I refer you to what's been

marked Monsanto's Exhibit Number Two and ask you to identify and explain it, please.

A Exhibit Number Two is a structure map on top of the Cisco formation in the area of the Indian Basin Field.

I'd like to point out that the field is defined by a fault marked with the dotted line on the western portion of the map. It is controlled by lateral facies changes from dolomite to limestone to the north and to the south, and it is controlled down dip by water production.

You can see on the map the two shaded portions, a blue area and a red area.

The blue area is that portion of the reservoir that was watered out prior to 1976 and the blue colored wells are the wells that control that information.

The red colored area is that area that has seen the water encroachment up to the first part of 1986 and the red colored wells are those that have watered out prior to 1986, and the wells colored in green are those wells that are making currently bettern than 20 barrels of water per day and should be the next wells to water out.

I'd like to point out that the lease in question is colored in yellow. That is Section 36 of Township 21 South, Range 23 East. On that section is the Monsanto No. 1 Lowe State and Monsanto is applying for an

unorthodox location that's located 330 from the south and the west lines of that section to replace our current well.

This location is optimally located to recover the remaining reserves that exist under our lease and we are asking for the right to produce the reserves that are under our lease.

Q I now refer you to what's been marked Exhibit Number Three and ask you to identify and explain that.

A Okay. Exhibit Number Three is a northeast/southwest structural cross section that goes through Monsanto's lease and the center well in that cross section is the Monsanto No. 1 Lowe State.

You can see a red shaded portion on that cross section. This is the area that has been invaded by the water and the blue shaded portion of the cross section is that part of the reservoir that is still producing gas and has not been invaded by the water.

The original gas/water contact of -3750 is shown by a red line that goes through the red portion of that cross section.

As you can see, the water has risen approximately 200 feet within the reservoir.

Q Now I ask you to turn to what's been marked Exhibit Number Four and explain and identify it.

A Exhibit Number Four is an Ispach map of

the Cisco reservoir. The parameters used to construct this map was a 3 percent porosity cutoff of all the footage within the reservoir above the original gas/water contact.

As you can see, Monsanto's well had 111 feet of porosity better than 3 percent above the original gas/water contact.

The main purpose of this exhibit is that it was used by our Engineering Department to calculate volumetric and reserve calculations.

Q Okay. I now ask you to refer to what's been marked Exhibit Number Five and identify and explain that.

A Okay. Exhibit Number Five is a structure map of the Morrow formation in the Indian Basin Field. Monsanto's lease in Section 36 again is colored in yellow and all producing Morrow wells are colored green, with the cumulative production from each of these wells written in red and you can see Monsanto's well produced 1/2 of a BCF and 1000 barrels of oil prior to being shut-in in 8 of 1984.

I would like to point out that the Morrow is the secondary objective in this application. If we were to -- a primary location for the Morrow here would be located on the eastern portion of Section 36 that would be closer to the Flag-Redfern well that made 3.1 BCF of gas.

As I mentioned, the Monsanto well is a

poor producer, having only 1/2 a BCF and we do not anticipate making great reserves in the unorthodox location that we have proposed but would like to drill it to there and prevent any waste and produce the Morrow formation here.

If a good well is encountered, it will only help offsetting operators by proving up their acreage as well.

Q Do you have an opinion as a result with respect to what sort of penalty factor the Commission should consider for Morrow production in the event it approves your application for unorthodox well location?

A It's my opinion that the Morrow location -- the proposed location is very risky for Morrow and it really should be considered as a wildcat well and that if any penalty should be imposed, it should be imposed against statewide rules as opposed to field rules of the Indian Basin Pool.

Q Were Exhibits Two through Five prepared by you or under your supervision?

A Yes, sir, they were.

MR. LOPEZ: Mr. Chairman, I'd like to tender Monsanto's Exhibits Number Two through Five.

MR. STAMETS: Any objection?

MR. CARR: No objection.

MR. STAMETS: The exhibits will

be admitted.

Q Does this conclude your testimony, Mr. Morris?

A Yes, sir.

MR. LOPEZ: We have no further questions of this witness.

MR. STAMETS: Are there questions of Mr. Morris?

Mr. Carr.

CROSS EXAMINATION

BY MR. CARR:

Q Mr. Morris, I would direct your attention first to your Exhibit Number Two. As I understand your testimony, the area shaded in red is the area that has watered out prior ot 1986?

A Right; prior to the first portion of this year, so my information that I had available to me.

Q And this is your interpretation based on the data that you have available to you.

A Right; correct.

Q If we go to the well in Section 23, the well which is shaded in green, you have drawn the watered out area and your interpretation runs virtually through that well spot, is that correct?

A That is correct.

Q And that well as the present time is producing water.

A Yes, it is.

Q In fact, that well is producing about 58 barrels of water a day, isn't that correct?

A The information I have, that may be correct, is 1730 barrels of water a month; that may calculate to the same number.

Q So you've placed the -- your interpretation places the oil/water contact, or gas/water contact, at that particular point.

If we drop down to Section 6 to the south and east of the proposed location, there also is a well in that section that has been shaded green, is that correct?

A That is correct.

Q That well is also producing water, is it not?

A Yes, it is.

Q That well is making approximately how many barrels of water a day, if you know?

A For November of 1985 that well made 982 barrels in that month of water.

Q Even though that well is producing 982 barrels of water a month in November, you have decided to

place the contact substantiallyl south of that.

A I wouldn't call that substantially south. It's -- you know, there is a little bit of room for interpretation in that; could put that water right through that area or closer to it, if you desired.

Q In essence, a different geologist with different -- with the same facts would construct a different interpretation.

A But basically this is not interpretation.

Q But some other geologist might read it differently.

A Perhaps a little bit differently, yes.

Q Now the proposed location is 330 feet from the common lease line separating Sections 35 and 36. That's approximately 80 percent closer to the lease line than is permitted by the special pool rules for the Cisco in this area, isn't it?

A I believe that is probably correct based on linear basis.

Q It also would be 80 percent too close to that common lease line in the Morrow formation, would it not?

A Yes.

Q By moving to this location Monsanto is

able to locate that well at virtually the highest structural point practical in Section 36.

A Based on my interpretation that is correct; that would be the optimum location to recover any reserves that remain on our lease.

Q Could we go now to your Exhibit Number Three, which is the cross section.

As I understand what you've done here, is the area that is shaded in red is that portion of the reservoir in this area that has experienced -- well, let's see, there's a red line that shows the original gas/water contact and then the area above that shaded in red is the area that has experienced water encroachment.

A That is right.

Q And the top of the red is the current gas/water contact.

A Right.

Q And the red line in the center of the red section is the original gas/water contact.

A Correct.

Q Now on this log -- on this well -- on this cross section you have logs for the Amoco well in Section 35 and also the Monsanto well, old Monsanto well in Section 36. Have -- could you -- will you look at the quality of the pay section in each of these two wells and in

terms of the quality of the zone itself, these zones are fairly comparable, are they not?

MR. STAMETS: Mr. Carr, my cross section, I don't believe has the well in 35.

MR. CARR: All right. All right.

Q Mr. Morris, have you reviewed the log on the Amoco well in Section 35?

A Yes, sir, I have.

Q And have you compared that to the Monsanto well in Section 36, and the pay sections are fairly comparable, are they not?

A Yes, they are.

Q How many feet of pay are there in the Monsanto well in Section 36?

A Based on a 3 percent cutoff, which is shown on the -- my, I believe it's Exhibit Number Four, the Cisco net pay Isopach, I have 111 feet of porosity, of net pay.

Q I'm sorry I couldn't hear you.

A 111 feet.

Q That is the Monsanto well.

A Right.

Q If we go again to Section 35 now and look at the feet of pay in the Amoco well, you have 264 feet of

pay, do you not?

A That is correct.

Q So you have a larger section over in Section 36 to -- I'm sorry in Section 35 than you do in Section 36.

A Yes. I'd like to point out a couple of important facts concerning those two wells.

Based on a 3 percent cutoff above the net -- above the original gas/water contact, Amoco's well does have 264 feet of net pay and Monsanto's well in Section 36 has 111 feet.

3 percent has generally been accepted by most operators in the field as the accepted cutoff value.

If one were to use a 6 percent cutoff in this field Amoco's well would have 59 feet of net pay above the original gas/water contact and Monsanto's well would have 70 feet above the gas/water contact, and the best porosity based on the sonic logs of these two wells, Amoco's best porosity is in the range of 8 to 10 percent and Monsanto is in the range of 12 to 15 percent.

Q But the standard figure that is used by the industry, according to your testimony, is 3 percent.

A That has been generally what has been presented before the Commission, yes, sir.

Q Now, Mr. Morris, the Amoco well in Sec-

tion 35 is also at a structurally higher position than the Monsanto, is that not true?

A That is correct.

Q And it is farther away from water encroachment.

A Yes, that is correct.

Q Now if we looked at your Exhibit Number Four, which is your Isopach of the area, this is an Isopach above the original gas/water contact, the red line that runs through the center of the area shaded red on Exhibit Three.

A Correct.

Q Have you prepared an Isopach map, or mapped the portion of the reservoir that is above the current gas/water contact?

A I have made one but I have not -- I do not have it at my disposal here.

Q There would be substantially less acreage or less substantially less reservoir above the current gas/water contact than above the original.

A That's right.

Q If we go to Exhibit Number Five, your structure map on the Morrow, you depicted a Morrow -- a fault traversing Section 36, crossing the northwest quarter of 36 and the southeast quartaer of 35.

Has any well in the area actually cut

this fault?

A Not to my knowledge.

Q This is your interpretation based on the general trends in the area as to the location of the fault.

A Right.

Q And it's possible that that fault might be further to the west or further to the east.

A That is correct. That is very subject to interpretation.

Q Is there any evidence that you have to show that this is in fact a sealing fault?

A No, sir, I do not.

Q Now, if we look at the Morrow reservoir, this is a -- would you characterize this as a homogeneous reservoir?

A The Morrow?

Q Yes.

A No, it consists of very thin lenses of sandstone that were deposited as delta sands and I would not consider them to be very continuous in this area.

Q In fact, if you get a Morrow well it depends on whether or not you're successful in intercepting one of those lenses, isn't it?

A That, as well as structural position, is -- both are very important factors.

Q It's possible that you can drill one Morrow well and have a very poor producer and offset it with one that will be very good.

A That is very -- quite possible, yes.

Q It is a reservoir, therefore, that fluctuates subtantially well by well.

A Yes, sir.

Q Now the spacing in the Morrow in this area under the special pool rules is one well per 640 acres. Do you think it would be wiser to treat this as a wildcat area?

A I do, since Monsanto's well is such a poor producer and it, I believe it was depleted in 1979, or essentially depleted.

Q Are there any other Morrow wells in the offsetting sections?

A Yes, sir, in Section 31, Flag-Redfern's well which was previously discussed.

Q So even though you'd like to treat this as a wildcat well, there is a Morrow well -- or wildcat area, there is a Morrow well on the offsetting spacing unit.

A Right; right. As you pointed out, the Morrow is a very risky type of reservoir and I feel that the closest well is a very poor and noneconmic well and I feel it should be considered as a wildcat venture.

Q If I also understand your testimony, you testified that it's possible to offset a poor well with a good well.

A That's true.

Q And if you drill and get a good well then there is no opportunity available to Amoco to come back and at that time seek a penalty, is there?

A I'm not familiar with the rule.

Q Thank you. That's all my questions.

MR. STAMETS: Are there other questions of this witness?

MR. LYON: I'd like to ask a question or two.

MR. STAMETS: Mr. Lyon.

QUESTIONS BY MR. LYON:

Q Referring to your Exhibit Two showing the water encroachment in the Cisco, that encroachment does not seem to follow a uniform elevation, does it?

A Right. There's, perhaps, some slight tilting of the water table in there, but I think it's really affected by the gas withdrawals in the area, so each well it will come up structurally higher than in other areas.

Q And if -- if the contour which you show the gas/water contact, say, in Section 6, were followed

around here it would be commercially watered out. That's the --

A Yes, if that contour --

Q -- (not clearly understood) contour?

A Right. That is correct.

Q Do you think that this might indicate disproportionate withdrawals of gas?

A I don't know if it would or not; possibly could, I suppose.

Most of these have produced similar amounts of gas in the field, so, you know, it is a prorated gas field.

Q Referring then to your Exhibit Four, I believe that I heard you mention that you did not believe that the Morrow should receive a penalty for being --

A Well, I said I believe it's a wildcat type thing and if a penalty should be imposed, I would think that statewide rules would be more applicable than the field rules.

Q Well, I may not have heard your testimony on this point, but did you propose a penalty for the Cisco?

A No, I did not.

Q Why is that?

A I believe our engineer is going to pre-

sent more detailed information on the Cisco and he'll be recommending the penalty that our company --

Q So that will be discussed by a later witness.

A Right.

Q All right. Now with regard to Exhibit Five, your fault in there that you show crossing the northwest portion of 36 and trending across Section 2, you have that State lease in Section 2, do you not?

A That is correct, yes.

Q Do you have plans to -- to drill a well in the eastern part of Section 2 if this well should be a good well in the Morrow?

A We have no current plans. We'd have to wait and see what the Morrow well does do.

We believe that the Morrow is going to be a sub-economic horizon here and we do not foresee drilling a Morrow well in Section 2.

Q All right, I believe that's all I have.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Morris, when you talk about any penalty for the Morrow being calculated on the statewide spacing, I presume you're talking about 320-acre spacing.

A That's correct.

Q And the footage location for a 320-acre drill site.

A Right.

Q And your real target here is the Cisco formation.

A Right.

Q And in the Cisco is there excellent drainage across the reservoir between wells?

A The Cisco reservoir is pretty much considered to be a very homogeneous type of reservoir, so you will be draining consistent drainage. Most of the wells should be in contact with each other.

Q But the Morrow, I take it from your testimony, is not that way.

A That is correct. You can see, these wells in 6 and 22 and 23 are very poor producers, and the well in 14, less than a mile away, has produced over 5 BCF of gas.

So I think that shows right there that -- the unpredictability of the Morrow.

MR. STAMETS: Are there other questions of this witness?

MR. LOPEZ: Mr. Chairman, I just have a couple on redirect.

REDIRECT EXAMINATION

BY MR. LOPEZ:

Q Following up with Mr. Stamets, then, Mr. Morris, do you have an opinion with respect to what the capability of a down dip well is of greater reserves than an up-dip well offsetting?

