STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO

11 May 1988

EXAMINER HEARING

IN THE MATTER OF:

Application of Santa Fe Energy Operating partners, L.P., for compulsory pooling, and a nonstandard gas proration unit, Eddy County, New Mexico. CASE 9372

Application of Bass Enterprises Production Company for compulsory pooling, and two nonstandard gas proration units, Eddy County, New Mexico. CASE 9374

BEFORE: David R. Catanach, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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I N D E X

I N D E X CONT'D

E X H I B I T S

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MR. CATANACH: Call next Case 9372.

MR. ROYBAL: Case 9372. Application of Santa Fe Energy Operating Partners, L.P., for compulsory pooling and a nonstandard gas proration unit, Eddy County, New Mexico.

MR. CATANACH: Are there appearances in this case?

MR. BRUCE: Mr. Examiner, my name is James Bruce from the Hinkle Law Firm in Santa Fe, representing Santa Fe Energy.

MR. CATANACH: Are there any other appearances?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin & Aubrey. I'm appearing on behalf of Bass Enterprises Production Company.

We'd request at this time, Mr. Examiner, that you also call Case 9374, and that Case 9374 and 9372 be consolidated for purposes of hearing.

MR. CATANACH: Okay, at this time we'll call Case 9374.

MR. ROYBAL: Case 9374. Application of Bass Enterprises Production Company for compulsory pooling and two nonstandard gas proration units, Eddy County, New Mexico.

ty, New Mexico.

MR. CATANACH: And we've got the same appearances in both cases?

MR. BRUCE: That's correct.

MR. CATANACH: Okay, Case 9372 and 9374 will be consolidated for the hearing today.

How many witnesses do you have?

MR. BRUCE: I have three witnesses, Mr. Examiner.

MR. KELLAHIN: I also have three witnesses, Mr. Examiner.

MR. CATANACH: Okay, can I get all the witnesses to stand and be sworn in at this time?

(Witnesses sworn.)

MR. CATANACH: Mr. Bruce.

GARY GREEN,

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

DIRECT EXAMINATION

BY MR. BRUCE:

Q Mr. Green, would you please state your

full name and city of residence?

A Gary Green, from Midland, Texas.

Q And what is your occupation and who are you employed by?

A I'm employed by Santa Fe Energy Company as a landman.

Q And have you previously testified before the Division as a landman and had your credentials accepted as a matter of record?

A Yes, I have.

Q And are you familiar with land matters involved in Santa Fe's application?

A Yes, I am.

MR. BRUCE: Mr. Examiner, are the witness' credentials acceptable?

MR. CATANACH: They are.

Q Briefly, Mr. Green, what does Santa Fe seek in its application?

A In Case Number 9372 Santa Fe Energy Operating partners, L.P., seeks an order pooling all mineral interest from the top of the Bone Springs to the base of the Morrow formation underlying the east half, west half, and Lots 1 through 4 of Section 30, Township 21 South, Range 28 East, Eddy County, New Mexico, forming a nonstandard 313.12-acre gas spacing proration unit for any and all formations,

a pool was developed on 320-acre spacing, to be dedicated to a well to be drilled at a standard location.

This application is a counter application to that of Bass Enterprises Production Company in Case 9374. In that case Bass seeks to force pool Santa Fe's acreage into a south half unit.

Q Would you please refer to what has been marked as Exhibit Number One and discuss its contents?

A Exhibit Number One is a land plat showing Santa Fe's proposed west half unit and well location. Santa Fe proposes a standard location 990 feet from the west line and 1980 feet from the south line of Section 30.

Santa Fe's acreage in Section 30 and Santa Fe's acreage in the area is stippled.

In addition, Santa Fe's acreage in the Indian Draw Strawn and East Carlsbad Wolfcamp Area to the southwest is indicated.

Q What is the lease ownership in Section 30?

A Santa Fe owns the fee leasehold in Lot 4 of Section 30. The remainder of the section is under Federal Lease NM-059365, owned by Bass.

Q And what parties does Santa Fe seek to force pool into its unit?

A Bass Enterprises Production Company and

Ralph Nix, an overriding royalty interest owner.

Q Was notice of Santa Fe's application sent to all other interest owners in the unit?

A Yes, and copies of the notices and certified return receipts are submitted as Exhibit Two.

MR. BRUCE: Excuse me, Mr. Examiner, I think I marked them as Exhibit Three.

Q Mr. Green, referring to Exhibit Two, would you please describe the history of Santa Fe's efforts to drill a well in Section 30 and please refer to that exhibit?

A Exhibit Two is various correspondence between Santa Fe and Bass concerning the proposal of this well.

Santa Fe initiated the proposal on October 6th, 1987. Santa Fe sent a letter to Bass proposing the 1280-acre working interest unit covering the east halves of Sections 24 and 25, Township 21 South, Range 27 East, and the west halves of Sections 19 and 30, Township 21 South, 28 East.

The letter proposed the drilling of a 12,200 foot Morrow test well located 990 feet from the west line and 1,980 feet from the east line of Section 30, Township 21 South, Range 28 East.

Santa Fe requested that Bass and Santa Fe participate on an acreage contribution basis and working in-

terest unit or requested that Bass would farm out its acreage to the working interest unit.

Attached to this letter is a well cost estimate and a plat indicating the well location and the proposed working interest outline.

On February 16th, 1988, Santa Fe had a meeting with Bass in their office whereby Santa Fe again requested Bass to consider Santa Fe's working interest unit proposal of October 6th, '87, and also at that time we proposed to enter into an area of mutual interest agreement to protect our mutual interest outside the working interest.

On February 22nd, 1988, Santa Fe wrote a letter to Bass as a follow-up to that meeting requesting to form the working interest unit.

On March 18th, 1988, Bass sent a letter to Santa Fe turning down Santa Fe's working interest unit proposal and advising that because of Bass' geological evaluation the east halves of Sections 24 and 25 were not prospective in the Strawn formation and the only basis to form a working interest unit would be for Santa Fe to reduce the size of the working interest unit whereby Santa Fe would own no more than 25 percent of the working interest.

This letter also proposed the drilling of a 12,100 foot Morrow test well located at 1980 from the west and 1980 from the south of Section 34, a south half prora-

tion unit.

Santa Fe rejected this offer because Santa Fe had offered to contribute a similar amount of acreage and have a -- share a similar amount of the cost of drilling the well. Santa Fe also believed that it would -- that the acreage that it would contribute to the working interest unit is prospective in the Strawn formation and also other zones.

Santa Fe also advised Bass at this time it would contribute its original acreage from the working interest unit but reduce its participation from 56.34 percent to 50 percent working interest.

On April 7th Santa Fe sent a letter to Bass proposing the drilling of a test well at a location 990 from the west line, 1980 from the south line with the working interest unit being reduced to just cover the west half of Section 30, because of Santa Fe's concern of the additional risk of drilling a wet well in the Strawn formation at Bass' proposed location.

On April 11th Santa Fe received notice of Bass' application to the OCD force pooling the west half of Section 30. Subsequent to that we received a correction notice changing the area to the south half rather than the west half.

Santa Fe also received a letter from Bass

rejecting Santa Fe's offer to reduce the working interest percentage in the unit from 56 to 50 percent and the letter also indicated Bass' intention to proceed with drilling a test well at the proposed location.

There have also been some follow-up phone discussions resulting in no changes in the parties' positions.

Q In your opinion has Santa Fe made a good faith effort to obtain the consent of Bass to join in the drilling of Santa Fe's proposed well?

A Yes.

Q And for the well what does Santa Fe propose as an operating agreement?

A Santa Fe would propose a mutually acceptable 1982 AAPL Model Form 610 Operating Agreement. This form is commonly used by Santa Fe in Eddy County for wells of this type.

Q Would you please describe Santa Fe's drilling history in Eddy County for the past few years?

A From 1983 to present Santa Fe has drilled 32 wells in Eddy County and all but one of these wells is drilled to the Morrow formation.

28 of these wells were successful in some formation.

Santa Fe also participated in 9 other

wells of which 8 were successful.

Therefore, Santa Fe has drilled 41 wells total of which 36 were successful; thus Santa Fe believes that the geological -- the geology discussed by our next witness should be given extra consideration.

Q Who does Santa Fe request the Division to designate as operator in the forced pooling order?

A Because Bass has the larger working interest in the west half of Section 30 and because the well is within the Big Eddy Unit, Santa Fe would request that Bass be designated as operator if they participate in the drilling of the well.

Q In your opinion will the granting of Santa Fe's application be in the interest of conservation and the prevention of waste?

A Yes.

Q And were Exhibits One through Three prepared by you or compiled from company records?

A Yes.

MR. BRUCE: Mr. Examiner, at this time I'd move the admission of Santa Fe Exhibits One through Three.

MR. CATANACH: Exhibits One through Three will be admitted as evidence.

Mr. Kellahin?

MR. KELLAHIN: Thank you, Mr. Examiner.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Let me use your Exhibit Number One, Mr. Green, as a reference point for my questions to you.

Were you the landman principally responsible for Santa Fe Energy's discussions with Bass in proposing various combinations of acreage for the development of the Strawn in this immediate area?

A No, I was not. I was the primary landman. The proposals from various prospects in this area were presented by our former Exploration Manager, Bill (unclear). I was not privy to all the conversations.

Q You are the author of the October 6, 1987 letter over Santa Fe Energy's letterhead to Bass proposing this 2-section working interest ownership?

A Yes, I am.

Q And that 2 sections was to include the east half of 24, the east half of 25, which is mostly Santa Fe acreage --

A That's correct.

Q -- and you were to combine that with the west half of 19 and the west half of 30, which is mostly the

Big Eddy Unit.

A That's correct.

Q The interest that Santa Fe Energy has in Section 30 is confined to the 40-acre tract in the southwest of the southwest of that section.

A That's correct, Lot 4.

Q And the balance, being some 600 acres, is operated by Bass pursuant to the Big Eddy Unit operations.

A That is correct.

Q And Santa Fe Energy acquired its lease, what, two years ago, perhaps?

A A year and a half to two years ago.

Q And you acquired that at a time that the Big Eddy Unit configuration was, as it is now, for this section.

A That's correct.

Q In fact the Big Eddy Unit has been in existence for some 30 years or more, has it not, sir?

A That's correct; since the early fifties, mid-fifties.

Q You've talked about Santa Fe Energy's success with regards to its Strawn development in this area and believe that that factor ought to be taken into consideration by the Examiner in allowing Bass to be the operator? I don't understand the point of talking about your success

for Strawn completions in Eddy County.