A Well, I believe that a down dip well will not produce any gas that is -- well, it will only produce, or largely produce gas from the down dip direction within the Cisco formation.

Q And my second question is, in terms of a measurement of the producing performance of the wells in the Indian Basin in the Cisco formation, is it your opinion that a 6 percent cutoff is a more realistic (not understood) than a 3 percent, although a 3 percent, as you testified, is the commonly used one?

A I think 6 percent is -- breaks out the better quality of the -- the better quality of the reservoir.

I would like to say that all of the footage of the 3 percent map is not perforated. Generally it's just the upper portions of the Cisco formation that are perforated, and that's generally where your better quality of pay is at.

MR. LOPEZ: No further questions.

MR. STAMETS: Mr. Carr.

RECROSS EXAMINATION

BY MR. CARR:

Q Mr. Morris, you testified at the Examiner Hearing in this case, did you not?

A Yes, sir.

Q At that time your calculations were based on 3 percent cutoff, is that not correct?

A That is correct.

Q And you decided to move to a 6 percent figure when you started preparing for today's hearing.

A No, sir. I originally made a 6 percent map and then I went back and made a 3 percent map to conform with the past hearings.

Q And when did you originally make the 6 percent map? For the last hearing?

A Yes, sir.

Q And so after looking at the 6 percent map and the 3 percent map, when you first presented your case you elected to use the 3 percent map.

A Because it was accepted by most of the operators in the field, yes.

Q Thank you.

MR. STAMETS: Any other questions of the witness?

He may be excused.

Let's take a short recess.

(Thereupon a recess was taken.)

MR. STAMETS: The hearing will come to order.

Mr. Lopez?

MR. LOPEZ: Thank you, Mr. Chairman.

JESSE ROBERTS,

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

DIRECT EXAMINATION

BY MR. LOPEZ:

Q Would you please state your name and where you reside?

A My name is Jesse Roberts. I reside in Odessa, Texas.

Q By whom are you employed and in what cap-

acity?

A I'm employed by BHP Petroleum. I would like to say Monsanto Oil Company but it's BHP, and my capacity is Regional Production Engineer.

Q Have you previously testified before the Commission and had your qualifications accepted?

A No, I have not.

Q Are you familiar with the application of Monsanto in this Case No. 8758?

A Yes, I am.

Q Would you describe your educational background and your work experience?

A I graduated from University of Texas at Austin in 1972 with a Bachelor's of Science degree in petroleum engineering.

I went to work for Gulf Oil in West Texas and worked for them until 1975 at which time I worked for a small independent for about a year.

I went to work for Monsanto Oil Company in 1976 and have been with them since.

MR. LOPEZ: I tender Mr. Roberts as an expert petroleum engineer.

MR. CARR: No objection.

MR. STAMETS: He is considered qualified.

Q Mr. Roberts, I refer you to what's been marked Exhibit Number Six and ask you to explain that exhibit.

A Exhibit Number Six is a production history, listed in chronological order of the Lowe State No. 1.

The well was drilled in 1964 and was dually completed in the Cisco and the Morrow. Date of first production was in January of '66, and in 1979, early 1979, the perforations we had in the Cisco watered out after producing approximately 14.9 BCF and 135,000 barrels of oil.

In September of 1979 the well was recompleted to upper perfs within the Cisco section and the Morrow was acidized.

In January of 1983 a compressor was installed on the well.

In August of 1984 the Morrow finally depleted after producing a total of about 1/2 a BCF and 2000 barrels of oil.

In May of 1985 the upper perforations within the Cisco section watered out after producing an additional 2.1 BCF and 6000 barrels.

The total cumulative from the Cisco is 17 BCF and 141,000 barrels.

Q I now refer you to what's been marked Exhibit Number Seven and ask you to explain it.

A Exhibit Number Seven is a graphical representation of the gas production history of the Lowe State No. 1 Well and a water/gas ratio. The gas on this graph is expressed in milions of cubic feet per month and the water/gas ratio is expressed in barrels of water per million cubic feet of production.

You can see from the date of -- of -- well, essentially 1970 through 1974 the well produced approximately 120,000,000 cubic feet per month.

Beginning the first part of 1975 the gas production began to decline, which was also reflected and was caused by the increase in water production. Water production prior to 1974 was essentially zero. Beginning in 1975 the water/gas ratio increased from approximately one barrel per million to over 100 barrels per million in 1979.

In 1979 the well was shut in several months while we evaluated a workover on the well.

After the workover gas production essentially stabilized between 30 and 40 million feet per month while water production, although it was never completely shut off, essentially stabilized at 60 to 80 barrels per million cubic feet.

Beginning in 1981 there was a slow, gradual increase in the water/gas ratio, which culminated in a ratio of approximately 300 in the later part of 19 -- well,

in the early part of 1985, after the well watered out.

Q I now refer you what's been marked Exhibit Number Eight and ask you to explain it.

A Exhibit Number Eight is a production tabulation from the Cisco and it essentially reflects the data that was on the previous exhibit, which was in graphical form.

Exhibit Number Eight shows production by year for the first nine years of life and thereafter it's production by month.

Gas sales are shown in MCF per month. Condensate production is shown in barrels per month. Water production in barrels per month, and then water/gas ratio is expressed in barrels of water per million cubic feet.

Q Okay, I now refer you to what has been marked Exhibit Number Nine and ask you to explain that.

A Exhibit Number Nine is a similar exhibit to what Exhibit Number Eight was. Exhibit Number Nine is a production tabulation of the Morrow formation listed by year from 1966 through 1985.

Shown on this exhibit are gas sales in MCF and condensate production in barrels.

The Morrow has produced approximately 500,000 -- or excuse me, approximately 1/2 BCF and 1788 barrels of condensate.

Q You've heard Mr. Morris' testimony. What is your opinion about a replacement well having any greater prospects of encountering greater reserves or production capability?

A We -- we feel that essentially the Morrow is a fairly risky location at the location that our replacement well would be drilled at. There's always a possibility that we could get a very good Morrow well in that location but that is strictly a guesswork estimation.

Just based on what we see in this section so far, which is 1/2 BCF well, we would estimate that the No. 2 Lowe State would probably be no better than the No. 1 Lowe State, which only produced 1/2 BCF.

Q Referring you to Exhibit Number Ten, I'd ask you to now explain it.

A Exhibit Number Ten is what's commonly referred to as a BHP/z versus cumulative production plot. This is a graphical representation of a material balance of the gas reservoir.

The scales on this are on the Y axis shut-in bottom hole pressure divided by the Z factor and on the X axis the original gas in place.

This type of plot is commonly used to project reserves for a particular gas well and it can also be used to project the original gas in place that that gas

well is -- is draining.

This particular exhibit shows that the original gas in place within our Lowe State No. 1 lease, or drainage area, is 32 BCF. The character of this curve is a straight line which projected downward through an original gas in place of 32 BCF. I believe in past literature the field has been described as a water drive or partial water drive. We feel that it is a very weak water drive and perhaps the water that is being produced within the field is as a result of water encroachment rather than a strong water drive, as such.

The 32 BCF figure of original gas in place, of course, is a material balance estimate.

We also did a volumetric estimate where we took the reservoir characteristics, such as porosity, pressure, and temperature, and projected a volumetric original gas in place.

Volumetrically we arrived at approximately 36 BCF, which compares to the 32 BCF through the material balance.

We've presently produced 17 BCF within this drainage area and subtracting out the 17 BCF from either the 32, which gives 15 BCF, or subtracting the 17 BCF from the 36 volumetric original gas in place, which gives 14 BCF, we would estimate that there's between 11 and 14 BCF of

gas remaining within this drainage area.

Q Okay. I now refer you to what's been marked Exhibit Number Eleven and ask you to explain and identify it.

A Exhibit Number Eleven is a map showing the Indian Basin Field. Our Lowe State lease is outlined in yellow, the key in this particular map. If we would refer to the well in Section 35, which is just to the west of our Section 36 well, beside that Amoco well there are several numbers. The number 27.2 represents the cumulative production from that well in BCF of gas as of January the 1st, 1986.

The 179 represents the condensate cumulative as of 1-1-75, 179,000 barrels in this case.

The 4.3 below the 27.2 represents the flow rate, and this is more or less an average flow rate in December of that particular well, 4.3 being 4.3 million cubic feet per day.

The 14 beside the 4.3 represents the oil or condensate production in that well, also in terms of -- in terms of barrels of oil per day, and then the zero represents the barrels of water per day production from that particular well.

You can see from this particular exhibit the wells in Section 6 just to the southeast of our section,

the well in Section 1 to the south of our section, the well in Section 2 southwest of our section, the well in Section 35 to the west of our section, and the well in Section 26, to the northwest of our section have all produced in the range of 24 to 27 BCF.

Our well, by contrast, has produced approximately 17 BCF.

Most of the wells to the west of us and to the north and to the south of us, with the exception of the well in Section 1, are still producing at rates of 4-to-5-million per day.

Q I now refer you to what's been marked Exhibit Number Twelve and ask you to explain it.

A Exhibit Number Twelve is a similar map to what Exhibit Number Eleven was.

Again in Exhibit Number Twelve the Lowe State acreage is shown in yellow with the replacement well shown by an arrow in Section 36.

Exhibit Number Twelve represents the cumulatives both in terms of gas and oil as of January, 1975, the time at which the Lowe State No. 1 Well began to produce water.

The main conclusion to be drawn from this particular exhibit is that for the most part wells as of this particular time frame had produced 11 to 12 BCF on a

very consistent basis.

For example, our Lowe State had a -- had a cumulative at this time period of 11.3 BCF.

The well just to the east of our section, 11.2; the well to the southeast, 12.1; the well just to the south, 12.4; the southwest offset, 11.9; the northwest offset, 11.8; the well to the north in Section 25 had a cumulative of only 7 BCF at this time frame; however, that was never quite the well's -- it was never quite the caliber of well that the other wells within the main body of the field were. It's a fringe well and just didn't appear to have the producing capability.

The main purpose of showing this exhibit is that we would like to point out that as of 1-1-75 our well had fared very well competitively compared to the rest of the wells in the immediate area. They all had the same cums; however, comparing back to the previous exhibit, you can see that over the 10-year period between '75 and '85, our well, the Lowe State No. 1, had -- had dropped off as far as its competitive characteristics were concerned, this being due to the water production.

Q Okay. In connection with this application you request a dual completion and I refer you to what's been marked Exhibit Number Thirteen and ask you to explain what it shows.

A Exhibit Number Thirteen is a Form C-107, Application for Multiple Completion, and attached to that is a wellbore sketch of our proposed Lowe State No. 2 replacement well for the Lowe State No. 1.

Referring to the sketch, what we propose to do with the Lowe State No. 2 is pretty much a standard program as far as the way a dual completion normally would -- would be made.

We would propose to perforate the Morrow and the Cisco, of course, and separate the two zones with a permanent packer, which would be located at approximately 9170 feet. Each zone would be produced out of a separate string of tubing and there would be a dual packer set at 7280 feet.

Behind the dual packer, or between the dual packer and the surface, we would have packer fluid, which would be fluid which is corrosion inhibited and we would also have pressure gauges at the surface on, of course, all strings of tubing, in addition to the annulus between the 5-1/2 inch and the strings of casing to monitor any potential tubing leak or packer leak.

We would -- we would think that this is a very standard procedure industry-wide for a dual completion, and in fact this is the -- the type of completion we have in our Lowe State No. 1 Well.

Q Were Exhibits Six through thirteen prepared by you or under your supervision?

A Yes, sir, they were.

Q Mr. Roberts, I think you -- I believe you testified in your opinion there remain approximately 11-to-14 BCF of remaining recoverable reserves underlying Monsanto's acreage.

Based on the penalty received at the initial hearing in this case, what is your estimate of what that penalty would allow Monsanto to recover?

A Our original penalty was assessed at 36 percent allowable factor, or 64 percent penalty.

The 36 percent factor would allow us to recover somewhere between 4 and 5 BCF of the reserves, the remaining reserves that we have on our lease.

I arrived at that by multiplying .36 times 11 BCF or .36 times 14 BCF.

Q Are there other factors that concern you with respect to drilling this replacement well, such as the water encroachment factor we discussed and the current depressed condition of the gas market?

A The -- the replacement well which we have proposed, we -- we have spotted in what we feel is the optimum location within our existing lease. Knowing that gas markets currently are very bad, we feel that if we're to have any -- any type of chance whatsoever to produce the re-

serves on this lease, we feel that we must be in an optimum position and the 330 location from the south and west corners represent that location.

Q Do you have an opinion as to what, if any, penalty should be applied and how it should be calculated?

A We feel that the penalty should be based strictly on productive acreage within our Lowe State lease.

Planimetering the watered out portion of our lease from Bill Morris' previous exhibit, we arrived at approximately 400 acres that we feel are still productive on the lease and we feel that a penalty based on the 400 productive acres divided by the original 640 acres on the lease would be what we feel the maximum penalty that should be assessed in this particular case. That penalty would represent 37 percent, which would leave us a 63 percent factor, allowable factor.

Q Is it your opinion that the granting of this application subject to not greater than the penalty you've just (not clearly understood) is in the interest of the prevention of waste and protection of correlative rights?

A Would you restate that, please?

Q Is it your opinion that the granting of this application for an unorthodox well location and ap-

plying no greater than the penalty you just recommended is in the interest of the protection of correlative rights and the prevention of waste?

A Yes, that's my opinion.

Q Do you have anything further to offer?

A No, sir.

MR. STAMETS: Would you like to offer your exhibits?

MR. LOPEZ: Oh, yes, please. We want to enter Exhibits Six through Thirteen.

MR. STAMETS: Without objection they will be admitted.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Roberts, let me ask you a few questions.

Now you made some volumetric calculations as to the original gas in place based on original conditions.

Have you made any calculations as to the gas in place under Section 36 at current pressures, the net acre feet of pay above the water contact, at this time?

A No, sir, we haven't. We've considered doing that, but we -- we decided to use the original condi-

tions because in that particular case we would have a common denominator with our material balance.

Q I presume then you've done no similar current calculations for the acreage which offsets Monsanto's acreage to the south and to the west.

A No, sir, we haven't.

Q So at this time you could not tell the Commission how much gas there is under your tract as compared to how much gas there is the offsetting tracts.

A No, sir, I haven't made those calculations.

Q In your Exhibit Number Ten, does that exhibit compensate in any way for the water encroachment?

A No. This -- this exhibit here would simply indicate that -- that the well is behaving on a volumetric fashion with no water drive or water encroachment affecting the points whatsoever.

Q Mr. Roberts, do you have any information as to the percentage of gas which is recovered from the Indian Basin Pool under a typical well?

A In utilizing cumulative production or an ultimate production basis?

Q Under normal operation how much of the gas you expect to recover, 85 percent, 90 percent, 95 percent?

A Normally we would expect somewhere on the order of 80 percent.

Q So if we're talking about there being 11 to 14 BCF which remains in the drainage area, you would only expect to recover 80 percent of that.

A That's correct.

Q Now we're talking about this drainage area, that drainage area might or might not be wholly covered by Section 36, is that correct?

A That's correct.

Q So that well could have been draining more than a section or could have been draining less than a section.

A We feel that -- that these wells tend to drain pretty much the 640 acres that's allotted to them by the field rules.

In referring back to my volumetric calculation and comparing that to the material balance, the two numbers compare reasonably well, which would indicate to me that 640 acres is approximately what the typical well in this area would drain.

Most of the wells do seem to be in communication, however, there is -- there is a similar pressure decline throughout the field.

MR. STAMETS: Are there other

questions of this witness?

Mr. Carr.

CROSS EXAMINATION

BY MR. CARR:

Q Mr. Roberts, if we go to Exhibit Number Six, it indicates that the Lowe State No. 1 Well was drilled in the second half of 1964, is that correct?

A That's correct.

Q By whom was that well drilled?

A That was drilled by Monsanto.

Q And if you've operated that spacing unit since 1964.

A Yes.

Q Now you were here when Mr. Morris testified that in his opinion that drainage for the well at this location would come from primarily acreage down dip to the well, do you agree with that?

A I think that is a factor. There are -- there are a number of factors that I believe play in where drainage actually occurs in this field.

There is dip and there is water encroachment, so utilizing those two knowns that we do know about this field, I do feel that for the most part drainage would occur around this wellbore and most likely would not come

from, say, down dip; however, there is some radial drainage involved, also.

Q Most likely would not come from down dip?

A I'm sorry, up dip. There is radial drainage involved also and this radial drainage, I feel, is as a result of the homogeneity of the reservoir. I really believe we have both factors in play here.

Q The fact that there would be a substantial down dip drainage would mean that once the hydrocarbon goes past the well location it's more difficult to recover.

A Yes.

Q This isn't a new theory --

A No.

Q -- not something we devised for the hearing today.

A No.

Q Now you encountered water problems starting back in 1974 in this well, didn't you?

A Yes.

Q And in the past twelve years you haven't considered drilling another well to protect your acreage from the migration of gas to adjoining properties.

A Prior to -- prior to watering out in 1985 this was an economical well. We have been able to do a workover on the well and we had been able to install a com-

sor on the well to keep it going; however, in 1985 it became increasingly difficult.

One complication that we have in this particular field is that all the produced water has gone through a produced water system to Marathon and they have a salt water disposal well near their plant, which is only a mile or two to the west of our well, and that salt water disposal well only has a certain amount of capacity and Marathon tends to shut wells in when they start producing excessive amounts of water.

So until 1985 it was an economical venture to continue producing this well.

Q Whether or not it was economical prior to 1985, the reservoir was functioning just like it has since 1985 and hydrocarbons were moving basically from northeast to southwest due to water influx.

A Yes.

Q And Marathon did not until the other well was shut in, consider doing anything to protect this particular acreage from this reservoir factor that was moving against -- no, I'm sorry --

A Monsanto?

Q -- Monsanto, I'm sorry, moving the hydrocarbons in a southwesterly direction.

A That's correct.

Q Now if we look at your Exhibits Seven and Eight, those are production figures and basically what they show, in '74, if I understand them, is in '74 you started producing water in your Lowe State No. 1 and that the well watered out in 1985.

A That's correct.

Q And Exhibit Number Nine shows that the Morrow has ceased to produce.

A Yes.

Q Now if we go to Exhibit Number Ten, I'll try to follow up on some things that Mr. Stamets asked but not duplicate those.

If I understand your testimony, you said looking -- when talking about testifying from Exhibit Ten, that there were, and I believe this is what you said, 11-to-14 BCF remaining within the drainage area.

What did you mean by drainage area? Did you mean on your lease or within the acreage that would be drained by that well?

A In this particular case I think the two are virtually the same. I indicated that 640 acres seemed to be a good figure for a drainage area and that coincided with the spacing in the field.

Q If we look at the proposed well today, is it your testimony that it would drain 640 acres?

A The No. 2 Well?

Q Yes, sir.

MR. STAMETS: Could we go off the record, please, I've --

(Thereupon a discussion was had off the record.)

MR. STAMETS: I'm sorry for the interruption, Mr. Carr, you may proceed.

Q Mr. Roberts, we were talking about your testifying that there were 11 to 14 BCF of gas remaining within the drainage area, and my question was were you talking about within Section 36 or were you talking within the drainage area, an area that will be drained by the No. 2 Well?

A I would say Section 36. That's -- excuse me, that's what my volumetrics were based on.

Q Your volumetrics are based on original recoverable reserves.

A Yes.

Q And the substantial amount of water influx has occurred since you first drilled the well and encountered original reservoir conditions.

A That's true.

Q And because of this encroachment there would be less than 11 to 14 BCF remaining there today.

A Yes.

Q Now, if I understand your Exhibit Number Eleven, Exhibit Number Eleven shows the cumulative production in a number of wells in the area.

Then we talked about Exhibit Number Twelve and, Mr. Roberts, I may not have understood your testimony, when you were going through wells on Exhibit 12 there was a well in Section 25 just to the north of the section we're talking about. Did you somehow consider this a typical well or not a typical well for the reservoir?

A I consider that to be a poor quality well.

Q And what's that based on, a review of the logs?

A It's based on its production history.

Q And so -- but it has produced 9-1/2 BCF.

A Yes.

Q And you're passing judgment on that only on the volumes that have been produced by that well.

A Yes, sir, that's true.

Q If we go to Section 30 and we look at the well in Section 30, we find that that well has only produced 15.4 BCF. Is that also not a typical well for the pool?

A That well probably had the capability of being a typical well for the pool; however, it lies in the northeast direction and a down dip direction, and I feel that the reason that that well never has produced the 23 or

27 BCF that's typical for the rest of the well, the reason for that is the fact that it is closer to the water table.

Q Did you come up with an average cumulative production for the wells in this general area?

A I don't have an average number, as such, just a range.

Q And what would the range be?

A Under current conditions 23 to 28 BCF.

Q And you have disallowed in setting that range the wells that produce less than that to the north of the subject acreage.

A Yes.

Q And you're recommending that a penalty be imposed on the well based only on the productive acres which according to your interpretation remain in Section 36.

A Yes.

Q And the penalty that you're recommending would not in any way take into account any drainage that might be occurring from offsetting properties.

A No, it wouldn't.

Q And I believe you testified to this --

A Yes.

Q -- but it is your opinion, is it not, that a Cisco well in the area has a good opportunity, it's likely that it can drain 640 acres?

A Yes.

Q And with the Morrow can you make that same statement?

A No, I really can't with the Morrow.

Q It depends pretty much on the well.

A Yes.

Q Even though you anticipate that a well 330 feet out of the corner of Section 36 will basically drain reserves that are on 36, in a homogeneous reservoir of this nature you would really expect there to be drainage from offsetting properties, would you not?

A There, yes, there would, there would be interference.

Q If I look at your -- and I don't know the number, it's your BHP/z -- Exhibit Number Ten, you've got basically a straight line here. Doesn't that indicate really that you don't have a waterdrive situation, that the water is not pressuring up the formation? It's more of an encroachment situation?

A I think that's probably a true statement. If it is a waterdrive, it's a fairly poor waterdrive, a weak waterdrive.

Q In this situation with the information you have on the reservoir, are you aware of anything that really disputes a basically radial drainage pattern in this

(not clearly understood) homogeneous reservoir?

A Not particularly, unless -- unless this weak waterdrive does have some effect.

Q Would you -- you may have said this also, to calculate the recoverable reserves you used an 80 percent recovery factor. Is that what you testified to?

A Excuse me. I used a 500 pound -- let's see. I used a 500 pound abandonment pressure in my volumetric calculation.

Q So you're assuming that you'll be able to produce the well until you get to 500 pounds.

A Yes.

Q And you're assuming, therefore, that you won't have water encroachment prior to that time?

A Yes.

Q If you're unable to get an order with a penalty that in your judgment permits you to develop the acreage, do you have any other plans for it? Do you have plans for the Lowe No. 1?

A The Lowe No. 1 we have considered as a potential salt water disposal well. Other than that, I really have no -- no conception what the Lowe No. 1 would be used for.

Q Will you consider using it for a disposal well whether or not the application is granted today with an acceptable penalty?

A Possibly, yes.

Q What zone would you dispose into?

A We really haven't even gotten that far with it yet.

Q Would you consider the Cisco?

A That, that's a difficult question. We just really haven't examined the well to the extent that we should in order to actually apply for a disposal permit.

Q Both the Cisco and the Morrow in this area are governed by special pool rules, are they not?

A Yes.

Q Both are prorated?

A Yes.

MR. CARR: I have no further questions.

RECROSS EXAMINATION

Q Mr. Roberts, I've got one other question on the Morrow formation, if that well were located on the southwest corner of the section, right smack dab on the line, and if there was radial drainage, how much of the gas would be coming off of the Monsanto tract?

A Of course the sections are staggered just a little bit right here, but I'd say approximately a fourth of it.

Q Would that sort of an analysis, perhaps, provide us another method of looking at a Morrow penalty, to, perhaps, draw a line from the nearest standard location to that section corner and -- and slide the scale from 100 percent allowable down to whatever it would turn out to be with the far left point being a 25 percent allowable?

A It could be, yes.

MR. STAMETS: Any other questions of the witness?

Mr. Lyon?

MR. LYON: I'd like to ask a question or two.

QUESTIONS BY MR. LYON:

Q Mr. Roberts, referring to Exhibit Ten, that seems to be much discussed (not clearly understood), I'm having a little trouble with my arithmetic.

As I read your scale, well, first let me mention that that exhibit does not identify the formation that you are --

A No, it doesn't.

Q This does apply to the Pennsylvanian, is that right?

A Pennsylvanian, yes, sir.

Q Now, your extrapolation indicates a re

serve of 32 BCF, is that right?

A Yes.

Q And you said that you had conducted volumetric evaluations that indicate, did I understand, 36 BCF?

A Yes, sir.

Q And you've produced 17 BCF?

A Yes, sir. Yes.

Q Then what would be your estimated remaining reserves?

A Just utilizing strictly Exhibit Number Ten with 500 psi abandonment pressure, which gives you 28 BCF, less the 17 BCF cum, that would give 11 BCF remaining reserves.

Q I see, so you based your -- your recoverable reserves at (not clearly understood)?

A Yes, sir, at 500 psi.

Q Okay, that's what I understood.

MR. LYON: I believe that's all I have.

MR. STAMETS: Any other questions of this witness?

He may be excused.

We will recess the hearing until 1:00 o'clock.

(Thereupon the noon recess was taken.)

MR. STAMETS: The hearing will please come to order.

ERNEST SZABO,

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

DIRECT EXAMINATION

BY MS. WALKER:

Q Would you please state your name and where you reside?

A I'm Ernest Szabo. I reside in Albuquerque, New Mexico.

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

A I am a petroleum geologist employed by the State Land Office, Oil and Gas Division.

Q Are you familiar with the application of Monsanto Oil Company in Case Number 8758?

A Yes, ma'am.

Q Have you previously testified before the Commission and had your credentials as an expert petroleum geologist accepted as a matter of record?

A No, ma'am, I have not.

Q Would you please state your educational

and employment background?

A My academic background consists of a Bachelor of Science in geology in 1950; a Master of Science in 1953; and a PhD awarded in 1968 at the University of New Mexico.

My professional background begins in 1953 with employment by the Sinclair Oil and Gas Company as an exploration geologist. I left Sinclair in 1965 as Staff Geologist and went back to the University of New Mexico for a PhD.

In '69 I accepted a position in Odessa as a Professor of Geology; left that position in 1974 as a tenured professor.

In 1974 I went back to industry and began my work in the Permian Basin area; had a two-year stint overseas on the Sahara Platform in Algeria; came back and again was gainfully employed in Midland, working the Permian Basin.

For a short period I was transferred to Denver by Great Western Drilling Company to work the overthrust belt and then transferred back to Midland as a district geologist, which position I held until 1985 when I accepted employment at the State.

Q Thank you.

MS. WALKER: I tender the wit-

ness as a qualified petroleum geologist.

MR. CARR: No objection.

MR. STAMETS: He is considered qualified.

How do you spell your last name?

A S-Z-A-B-O. The "Z" is silent.

MR. STAMETS: Thank you.

Q Dr. Szabo, I would ask you to refer to what have been marked as Land Office Exhibits One through Four. Were these exhibits prepared by you or under your direction?

A They were prepared under my direction.

Q I will ask you to refer to what's been marked as State Land Office Exhibit Number One, identify the exhibit and explain it to us, please?

A The first exhibit is intended as an index map to focus our attention on the area concerned at this hearing.

It shows the relative positions of active wells in the area, as well as certain inactive wells.

The circles are circumscribed around the well spots to include a 640-acre drainage area, so each circle, then, represents 640 acres.

In addition, we have superimposed the

proposed Monsanto well to show its relationship to wells which surround it.

The base map is one we borrowed from Monsanto, doubled their scale and used their structure contours which provide a background. The structure contours are on the Cisco. The map is on a scale of one inch equals 1000 feet. Contouring is on 20-foot intervals with 100 foot (not clearly understood.)

Q Could you explain why you have two circles colored in green, Dr. Szabo?

A Yes, ma'am. The concern of the State Land Office, in my opinion, is in the tracts which Monsanto has drilled and they're colored in green to show that they are essentially State tracts. And Marathon is colored blue; Amoco is colored yellow.

Q Okay. Would you please refer to what has been marked as State Land Office Exhibit Number Two, identify the exhibit and explain it to us?

A State Land Office Exhibit Number Two is intended to show as best we can project with information at hand, the position of an oil/water contact in the producing area and also show the current active wells in the area.

The active producing wells are not colored and form a scalloped western margin. The water incursion is estimated to be along the 3530- contour.

We've continued to point out that the proposed well is present but not emphasized.

Q I would ask you to refer to what has been marked State Land Office Exhibit Number Three, identify this exhibit and explain that exhibit to us.