A I don't think we addressed specifically Strawn completions. I said, I think what we're trying to indicate, that we are a successful operator in the area.

Q Despite that success, however, you propose that Bass ought to be the operator of the well drilled in Section 30.

A We would propose to allow Bass to operate that well. Our concern is the location of the well. We feel that Bass is competent to operate the well; we have no problems with Bass operating it.

I think under the terms of the Big Eddy agreement, even if we were to drill the well, we would turn over operations of the well to Bass after it was completed.

Q The proposed location you have told us about today that's on Exhibit Number One is a location that is off the Santa Fe Energy lease.

A That is correct.

Q Do you know, Mr. Green, that even if Santa Fe Energy was designated the operator of this spacing unit for this well, that you could not actually drill the well because of the terms and conditions of the Big Eddy Unit agreement with the Bureau of Land Management?

A No, I was not aware of that.

Q The -- looking at the east half of Sec-

tion 25, Santa Fe Energy, in the southeast quarter of that section, has drilled an attempt to produce from the Strawn formation, has it not?

A I am not familiar with that well and it would probably be best answered by our geologist or engineer.

Q Does that dry hole represent one of Santa Fe Energy's success in Strawn attempts in the immediate area?

A No, it does not.

Q Your initial letter of October 6, 1987, as well as Exhibit Number One, poses a well location 1980 form the west line and 19 -- I'm sorry, I misspoke.

It's 990 from the west line and 1980 from the south line.

A Yes, sir.

Q Bass, in their letter to you of April 7th, I'm sorry, there's prior correspondence, of March 18th, 1988 --

A Uh-huh.

Q -- Bass is proposing that the well be located 1000 feet farther to the east --

A Yes, sir.

Q -- which will put it at a 1980 from the west line location and a 1980 from the south line location.

All right? Agreed?

A Agreed.

Q And in that letter Mr. Hansen for Bass proposed that the orientation of the spacing unit be a south half orientation, is that not true?

A That is true.

Q And, in fact, Bass has never proposed to Santa Fe any other orientation for the initial well in Section 30, other than a south half orientation.

A No, that's true.

Q Okay. So the initial advertisement, or the application that we filed for Bass is simply a typographical error. It was never understood by Santa Fe that Bass was proposing to agree with you for a west half orientation.

A No, it was not.

Q As of today, Mr. Green, does Bass -- I'm sorry, does Santa Fe Energy still maintain that it desires the orientation of the spacing unit to be a stand-up west half orientation?

A Yes. Yes, it does.

Q And in that orientation, then, Santa Fe Energy would have a 12-1/2 percent working interest?

A That is correct.

Q And under a laydown, as Bass proposed,

you would still have the same 12-1/2 percent interest.

A That is correct.

Q Your base lease that you acquired for that 40-acre tract is -- is that fee minerals?

A Yes, sir.

Q The balance of the Section 30 is Federal minerals?

A That's correct.

Q Is the fee tract, that 40-acre tract, is that under common ownership by one fee mineral owner?

A No, it is not.

Q You have undivided ownership?

A I have undivided ownership in that.

Q And you have obtained leases from all the undivided owners for that 40-acre tract?

A Yes.

Q And what is the net working interest that Santa Fe Energy has obtained under that tract?

A We have 100 percent of the working interest.

Q What is the -- what is the royalty burden on that 40-acre tract?

A The royalty burdens are -- they will vary from 3/16th to 1/6th and we possibly could -- I don't have that information -- we possibly could have a small interest

with a quarter royalty.

Q And those are all leases acquired about 18 months ago?

A 18 to 12 months ago.

Q After acquiring the initial base leases for the 40-acre tract, Mr. Green, has Santa Fe Energy further burdened its interest by additional overriding royalty interest?

A No, it has not.

Q You have not sold any interest to any other working interest owner?

A No, we haven't.

Q Have you caused to be filed on behalf of Santa Fe Energy an APD with the Bureau of Land Management proposing your well location and the west half as the spacing unit?

A No, we have not.

Q Now, the initial proposal to Bass was to form this 2-section working interest ownership for those portions of the four sections that we've described.

A Right.

Q When did you first specifically correspond with Bass with regards to this specific 320-acre spacing unit and this particular well?

A The letter was written on April 7th.

Q So it's the April 7th letter, then, represents the first correspondence from Santa Fe to Bass that is specific as to this particular 320.

A That is correct.

Q In that proposal you're proposing a Strawn/Morrow test to 12,200 feet and you are proposing a different location from the location that you have proposed on October 6th, 1987, and it's also a different location than you have picked on Exhibit Number One, is that not true?

A That is -- that is true but I believe that to be a typographical error, 1990 from the west line and 1980 from the south line.

Q The letter of April 7th, 1988, in fact, shows a proposed location, at least in this letter, of 990 from the west and 1980 from the north line of Section 30.

Are you with me, Mr. Green?

A I'm, yeah, I'm with you now.

That is correct and I think we did move that location a time or two, and this could be a proposal and then we conceded to move it down to the southwest quarter. You could be right that we did propose it in the northwest quarter and we have since conceded to move it to the southwest quarter.

Q Am I clear now in understanding after

you've read through the letter that the April 7th, 1988 letter, when it locates the well 1980 from the north line, in fact is not a typographical error?

A No, that was -- it's not a typographical error.

Q You said what you meant to say at that --

A That said what I meant to say at that time.

Q Okay. Do you have subsequent correspondence or communication from Santa Fe Energy to Bass in which you amend your location and show that you're now returning back to the original proposed location?

A No, I do not.

Q Were you privy to any discussions between Mr. Jens Hansen and Mr. Bill Schaefer of Santa Fe Energy with regards to discussions about where to locate this well?

A Yes, I was.

Q Were you involved in discussions in which you were present between Mr. Hansen and Mr. Schaefer in April of this year?

A March, not April of this year, March is when I believe we had our meeting. Mr. Hansen visited our office in Midland.

Q In that discussion in March did not Mr. Schaefer tell Mr. Hansen on behalf of Bass that Santa Fe

Energy proposed to move its location to the northwest quarter in order to move away from the water that he believed to be present in the section?

A He proposed to move as close to the west line, whether it be in the north or the south, to get away from the water in the east part of the section.

Q And based upon that desire to move away from the water, then he proposed the location 1980 from the north line, 990 from the west line.

A Yes.

Q When were you subsequently told by Mr. Schaefer that he was now returning to the original location in the southwest quarter?

A It had to do with discussions with the Bureau of Land Management concerning the acreage involved that they felt they would have enough acreage or they would have -- there was enough acreage in the lease to have a north half spacing unit if the well was there and they possibly would have some trouble approving a communitization agreement covering the west half.

We took that into consideration. They advised us that unless we could convince them or show them that with our geological interpretation of the west -- east half of that section being wet, then they would, of course, approve it. Rather than risk that factor we agreed to move

it back to the south whether we got their approval or not. Our main concern was to get as close to the west line and a legal location and stay as far from the east half of Section 30 as we could because we believe the Strawn to be wet.

Q I'm not sure I understood you, Mr. Green.

A Uh-huh.

Q Are you telling me that Mr. Schaefer's decision to pick a point high on the structure as he has interpreted it and to move to the northwest quarter, was allowed to be overridden because the BLM desired it in the southeaast quarter -- the southwest quarter?

A I probably shouldn't answer this question. It would probably be better to ask Mr. Eckerty, our geologist. I'll just leave it at that, our geologist --

Q As best you know, though, Santa Fe --

A I trust my -- as best I know, what I understand, that there was not a great deal of difference between the two locations and that's something that Mr. Eckerty can discuss.

Q Difference between what two locations, Mr. Green?

A Between 990 from the west line and 1980 from the south line and 990 from the west line and 1980 from the north line.

Q Have you obtained information as a land-

man from the Bureau of Land Management as to whether or not they will give any consideration at all to using the west half as the spacing unit?

A Yes, we have.

Q And what was -- what answer did you get?

A The answer that we got was that we would have to present our case and show them that the east half of the section was wet and that we would be wasting -- it would be contributing to waste if we did not, you know, have a west half proration unit; that they would -- they would consider it if we could geologically show that we could drain the reservoir with one well in the west half.

Q And when you discuss these kinds of matters with the Bureau of Land Management, what particular individual with the Bureau of Land Management do you deal with?

A I talk to Mr. Armando Lopez.

Q Any others, sir? Do you have a recommendation to the Examiner, Mr. Green, as to a proposed overhead rate on a monthly basis for a drilling well and a producing well?

A Probably, I think, in the area that Santa Fe would use $5445 for a drilling well; 500 -- 10 percent of that, $544 for a producing well.

Q If I told you that Bass will propose that

the drilling well rate be $5500 a month and the producing well rate would be 10 percent of that, would yau have any disagreement with that?

A No.

Q Were you involved in discussions with Bass that predate the October '87 proposal whereby the discussion initiated by Santa Fe Energy was one where you proposed a working interest unit or area of mutual interest that would include all of Section 19 and all of Section 30?

A No, I was not.

MR. KELLAHIN: Thank you, Mr. Examiner.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Green, I'm just trying to figure out here, what -- what portion of Section 30 lies within the unit itself?

A All of Section 30. If you'll look at the hatched line running up to the top of 13 all the way and coming back, all of that acreage falls within the Big Eddy Unit boundaries.

Q Including your 40-acre tract.

A Including our 40 acres.

Q Okay. That's all I have. You may be ex-

cused.

MR. BRUCE: Could I ask one -- one -- a couple extra questions, Mr. Examiner?

REDIRECT EXAMINATION

BY MR. BRUCE:

Q Mr. Green, referring to your October 6th, 1987 letter to Bass, the well location you proposed in that letter is the same that you are proposing today, is it not?

A That is correct.

Q And because only the west half of Section 30 would have been included in the proposed working interest unit, it would be necessity have been stand-up west half unit.

A That's correct.

MR. BRUCE: That's all, Mr. Examiner.

DON ECKERTY,

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

DIRECT EXAMINATION

BY MR. BRUCE:

Q Mr. Eckerty, would you please state your

full name and city of residence?

A Donald Dale Eckerty, Midland, Texas.

Q And what is your occupation and who are you employed by?

A I am a Senior Geophysicist with Santa Fe Energy Company.

Q And have you previously testified before the OCD as a geophysicist?

A No, sir.

Q Would you please discuss your educational and work background?

A I have a BS in geology from Indiana University, 1965; an MA in geology from Indiana in 1968.

I have worked four years with Shell Oil, largely in the Northern Michigan Reef Trend.

I was Senior Geophysicist with Getty Oil in Midland, Texas for 7-1/2 years. I specialized in the Delaware Basin of west Texas and New Mexico; also worked the Valverde Basin of west Texas.

I had a year and a half with ARCO Petroleum as a project supervisor and geophysicist, working the east portion of the United States from the Williston Basin to the Gulf Coast, including west Texas.

I was Senior Geophysicist with Monsanto in Midland, Texas for one year and I worked the Midland and

Delaware Basins of west Texas.

For the last four years I have been with Santa Fe Energy in Midland and I've -- almost the entire time I've worked the southeast New Mexico Morrow, and the last two years I have concentrated on the Strawn in Eddy and Lea Counties, doing largely geology.

Q And are you familiar with the geology and geophysics involved in Santa Fe's application?

A Yes, sir.

MR. BRUCE: Mr. Examiner, at this time I would ask you if the witness' credentials are acceptable?

MR. CATANACH: He is so qualified. How do you spell your last name, sir?

A E-C-K-E-R-T-Y.

MR. BRUCE: Before I move on, Mr. Examiner, I meant to move the admission of Exhibits One through Three previously, and I did not.

MR. KELLAHIN: No objection.

MR. CATANACH: Exhibits One through Three will be admitted into evidence.

Q Mr. Eckerty, would you please refer to Santa Fe Exhibit Number Four and describe its contents for the Examiner?

A Exhibit Number Four is a map of what we

feel is the primary Strawn reservoir in our La Huerta prospect, which is the name we give this -- this prospect.

We have in pink a reef developed within the Strawn. It is a tight reef. It's in Sections 25 and 26 of Township 21 South, Range 27 East. Within what we feel -- we call the second Strawn, which I will discuss at further length in the next exhibit, we have developed a pod of reservoir -- pod of porosity that extends partially around this reef. This is caused by -- well, it's development of porosity in carbonate detrital sands that spread around the reefs and sometimes lap over the reefs. In this case it is adjacent to the reef.

The yellow on this map is the reservoir above the water level and we have the water level right at the Bass 65 Well.

The contours on the map are the -- the structural contours are on top of this second zone of Strawn porosity that we see mapped in the area. We feel that this gas/water contact lies right at the midpoint of Section 30 or within a short distance, and that the wells in this reservoir to the east have encountered wet porosity.

Q Would you please describe the cross section which is depicted on this map, which wells are included?

A The cross section B-B' starts at the

Champlin Toothman Well in Section 25 of 21 South, 27 East, through our previously mentioned Vernon Fed Com Well, also in Section 25, crosses to our location, then south to the Bass 65 Big Eddy Well in Section 31 of 21 South, 28 East, then north to the PanAm No. 2 Well in Section 19, and then east to the Bass No. 60 Well, I believe 60, in Section 20 of 21 South, 28 East.

Q Will you please now refer to Exhibit Number Five and discuss that cross section in greater detail?

A Yes, sir. Cross Section B-B', previously described, I will go through from west to east.

The Strawn, as we see it in Eddy County, is developed -- I'm talking about the Strawn developed updip from a Strawn shelf, carbonate shelf, in -- went across Eddy and Lea Counties.

Santa Fe, with our work largely concentrated at this time in Indian Draw and then to the Carlsbad South, to the south of this prospect, and then along this basinal shelf edge to the northeast, has divided the Strawn into a series of sub-units which we feel are mappable over this entire region.

The -- there's a stray carbonate in this cross section we know as the Upper Strawn. This is of no interest to us. It occurs in this locality and then goes to the northwest.

The major units I'll discuss are the First Strawn, the Second Strawn, and our Third Strawn zone from top to bottom.

In this case, and in every reservoir we are familiar with, the porosity developed in the Second Strawn has contributed the bulk of hydrocarbon production from the Strawn.

In this case at the Champlin Toothman we've developed dense carbonate which we interpret as an internal algal reef.

Our Vernon Well, moving to the east, is right on the edge of this reef. These reefs are very small in areal extent but can be very high, or they can be very tall, if you get in the right climate. In this case the reef is restricted to the Second Strawn.

As we come down dip on the section to the east of the reef, you can see by the time you get to the Bass 65 Well that you're picking up more internal structure within the Second Strawn. We have been able to classify this internal structure into two major zones which once again we're able to follow around the area, an upper zone A, a lower zone B.

In this area the Bass 65 Well has a major porosity developed in what we feel is Zone 2B, the second Strawn unit and the B reservoir -- the B unit in -- B zone,

excuse me.

In this area, as well as in our Carlsbad Field to the south, we see this porosity developed right up to the edge of the reef and this will -- I will refer to this again on a later exhibit.

In the Bass 65 Well we have a water level as shown. The, as I mentioned before, the oil above, oil and gas above the gas/water contact is shown in orange. The water-filled porosity is shown in light blue.

As we come further to the east we see that zones A and B can thicken and thin. This is largely due to the winnowing and reworking of carbonate sands along this shelf and around these reefs.

The PanAm Big Eddy Unit No. 2 Well shows some carbon -- hydrocarbon filled porosities that were tested by PanAm in 1963. This well does have water saturations and bulk volume water calculations that would suggest it should produce. It produced a total of 1447 barrels of oil and was abandoned by PanAm.

We've had a Schlumberger log analyst, Mr. Steve Hansen in Midland, go over both the Bass 65 Well and the PanAm Big Eddy No. 2 Well. He feels that --

MR. KELLAHIN: Objection, Mr. Examiner, as to what this individual feels. It's hearsay.

MR. CATANACH: We'll disallow

that.

A Okay. We feel, we believe that the porosities, largely in what I call Zone A in the PanAm Big Eddy 2 Well, are noncommercial and cannot be connected to the porosity that we mapped in the Bass 65 Well.

And the final well in the cross section, the Bass Big Eddy Unit No. 60, is well down dip on the structure. The water calculations that I have run indicate that it is in a transition zone, oil and water. We have put the water level in this zone right at the well. We feel that effectively this well is wet in all zones in the Strawn.

Q Mr. Eckerty, from your calculations is the PanAmerican No. 2 Well wet?

A The PanAmerican No. 2 Well, as I mentioned, it calculates hydrocarbon productive but it was tested noncommercial by PanAm in 1963.

It was perfed to two zones in what I feel is -- what is the Zone A of the Second -- of the Second Strawn, one set of perfs shown on the cross section at the top of Zone B in a minor internal porosity developed in the Second Strawn that is also not connected to the Big Eddy No. 65.

It is our contention that none of these zones contribute a significant -- can be expected to contri-

bute a significant amount of hydrocarbons in any well drilled at either of our proposed locations the west half of Section 30, and that the -- our argument is that we are trying to get as far above this water level depicted on the Bass 65 Well, as far above it as we can, and even 1000 foot move to the west from Bass' location to ours could result in significant gain in structure and still remain outside of the tight reef in the Second Strawn, which our Vernon Fed Com No. 2 Well encountered, and I intend to follow this up or back it up further with my next exhibit, which will show our Carlsbad South Strawn Field, an analagous situation.

Q So, in other words, Mr. Eckerty, Santa Fe is attempting to move the well up dip from the Big Eddy Unit No. 65 Well in order to get as far away as possible from the gas/water contact?

A Yes, sir.

Q And in your opinion is Bass' proposed location, 1980 feet from the west line and 1980 feet from the south line, too close to the gas/water contact?

A We are uncomfortable with the location that far to the east in this reservoir.

Q And that is because your interpretation is that the entire east half of Section 30 is wet and nonproductive?

A Yes, sir.

Q And you mentioned calculations on a Pan-American well, did you have your calculations confirmed by outside --

A Yes. That's where I was trying to go when I mentioned the log analyst and --

Q Okay. You mentioned Santa Fe's experience in the Carlsbad Strawn Pool. I believe this pool is indicated on Exhibit Number One by Santa Fe's acreage, oh, about four or five miles southwest of the proposed well?

A It is.

Q Would you please now refer to Exhibit Number Six and discuss the characteristics of the Carlsbad Strawn Pool?

A In the Carlsbad Strawn Pool I'm referring entirely to the wells that Santa Fe operates in Sections 22, 27, 28, Township 22 South, 27 East.

Once again we have a Strawn reef shown in pink that is fringed by detrital carbonate sands.

Once we get out of this reef we get into our normal three Strawn units which we can map, the First, Second, and Third Strawn, once again from top to bottom. I mentioned earlier that these reefs can vary in size. This reef was developed basinward of our La Huerta prospect further down -- down the dip, and conditions at this particular place were favorable for reef growth throughout the Strawn,

but once again we see a very sharp contact between reef and off-reef material.

The analogous reservoir to the one I mentioned earlier at the Bass 65, is what we refer to our Weems -- as our Weems/Neeley reservoir, which is also developed at the top of the lower zone of the Second Strawn, denoted as Zone B.

The same color scheme is in effect. The Weems/Neeley reservoir above the gas/water contact is in orange and below the gas/water contact is light blue.

I'd like to refer to the cross section and the map on this particular on interchangeably since they are in the same exhibit.

Santa Fe in 1985 drilled the well which we feel is analogous to the Bass 65. It was our Henry 2 Well, the third well from the left on our cross section. It, as the Bass 64 Well did, encountered both hydrocarbon filled and water filled porosity in the Weems/Neeley zone. Unfortunately, this well, even though we perfed it only in the upper part of this zone, produced a lot of water and became noncommercial very quickly. We squeezed it off.

From 8-85 through 10-85 this well produced 21-million cubic feet of gas, 547 barrels of oil, 4643 barrels of water.

We then squeezed this off because the

wells to the west in the same reservoir were sufficient to -- to drain this.

We then recompleted the Henry 2 up the hole in the Strawn at the perforations indicated between 10,496 to 10,568. Even in these upper zones, the First Strawn perfs and the Zone A perfs, you can tell by the production that a rather minor amount of hydrocarbons are being produced; in fact, this well is for all practical purposes noncommercial in the Strawn.

This is analogous to the situation that we see at the Bass 65 where a few -- that's referring back to a previous exhibit, can I do that -- where the bulk of the perforations produced gas, oil and water out of this Second Strawn Zone B of Exhibit Four.

The scattered perforations up the hole contributed an insignificant amount of hydrocarbons and we don't feel that they are worth pursuing as an objective.

Q So in other words the second unit B Zone is the major producing element.

A The second unit B Zone is the major element and we see this at both these locations, our Indian Draw -- or our Carlsdad South and at the Bass 65 Well to the north.

Q And so looking at Exhibit Six in the Carlsbad South Pool, by moving west and up dip to the Weems

and Neeley wells, you encountered substantial porosity and productivity.