A Exhibit Number Three is essentially Exhibit Two with the proposed Monsanto test superimposed and emphasized with a cross-hatched pattern.

The part that would fall upon what we consider possibly isolated or bypassed producing area, which has been colored in red, is shaded in a deeper pink color to show it's position over the reservoir.

In the original instance we would estimate the first or Lowe State Well (not clearly understood) approximately 50 percent of reservoir behind where the water finally encroached.

In this case it would seem that the proposed well would recover possibly 50 to 55 percent of the producable reserves; however, it's my opinion that depletion is not a factor in the ultimate life of this well, but rather the encroachment of water.

Thus I would estimate that the active life of this well would terminate when the water encroachment would reach the -3440, or thereabouts, contour.

This would not drain the entire area re-

presented in pink but would represent significant reduction. There would be large areas that would be outside the drainage capabilities of this well circle.

Q Is it your opinion that the proposed Monsanto well would drain gas from the pool that would otherwise remain unproduced?

A It would be my opinion, yes.

Q I will now ask you to refer to what has been marked as State Land Office Exhibit Number Four, identify this exhibit, and explain the exhibit to us.

A Exhibit Number Four is intended to show the overlaps between the wells in the area and the proposed Monsanto well.

It was of interest to note that the Marathon well and the Lowe State well overlap each other significantly and yet they were part of a legal location. The overlap computed to approximately 150 acres or about 23-1/2 percent of a 640-acre circle.

Looking at other areas, we note that it's quite common to find overlaps between producing circles.

In the case of the Lowe State Well and the Amoco Trigg we note the segment which is lettered A. This segment computed to 16 acres or about 2-1/2 percent of a producing area.

This segment would be abandoned to Amoco

if the Monsanto Lowe State Well is flooded; therefore it becomes part of the producing or uncontested producing area of the Amoco Trigg.

In addition, we look to the south and we find the Monsanto Conoco State and its relationship to the Amoco Trigg with another overlapping area, labeled B.

Now this overlap computed to approximately 20 acres, or roughly 3.1 percent of a 640-acre area.

Now we note also that there is a new factor introduced into the picture, which is the proposed well.

The proposed well, of course, we ignored the old Lowe State Well because it's to be abandoned if the new well is permitted, therefore there's no effect; however, the new well would overlap other production.

In one instance it would overlap the Monsanto Conoco State by a total of 156 acres or roughly 24 percent of the producing circle, and it would overlap the Amoco Trigg by 30 acres or 4-1/2, roughly 5 percent.

MS. WALKER: I now offer State Land Office Exhibits One through Four into evidence.

MR. STAMETS: These exhibits will be admitted.

Any questions of the witness? Mr. Carr.

CROSS EXAMINATION

BY MR. CARR:

Q Dr. Szabo, will the Land Office call another witness who will talk about imposition of a penalty?

A Yes, or it will be suggested. There are certain reservations I have regarding the qualifications to recommend penalties.

Q As I look at your Exhibit Number Four, you've testified that a certain drainage area would be abandoned to Amoco.

A Yes, sir.

Q I didn't see what acreage you were identifying.

A That would have been labeled A.

Q That's labeled A on Exhibit 35. Without that -- without the new well A is going to be abandoned to Amoco? Is that what you're saying?

A If the Monsanto well is plugged, A would be essentially abandoned to Amoco.

Q And all of Section A is on the Amoco lease.

A That's true.

Q Okay. Now, you've drawn certain circles on -- depicting 640-acre drainage around various wells. Did

you draw a drainage circle around the nearest standard location that Monsanto could locate a well on and develop in Section 36?

A No, because that was not part of the application.

Q If I look at the way you have interpreted the water, the gas/water contact on your Exhibit Number Two, it appears to me that based on your interpretation of the placement of the water, that there would be a standard location 1650/1650 out of the southeast corner of Section 36 available for a well to be drilled.

A Essentially that would be true, yes.

Q Thank you. I have nothing further.

MR. STAMETS: Any other questions of this witness?

MR. LYON: Yes, sir.

MR. STAMETS: Mr. Lyon.

QUESTIONS BY MR. LYON:

A Referring to your Exhibit Four, you show three areas of overlapping arcs, Area A, Area B, and Area C.

Area B is bounded by a circle drawn around the Amoco Trigg Well, our proposed well, and by the No. 1 Conoco State.

Is the No. 1 Conoco State being abandoned

A No, there was no intent to show the No. 1 Conoco State abandoned. It is an active producer worthy of continued production for an unknown length of time.

The Area B, which is circumscribed is part of the original scene in the field where the Conoco State is present, the Amoco Trigg Federal is present, but the proposed well is not there. In other words, Area B is an overlap between Conoco State and the Trigg Federal.

Q Right, and there's none of that area that is exclusively drawn around the proposed location.

A Eventually, if the proposed location is permitted, the eastern part of the circumference of the proposed well would overlap in this Area B.

Q But since the area that's colored for Area B is strictly an overlap of the Trigg Federal Well and Conoco State Well, then I fail to see that there's any significance in relation to this proposed well.

A There isn't until the proposed well is drilled, at which time it will overlap to the producing area again.

Q But that area in that -- the area in Area B would not be lost to -- would not be forfeited by failure to drill that well, isn't that right?

A No.

Q You mean that's right.

A Yes, you're correct in your statement; no, it would not be lost.

Q All right, that's all I have. Thank you.

MR. STAMETS: Any other questions of the witness?

MR. LOPEZ: If I may, just a couple of questions.

CROSS EXAMINATION

BY MR. LOPEZ:

Q Dr. Szabo, if I understand Exhibit Two, the area you've drawn as pink is the area that you computed that would not be drained by any of the existing wells.

A Subscribing to the idea of radial drainage the area in pink would be beyond the drainage reach of the actively producing wells and certainly would be beyond the capabilities of the shut-in wells because water encroachment would not predict -- permit up-lifting gas production.

Q So then as I understand Exhibit Two with relation to Exhibit Three, unless the Monsanto proposed well is drilled, substantial waste could occur, again subscribing to the theory of radial drainage as shown on Exhibit Three, I guess.

A That would be my interpretation, yes.

MR. LOPEZ: No further questions.

RECROSS EXAMINATION

BY MR. STAMETS:

Q Dr. Szabo, why is the Land Office interested in this application?

A First, of course, our interest is in protecting the rights of the State, which -- we are landowners under the section in question.

We derive a certain income for the beneficiaries of the State from production derived from this section.

If we don't get the most efficient and maximum production out of the section, we are depriving the beneficiaries of the maximum income which could be derived from this, and at the same time we're, you might say, encouraging waste.

Q So the Land Office is interested in seeing the well is drilled in order for them to receive royalties from gas which underlies the section.

A The Land Office is interested in recovering the producable hydrocarbons under its section.

Q If the well were not drilled at all, would that gas migrate to other producing wells in the pool?

A It is my opinion, yes, it would migrate up dip and be produced elsewhere, thus representing a significant loss to the State and its beneficiaries.

Q So we're talking about more a correlative rights issue here than a waste issue.

A Without waste or without correlative rights we can't consider waste and without waste we can't consider correlative rights.

We are concerned with correlative rights, yes, as we know them.

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

Mr. Carr.

RECROSS EXAMINATION

BY MR. CARR:

Q Dr. Szabo, just to be sure I understand, you have been, as you've been constructing these models, assuming we have a homogeneous reservoir and radial drainage particularly.

A I think there's general agreement that the reservoir is homogeneous being a carbonate type of reservoir, yes.

Radial drainage we assume as a factor in considering production allotments, allocations, and what

have you.

Q And your exhibits are based on the assumption of radial drainage?

A I would say 95 percent so, yes. There would be other background considerations, but we would assume that we are all draining 640 acres.

Q Thank you.

MR. STAMETS: Any other questions of the witness?

He may be excused.

MS. WALKER: The State calls Bruce Stockton.

BRUCE STOCKTON,

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

DIRECT EXAMINATION

BY MS. WALKER:

Q Would you please state your name and where you reside?

A My name is Bruce Stockton. I reside in Santa Fe, New Mexico.

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

A I am a petroleum engineer currently employed by New Mexico State Land Office as such.

Q Are you familiar with the application of Monsanto Oil Company in Case Number 8758?

A Yes, I am.

Q Have you previously testified before the Commission and had credentials --

A No --

Q -- as an expert petroleum engineer accepted as a matter of record?

A No, I have not.

Q Would you please state your educational and your work background?

A Education, I hold a Bachelor of Science degree from the New Mexico Institute of Mining and Technology in engineering and an MBA degree from New Mexico State University.

I am a Registered Professional Petroleum Engineer, registered in New Mexico.

And experience, upon graduation from New Mexico Tech I spent three years as a reservoir production engineer with Texaco, Incorporated, two years as General Manager of a company called Corod, Incorporated, in Odessa, Texas; three years with Kaiser Steel Corporation as an engineer; returning to obtain an MBA at New Mexico State Uni-

versity, I worked concurrently as an energy Research Associate at New Mexico State, and before coming to the Land Office spent five years in New Mexico Energy and Minerals Department as an Energy Consultant.

MS. WALKER: Are the witness' qualifications accepted?

MR. STAMETS: Mr. Stockton, in what was your BS in?

A The degree itself was in metallurgical engineering.

MR. STAMETS: So your experience has been in petroleum engineering and you -- you are registered as a petroleum engineer?

A Yes, I am a registered petroleum --

MR. STAMETS: Any questions? The witness is considered qualified.

Q Mr. Stockton, I'll now ask you to refer to what has been marked as State Land Office Exhibits Five through Eight. Were these exhibits prepared by you or under your direction?

A Yes, they were.

Q Will you please refer to State Land Office Exhibit Number Five, identify the exhibit, and explain it for us?

A State Land Office Exhibit Five is -- con-

sists of four production decline curves, representing the wells which are found in Sections 35 and 36, Township 21, Range 23 East, and Sections 1 and 2, Township 22 South, 23 East.

Just briefly, these curves indicate the production history of the four wells. As you can see by starting with the production curve for the Amoco Federal No. 1 in Section 35, to date it has shown no discernable decline in hydrocarbon production and water production has held relatively stable.

I think that the -- the drop in oil production to zero in 1982 may be a data, mistake in the data which is available to me.

Going on to the Monsanto Conoco State Well in Section 2, it too shows no discernable decline in production and water production is holding stable.

In the ARCO Smith Federal No. 1 Well, production decline started beginning about 1975 or '76, and water production began to increase during the same time period until in -- sometime in'85 water production became such that the well was apparently shut in.

In the Monsanto Lowe State Gas Com No. 1 in Section 36, hydrocarbon production began its decline in 1975 with an increase in water production.

In 1979 there's a decrease in production

indicating that the well was shut in while a workover was done, I presume in an attempt to shut off some of the water production.

As can be seen from this, from the water production subsequent to this workover, the attempt was not very successful and late this year, late last year, 1985, the well was shut in.

These curves, I think, indicate that in the western part of this four section area we have two good producing wells at this time. In the eastern part we have two wells which began decline and were eventually overcome by water.

They also indicate that, apparently, all the wells in this area do produce water.

Q Mr. Stockton, please refer to what's been marked as State Land Office Exhibit Number Six and I'll ask you to identify the exhibit and explain it.

A State Land Office Exhibit Number Six is a summary of the recoverable reserves in the four section area previously discussed, as well as their totals.

Attached to the summary, which is on top, are material balance calculations, the bottom hole pressure over z versus cumulative curve, and the Isopachous map which was used to do volumetric calculations for these four sections.

The summary table, in the columns indicate the four sections involved as well as a total of those four sections, and the rows, we will discuss now row by row.

Rows 1 and 2 indicate the recoverable in place reserves by both the volumetric and material balance methods for the four sections being discussed.

MR. STAMETS: Excuse me, Mr. Stockton, this is as of what date?

A These are in place, original in place recoverable reserves.

Row 3 of the table indicates the cumulative production as of 1-1-86 for each of the four wells.

Rows 4 and 5 indicate the total remaining recoverable reserves for each of the four wells, as well as the total. The recoverable reserves in this case were estimated by subtracting from the original in place recoverable reserves the cumulative production.

Rows 6 and 7 indicate what would be, in my opinon, to be the recoverable reserves that would be recovered without additional drilling in this area.

By the volumetric method the total is 13.95 billion cubic feet, or BCF.

By the material balance method the total is 28.41 BCF.

Rows 8 and 9 indicate the maximum amount

of gas that could be lost without additional drilling in this area. Once again for both volumetric and material balance methods, Rows 8 and 9 are arrived at simply by subtracting Rows 6 and 7 from Rows 4 and 5.

Rows 10 and 11 indicate the expected recovery that I believe the Monsanto well could achieve. These are based on both volumetric and material balance calculations.

The volumetric calculations are arrived from the figures above while the material balance sumw as arrived at by doing a separate bottom hole pressure over gas deviation factor z curve versus cumulative for that well, using what I believe to be the estimated bottom hole pressure and the decline in pressure that that well would experience.

Let me discuss just briefly the -- how I arrived at the volumetric expected recovery of the Monsanto proposed well.

From the Amoco Section 35 I estimated that this well would recover no more than one quarter of its total remaining reserves, total remaining recoverable reserves, or in other words, 9.97, from Row 4, divided by 4.

I estimated that their well will recover all the recoverable reserves in Section 36 and Section 1 and would recover no more than one quarter of the reserves found in Monsanto's Section 2, or .99 BCF. The total of these is

19.82 BCF.

These figures, of course, are based on -- on a pressure decline all the way down to approximately 500 psi.

Q Mr. Stockton, please refer to State Land Office Exhibit Number Seven, identify it and explain it.

A Exhibit Number Seven is some of the same information that you found in the summary table of Exhibit Number Six. This is a volumetric calculation of the lessees' reserves for the four sections in question and an estimation of those which would be drained by the Monsanto unorthodox location.

Schematically represented here are the four sections. Within each section I have summarized the recoverable reserves in place, the cumulative reserves, and the remaining recoverable reserves, all in billions of cubic feet.

Going to the bottom of this exhibit, I have taken the expected recovery using the volumetric appraoch for the Monsanto proposed well, of 19.82 BCF, and from that calculated what I believe might be a production penalty that could be applied to this proposed well.

This well could be expected to recover nor more than one quarter of the reserves from Amoco's Section 35, or 9.97 BCF divided by 4.

Using that figure, 2.49 BCF and dividing it by the expected recovery of the Monsanto well results in a suggested penalty of approximately 12.6 percent.

Q Please refer to State Land Office Exhibit Numer Eight and explain that.

A State Land Office Exhibit Number Eight is essentially the same as Exhibit Number Seven with the exception that these calculations are based on the material balance reserve calculations.

Once again schematically presented are the recoverable reserves in place, the cumulatives and the remaining recoverable reserves.

A suggested penalty using this method could be calculated by taking 20.83 BCF remaining recoverable reserves in Monsanto's -- I'm sorry, in Amoco's Section 35, dividing that by 4 and then dividing that result by the Monsanto well recovery of 14.14 BCF, which would give a suggested penalty of 6.8 percent.

MS. WALKER: I offer State Land Office Exhibits Five through Eight into evidence.

MR. STAMETS: Without objection they will be admitted.

Mr. Carr.

CROSS EXAMINATION

BY MR. CARR:

Q Mr. Stockton, if we go to, first, Exhibit Number Five, what you have here are some production graphs on four wells in the area of the proposed Monsanto well.

A Yes.

Q And each of the wells that you have included a decline curve on, or a production curve on, is structurally up dip from the existing Lowe State No. 1 Well, the old Monsanto well.

A The wells in Section 2 and Section 35 are up dip. I am not sure about the well in Section 1.

Q In Section 1 the Land Office Exhibit Number Four shows it at a depth of -3517 and the well in 36 is at -3538, so it would be up dip from that as well, would it not?

A By 19 feet?

Q 19 feet.

A Yes.

Q All right. In fact all of these being up dip you would expect them to still be producing without having -- because a gas/water contact hasn't gotten to them, has it?

A The two in Section 2 and Section 35 I would expect to still be producing.

Q The gas/water contact, though, has not reached any of the wells depicted in Exhibit Number Five, has it?

A I don't think one can say that for certain on the well in Section 1.

Q Section 1, it may be there?

A It may be there.

Q So your -- the Land Office interpretation might be different from that presented by Monsanto earlier that showed it not to that well.

A That's possible. We are basing the facts here, of course, on -- on the fact that the well was shut in according to the latest C-115s filed. I think it was shut in in November or December of 1985, and that should be more recent information than is available generally.

Q Based on the best data available to you.

If we look at your Exhibit Number Six, and we go to the first set of figures, In Place Recoverable Reserves, and go to the Monsanto well in Section 36, you show a figure for the original recoverable reserves of 24.96 BCF. That's the original figure.

A By the volumetric method, yes, that's correct.

Q Then we have Cumulative Production to Date a couple of lines down of 17.98 BCF.

A Uh-huh.

Q And so you then have remaining recoverable reserves, volumetric -- using the volumetric approach of 7.88 BCF.

A Yes.

Q These figures do not take into account any water encroachment, do they?

A To some extent they do. They're not going to take into account gas which may be entrapped by water encroachment.

Q If we take the total that you started with, we subtract the production to date, we get the exact number that you've submitted as being in place. There's no room in there for the water encroachment that has been depicted, is there? You're talking about original reservoir conditions.

A This is all based on original reservoir conditions, that is correct.

Q You haven't Isopached the net pay interval above the present gas/water contact, have you?

A No, because I do not have that information.

Q Now in developing these figures concerning drainage, have you been assuming the wells will only drain 640 acres?

A No, I have not assumed that a well will drain anything, as far as acreage is concerned.

Q So --

A These figures are based on the fact that a lessee of record has the right to drain the section that he has leased.

Q And then you've attached some BHP/z curves and you've taken these all down to a (not understood) of 500 pounds, and that's abandonment pressure in your opinion?

A That's the abandonment BHP/z pressure, yes.

Q And in fact many of these wells may experience water encroachment long before they get there.

A I will readily concede that.

Q Now if we look at Exhibit Number Seven, again what we have is a method of computing a penalty where we have taken reserves in place, subtracted cumulative production and come up with a remaining reserve figure.

Again this penalty is based on original reservoir conditions.

A Yes, it is.

Q And again Exhibit Eight would be based on original reservoir conditions.

A Yes, it is.

MR. CARR: I have no further questions.

MR. STAMETS: Other questions of Mr. Stockton?

QUESTIONS BY MR. LYON:

Q Mr. Stockton, referring to Exhibit Six, I'm still a little bit foggy about the last row of numbers there where you have Expected Recovery of Monsanto proposed well from each Section.

The figure under Amoco's Section 35 well, how -- how does this -- how do you arrive at that figure?

A Okay, that was by assuming that the proposed location will drain no more than one quarter of Section 35, or the remaining reserves in Section 35. So I took the remaining reserves in Section 35, which is the first column, Row 4, divided by 4. That will give you 2.49.

Q What is the basis for your assumption that it will drain only 25 percent?

A Well, I'm assuming the reservoir is -- is fairly homogeneous; that the pressure will decline uniformly amongst the wells found in the reservoir, which history also shows to be true; and that there's just no way that you could have more than one quarter flow down dip to this well. In my opinion it would probably drain less than one quarter.

Q Well, how about the ARCO well in Section 1, you don't discount that remaining reserves, is that right?

A That's because I'm assuming that the ARCO well is not going to produce any more. All those reserves, or almost all those reserves could be drained by this well. That again, I think, is a very conservative estimate. It may never drain that much.

Q Well then, do I interpret this to say that the figure over on the right total of 19.82 is to be recovered by the proposed well and that that gas that is coming off these other wells that you have listed?

A That's -- that's a maximum recovery that I think one could expect for the proposed well.

Q But you do expect those reserves to be recovered by the proposed well rather than the wells you have it listed, is that right?

A That's right.

Q Okay. Thank you.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Stockton, the material balance calculations that you've made on Exhibit Six, I'm not clear but does this reflect current conditions?

A Yes, those are -- well, up to current conditions. Those are a result of using bottom hole pressures over the life of the wells.

Q The material balance in Row 5, is that derived using BHP/z plots?

A Yes.

Q So you've not gone in and made a volumetric calculation based on current pressures and net acre feet of pay under these tracts.

A Because I do not have available to me the information to do that.

This -- this data is based on the best available information we have available.

Q So -- okay. Columns 4 -- or in Rows 4 and 5 under the Monsanto Section 36, you give a range based upon your calculations of remaining recoverable reserves, say, roughly, 8 to 10 BCF. Do you think it would be appropriate, if those figures were correct, for the Commission to enter an order which would allow no more than 8 to 10 BCF to be produced from that well and once that volume had been produced it should be shut in?

A Theoretically I think that would be very appropriate. I -- I would like to be around to see how the Director of the Oil Conservation Division is going to handle that when the well reaches that figure and is still produc-

ing, but I do believe that would be very appropriate.

MR. STAMETS: Any other questions of the witness?

RECROSS EXAMINATION

BY MR. CARR:

Q Mr. Stockton, one thing I forgot to ask you, if we look at Exhibits Seven and Eight, these contain penalty recomendations from the Commissioner of Public Lands, or methods of computing of a penalty on production from the subject well from the Cisco, is that correct?

A Yes, that's correct.

Q Now, if Atlantic Richfield in Section 1 were to come before this Division and propose to locate a well 330 feet out of the northeast quarter -- northwest quarter of Section 1, would the Commissioner of Public Lands be willing to stipulate that this was the appropriate method of imposing a penalty on that well?

A Yes.

Q Thank you.

CROSS EXAMINATION

BY MR. TAYLOR:

Q Mr. Stockton, on your Exhibits Six, Seven, and Eight, I'd like -- first of all, is the Land Of

fice recommending a production penalty of -- of either 12.6 or 36.8, or something between the two?

A Yes. The Land Office is recommending, if the Commission sees fit, a production penalty in that range, or I think, more importantly, the Land Office is urging the Commission to consider a methodology similar to this to arrive at a penalty rather than methodologies that have been used in the past.

Q What is -- what's the difference between the two numbers you come up here with? Is it the fact that the material balance method shows a higher amount oif -- or a larger amount of gas in place and therefore you have a larger penalty, or why are those so much different?

A Well, yes, that -- it's -- what you said is slightly reversed. The material balance method shows a larger amount of gas in place; therefore the denominator in calculating the penalty is smaller -- or larger, making the penalty smaller, as opposed to the volumetric.

Q Essentially, would each of these penalties result in the same amount of production from the well or would they -- over the total life of the well or would -- would one of the penalties because they differ on the amount of volume in place that they're based on?

A No, the penalty would be -- the amount of production from the well would be different from the two

penalties, or the way I understand it, that it would be applied.

Q Thank you.

MR. STAMETS: Any other questions of this witness?

He may be excused.

MR. CARR: At this time we'd call Steve Scheffler.

STEPHEN P. SCHEFFLER,

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

DIRECT EXAMINATION

BY MR. CARR:

Q Would you state your full name and place of residence?

A My name is Stephen Paul Scheffler. I reside in Houston, Texas.

Q Mr. Scheffler, by whom are you employed and in what capacity?

A I'm employed by Amoco Production Company in Houston as a Senior Staff Petroleum Engineer.

Q Have you previously testified before this Commission and had your credentials as a petroleum engineer

accepted and made a matter of record?

A Yes, sir, I have.

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

A Yes, sir.

Q Are you familiar with the subject area and the proposed well?

A Yes, sir.

MR. CARR: We tender Mr. Scheffler as an expert witness in petroleum engineering.

MR. STAMETS: He's considered qualified.

Q Mr. Scheffler, please state what Amoco seeks in this hearing today.

A We seek the imposition of a penalty on the proposed well location that Monsanto has made application for here today should that well be drilled at that location.

Q What are the spacing and well location requirements in the two pools which have been identified as the subject of today's hearing?

A In both the Indian Basin Upper Penn horizon and the Indian Basin Morrow, the existing field rules call for 640-acre spacing, which allows for wells to be drilled 650 feet off the proration unit line.

Q How close to Amoco's proration unit line is the proposed well location?

A 330 feet.

Q On an east/west axis?

A Yes, sir.

Q And what percentage does that compute to be in advantage they're gaining over standard location?

A That would be 80 percent too close.

Q Are they also 80 percent too close to the outside boundary of their proration unit based on a north/south axis?

A Yes. sir.

Q Would you generally describe the nature of the reservoir we're talking about?

A With regard to the Canyon Cisco the information I have is that it is a very homogeneous reservoir, that it produces from a lithology that is dolomite in nature; that it has very fractured and vugular available pore space for the transmissibility of the gas.

Q And both pools that we're talking about today are prorated pools?

A They are, yes.

Q Would you now go to Exhibit Number One, identify this, and review the information that's contained on this exhibit?

A My Exhibit Number One is simply a map of a portion of the Indian Basin Upper Penn Pool.

On this exhibit I've attempted to similarly show the -- with the same sort of colors, wells that are currently shut-in in the field as a result of those wells encountering water encroachment and subsequently being shut-in. Those wells are highlighted with the pink dots.

I've also shown wells in the field area that are currently producing at rates of 20 barrels of water per day or more. Those are wells that are identified by a green hatched circle, which there are three, or rather four, I should say, and the green dots that you see on the well locations off to the west are wells that are producing essentially water free in the Indian Basin Upper Penn Field.

All these wells are producing from the -- have been or are currently producing from the Indian Basin Penn Pool.

Also on this exhibit I've identified dates for those wells that are identified by the pink dots, dates which show the time the well was shut in.

Beneath -- let me say one more thing. The numerator that I've identified beneath wells that are currently producing, those being the green dotted wells and those with green hatched circles, represent the average actual daily production on a producing day basis for the month

of November of 1985. That is gas in MCFD with the next numeral being condensate production in barrels of condensate per day; the last number representing water production in barrels of water per day.

Beneath that information I have shown the cumulative production as of 12-1-85; that is cumulative production for gas as well as condensate.

Q In the last several months several wells have been shut in due to water production, is that correct?

A Yes, that is true.

Q Can you identify the three most recent?

A Yes, sir. Since the last hearing, wells that at that time were identified as producing 20 barrels of water per day or more and have since been shut in, I have -- I would point out now as being one of those wells, the well in Section 1 of Township 22 South, Range 24 East. That's the ARCO Smith Federal No. 1 Well. It was shut in in November of '85.

Another well, moving up to Section 31 of 21, 24, is the Flag-Redfern Winston gas well. It was shut in in November of '85, and the last well which was identified in the previous hearing as producing at 20 barrels of water per day is the Getty Oil, or rather Texaco now, Getty 1 B-32, located in Section 32 of 21, 24. That well was never put on -- tied to a gathering system. It was

a marginal well. It is cutting, in my understanding in talking to Texaco, excessive amounts of water, something around 100 barrels a day. They anticipate the well will be plugged.

MR. STAMETS: What was the location of the last well, please?

A It's in the southwesterly portion of Section 32 of Township 21 South, Range 24 East. It would be the well, Mr. Commissioner, that is identified by the asterisk right next to the dry hole symbol.

MR. STAMETS: Okay, thank you.

Q Mr. Scheffler, in preparing for today's hearing did you review the data, the technical information available on the Cisco formation in this area?

A Yes.

Q In your opinion do we have a water drive reservoir here?

A The way I would describe the producing mechanism in this reservoir is a gas expansion mechanism with water influx.

Q As a result of this study did you discover anything that would tend you to believe that the drainage pattern for any of these wells would be other than radial?

A No, sir, I believe that drainage patterns

out here are radial.

Q If we look at the proposed location 330/330 out of the southwest corner of Section 36, in your opinion would it be feasible or practical for Amoco to attempt to offset that well equidistant from the common boundary between the two leases?

A No, sir, I don't think it would be feasible.

Q Would you now go to Amoco Exhibit Number Two, identify this and review it for the Commission?

A Exhibit Number Two is the base map, the base structure map that was presented today by Monsanto, the structure identified as the top of the Cisco.

On this structure I have transferred all those wells that were shown on Exhibit Number One as having been shut-in as a result of water encroachment to this exhibit. I've identified them again by the pink dots.

With this information I have described what I believe to be a representative existing gas/water contact in the field at this time.

Q And this is your interpretation placed upon the original map offered in the Examiner Hearing by Monsanto?

A Yes, sir.

Q And how many acres, productive acres, in

Section 36 did you come up with?

A Planimetering the productive acreas, the surface acres that lies within Monsanto Section 36 I arrived at a number of approximately 233 acres.

Q Now this is not as optimistic a picture was was presented by Monsanto. Do you believe this is a pessimistic picture of where the gas/water contact should be placed?