A Yes, sir. The Weems and or the Neeley well remained in the thick, porous zone and were above the gas/water contact.

Q And so Santa Fe hopes to avoid a Henry No. 2 or Big Eddy No. 65 situation.

A We -- we hope to avoid a Henry 2, where we want to stay above the water, and in this case we would say we want to stay as close to the reef as we can get without encountering it.

Now, our Henry reef is one of the reefs in this trend that does produce. In fact, I believe it has the -- the highest, or second highest calculated open flow in the state of 267-million cubic feet. This is an example of a reef that produces surrounded by fringing sands that also produce. We have other examples that we could bring up where the reef itself is tight while the fringing carbonates produce, such as we see at La Huerta.

We could have examples such as we see at other fields where both the reef and the fringing carbonate sands do produce but to reiterate, what we are trying to do is stay above the water and stay out of the tight reef.

Q And in your opinion will the drilling of the well at Santa Fe's proposed location prevent waste?

A Yes, it will.

Q And in your opinion would the drilling at Bass' location risk the chance of being at or near the gas/water contact or watering out too soon and thus requiring the drilling of a second well in the west half of Section 30.

A The structural information available to me indicates that the dip at the La Huerta prospect is from west to east and Bass' well would be down dip from our proposed location.

Q Now, Santa Fe's, and I believe Bass' proposed wells are both Strawn -- they're primarily targetted at the Strawn, is that correct?

A Yes, sir, both -- both of these wells have the Strawn as the major objective.

Q Does Santa Fe propose to drill the well or have its well drilled to test the Morrow formation?

A We do.

Q And would that well have a reasonable chance of being successfully completed in the Morrow at Santa Fe's location?

A It has a reasonable chance.

Q But the Morrow is riskier than the Strawn.

A The Morrow is a riskier zone to test,

yes, sir.

Q Now, Bass has also applied to force pool 160-acre units. To your knowledge are there any productive formations or pools in this area with 160-acre spacing?

A All of the pools of which I'm aware are for gas are on 320-acre spacing.

Q And what penalty do you recommend for nonconsenting interest owners?

A A normal nonconsent on a risky -- risky well, such as we're attempting to drill, would be a 200 percent penalty.

Q And you think that's justified by the geology of this area?

A Yes, sir, I do.

Q Were Exhibits Four through Six prepared by you or under your direction?

A They were.

MR. BRUCE: At this time, Mr. Examiner, I move the admission of Exhibits Four through Six.

MR. CATANACH: Exhibits Four through Six will be admitted into evidence.

MR. KELLAHIN: No objection.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Eckerty, if you'll go back to your Exhibit Number Four, you've qualified yourself as an expert witness before the Division not only as a geologist but as an individual with professional and educational qualifications as a geophysicist. Have you applied any of the methods of the geophysicist to picking this well or determining the orientation of the spacing unit?

A No, sir, we have not.

Q We don't have any seismic information to use as a tool in evaluating and picking a location?

A We have not used seismic in this area.

Q From a traditional geologic examination, if you will, applying that area of your expertise to this project, Mr. Eckerty, when did you first become involved in picking this particular location?

A This area has been a prospect or a lead for Santa Fe for I would say at least a year and a half.

Q I didn't make myself clear.

A Okay.

Q You personally, other than Mr. Schaefer, who is a geologist for Santa Fe Energy --

A Right.

Q -- and no longer is working this particu-

lar prospect.

A Oh, this -- this is a prospect that I developed.

Q All right. That's what I'm asking you is --

A Fine.

Q -- whether you did the work or whether --

A Yes, sir.

Q -- Mr. Schaefer's done the work.

A No, sir. I did it.

Q This is your work.

A I developed this one.

Q All right. When we look at Exhibit Number Four, let me see if I can't understand where you approximate the various proposed locations to be on the structure portion of this display, and so that we're all looking at the same things, the heavier lines that run generally north to south, those are your interpretations of the structure.

A Yes, sir.

Q And when we look at the contour line for the structure immediately to the west of the red dot, which is your No. 1 location, if you'll bear with me, that contour line immediately to the west is at a -7450 feet, is that not correct?

A It is.

Q All right. That -- that's a structural line.

A It's a structural line.

Q When we look at your location number one --

A Uh-huh.

Q -- which is the one displayed with the red square, approximate for me what you think the structural depth is.

A It's approximately 7465 feet, thereabouts. We are saying that we are approximately -- we're talking 20 feet or so here of difference.

Q When we go 1000 feet farther to the east and look at the Bass location at 1980 from the west line, it's your opinion that that is going to be approximately 7485?

A Not quite; somewhere in that range, yes, sir.

Q What is your best estimate of what it is?

A I would say that we should be between 15 and 20 feet high at our location; very possibly a little more. Due to the effect of these zones at the edge of the reef, it's -- with just well control it's hard to be precise, but as I mentioned before, definitely you are coming up dip to the west.

Q I'm asking your best approximation. I realize that there is not enough subsurface control to be so specific.

When we look now to the location that was described in Mr. Green's letter of April 7th in which at least an alternative location proposed by Santa Fe is one that was 990 from the west and 1980 from the north line --

A Uh-huh.

Q -- approximately what structural position does that put us in?

A On this interpretation approximately 7455; thereabouts, I'd say 8 or 10 feet different. The structure is almost north/south through here, the trend of the structure.

Q The second proposed, if you'll bear with me, for Santa Fe's alternative location, would have gained 8 to 10 feet of structure.

A It's -- they're toss-ups, yes, sir, it was slightly -- slightly higher but very close.

Q The structural interpretation on the display shows a slight nosing of the structure to the east in Section 30? Am I reading this correct?

A There is a slight nose.

Q And the nosing of that structure is what causes you to take the contour line at -7500 and put a lit-

tle wave in it, if you will, as we go into the east half of Section 30?

A Yes. I'm trying to -- I've to bring it in from the west down from Section 36 and 31; 36, 21, 27 South; 31 of 21, 28 East, and then I've got to -- I've got to turn it north and then try to keep it in perspective to the Big Eddy Well in Section 19, the PanAm Well.

So I'm trying to come out of this re-entrant I see to the south and still form the contours in a reasonable manner through this Section 30.

Q When we look at the wells in 29, and let's put some numbers on them so we're all looking at the same ones, the north well is the Big Eddy 39 Well, is it not?

A It is.

Q All right, and the well in the southwest quarter of 29, that's the Big Eddy 54?

A Yes.

Q Are those control points for interpreting the structure in the Strawn?

A They are. We've -- we've also picked the top of this Second Strawn Zone B in those wells.

Q For picking the structure on the Strawn what have you used for the -- for the line of structure, what point? The top of the Strawn, the top pay?

A No, sir. The contours on this map are on top of the Zone B. That is why you don't see any structural values in the reef because I don't recognize Zone B in the reef.

Q That is where we were going because I didn't understand what you had done.

A Okay.

Q The top of the structure as you've displayed here, I'm sorry, the structure you've displayed here is picked on the top of Zone B.

A Yes, sir.

Q Okay.

A I should have made that clearer going through.

Q In picking the structure we see with the Big Eddy 54 Well that we're at a -7571, correct?

A Correct.

Q The Big Eddy 39, then, is at a -7587.

A It's slightly lower, yes.

Q At the proposed Bass location you've approximated for us a -7485. My concern is why you have not chosen to make a more significant nosing of the structure to honor the structural position for the control wells in 29.

Would that not cause you to make a greater nose in the structure, if you will?

A There could be more or less nosing. This was what I felt was the reasonable fit on this. In other words, the structure does not stay absolutely at the same gradient throughout.

Q Yes, sir, I understand, and I know just enough about geology to be dangerous, Mr. Eckerty. What I'm asking you is within the range of -- of choices for your profession, whether or not it would be reasonable for a different geologist to display a stronger nosing effect to the structure as he moved east with his interpretation through Section 30?

A I suspect it would. This is a -- this was my -- what I felt was the most reasonable interpretation that I had on this particular prospect.

Q Now taking you back to the earlier question, what have we defined here when we look at the second Strawn reef in the wells, I believe it's the Santa Fe Vernon Federal 1-Y Well?

A Right.

Q When we look at what you've identified as a Strawn reef, you have taken the Strawn reservoir to be tested with this well and you've curved and wrapped the reservoir to the north around the second Strawn reef in the Vernon well.

A And that as just to what we see at the

Carlsbad Field shown on Exhibit Six.

Q Within this immediate area, looking at Sections 19, 24 and 25, do we yet have any subsurface geology that will help us pick and define the reservoir?

A Not until we get a well into it.

Q At this point we lack that control.

A We do. This is -- this is what Santa Fe, what we feel, what I feel is the reasonable picture of this reservoir based on knowledge gained elsewhere in the Strawn trend.

Q Is it fair to call that an interpretation based upon what saw in the South Carlsbad reef situation?

A It is.

Q And at this point we don't have the subsurface control to confirm that the reservoir itself has a size and shape as you've displayed it here.

A No, we do not.

Q Can you make a log analysis or examine the logs to satisfy yourself that the Vernon Federal Com Well from log analysis in fact shows a reef?

A We interpret it as being right at the edge of the reef. If you look at the Champlin Toothman Well --

Q I don't want to move ahead too far just yet, Mr. --

A Oh, excuse me.

Q -- Eckerty. What I'm looking for is the field data, if you will, the log data --

A The log data.

Q -- that you go to and say, "Ah, ha, this --"

A This is a reef.

Q "-- is a reef." All right. Where is that on the cross section, Number Five, for the Vernon well?

A It's the second well in from the cross section edge, and when we -- when we see massive carbonates beginning to develop with the shale stringers decreasing, when they're adjacent to a massive well, such as we see at the Toothman to the west, we would put the edge of our reef right there at the Vernon.

Q When you're looking at the Vernon log you're looking on the left side of the log here and you see this carbonate section --

A Right.

Q -- and that you've interpreted to be what you've identified as the Second Strawn reef?

A And we -- we would interpret it to be edgy, right on the edge of the reef. We are starting to see some gamma ray character but it's still pretty much a massive carbonate, although admittedly not as massive as we see

in the Champlin 2.

Q What is the vertical thickness there in feet, approximately, for the reef as you find it in the Vernon Well?

A The Vernon Well is approximately 90 feet. The Champlin Toothman, 145 feet.

Q In that South Carlsbad reef situation you've described for us, that well is in the immediate vicinity of the Strawn Shelf, is it not?

A It's closer to the edge of the Strawn Shelf.

Q And approximately how distant is the Carlsbad Strawn from the edge of the shelf?