A I would call this an optimistic presentation myself.

Q And why is that?

A If we look at -- if we look at the well that's down in Section 6, the Amoco Federal B No. 1 that I've identified with a green hatch mark, that well is at a subsea datum of minus -- the top of the Cisco there is identified as being a datum of -3474 feet, I've honored that contour, or that subsea level, on the Monsanto lease as the point in the southeastern portion of that lease I believe the contact is.

I further could very well have honored that same contour line significantly further over to the west and then brought it up on the western edge of the Monsanto lease and still been consisten, I believe, with a representative location of the gas/water contact on that lease. Had I done that, I would have received -- or seen much less

productive pay in Section 36 than I've shown here now.

Q And when we look at the well in Section 6, that is the well that Mr. Stockton in his testimony said might have (not understood) watered out. Is that not correct?

A I'm sorry, sir, in Section --

Q In Section --

A 6?

Q Yes.

A Yes.

Q Now I'd like to direct your attention to Exhibit Number Three and ask you to review that, please.

A I'm sorry, looking back up, Mr. Carr --

Q All right.

A It may have been the well in Section 1 that we were talking about that may have been watered out.

Q Mr. Scheffler, now will you go to Exhibit Number Three?

Will you identify that for the Commission and review how you have calculated the penalty based on productive acres?

A Yes, sir, this is my proposed method by which one could calculate a penalty to be imposed upon the well that Monsanto is proposing to drill at the unorthodox or the nonstandard -- unorthodox location, using a ratio of

productive acreage to -- or the nonproductive acreage to the total acreage available in the proration unit.

I've shown here the method by which I've calculated the proposed production limitation factor for the Monsanto unorthodox well location.

I've first shown that the nonproductive Monsanto acreage in Section 36 is some 407 acres; that the acres in that stand-up proration unit are in fact 640; therefore I would say the recommended penalty with 407 acres of the 640 being considered nonproductive should be a ratio of the 64 percent restriction of the unorthodox well's production, or 36 percent production limitation factor applied against the well's monthly allowable as set by the Division.

Q And this factor is determined simply by using the productive acres as you have interpreted them to be in Section 36?

A Yes, sir.

Q Would you now go to what has been marked as Amoco Exhibit Number Four and review that for the Commission?

A Exhibit Number Four is a plat of the Section 36 and surrounding sections with wells on them that exist in the Indian Basin Upper Penn Field area.

On this exhibit in Section 36 I've shown the location of Monsanto's existing Lowe State No. 1 Well.

I've also shown the location at a 1650 location off the western and southern boundaries of that 640-acre proration unit of a standard location.

Q Is that the nearest standard location to the southwest corner of Section 36?

A Yes, sir, it is. That's the well with a red dot. I've shown the proposed location that Monsanto is making application for here today, which is 330 feet off the westernmost proration unit boundary line and the southernmost proration unit boundary line.

Q Would you identify the area which is indicated by the cross hatching on this exhibit?

A Yes, sir, that area describes the net encroachment that I've identified that would exist if one were to compare the difference in encroachment that would exist if you had a 640-acre drainage area around the regular location I've shown at 1650 on Section 36 versus the proposed unorthodox location at 330 feet off the west and southernmost proration unit boundaries.

Q This is the additional drainage area gained on all offsetting properties.

A Yes, sir.

Q What percent of a standard drainage area does this 210 acres represent?

A That would represent a 33 percent net

area of encroachment on offset acreage of a 640-acre drainage area.

Q Would you now refer to Exhibit Number Five and review the calculations set forth thereon?

A Yes, sir. Exhibit Number Five is the proposed production limitation factor for the Monsanto unorthodox well location, using the method I've discussed in Section 5 -- or rather on Exhibit Number Four.

I've shown a variation from standard location in a north/south direction to be 80 percent of the 1650 location.

I've also shown the net acres of encroachment on offset acreage to be 210 acres, or 33 percent of a 640-acre drainage area.

I would recommend that a penalty be imposed with 80 percent east/west factor and 80 percent north/south factor and a 33 percent net acre factor, which would yield an average of a 64 percent restriction of the unorthodox well's production.

Q Now, Mr. Scheffler, you presented two different approaches here of assessing a penalty. Do you believe that the Division should use either of these approaches or what is it that you recommend?

A I would say that either one of these methods of imposing a penalty on the applicant would be a

means by which to -- to adequately -- or begin, perhaps, to protect the correlative rights of those that are going to be seeing drainage from their offsetting sections; however, a more appropriate means would be actually combine the two and perhaps apply a 36 percent allowable limitation factor to the -- that would be based upon productive acreage, as well as a 36 percent allowable or production limitation factor based upon the calculation I've shown in Exhibit Number Five, which is based upon 640-acre radial drainage.

Q If you did that, what would you do, multiply the two factors?

A Yes, sir.

Q And what penalty would you come up with?

A Approximately 13 percent.

Q And if you came up with a 13 percent penalty, as you've recommended, it would account for additional drainage off -- outside the unit as well as the fact that there are nonproductive acres within the unit.

A Yes, sir. It would not be a 13 percent penalty. It would be a 13 percent production limitation factor and it would take care of our concerns.

Q Now, would you now go to what has been marked as Amoco Exhibit Number Six, again identify this, and review it for the Commission?

A On Exhibit Number Six again I've utilized

Monsanto's structure map for the top of the Cisco and with this exhibit I have identified a contour interval of 20 feet; I've shaded it in brown.

If you'll note, the Monsanto Lowe State No. 1 lies approximately in the center of that -- those two contours that bound that location.

The purpose of this exhibit is to show that wells that are consistent, fairly consistent, with the structural location of the Monsanto well have behaved very similarly to the Monsanto well from the standpoint of ultimate recoveries. That is to say that structurally comparable wells in the area that I have identified and I've noted by the pink dots, have not behaved significantly different from the Monsanto well. I would expect the Monsanto well to have recovered reserves consistent with the wells that I've shown by the pink dots, not necessarily by wells located off to the west.

Q So what you're saying is by taking wells that are located in a similar structural position their cumulative production is consistent with the Lowe State No. 1 Well.

A Yes.

Q Would you go to Exhibit Number Seven and review that, please?

A On Exhibit Number Seven I've listed the

wells that I have shown here on this exhibit, identified by either the pink dots or those that have the hatched in green circle around them, the first one being the Indian Basin Gas Com No. 1, which is located up in Section 23 of 21 South, 23 East. I've identified the top of the Cisco for that well. The net H is indicated by Monsanto on their, I believe it is Exhibit Number 5, their Isopach map, and the cumulative recovery that I believe that well will ultimately realize.

I've done the same sort of an analysis for each of the wells, a total of six, not including the Monsanto well.

When I average the subsea datum to the top of the Cisco I come up with an average top of the Cisco of -3533 feet, an average H of 129 feet, and a cumulative recovery of about 17.7 BCF.

When comparing this to the Lowe State Gas Com No. 1, I get very similar numbers from the standpoint of comparable subsea datums and ultimate recoveries. In fact, I find that I might say the Lowe State Gas Com has done very well considering it has less pay, that is 111 feet, than the average pay that is exhibited by these wells that are comparable structurally, that being about an average of 129 feet.

There's only been some 1.2 BCF less cum by the Lowe State Gas Com No. 1.

Q Mr. Scheffler, will you now go to Exhibit Number Eight, identify this, and review the calculations contained on this exhibit for the Examiner.

A This is an exhibit on which I have attempted to describe the existing gas in place above the existing gas/water contact as described by Monsanto in their previous hearing.

What this is is a gas in place calculation for gross acre feet above existing gas/water contact described by Monsanto, the gas/water contact being at -3528 feet, that's the average, in Section 36 of Township 21 South, Range 23 East. Again, that gas/water contact is relative to the previous hearing.

I've shown the gross pay above the original gas/water contact described by Monsanto, that original gas/water contact being at -3750 feet, to be some 151,098 acre feet. I obtained that number by planimetering the structure map that Monsanto presented in this hearing and determining the total gross pay above the original gas/water contact and I've shown that number as I've indicated.

I then defined the gross pay remaining above the existing average gas/water contact described by Monsanto at -3528 feet. Again that is relative to the previous hearing. I planimetered the, what I'll call remaining gross acre feet above the existing gas/water contact at that

subsea datum and came up with an acre feet of 16,438. Again Monsanto's estimate of original oil in place by pore volume is some 36.2 BCF.

Taking these three factors and also taking some reservoir conditions, that is, an initial formation volume factor, excuse me, a formation volume factor that -- a formation volume factor that would be described for the original reservoir conditions of .005 reservoir cubic feet, cubic feet per standard cubic feet, a reservoir temperature of 146 degrees Fahrenheit, a current reservoir pressure of 1700 psi, and this was obtained from the P/z curve that Monsanto presented, and a current z factor of some .86.

I've used all these data, pieces of data here to come up with a method of calculating what I believe to be a representative original gas in place figure that currently exists above the existing average gas/water contact of -3528 feet.

That number I've shown here is some 2.3 BCF.

Q Now this 2.3 BCF figure, is that the total reserves or is that the recoverable reserves?

A That would be reserves that I would define as being -- well, I wouldn't define that as being reserves. What those are are the original amount of -- the original amount of gas in place that would exist given the

current pressure conditions above the existing gas/water contact.

Q Now, to that figure if you're trying to estimate what will be produced from a well at the proposed location, would you apply a recovery factor?

A I could apply a recovery factor if I used Monsanto's recovery factor of 80 percent. You would get something significantly -- well, not significantly, but something more than that in terms of recoverable reserves.

Q So your recoverable reserves would be less than 2 BCF.

A Yes, sir.

Q Mr. Scheffler, you've heard Monsanto's recommendations concerning the Morrow formation, attempting a well in the Morrow formation. How would you recommend that the penalty be imposed on any production from the Morrow?

A I would recommend that the penalty be based upon the existing rules that are in place for that particular horizon; that is, the 640-acre spacing with 1650 distances prescribed for regular locations off the boundary line of the proration unit.

I would utilize the same approach for the Morrow that I have shown by the radial drainage technique for the Cisco.

Q If in fact a good Morrow well was encountered or was completed by Monsanto at that location, at that time are you aware of any way Amoco could seek to have a penalty imposed on that production (not understood)?

A No. sir.

Q Now you've recommended that certain penalties be imposed on production from the proposed well in each -- in the Cisco and in the Morrow formations. Against what do you recommend that penalty be applied?

A I would apply that penalty against the -- the allowable that will be assigned by the Division on a monthly basis because this is a prorated gas pool.

Q In your opinion would that imposition of the penalty you've recommended be fair to Monsanto?

A Yes, sir, I feel it would be more than fair.

Q In your opinion will granting the application of Monsanto but imposing the penalty recommended by Amoco protect correlative rights, be in the best interest of conservation and the prevention of waste?

A Yes, sir.

Q Were Exhibits One through Eight prepared by you or compiled under your direction and supervision?

A Yes, sir.

MR. CARR: At this time, Mr.

Stamets, we would offer into evidence Amoco Exhibits One through Eight.

MR. STAMETS: Without objection the exhibits will be admitted.

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

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Scheffler, did you make any calculations of how much gas remains to be produced under the Amoco acreage in Section 35?

A No, I have not.

MR. STAMETS: Are there questions of the witness?

MR. LOPEZ: Yes, Mr. Chairman.

CROSS EXAMINATION

BY MR. LOPEZ:

Q Mr. Scheffler, you're the same witness that testified for Amoco in the original hearing in this case, are you not?

A Yes, sir.

Q And if I have the exhibit marked correctly, your Exhibit Number Four is the method by which you sug-

gested a penalty be applied in the original hearing and in fact was applied, is that correct?

A Yes, sir.

Q With respect to this formulation, I'd like to examine with you your reasons for justifying such an approach.

First of all, as I understand it, you have initially calculated the percentage by which the proposed location differs from a standard location in the subject section, is that correct?

A With regard to distances.

Q From the lease line.

A Yes, sir.

Q And that's a feet distance calculation, is that correct?

A Yes, sir.

Q Then -- and I understand that that's both from the west line and the south line.

A Yes, sir.

Q Now Amoco's acreage lies to the west and therefore that I can understand.

What is your justification for Amoco's arguing ARCO's case who is the operator of the section lying to the south of the subject section?

A Drainage.

Q How would drainage of that section affect Amoco? My question is how would Monsanto's drainage of the ARCO section affect a penalty which should be applied against Amoco and your well?

A I don't believe the penalty should be a function of ownership around that location, nor should it be a function of the people that protest and do not protest, so to my mind it should be a function of the radial drainage that will occur at the new or proposed location and the amount of net acre feet that will result due to that proposed location encroaching on the surrounding acreage.

Q Isn't this a matter of correlative rights and isn't the argument between the correlative rights of Amoco and the correlative rights of Monsanto to recover the remaining reserves in the section, and if your correlative rights are not affected by drainage occurring in Section 1, how can you justify complaining?

A By the fact that that well's going to recover reserves in a radial pattern.

Q Right, but if the part of the radius that will be occurring affects ARCO and not you, how are your correlative rights being affected if ARCO's correlative rights are being affected, and should that be taken as a consideration in making a determination as to the affect on correlative rights?

A If it's a correlative rights question I think the correlative rights should be considered all around that lease acreage. Correlative rights are not limited by, again, operators.

Q So is it your testimony here today that in any case before the Commission that the Commission take into account whatever correlative rights that are going to be affected in the universe and not those affected by the complaining parties?

A I would limit my correlative rights concern to not -- to something less than the universe. I would consider only that area that's going to be affected by the radial drainage of the well.

Q Well, okay, I understand. Continuing this line of questioning, as I understand it, still referring to this Exhibit Four, in formulating your approach, you then went on to consider the amount of acreage, and I think it's referred to in another one of the exhibits -- the exhibit I was referring to -- well, let me correct the record.

The exhibit I've been referring to has been marked in this case as Exhibit Five. I've been referring to it as Exhibit Four.

Then referring to what is in this case Exhibit Four, I believe the acreage penalty of 33 percent has been added to your calculation in Exhibit Five, where

you arrived at this 64 percent number.

A Yes, sir.

Q My question to you is what justification is there to both (not clearly understood) combine an acreage factor overlap of what you say is 210 acres, for 33 percent, which is a feet times feet calculation in a formula and combine it with straight feet distance calculations? Isn't that mixing apples and oranges?

A No, sir.

Q Why not? How if feet squared -- how can a feet squared formula be combined with a straight feet formula?

A I don't understand the feet squared concept.

What I've done is taken a simple 8 percent of the 1650 foot location and from both the south line and the west line and added that together along with the 33 percent net acre foot encroachment, and averaged that and come up with my penalty of 64 percent, which inversely equates to a 36 percent production limitation factor.

Q Doesn't this in fact have -- constitute a double dipping? Not only have you penalized the applicant on the basis of distance from lease lines but then on top of it you take a p squared ratio of encroachment by overlap and add that to it.

A No, sir. I think that Monsanto has a perfect right to encroach at a 1650 foot location as per the existing field rules. Once they move beyond that, you have to take into consideration additional encroachment, and you have to take into consideration that you're going beyond the 1650 provided for spacing in the field rules.

Q Again, and with respect to your Exhibit Four, the overlapped acreage, I notice that much of the overlap lies in Sections 1 and 2 in which Amoco has no interest, is that correct?

A Yes, sir.

Q And again I assume your same answer, but what is your answer for complaining about encroachment in areas where the parties affected aren't complaining?

A I don't think the parties affected has anything to do with this.

Q So you think that --

A I'm sorry.

Q -- correlative rights is a universal issue and not --

MR. CARR: I object. May it please the Commission, this has been asked and answered ten times.

MR. LOPEZ: Well --

MR. CARR: We have said it

isn't a universal situation. We're talking about a factor that includes additional drainage area that is gained on offsetting properties by virtue of the unorthodox location and we've said that two or three times and we can talk about it all afternoon if you want to talk about one point over and over again. It's been asked and it's been answered.

MR. STAMETS: Sustain the objection.

Q Mr. Scheffler, if I understand correctly, the well in Section 1 has now been shut in due to water encroachment.

A Section 1?

Q The ARCO well?

A The ARCO, yes, sir.

Q And with respect to your Section 4 and your hatched mark in the overlap area, I notice a portion of that (not understood) Section 1.

A Yes, sir.

Q Assuming that the -- ARCO does not seek to replace the existing well, and, as I understand it, your testimony is that the field is subject to radial drainage, how would that cross hatched area indicated under Exhibit Four in Section 1 be recovered?

A Monsanto is going to be, if they drill this well at 330 feet, will be -- will have a penalty im-

posed on their production. That penalty is not going to keep radial drainage from occurring.

Q Now I don't think you answered my question.

Assuming that -- well, let's back up a minute.

Your calculation based on your last exhibit shows that optimistically there are 2.3 BCF remaining for Monsanto to recover.

A Yes, sir.

Q If that's the case, why should there be any penalty or not? In your opinion will the well at the proposed location with that kind of optimistic recovery be economically justified?

A A well at your proposed location is going to recover significantly more than 2.3 BCF.

What I'm identifying for you is remaining reserves above the existing gas/water contact that remain on your lease in terms of original -- those are not reserves, excuse me, in terms of original -- or gas in place above the gas/water contact.

You're going to recover, if you drill your well at that proposed location, likely significantly more than that; that's the reason for your penalty, because you're going to be draining offset acreage, and you're going

to be draining the area you're referring to in Section 1 that's not yet watered out by Atlantic Richfield.

That's the reason for the penalty.

Q Well, would you agree with me that if the well is not drilled at the proposed location that there would be a significant waste with respect to regaining the recoverable reserves in Section 1?

A No, sir.

Q Why not?

A If -- you're saying if you do not drill the well --

Q Yes.

A -- at the proposed location?

Q Right.

A You're saying if you don't drill any well at all there --

Q Correct.

A -- would there be waste at that location? I think that that's a question that in my mind would have to be answered by -- by ARCO. I don't know how many reserves are remaining there but I think that you're again, you're not necessarily talking about waste occurring, because if we're talking about an advancing movement of water, that gas is going to be moved.

I don't think waste is going to neces-

sarily occur.

Q Then in your opinion the gas would migrate up dip to the up dip well.

A It very well could.

Q If there are only 2.3 BCF underlying -- remaining underlying the Monsanto tract, would you oppose the penalty that was suggested earlier by Mr. Stamets, whereby Monsanto would be allowed to recover 8 to 10 BCF and then production stop?

A I certainly would.

Q Now referring to what you introduced as your Exhibit Number Two, and I refer you to the area you've colored in with respect to the Section 36 and the subject of this hearing with respect to Monsanto's application.

A Yes, sir.

Q And ask you to explain why you've extended the line to the south covering several contour lines.

A There are two data points that lead me to believe that that's an accurate depiction. As I said earlier, it may be an optimistic depiction of the presence of the existing gas/water contact.

The first date point being the Amoco's Federal D No. 1 located in the northwest corner of Section 6, that well is currently cutting water which leads me to believe that the water contact is in close proximity, con-

sistent with, if we move around along that contour, that would basically identify -- be identified by the red line I've drawn there.

We have a new data point, the Flag Redfern well that watered out, I believe I said in November of '85, which would draw that water contact down. So in honoring that data point, the Flag Redfern well and Amoco Federal D No. 1, I feel very comfortable with the location of the contact I've drawn in the lower portion of Section 36.

Q As a matter of fact, though, isn't it true that where you contour lines with respect to water encroachment is subject to varying and wide interpretation?

A Subject to interpretation but the interpretation can be combined with accurate data.

Q At the original hearing in this case Amoco did not present any penalty formula based on acreage, remaining acreage reserves, did it?

A No, sir, I don't believe it did.

Q Doesn't it strike you as surprisingly coincidental that based on your interpretation of the remainng acreage underlying 36 on your acreage calculations that it in fact exactly coincides with your interpretation of your -- of the penalty 80 percent, of 80 percent plus 32 percent divided by 3 equally 64 percent?

A No, sir, I just knew where it was. I

used the data that was available to me, and when I drew it I got that contact, and when I planimetered it I got 233 acres considered to be productive.

I did not try to back into a contact. I drew the contact and then planimetered the acreage.

MR. LOPEZ: Could I have just a minute?

No further questions.

RECROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Scheffler, in looking at your Exhibit Number One and Exhibit Number Two, it's not clear to me why you've drawn the water line where you did. That well only watered out last September -- last June.

A I'm sorry, sir, Mr. Commissioner. Could you reference the location you're looking at?

Q Okay. We're looking at the Monsanto well in Section 36.

A Yes, sir.

Q And that was shut in last June and I presume that's basically when it watered out.

A Yes, sir.

Q You show the contact, then, several feet, and my eyeballs aren't good enough to measure that out, but

say 100 or 200 feet west of that well rather than running the line right through it, and I'm not sure what your justification is for having a line that far west of the well at this time.

A Okay, the line, as I've drawn it through the Monsanto or in the proximity of the Monsanto off to the west, is about, I'd say, structurally maybe 15 feet up structure.

Q Is there any justification? What is the justification for that?

A My justification would be that in tying back to a gas/water contact, a gas/water contact that is drawn through the well that's currently cutting water up in Section 23, I feel that I would want to move that gas/water contact perhaps just beyond the contour line that the well in Section 23 is located on, simply because the Monsanto well has watered out; the well in Section 23 is still producing.

Q If a line were drawn through the Monsanto well instead of to the west of it, that would change, then, the amount of productive acres in that section, would it not?

A If I drew it through the Monsanto well?

Q Yes.

A Yes, sir, if I drew it through the Mon

santo well it would change the number of productive acreage -- acres; however, I feel that, you know, in order to be consistent with the method, that again, this same method and approach was used by Monsanto, and that I've honored their contour line through that producing well in Section 23, but if I were to draw it through the Monsanto well, I would be inconsistent with that approach; as well, I would be inconsistent with the fact that I've drawn a line through the well in Section 6 that is currently still producing gas but cutting water.

Q Okay. Do you have any disagreement that producable reserves still underlie Section 36?

A There are producable reserves underlying Section 36 and I have tried to quantify those, at least quantify the number of in-place -- the amount of in-place gas above the existing gas/water contact, and whatever recovery efficiency one wants to apply to that, would be the reserves that remain in Section 36.

Q Is it possible to calculate the reserves under Section 36 and also under Amoco's Section 35?

A To do that properly one would have to Isopach the remaining pay above the existing gas/water contact for this entire area in order to get a good Isopach map, and then to planimeter that acreage in each of those sections above that gas/water contact, which would give you

then the net pay that exists the existing gas/water contact and apply a calculation to that that would give you some estimate of the number of remaining reserves above that gas/water contact.

I think that to do it right, one would have to have some idea -- well, one would have to practically model this reservoir so that you could get a true recovery efficiency that you might expect with this water encroachment, so that you would basically know just what in terms of gas recovery you've realized when you compare what's ahead of the -- above the gas/water contact versus what is below it when it has risen, a fractional flow curve approach, I guess, is what I --

Q Your answer is yes, it is possible.

A Yes, sir, it would be possible with some work.

Q Okay.

A It certainly would, with some work.

Q If such calculations, for example, showed that the remaining reserves under Section 36 were half of those under Section 35, and this pool being prorated on an acreage basis, if the allowable assigned to a well in Section 36 were 50 percent of an allowable in Section 35, under those conditions would Amoco's correlative rights be violated with this well at the proposed unorthodox location?

A Could you repeat that one time, Mr. Commissioner?

Q I hope so.

A Okay, one more time.

Q Make one assumption here.

A Okay.

Q And that assumption is that the reserves, remaining reserves under Section 36 are one-half of the remaining reserves under Section 35. We do know that this pool is prorated on a straight acreage basis, so if we assign the well a the proposed unorthodox location in Section 36 50 percent of a regular allowable, while Amoco's well receives 100 percent of a regular allowable, would be be protecting Amoco's correlative rights?

A No, sir, I don't think so.

Q In what respect?

A I don't think you -- well, again, if we make that assumption, I guess I -- well, let me back up here.

I guess I have a problem with the assumption but I --

Q I appreciate that.

A It seems to me that if you're going to be talking about imposing a penalty based upon some kind of remaining reserve number, then that reserve number is going to

have to be accurately determined. That's why the approach we've used here is to show you that in fact the number of reserves that we estimate that --

Q Mr. Scheffler, you're answering me with a different set of circumstances. I wish you'd go back and answer the question that I asked with the assumptions, and I'm assuming that the assumptions are 100 percent correct in my assumption.

A Okay. Well, given this is a prorated field and if you want to assume that 50 percent of the gas remaining to be recovered, or the gas remaining to be recovered in 36 is 50 percent of what's in 35, I guess that would be an approach, yes, sir.

Q All right. Now, am I correct, you've sat in on this whole hearing, am I correct in stating that no one has presented any calculations of remaining producable reserves under Section 36, under Section 35, under Section 1 at this point.

A Yes, sir. No one's shown anything for 35, 2, and 1, you're right.

Q I also, I wish -- I'd like for you to answer this question for me.

Do you believe that of the evidence that we've got at this point, that's been presented in this case, that Monsanto's Exhibit Number Four, which is their Isopach

map --

A Yes, sir.

Q -- would be the closest thing that we have to work with in attempting to determine the relative reserves under these tracts.

A It might be the closest thing you have but it's completely incorrect, I think, for the purposes you would try to use it for.

Q I also assume that Amoco did have the opportunity to present something that they thought was more correct.

A What I would say is that we've been talking all day about -- we had the opportunity, yes, sir.

Q Thank you.

A What I would say, though, is that we've been talking all day about reserves that exist above the original gas/water contact -- or above the existing gas/water contact. We have been, that is Amoco. Monsanto again has been talking about reserves above the original gas/water contact; entirely different things and I think we're talking apples and oranges there when we try to mix the two and come up with a remaining reserve number.

MR. STAMETS: Are there other questions of this witness?

CROSS EXAMINATION

BY MR. TAYLOR:

Q Mr. Scheffler, what was your -- did I understand you to say finally in your testimony that you would recommend a 13 percent production limitation factor? What were you talking about?

A What I said there is if one is to consider both the penalty that we recommended utilizing the radial drainage circle approach, we came up with an allowable limitation penalty there of 36 percent to be imposed upon the allowable for the well.

Then if you go and you look at the penalty to impose -- to be imposed based upon productive acreage ratio to total acreage in the unit, you get a 36 percent allowable limitation factor.

What I was saying is that actually instead of taking one or the other, it seems that it could very well be considered appropriate to apply the 36 percent that was determined from the drainage area analysis to the 36 percent penalty that we came up with by utilizing identification of productive acreage, which would result in basically multiplying one penalty times the other and giving you a 13 percent production limitation factor.

Q And the meaning of that is that the well would be able to produce 13 percent of its --

A Allowable.

Q -- of its allowable.

In looking at your various penalties, what overlaps in drainage did you use --

A I'm sorry --

Q -- for the various wells?

A Can you repeat that, please?

Q When you look -- when you determine a penalty, don't you look at wells in the area and how much they -- how much the application well overlaps their acreage?

A Well, I consider the offset acreage, yes, sir.

Q Which ones did you look at?

A I looked at Section -- well, I looked at the overlap that occurred onto Amoco's Section 35, the Monsanto acreage in Section 2, and then the acreage that was encroached upon in Section 1 of, whatever that is, 22, 23, I believe.

Q Is that ARCO?

A Yes, sir.

Q Did ARCO object to this application?

A I -- no, sir, I have not seen anyone from ARCO.

Q Did Monsanto object to it?

A No, sir.

Q So you're -- so Amoco is objecting to the overlap of the drainage of this well for the other parties or for the other potential parties in this case that didn't come in.

A Well, we're taking the approach that drainage is going to occur radially and it just so happens that when that happens it's going to occur on these other tracts surrounding that location, and so therefore there will be a violation of correlatie rights.

Q If no one objects to an application for unorthodox locations does the Division have a duty to determine what drainage will occur and assess a penalty on every unorthodox application?

A If no one objects, then I don't think there's a need for one to assess a penalty. If one person objects to the location of a well, then I think a penalty ought to be imposed given a complete picture as far as what correlative rights violations will occur.

Q Why shouldn't the penalty affect only the drainage to Amoco rather than the drainage to the parties that are not objecting?

A Again, I don't think that those who object or who don't object, that the penalty should be a basis for that. In this case we have one objection, that's Amoco.

Our identification of the prevention of correlative rights -- or the protection of correlative rights that should occur here, I think, would be enough for the Commission to go forward and set a penalty that would take care of the prevention of those, or the protection of those correlative rights.

Q How much overlap or drainage would there be to Amoco's acreage alone?

A I haven't really calculated that number.