A Within two to three miles. You're -- when you get off that edge right from our Henry Well and go to the southeast, within a couple of miles you're -- you're down to just ratty Strawn, such as you might see further basinward all the way into Texas. And we see the same phenomena at, well, locations such as Bass' Big Eddy Field itself, where we have the big reef developed right on the edge. If you go to the next wells to the southeast of there, you get no carbonate.

Q How far is this La Huerta prospect from the edge of the Strawn Shelf?

A It would be more like seven or eight

miles to the north of the shelf edge. That's why we see the Strawn carbonates thinner and the reefs more patchy and not as tall.

Q Where is the Burton Flats Pool? That's farther to the north and west of this location?

A Burton Flats is further to the north and just about due north another five miles, or so.

Q And do you see any of this Strawn reef occurrence in the Burton Flats Pool?

A It's been a long time since I looked at that particular pool. I think up there I see mostly the -- the fringing material, the detrital carbonate, but I would have to -- I would have to say that I would need to look at some logs up there again before answering that. I've concentrated down at our Carlsbad --

Q If the Second Strawn reef exists as you've interpreted it in the Vernon Well, this will be the first occurrence of a similar reef this far west of the shelf edge of the Strawn, will it not?

You're seven miles --

A This occurrence.

Q Yeah, you're --

A Six or seven, okay.

Q -- six or seven miles away from the edge of the shelf. Can you think of any others that will be this

far to the north and west of that edge?

A The Coquina Nichols Well in Section -- it's in Township 22 South, 27 East, Section 21. It's not indicated but it's -- it encountered a fairly strong build-up of carbonate in the Strawn; not as big as we see at the Henry but bigger than we see at the -- at the La Huerta.

Q And that's an area down by the South Carlsbad --

A Right.

Q -- Field?

A Right, it would be another, say, two miles north of our Henry Well.

Q So the occurrence of this shelf in the La Huerta prospect is the one that thus far is the farthest away from the edge of the shelf.

A I'm trying to think of some others. For right now I'd say yes, that I am aware of.

We've concentrated on -- we've concentrated on the shelf edge fields and then moving shelfward.

Q Let's look at the Isopach portion of Exhibit Number Four. Do you find with any of the three well locations we've discussed, either the Bass location or the two Santa Fe Energy locations, all of those locations fall within a reservoir thickness mapped by you to be in excess of 30 feet?

A They do. Once again, that's a reasonable interpretation of the way the porosity, I would expect, to fringe this build-up of this reef, based on analogy to what I see at Carlsbad.

Q And as we move farther to the west, then, we're going to lose reservoir thickness. As you've interpreted it, we will lose that thickness when we get over into Section 25 to the west.

A We should, yes. I would not expect it to extend into Section 23 or 26. It could. I was trying to be conservative when I mapped it.

Q When you look at the reservoir thickness for the Vernon Well in Section 25, what thickness in the reservoir did you find in that well?

A No reservoir in the Vernon Well.

Q You got zero.

A Right. In fact, as I said, I mentioned I couldn't even pick the zone in the Vernon Well.

Q Have you proposed a well location in the northeast quarter of 25 for your company?

A We would intend to -- to put a location in the west half of Section 30 where we're proposing it now and then step to the west.

Q The idea would be use a location in the west half to test the reservoir further and then a subse-

quent development location would be located in the northeast of 25?

A Certainly. If we had the well there now, we would already know for sure whether the reservoir is in fact there. We would rather -- we would rather test this in an orderly manner stepping out from the Bass 65, where we have the reservoir proven, but largely wet.

Q When we look at the reservoir thickness for the 65 Well, which is in the northwest of 31, you've interpreted 36 feet of reservoir thickness?

A That would be -- that would be reservoir greater than 4 percent, is our cutoff.

Q You've used a 4 percent cutoff? Does it make a difference if you'd used a 5 percent porosity cutoff?

A Whichever -- whatever cutoff you use will certainly affect the amount of net thickness you come up with.

Q If we use a 5 percent rather than a 4 percent, what happens?

A You would get a thinner reservoir.

Q With 4 percent, then, we have a thicker reservoir than if at 5.

A Certainly, and thinner than if at 2.

Q All right. You have interpreted using a 4 percent cutoff, 36 feet of reservoir thickness.

A This is based on what we see once again in our work around Eddy County, and based on our -- down at Carlsbad, if we get less than 4 percent, we realize that it could still produce but we like to use 4 percent as our, I'll say ballpark, when we map our reservoirs.

Q Am I correct in your picking of the gas-water contact as you've identified it on your display, Exhibit Four, you have made the judgment that the 65 Well is all water.

A No, sir. As shown on the cross section, there is approximately 4 feet of hydrocarbon-bearing zone above. In fact, the well did produce over 15,000 barrels of oil and 324-million cubic feet of gas along with approximately 215,000 barrels of water and we think that the bulk of this production must have come from this zone.

Q I guess I didn't understand you when you were talking on your direct examination when you said that the water level in the 65 Well was at all levels in that well. Maybe I didn't understand --

A At all levels?

Q Yes, sir. I had understood you to say that in picking the gas/water contact you were using the entire thickness as the water encroachment.

A I do not recall stating it like that.

Q Okay.

A What I meant, if I -- if I did, what I meant to say was that the water level is high in that well. At the present time I would predict that the water is -- has in fact encroached to the top of that zone, but in fact if it had been wet all along, we would never have got the 15,000 barrels of condensate and the third of a B of gas from it.

Q How many feet of that reservoir thickness do you attribute to the gas volume in that well originally?

A The original contact that our analyst showed was approximately 7488 subsea. As I said, that was, I think, around four, four to five feet of column above water originally in that well.

Q When we look at the Big Eddy No. 2 Well, which is in the southeast of the southeast of 19?

A Uh-huh.

Q You've got that well significantly below the gas/water contact.

The Big Eddy No. 2 Well originally produced some hydrocarbons?

A It produced 1400 barrels of oil and we do not have the informaton on how much water or gas it produced because the State records don't have it; however, it's had, I believe, a GOR of -- I have it here somewhere, it's around 18,700-to-1. Well, it's on here, it's 18,700-to-1 on the

cross section.

As I mentioned when I went through here, that well calculates to be hydrocarbon-bearing. In fact, it did produce some water -- or some oil, but that it -- that fact, once we see a water level at a higher level in the Bass 65, to me separates those perforations and those porosities from the major reservoir I'm seeing at the (unclear) and I believe I said, or meant to say, that we attribute no commercial potential at this point to those zones. In fact, we show them feathering up onto the structure in the cross section.

Q Other than the Big Eddy No. 2 Well and the Big Eddy 65 Well, those are two best and only controls for the gas/water contact on this display, are they not?

A They are, uh-huh. There's -- yes. If in fact, if in fact, well, what we are saying is that in this main reservoir a location anywhere in the west, and far to the west in Section 30, should have a good chance of still being in the good porosity and above the water. If in fact the east half were commercial, we wouldn't feel at all bad about Bass drilling 100 percent offset in the east half on a standup and draining it, but we feel that the west is where we want to be.

Q When we look at the reservoir thickness on the isopach, we do have reservoir thickness throughout

all of the east half of Section 30.

A There is reservoir developed.

Q And the issue then for you is where is the gas/water contact within the east half of Section 30.

A It is the issue.

Q What information would cause you to move the gas/water contact farther to the east?

A A more -- it would take a more exact structure map for certain, or at least we would have to be convinced that the nose, in fact, was stronger. It might -- someone would have to address why the well in Section 19, the PanAm well in fact failed to produce commercial quantities of hydrocarbons and then why those zones indicated hydrocarbon-bearing but in fact are separated, or seem to be separated from the Bass 65 due to the water, the level we see it.

Q The gas/water contact you believe is going to follow the lines of the structure?

A We think it will stay reasonably close to the lines of the structure.

Q And so whatever the structure is within Section 30, that gives us a good basis upon which to determine whether -- where the gas/water contact is.

A On the structure on top of this particular zone. You could make a structure map of units elsewhere

in the section, I'm sure, and come up with different structural interpretations, but since we are convinced that this particular reservoir is in fact contained within our second zone, we would have to see proof that it in fact (not audible).

MR. KELLAHIN: I'm not sure how you want to handle this, Mr. Examiner, I mean with regards to whether you want a lunch break or how do you want to handle it?

MR. CATANACH: We'll probably take a break after the applicant finishes its case.

MR. KELLAHIN: All right, let me take a moment and see if I can't shorten this.

Q Were you involved with the discussions between Mr. Schaefer and employees of Bass with regards to discussing various locations for the well in Section 30?

A No, sir, I was not.

Q Other than the interpretation that you've given us today, particularly Exhibit Number Four, have you had between October of 1987 and this, the date on this display, other interpretations of this area?

A Originally I had another well, or I had a slightly different picture down dip in the porosity of this zone. When I -- we made more detailed well log analysis of the wells, we settled on this interpretation. In fact, we

have had an on-going -- an on-going program evaluating these.

Q The last of the subsurface geologic data available to you was the results from the drilling of the Santa Fe Vernon Well in, what was it, July of '85, the summer of '85?

A Summer of '85, right.

Q Since then we don't have any new geologic subsurface data for this immediate vicinity.

A We have no wells drilled since then right in this vicinity. This is based on the analysis of the existing well logs and production informaton available to us.

Q Am I correct in understanding that the second location Santa Fe proposed, which is in the northwest quarter, would be at a location on the structure that's 8 to 10 feet higher and still would be within the 30-foot thickness of the way you've mapped the reservoir on the isopach.

A It would still -- it would still be within the reservoir and marginally higher than where we're at, but we feel that any location in the west half of Section 30 at a reasonable distance above the water will drain the hydrocarbons in Section 30.

Q Thank you, Mr. Eckerty.

MR. CATANACH: I have nothing.

Mr. Bruce?

MR. BRUCE: Just briefly, Mr.

Examiner.

REDIRECT EXAMINATION

BY MR. BRUCE:

Q From Santa Fe's experience in the Carlsbad South, I believe you said that Strawn reefs are not large in areal extent, is that correct?

A Very, very limited in extent, as a matter of fact.

Q And that forms the basis where you believe on Exhibit Number Five that this Strawn reef will end just immediately to the east of the Vernon Well?

A Yes. In fact, due to its position in the -- only the Second Strawn, it could in fact be smaller than I've shown it. In any event, we feel that it does not extend beyond the Vernon.

Q Thank you, Mr. Eckerty.

MR. CATANACH: No questions. The witness may be excused.

MR. BRUCE: A final and short witness, Mr. Examiner.

JOSEPH PARADISO,

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

DIRECT EXAMINATION

BY MR. BRUCE:

Q Will you state your name and place of residence?

A Joseph Paradiso, Midland, Texas.

Q And what is your occupation and who are you employed by?

A Petroleum engineer with Santa Fe Energy.

Q And have you previously testified before the Division as petroleume engineer?

A Yes, I have.

Q And are you familiar with the engineering matters involved in Santa Fe's Case Number 9372?

A Yes, sir, I am.

MR. BRUCE: Mr. Examiner, are the witness' credentials acceptable?

MR. CATANACH: They are.

Q Mr. Paradiso, do you have an opinion as to the acreage which will be drained by a Strawn well located in the southwest quarter of Section 30?

A Yes, I do. I believe it will drain 320 acres, or greater.

Q And what is that opinion based on?

A It's based on the Santa Fe wells in the

Carlsbad Strawn Pool.

Q Referring to Exhibits Seven and Eight, Mr. Paradiso, would you please describe them briefly?

A Yes. These are our bottom hole pressure, better known as P/z curves versus cumulative, which we use to obtain a gross ultimate recovery, and these are the two wells that are comparable to the -- to the well location, of the same zone as compared to the one in the La Huerta.

Q And briefly what do they show to be the ultimate production from these two wells?

A We have an ultimate production -- recovery of 6.4 BCF in the Neeley and 7 BCF on our Weems.

Q And would you please now refer to Exhibits Nine and Ten and discuss them briefly?

A Okay. Exhibit Nine just shows a basic formula that we use for the volumetric reserve calculations, in which I take the gross ultimate recovery from the P/z curve with the other data and then solve for the acreage drainage, do a drainage calculation and solve for the acreage.

Q And what are the results of your calculations on the Neeley and Weems?

A Okay, the Neeley, we estimate it will drain 572 acres and the Weems, we estimate it will drain 347.

Q And both those are Strawn completions, are they not?

A That's correct.

Q Based on these calculations, what is your opinion regardng the drilling of a well in Section 30?

A I believe that one Strawn well in Section 30 will drain at least 320 acres and since the east half we believe is wet and does not contribute to production, only one well is needed today in the west half of Section 30; therefore, drilling a well with a south half unit will require two wells in Section 30 and cause the drilling of an unnecessary well and cause an economic waste of approximately $1-million.

Q In your opinion will the granting of Santa Fe's application and the denial of Bass' application be in the interest of conservation and the prevention of waste?

A Yes, I do.

Q And were Exhibits Seven through Ten prepared by you or under your direction?

A Yes.

MR. BRUCE: Mr. Examiner, at this time I move the admission of Exhibits Seven through Ten.

MR. CATANACH: Exhibits Seven through Ten will be admitted in evidence.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Paradiso, if you'll take Exhibit Number Nine for me, let's go through the parameters for your volumetric calculation so that I can simply clarify for myself out of the calculation what values you've used.

For reservoir thickness what has you picked?

A 22 feet. Are you referring to the Neeley, now?

Q Whatever was done to get the calculation for Exhibit Number Ten and let's use the one for the Neeley Well, if you will, please.

A Okay, that would be 22 feet.

Q You've got 22 feet. What have you used for porosity?

A 7.2 percent.

Q And your water saturation?

A Well, I have the gas saturation plugged in there. That would be 38, approximately, water saturation, which --

Q Where in the calculation did you plug that in?

A That's the 622.

Q Okay.

A One minus the water saturation would give you your gas saturation (unclear).

Q Okay. And what have you used for your reservoir pressure?

A 5600 pounds.

Q And where does that reservoir pressure come from?

A That was measured from a build-up extrapolated like we do --

Q Was that an early build-up test in the well?

A Yes, sir.

Q Was that the first build-up test --

A Yes.

Q -- you had?

A Yes, sir.

Q In your opinion does that represent original reservoir pressure for that area?

A Yes.

Q What did you use for your reservoir temperature?

A That would be -- I'd like to refer to these so I don't make a mistake.

It would be 180 (not clearly understood)

-- I should have listed those, maybe -- if I've not made a mistake.

It's 640 minus the -- it would be -- 460 degrees would change the (not clearly understood).

Q Okay. What have you used for the compressibility factor?

A .93.

Q And what have you used for your recovery factor?

A .8.

Q That would be 80 percent recovery?

A Yes.

Q This is not, then, a water drive reservoir, is it?

A Not that we know of yet.

Q Okay. Not for the Neeley Well and you don't attribute any of the potential for production in the La Huerta prospect to be a water drive reservoir, do you?

A I think that it could be a, I would say, how would I phrase that, not a very active water drive, slight water drive.

Q Have you conducted any engineering studies to determine whether or not this La Huerta prospect may be a water drive reservoir?

A No.

Q You haven't taken any flowing tubing pressures versus time and analyzed that to see what results you get?

A In La Huerta?

Q Yeah, on La Huerta?

A No.

Q And you haven't taken any gas/water ratios versus cumulative gas production to see what effect that has?

A No.

Q The calculation of the volumetrics for the Neeley Well shows you using those parameters that you've got 572 acres?

A Yes, sir.

Q And under the Weems Well you've got 347 acres?

A Yes, sir.

Q Now your conclusionary summaries with regards to Mr. Bruce's questions, are predicated and assume that the geology is correct, do they not?

A That's correct.

Q And if the geology is wrong, then you're going to need two wells in the section, is that not true?

A That's correct.

Q And doing the volumetric calculation is

not going to tell you how many wells you ought to drill in Section 30.

A It may or it may not. If the geology is correct, it does; if the geology is not correct, it doesn't.

Q And the engineering calculations that you've done are not going to tell you how to orient the spacing unit in the section independent of the geology?

A That's correct.

Q When you were -- on your earlier displays, on Seven and Eight, I need to ask you some information on these.

These are your decline curves on the Neeley Well and the Weems Well?

A P-z curves.

Q Yeah.

A What were you using for abandonment pressure?

A We used 500 pounds.

Q Do you use a 500 pound abandonment pressure on all your wells, Strawn wells?

A Typically we'd use 10 percent, around 10 percent of the original bottom hole pressure.

Q 10 percent of the original pressure, it was -- we were working about 1560 -- I'm sorry, 5600?

A Right, yeah.

Q Okay, and you're using 10 percent.

A It was somewhere round (not understood).

Q Would it be unreasonable for an engineer to use 1000 pounds as the abandonment pressure?

A Not in some cases.

Q That will simply give you less reservoir --

A Yes.

Q -- will it not?

A Yes.

Q It would be a more conservative analysis of what would be the reserves attributable to the well.

A Right. Yes.

Q If I understand the calculation, your recovery factor is 80 percent.

A Uh-huh.

Q If you're using an abandonment pressure of 10 percent, would that not equate to a 90 percent recovery?

A Well, not necessarily; and this is -- this is conservative.

Q Okay.

A I think typically these will range from 70 to 90 percent recovery factor.

Q Okay, so -- so the recovery factor could

fluctuate --

A Some.

Q -- within 70 to 90 percent.

A That's possible.

Q A choice of recovery factor within that range in your opinion as an engineer would be reasonable?

A Uh-huh, it would not change a whole lot the drainage (not understood) when you go through the calculations.

Q Thank you.

MR. CATANACH: Mr. Bruce, anything else?

MR. BRUCE: Yes.

REDIRECT EXAMINATION

BY MR. BRUCE:

Q Mr. Paradiso, based on your calculations only if most of the east half of Section 30 is dry would a second well be needed to drain the section, is that correct?

A Uh-huh, that's correct.

MR. BRUCE: Nothing further.

MR. CATANACH: Okay, let's take about a twenty minute break.

(Thereupon a recess was taken.)

MR. CATANACH: Okay, we'll re-convene the hearing at this time.

Mr. Kellahin.

MR. KELLAHIN: Thank you. Mr. Examiner, at this time we'll call Bass' geologic expert, Mr. George Hillis. His last name is spelled H-I-L-L-I-S.

GEORGE A. HILLIS,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Hillis, you were one of the witnesses sworn this morning, were you not, sir?

A Yes, sir.

Q And have you previously testified before the Oil Conservation Division as an expert petroleum geologist?

A On two previous occasions.

Q Would you summarize for us what it is that you do for Bass Production Company?

A With Bass Production Company I work in both the exploration and development ends of their company and I am heavily involved in the petrophysical studies.

Q Have you made a specific study of the geologic facts surrounding Bass' proposed development of Section 30 with regards to the Strawn-Morrow test that is the subject matter of this hearing?

A Yes, I have.

Q Would you give the Examiner a little of your background and personal involvement in not only this project but in the immediate area in developing Strawn prospects?

A I first was exposed to southeast New Mexico in 1981 when I joined Bass and since that time have been responsible for the exploration and development within the Bass Federal Units within the Eddy and Lea Counties.

With respect specifically to the Strawn formation I have been involved in a one-half to two year regional study of the Strawn across the area, and with respect specifically to Section 30 of 21 South, 28 East, selected this prospect back in the latter part of 1985.

Q Do the recommendations and positions that Bass has taken with regards to the development of the Strawn in Section 30 represent your personal opinions and recommendations?

A They do.

Q Do you agree with the Santa Fe geologist, Mr. Eckerty, do you agree with his presentation of how

Section 30 ought to be developed with regards to well locations and to the orientation of the spacing unit?

A Absolutely do not agree with it.

Q Where, in your opinion, Mr. Hillis, did Mr. Etcheverry go wrong?

A Eckerty.

Q Did I say it wrong? Eckerty, I'm -- I'm having a terrible time with his name. Mr. Eckerty, where did he go wrong?

A In several areas, but his primary area of being wrong is in the correlations between the wells involved in that adjacent area. His correlations are incorrect, specifically the correlation between the Bass Big Eddy Unit 65 Well and the PanAmerican Big Eddy Unit No. 2 Well.

Q What has he done that you would do differently and in fact have done differently?

A He in his exhibits has indicated that the reservoir rock contained within the PanAmerican No. 2 Well is not correlative to the reservoir development within the Big Eddy Unit 65. This is opposite to what actually occurs. The reservoirs in both these wells are correlative.

Q In what other areas do you disagree with the Santa Fe presentation of geology?

A That is the basic one. From it comes correlation problems on other logs, especially the logs from

the two wells in Section 29 with the incorrect structural pick in those wells it makes in my opinion the structural interpretation here incorrect.

The analagous situation of this area, the La Huerta prospect, to the Carlsbad Strawn South Area that Santa Fe have dealt with today, I do not believe you can compare these two areas directly. They are two different depositional areas within the Strawn Shelf; one being, the one to the south being along the shelf edge of the Strawn, where immediately you go into a basinal facies to the south of that, as compared to the area in Section 30 where you're six or seven miles back from the shelf edge and you have several miles of shelf edge before you come to that basinal facies.