Q You don't know -- you don't know how much the overlap is there?

A No, sir, I don't. I haven't --

Q You accept for purposes of -- or for -- to be correct the exhibit of the State Land Office No. 4, which seems to show 30 acres?

A I'd say probably more on the line of 40 acres -- 80 acres, I'm sorry.

Q There's 80 acres overlap between the proposed location and Amoco's existing well.

A Estimating it, possibly. I'd have to actually work it out to determine that acreage.

Q What is the difference in the penalty that would be assessed if you looked only at Amoco's acreage versus the acreage that you've been considering, which includes Monsanto and ARCO?

A It would be reduced.

Q To what degree?

A The penalty would be reduced from a 36 percent production limitation factor to about a 42, 42 percent production limitation factor.

Q Considering only Amoco's acreage there would be a 42 percent limitation factor, would you explain how my arrived at that?

It looks to me just looking at the map that the acreage that's overlapped is not Amoco acreage.

A Well, let me run through the calculations one more time to make sure they're right.

80 acres, as the only area of encroachment that we would consider and define what portion that would be of a 640-acre drainage area, then I get a ratio there, 80 acres represents -- 80 acres would represent about 12.5 percent of a 640-acre drainage area.

If I then take that 12.5 percent net acre encroachment and add it to the 80 percent east/west factor and 80 percent north/south factor, 172 divided by 3, which gives me 57.5 percent restriction of an unorthodox well's location, or 42 percent production limitation factor.

Q So, if we're looking only at Amoco's objective in this case, the penalty would more like a little less than half, based upon your findings and not Monsanto's.

A If you consider just Amoco's acreage, yes, sir.

MR. TAYLOR: That's all the questions I have.

MR. STAMETS: Any other questions of this witness?

He may be excused.

Does anyone have anything further they wish to add in this case?

MS. WALKER: Mr. Commissioner, with your permission I would like to recall Mr. Stockton for a very, very brief observation.

MR. STAMETS: You may recall your witness, Ms. Walker.

BRUCE STOCKTON,

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

REDIRECT EXAMINATION

BY MS. WALKER:

Q Mr. Scheffler recommended a production penalty of 64 percent based on a formula that includes percentage deviation from a standard location as well as an acreage amount, is that correct?

A Yes. That is correct.

Q And do you have an opinion as to the reliability of such a formula?

A Yes, I do.

Q I would ask you to refer to what has been marked as State Land Office Exhibit Nine. Was this exhibit prepared by you or under your direction?

A Yes, it was.

Q Would you please explain this exhibit to us?

A This exhibit is a calculation of several examples of a possible penalty using a method which -- which has been presented before, taking the ratio of length, length and area and then dividing them by 3.

I submit to the Commission that this method is not valid and if the Commission wished to indulge in a rather lengthy theoretical discussion, I can prove this mathematically, but for purposes here I thought that it would be a little quicker to present a few examples.

If you will refer to the exhibit, the first example, 330 from the west, 330 from the south, is the same as the Monsanto unorthodox location. We calculate the north/south penalty as 80 percent, the east/west penalty as 80 percent, the area penalty is 36.43 percent. The area penalty, by the way, is identical to the area drained by the

unorthodox location from offsetting sections.

The total penalty is 65.48 percent. I've put in a few more examples here so one can see what happens as the area changes in relation to the total penalty.

Let's look, for example, at the third one. Hypothetically I've said we'd drill a well one foot from the west line, 1650 from the south. In that case we end up with a total penalty of even less than the 330/330 one.

Or look a the last example. In this case we're drilling a well -330 feet from the west line, drilling in the adjoining section 1320 from the south line. We're draining an acreage of 291 acres, roughly, from adjoining sections and yet the penalty calculates to be less than the total penalty on the 330/330 location.

Q Mr. Stockton, in your opinion is the formula recommended by Mr. Scheffler a reliable formula on which to base a production penalty?

A No, it is not.

Q Thank you.

MS. WALKER: I would offer State Land Office Exhibit Number Nine into evidence, and I have nothing further.

RECROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Stockton, do you believe the Commission would authorize a well to be located in an adjoining section?

A I certainly hope not.

Q One foot from the line?

A I certainly hope not.

Q Thank you.

MR. STAMETS: Any other questions of the witness?

I would suggest for those who are interested that they might wish to dig out the order resulting from the de novo hearing involving Yates Petroleum Company, which was heard in January of this year, and I believe that that order is quite instructive as to various and sundry factors which the Commission has and is currently utilizing in assigning penalties in cases such as this.

Does anyone have anything further they wish to add in this case?

Mr. Carr?

MR. CARR: I have a closing statement.

May it please the Commission, Monsanto is before you today seeking your authority to lo-

cate a gas well at a nonstandard location for both the Cisco and Morrow formations.

In the subject acreage both of these formations are on 160-acre spacing units and the testimony today -- I'm sorry, 640-acre spacing units, and the testimony here today shows that at least in the Cisco a well will probably drain an entire section.

The special pool rules for these pools provide for a setback of 1650 feet from the adjoining propertys and Monsanto is seeking permission to locate a well 80 percent closer to the property of the offsetting interest owners at a location 330 feet away, and so they gain an advantage on Amoco.

The basic question before you today actually involves correlative rights. Correlative rights, as you are aware, are defined not as guaranteeing to each interest owner that he can produce the reserves under his tract today or in 1964 or tomorrow, but it is defined as the opportunity afforded to permit an operator to produce these reserves without waste and he is then given an opportunity to produce the reserves that are underneath his property, but if you engage today in an exercise which results in an order whereby you say Monsanto you have 50 percent remaining reserves under your tract; Amoco you have twice that much and we're going to lock those in to

guarantee you that you can produce those, I suggest you're departing from the definition of correlative rights and you're taking on a new course of action which will result in every time I'm ever before you again with an unorthodox well location, I'm going to say we have X reserves under this property and we want you to set up a penalty for us where we can produce that amount, what we can show you today.

It's inconsistent with the definition. What you're to do is afford Monsanto an opportunity through your rules to produce its just and fair share of those reserves, the reserves under the property.

Monsanto has been sitting here since 1964 aware of what goes on in that reservoir. They have known that reserves are moving from the southeast -- from the northeast to the southwest in Section 35 and they don't do one thing about it until their existing well is shut in and now they want to come and get 80 percent too close to us and at something in the neighborhood of a penalty between 12 and 50 percent. That's absurd, because you are here directed to and authorized to impose a penalty on that well because of the advantage it's gained, and you've done that through the years.

If you look at the order you cited, you'd note that in Order R-8025-A, which you issued in February, that you traditionally have imposed a penalty

and you've used a number of formulas in doing that. You've tried to impose a penalty that will be effective to protect the guy who's being harmed because somebody else is gaining an advantage on his property.

You've used a number of approaches, and certainly we've explored every possible approach here today. The bottom line is we are asking you to impose a penalty that is effective, a penalty that is meaningful, and a penalty that today gives them an opportunity to produce their just and fair share but protects us from drainage which results from advancing on us by 80 percent.

I don't know of any more garbled (not understood) than suggesting that when you impose a penalty, you base that on the number of people who protest. I think that entirely misses the mark. If I have one acre of land in the extreme southeast corner of Section 36 and Monsanto wanted to drill 10 feet away, assuming, and let's assume for my argument that I'm 100 percent correct, that you let them do that, and I have that one acre offsetting them 10 feet away and I'm the only person who objects, you would say, well, because nobody else did, drain him, if that's the logic.

The idea is that you set a penalty based on certain factors designed to protect somebody because of the advantage gained on them to drain them. It's

not keyed to ownership and it's not keyed to how many people come in and protest and if you take that approach, then let's forget the whole thing because a penalty will be absolutely a farce.

There are facts before you today and they're simple. They are 80 percent too close to our lease line and they have produced this section for years; 640-acres is the presumed drainage radius. We have in this pool radial drainage. We cannot economically offset drainage with counter drainage unless we want to come in, cozy down in there with another unnecessary well 330 feet from that lease line and we are going to drain it, and when you look at what's happening to us, the drainage is keyed to two things. We're being drained because of the proximity to us. They are 80 percent too close. We're also being drained, because the new well which could drain 640 acres has a lot of acreage that's been watered out.

I can't help it, they can't help it, their acreage is down structure. Their acreage has been watered out. The pay is thinner in their acreage, and when you look at this whole mess that's been dumped in your lap here today, all we're asking is that you take the factors that have been presented to you, you come up with a formula based on the advantage they gain, not on how many people are lined up on either side of the room, but the ad-

vantage they gained on us.

As to the Morrow, their own testimony is they may get a good well. It's a risk but a Morrow well is a risk, and they may get a good well, and we ask that you come in and impose a penalty using the formula that you have traditionally used, using the two circles, and that you penalize production in the Morrow.

I don't think it is reasonable to ask you to treat this as a wildcat prospect when is a well on the section that has been completed in the Morrow. There's a well on the adjoining property that has been completed in the Morrow. This isn't a collateral attack on pool rules. What we are doing here today is dealing with the rules for the Morrow in this area and we submit that when you calculate and impose a penalty on that, you should use 640-acre spacing. If you don't come in and you don't enter a penalty which is meaningful to protect us because someone wants to be 80 percent closer to us than the rules provide, the rules which you have promulgated, we submit you will fail in your duty to protect correlative rights and you will have failed to carry out your statutory duty.

MR. STAMETS: Ms. Walker?

MS. WALKER: Yes. May it please the Commission, the State has presented expert geological and engineering testimony that shows that the pro-

posed unorthodox location is necessary in order for Monsanto to recover its just an equitable share of the gas from the pool.

The State's evidence has also shown that the proposed well will increase recovery from the pool and insure the production of gas that might otherwise be lost.

If the Commission grants Monsanto's application for an unorthodox well location, it would protect correlative rights and prevent waste.

It is the State's position that if the application for the unorthodox location is granted, any production penalty in excess of 36.8 percent that might be imposed could not really be justified. The only purpose of a production penalty is to offset any advantage obtained over other producers by reason of the unorthodox location. It is not the penalty's purpose to punish a producer who has been granted an exception location.

The State's geological and engineering evidence shows that any advantage gained by Monsanto over the producing wells in the area as a result of the unorthodox location would fall somewhere in a range between 4.5 percent and 36.8 percent. On an acreage basis the drainage area for Monsanto's proposed well overlaps the drainage area of the producing Amoco well by only 4.5

percent.

A volumetric calculation of the reserves in the Amoco well that might be drained by the proposed Monsanto well indicate that only about 12.6 of Amoco's production would be drained by the proposed Monsanto well.

A material balance calculation of reserves for the Amoco well that would be drained by the proposed Monsanto well indicate that approximately 36.8 percent of Amoco's reserves would be affected by the proposed well.

It could reasonably be concluded that a production penalty in the amount of any part of these percentages would accurately reflect the advantage Monsanto might obtain by reason of the unorthodox location. A production penalty in excess of 36.8 percent, however, would not correspond to the advantage obtained by reason of the unorthodox location and could not be justified.

The State has also offered expert testimony to show that the penalty formula urged by Amoco does not accomplish the intended purpose of offsetting an exception location advantage over other producers. The formula produced inconsistent results that bear no real relation to any advantage that might be obtained.

The formula's use of percentage deviation from a standard location is premised on the as-

sumption that the standard location was a better location and that the production should be increased for the degree of variation from that proposed better location.

Such an assumption is false. Exception locations are granted precisely because they are preferable locations, since they more effectively prevent waste and protect correlative rights than the standard location. Percentage deviation factors in a penalty formula simply punish producers in direct proportion to the distance the well is removed from the standard location. There is no correlation between a percentage deviation and the advantage obtained by virtue of the exception location.

As a consequence, production penalties derived by use of such a formula would be transformed from protective measures into punitive measures.

The penalty formula proposed by Amoco should not be used.

Because the exception well would prevent waste and protect correlative rights, we respectfully request the Commission grant Monsanto's application for the unorthodox well location.

The State further requests that if the Commission should choose to impose a production penalty on the well, that such penalty be based on the advantage actually obtained by Monsanto as indicated by either

acreage overlap or the State's reserve calculation, and that such production penalty be limited to an absolute maximum of 36.8 percent.

Thank you.

MR. STAMETS: Mr. Lopez.

MR. LOPEZ: Mr. Chairman, may it please the Commission, may I ask a question first? May we be allowed to submit requested findings and (not clearly understood)?

MR. STAMETS: If any party to this hearing so desires, they may do so. We're not requiring any party to do that, no.

MR. LOPEZ: Well, we'll be glad to take advantage of that offer and that will shorten my closing remarks.

I call to the Commission's attention the two basic principals which I believe are involved in this order.

The first, that not only is Monsanto entitled to seek an unorthodox well location under the circumstances of this case but I submit Monsanto is obligated to seek such an unorthodox location in order to protect the rights of other working interest owners and royalty owners.

Second, I believe the law will

show that there is no simple algebraic or other mathematical formula which the Commission should adhere to that cases of unorthodox well locations, subject to allowable penalties, have to be weighed on a case by case basis within the discretion of the Commission.

The State Land Office has showed the absurdity of the mathematical approach urged by Amoco at the original hearing in this case and resubmitted today, and further butressed by the acreage acreage formulation that Monsanto used in the first case, I believe we have shown that this is a reservoir where the gas is migrating westward and up dip. I think it's been further shown that there are additional significant reserves to be recovered under the subject tract.

I believe that there is ample evidence to show that the quality of pay is better in the Monsanto tract than the Amoco tract.

I think that under whatever formula you use, whether it be an acreage formula or whether it be on a volumetric or other basis, the range of penalty in order to allow Monsanto to protect its correlative rights and that of the other working interest owners should be no greater than 36.8 percent and could be as little as 4.8 percent at the discretion of the Commission.

I think there is also ample

evidence to show that unless the subject well is granted with a reasonable penalty that significant waste can and will occur.

I also suggest to the Commission unless a reasonable penalty is forthcoming that the correlative rights of Monsanto will be jeopardized in that reserves that it's entitled to recover under its tract will migrate up dip to Amoco, and I further suggest that this is the reason why Amoco has taken the extreme position of restricting the estimate of reserves under our tract and going so far as taking both their approaches and combining them together to do a double dip and getting the penalty to be as high as 86 percent.

MR. STAMETS: If there is nothing further, this case will be taken under advisement.

(Hearing concluded,)

C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY the foregoing Transcript of Hearing before the Oil Conservation Division (Commission) was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd CSR