Q Let's focus on the Unit 65 Well for a moment. Mr. Eckerty used that well as a control well in picking his gas/water contact.

Where do you and Mr. Eckerty disagree on that issue for that well?

A Mr. Eckerty basically says that in the 65 Well the top three or four feet are up in a transitional type zone of gas and water with the remaining reservoir rock, approximately 30 to 32 feet below that, being within a water zone.

My disagreement with him there is that

the top three or four feet in the Big Eddy Unit 65 Well are within the gas column of the field and the lower 32 feet are in the transitional zone of gas and water.

Q Were you asked by your company to make a complete and thorough geologic study of this immediate area to advise them how to orient the spacing units and where to pick well locations for the development of the Strawn potential in this section?

A Yes, sir.

Q Would you summarize for us the types of information and the methodology that you've used to make that study?

A Very simply, the study of Section 30 was done along with a regional study, which involved several prospects. Spacing with regard to Section 30, based on the reservoir trends going through Section 30, and understanding and examining existing producing fields and spacing, I have always felt from day one that Section 30 is better developed on a south half/north half proration unit basis; whereas, by drilling the low risk well of the south half proration unit would then allow us to select that second location in the north half and not be restricted to a northwest quarter or a northeast quarter if we had taken a west half or east half proration unit.

Q Does Mr. Eckerty's geologic interpreta-

tion give you the opportunity to fully develop the section?

A No, it does not.

Q Is this something you were asked to do and evaluate after Santa Fe proposed the formation of the two-section area of mutual interest in October of 1987?

A No, the prospect in-house at Bass, as I said, was originated in the latter part of '85. The location, the first location was set up as the location we present today on the south half proration unit basis.

Q Do you have a geologic opinion as to whether the east half of Section 30 is potentially productive and will contribute hydrocarbons for development in the Strawn reservoir?

A Without a doubt the east half has recoverable hydrocarbons within it.

Q Do you have an opinion as to whether or not there is sufficient reservoir present in Section 30 to geologically support the drilling of two wells?

A Yes.

Q And what is that opinion?

A My opinion is that there is adequate hydrocarbons and which will be best recovered using two well locations.

Q Do you have a geologic opinion concerning the orientation of the spacing units?

A Ask me that again, please?

Q Yes, sir. Do you have a geologic opinion as to what orientations of the spacing units in Section 30 is the most reasonable?

Do you want laydowns or standups?

A Well, laydowns, yes.

Q And why, sir?

A As I explained, the Section 30, as used will demonstrate with our maps of the reservoir later in our testimony, is clearly going to be better developed on a laydown pattern with the first well being in the south half proration unit and the second well being in the north half proration unit.

Q You've had the opportunity to listen to Mr. Eckerty's presentation of geology, his interpretation and his discussions of the three well locations, the Bass location, the first Santa Fe Energy location, which is 1000 feet to the west of your location, and then the second Santa Fe alternative location, which is up in the northwest quarter of the Section 30.

Do you have a geologic opinion as to which location represents the least risk to the working interest owners in the section?

A Without a doubt the Bass location.

Q Do you have a recommendation to the Exa-

miner as to what percentage risk factor penalty to apply against Santa Fe Energy should they choose not to join you in the drilling of the well?

A We are -- we believe, we find our location to be of the lowest risk and are prepared to assess a 150 percent penalty.

Q Let's turn, Mr. Hillis, to the specifics of your study, sir, and let's commence with Exhibit Number One.

Some of the basic data, obviously, has been covered by the Santa Fe witnesses this morning and I don't propose that we cover the same things.

Let's take a moment and simply orient the Examiner as to what you have done with Exhibit Number One.

Q Well, Exhibit Number One for a 25 square mile area centered on Section 30 of Township 21 South, Range 28 East, I have shown the production from the Bone Springs and deeper formations within that area.

I have also indicated in Section 30 Bass' proposed location for the Big Eddy Unit 102, and I've also indicated unique well numbers to six of the wells in the immediate vicinity of Section 30.

Q Let's take a moment and identify the six key wells that you have focused on in your study and I think for continuity, we'll try to use the same identification

that Mr. Eckerty used this morning.

But if you'll start with the well that's numbered No. 1 on Exhibit One, that's the Big Eddy 65 Well, is it not?

A That is correct. The well, Unique Well No. 1 is the Bass Big Eddy Unit No. 65 Well, which is located in Section 31 of Township 21 South, Range 28 East.

Q Your No. 2 Well is the Vernon Well in the east half of 25?

A Yes, sir.

Q Okay. The No. 3 Well is the PanAmerican No. 2 Well we've discussed earlier today?

A Yes, sir, located in Section 19, 21 South, 28 East.

Q No. 4 goes into Section 20 and picks up a unit well. What's the unit number for that well?

A Big Eddy Unit No. 60.

Q Okay. And we drop down into 29 now and we pick up No. 5 Well, which is the Big Eddy 39?

A Yes, sir.

Q And then south of that is the Big Eddy 54?

A Yes, which is Unique Well No. 6.

Q Your primary objective in drilling this well is to test the Strawn formation, is it not?

A It is, sir.

Q All right. Do you intend to drill this to a sufficient depth to also test the Morrow?

A Yes, we do.

Q And in the unlikely event there is shallow gas production above the top of the Wolfcamp, you're proposing to accomplish in this pooling order the pooling of all parties for those shallow gas zones if we're so lucky to find any.

A That is correct.

Q But the primary objective remains the Strawn development that has occurred in the immediate area.

A Yes.

Q Have you determined, sir, whether or not geologically there is any advantage to your location in terms of stacking the potential to encounter all of these various reservoirs that you've identified on Exhibit Number One?

A I do. The Strawn is our primary objective and the location has been primarily selected based on the Strawn regional mapping; however, we have three secondary objectives.

Going from top to bottom, the first one is a Bone Springs sand which is correlative to the sand producing three miles to the northeast, Avalon Field, in which we had a gas show in the Big Eddy Unit 65 and we

anticipate in the Big Eddy 102 to be approximately 50 feet high structurally to the 65 Well.

Below the Strawn our next secondary objective is the Atoka sand, which is found productive also in Unique Well No. 1 and further to the east of Section 30.

And finally, our third secondary objective are the Morrow Clastics which are productive both in Unitque Wells No. 1, 5, and 6 in close proximity to our location.

Q All right, sir, let me show you what is marked as Exhibit Number Two and have you identify Exhibit Number Two.

A Exhibit Number Two is a tabulation of the production data presented on Exhibit One on a per well basis and if one well is produced from more than one zone, then all zones are given separately.

Q It simply affords anyone that cares the opportunity to check the data that you've utilized in order to compile Exhibit Number One.

A That is correct, sir.

Q And what is the source of the data that's been utilized to prepare Exhibit Number Two?

A The source is from Petroleum Information Corporation and accessed using computer data, computer access.

And this is basically a xerox of the original computer printout.

Q Let's go now, sir, to talking about the Strawn structure and the structure map itself.

I have before me what you've shown me to be a type log for the Big Eddy Unit No. 65?

A Yes, sir.

Q Let's talk about that one first so that we have a point of reference to talk about the structure.

A This is Unique Well No. 1. It's a copy of the porosity log run in this well and for your convenience, using color tabs, I have indicated the primary objective opposite the blue tab. This is the Strawn interval which produced in the Unique Well No. 1.

Our secondary objectives, going from the top down, the green tab is indexed opposite the East Avalon Bone Springs sand.

The orange tab is located opposite the Atoka sand secondary objective, which was perforated and produced for a short time in Well No. -- Unique Well No. 1.

And, finally, the yellow tab is indexed across from the Morrow Clastics which have produced in Unique Wells 1, 5 and 6.

Q I believe I misspoke, Mr. Hilis, when I identified that as Exhibit Two. In fact it's Exhibit Number

Three. If you'll correct your copy then we'll be straight.

Let's turn now to Exhibit Number Four. Is Exhibit Four an exhibit that you've prepared?

A It is, sir.

Q Does this represent your own personal interpretation of the structure regionally for the top of the Strawn?

A Yes, sir.

Q Describe for us the method that you have used to pick the marker by which you then have mapped the structure in the top of the Strawn.

A This is best illustrated on the exhibit by the type log on the lefthand side of the exhibit and this is taken from the porosity log over the Strawn interval on Unique Well No. 1. The top of the Strawn is indicated at a depth of 10,350, approximately, and is correlative to the New Mexico State recognized top of the Strawn in this area.

Q You've also identified by arrows in the center portion of the display the proposed location which is the Bass location in 30 and then the Well 65 immediately to the south as the type log well.

A That is correct.

Q In making your regional study of the structure for the Strawn, Mr. Hillis, what have you been able to conclude?

A I have concluded on the regional Strawn and this is just a part of the regional mapping we have done on the Strawn, that within Section 30 we recognize a subtle structural west trending to east nose, based on the well control we have available to us. We also recognize that this nosing occurs elsewhere in the area. For example, in the southeast quarter of Township 22 South, 27 East, over the Carlsbad Strawn Field. We recognize a very significant west to east nosing based on the well control that is available in that producing area.

I strongly feel that within Section 30 that we may also find our west to east nose is a little bit ore extreme towards the east, but with the well control I have available at this time until we drill in Section 30, I can only honor the data in front of me.

Q You have Mr. Eckerty's structure map before you. It's Exhibit Number Four, Mr. Hillis?

A Yes, sir.

Q We're going to come to a more specific, site specific copy of your structure map but generally looking within this area, do you have an opinion as to whether Mr. Eckerty has been too conservative in the way he has attempted to draw the structure as it comes across and noses in Section 30.

A Yes, I do.

Q And what is that opinion?

A My opinion is that even though the eastern wells in Section 20 and 29 have been incorrectly correlated and thus the structural tops presented on Exhibit Four are wrong, even taking those into account, the contouring of the data on Exhibit Four is very conservative, especially the gap, the spacing between the -7500 and the -7600 foot contours.

Q You talked about a gap. Don't you find that the contour lines on the structure map are evenly and uniformly displayed on that exhibit?

A No, they are not; not through that specific area. They are evenly displayed west of the -7500 foot line and east of the -7600 foot line.

Q Can you draw a corollary to any other structural feature within the area mapped on the Strawn map to show us a similar nosing effect in the Strawn that you have interpreted for Section 30?

A Yes. On the map in front of us, Exhibit -- our Exhibit Four, based on our well control we recognize a west to east trending structural nose.

Q And can we see a similar example of that nose if we look at the South Carlsbad Strawn Pool?

A Very much so, although --

Q I'm sorry, I misspoke. It is the Carls-

bad Strawn as opposed to the South Carlsbad Strawn.

A Yes, it is the Carlsbad Strawn and not Strawn South.

Q There's a structural nose feature in that pool, is there not?

A A very extreme structural nose, correct.

Q Mr. Eckerty made reference to the fact that he thought there was a Strawn reef that he had interpreted in the Carlsbad Strawn Pool and therefore he equated it to his evaluation of the Vernon Well and therefore has wrapped his reservoir, if you will, to the north of the Vernon Well, around the top of Section 25 on this reef feature.

Do you see that kind of reef feature if you look at the Carlsbad Strawn Pool?

A The Carlsbad Strawn of Santa Fe to the south?

Q Yes, sir.

A I recognize development of the skeletal sand within that reservoir zone on the eastern and southeastern and northern edges of that field.

Q And where is that feature in reference to where you have mapped the edge of the Strawn Shelf?

A It is within one mile of the shelfal (sic) edge of the Strawn.

Q Do you see any other Strawn pool or feature like that that is farther removed from the Strawn Shelf than your proposed development in Section 30?

A Yes, I do.

Q All right, show me one.

A Several miles northwest of the Carlsbad Strawn is also the Carlsbad Strawn Field. It's located. three wells in Sections 8 and 17 of 22 South, 27 East.

Further to the north in the Burton Flats Strawn Field in Township 21 South, Range 28 East, I recognize production from the same reservoir.

Q My question is, though, do you see the reef feature, that thick carbonate reef that Mr. Eckerty's discussed with us, do you see that as being a major geologic feature for the development of the Strawn reservoir in Sections 25 and 30?

A No.

Q Why not?

A The Section 30 prospect area is very like the Burton Flats Strawn, the northernmost Carlsbad Strawn field, and they are located a significant distance away from the shelfal (sic) edge.

Specifically in Section 30 we recognize carbonate reefing trending northeast/southwest for several miles and in front of that where higher energy has occurred

on the -- on the shelf, we find deposition of this skeletal sand reservoir. The reason for that skeletal sand to be there, as I say, is because of the high energy on the basinward side of the carbonate build-up, a reefing area, and that high energy is not evident, it is more dissipated on the western side of the carbonate and I would not expect it to be developed there in a widespread fashion.

Q I direct your attention now, Mr. Hillis, to Exhibit Number Five and identify that exhibit for us, please.

A Exhibit Five is a xerox of a computer printout for Petroleum Information of the production from the Strawn wells and fields represented and tabulated on Exhibit Four.

Q Again this is just the supporting data that you have compiled and tabulated so the Examiner or anyone else can check the accuracy of the prior exhibit.

A It is, but in addition, for example, in Burton Flats Strawn Field and several of the other fields where we have a multi-well field on Exhibit Four, I have given the field total.

The printout of the computer production will also break that down on a per well basis.

Q This next display, Mr. Hillis, is a little large. I think we'll put it on the wall here and give

us an opportunity to discuss it in that fashion.

Mr. Hillis, does Exhibit Number Six also represent your work product?

A It does, sir.

Q Before we go into the detail about each of the parts to the display, give us a quick summary of what you have depicted on this exhibit.

A On this exhibit, Exhibit Number Six, I have depicted once again the type log from Unique Well No. 1 as illustrated on previous exhibits and specifying the C carbonate reservoir zone, I have for that reservoir fairway built a collage going from left to right.

From left there's a structural map on top of the C carbonate zone.

In the center is a net (unclear) isopach map of the reservoir using porosity equal to or greater than 5 percent porosity per foot of rock and another format of that is shown in the final on the righthand side, which is a porosity (unclear) map, which is simply taking the porosity on a per foot basis and adding it up to show the distribution of the reservoir fairway.

Q In order to pick a location for the well in Section 30, is it important to you as a geologist to first of all accurately map and interpret the structure, then to accurately map and interpret a net pay isopach, and

then to integrate the two?

A Without a doubt that's yes.

Q Let's start with the structure map.

A The structure map, unlike that shown in the previous exhibit, which was on the top of the Strawn, is on the top of the C carbonate, which is illustrated on the type log on this exhibit.

Here we also recognize --

Q Refresh my memory now, did Mr. Eckerty map on top of the C zone? I have forgotten.

A What Bass is obviously calling the C reservoir in this hearing, Santa Fe are referring to as the Strawn -- the Strawn B. The Second Strawn.

Q Mr. Eckerty mappped his structure on the top of the B Zone, I believe.

A That is correct.

Q Now what did you use as the top of the structure?

A I used a more correlative regional marker, which is a shale marker, approximately in Unique Well No. 1 about 20 feet above the actual commencement of porosity.

Q Why, in your opinion as a geologist, is it more appropriate to use the top of the C carbonate as the marker as opposed to the top of the B?

A Because on a regional investigation of the structural configuration of the C carbonate, this is by far a more correlative pick. We do later on show locallly a mapping on the actual top of the reservoir porosity, specifically in the Section 30 area, but that would not be possible in a regional sense.

Q All right, continue on with your explanation of your interpretation of the structure.

A The structure map is on a contour interval of 50 feet. This is a 1-to-2000 foot scale map.

And then, as (not clearly understood) has, we saw on the top of the Strawn map a subtle, west to east trending nose across Section 30. It demonstrates that Bass' proposed location would be approximately 60 to 65 feet structurally higher to Unique Well No. 1.

Q Do you share with Mr. Eckerty his concern that it is of material significance that the well needs to be located a distance to the west where he can gain approximately 20 feet of structure?

A No, I do not.

Q Why not?

A Because you would be creating off very little structure for having the reservoir or not having the reservoir.

Q Well, let's go now to the second panel of

the display and discuss how you have mapped the reservoir.

A This is the net H isopach map. It shows the reservoir fairway, as I call it, the Carlsbad Strawn East reservoir fairway, trending northeast/southwest. The specific well control where we have reservoir rock development, these wells are colored in orange on the display.

Where we do not have reservoir development for wells around the fairway, these are indicated in green on the exhibit. These are zero points.

Basically, here we find that the proposed location by Bass will be within the reservoir fairway and will have approximately 20 feet of reservoir rock.

The Santa Fe Energy proposed location, as known to me from the April 7th letter, that location being 1980 from the north, 990 from the west, would be not in the reservoir.

Q Is a reservoir thickness of 20 feet, based upon your net pay map, is that a sufficient enough thickness to give you a commercial well?

A It is, sir.

Q If you project the Santa Fe Energy location down to the location they gave us today, which is the original one from October, giving you 1000 feet to the west of your proposed location, can you approximate for us what would be the point of the reservoir thickness that that

would encounter?

A I have approximated where I believe that location is with an X here. That location would plot right on the edge of the reservoir, but severely past the up-dip limit of the reservoir.

Q If you go back to the structural display do you gain significant structural advantage if you move to the west under your interpretation?

A No, I do not. I believe over the past location we would gain perhaps five, possibly up to ten, feet of structure.

Q Is that going to make a material difference to you as a geologist in deciding how to locate the well to avoid contact with the gas/water contact?

A It is going to make me, when I consider the balancing of structure being high enough to model the gas/water or gas transition zone versus being in the reservoir or not being in the reservoir, very much in favor of the Bass location.

Q Do you have other displays that map your interpretation of the gas/water contact?

A Yes, I do.

Q Let's continue on with the -- the isopach in the center.

Do you have an opinion, sir, as to

whether or not, based upon your mapping of the reservoir, as to whether or not the entire Section 30 has a reasonable potential for production from a well -- well, let me start over again.

If we do the orientation of the south half --

A Yes, sir.

Q -- would that orientation in the south half give you an orientation that will maximize your ability to produce out of that reservoir? We are not significantly integrating potentially nonproductive acreage by that orientation.

A No, we are not.

Q Conversely, if we stand up the spacing units, what is your opinion about the issue of putting in potentially nonproductive acreage in either the west half or the east half orientation?

A I feel the west half proration unit we would be putting in a little bit more of your nonproductive acreage on that extreme western half.

Q By orienting the spacing units where they are laydowns, in your opinion, then, do you maximize the potential for having two wells in the section?

A Without a doubt in my opinion it's the proven way to develop the field.

Q Let's go to the third panel on Exhibit Number Six and have you explain and describe that display.

You might turn 180 degrees here, if you will --

A Okay.

Q -- and stand to the wall so you don't have to talk with your back to us. Go ahead.

A This is the porosity H isopach map of the reservoir fairway and this primarily is taken from the porosity of each single foot of rock shown on the net H map, and add it together to get the total porosity H, primarily for use in determining the volumetrics of the reservoir.

Here we find the Bass location, Big Eddy 102, would have a porosity H of approximately 2.0. This would, with the 20 feet of reservor rock, give us an average porosity of around 10 percent, of 10 percent in the reservoir, which is well above the porosity cutoff.

The proposed location as known to me of Santa Fe's up until today, once again would lie outside the reservoir limit, and the Santa Fe location given to us this morning at the hearing, a location 990 from the west and 1980 from the south, would like within the reservoir but have a very low porosity value; probably in the order of 25 percent or less of the Bass location.

Q Mr. Hillis, let's turn now to Exhibit

Number Seven, if you will, please, and identify that exhibit before we describe what it is.

A Exhibit Seven?

Q Yes, sir.

A That is a tabulation of --

Q I've confused you. Seven is the stratigraphic cross section.

A Okay, Exhibit Seven is a stratigraphic cross section. Two cross sections are shown on it, both trending from west to east, the most northerly one going through Section 30 and a southerly one located approximately 2-1/2 miles to the south, through the reservoir fairway in that area.

Q Why would you do this? Why would you prepare such a display?

A I wanted to confirm from my mapping the up dip limit of the reservoir in a more visual type understanding of it.

For example, on the north cross section, on an index map here, which is the porosity H map which we have given in the previous exhibit, the only difference here being it shows the traces of the two cross sections. The most north cross section A-A', starting from the west is the Santa Fe Vernon Well, Unique Well No. 2, where the C carbonate reservoir is not developed, projected then, as we move

eastwards, is the Santa Fe proposed location and then the Bass proposed location. This shows Santa Fe's location to be beyond the reservoir limit and the Bass location to be within the reservoir limit.

And then projected in on this relative porosity H trend is the Bass Big Eddy 65, Unique Well No. 1, showing the productive interval.

As we go across to the eastern side of the fairway, we pass through the Big Eddy 39 Well, where we have still some reservoir development. In this particular case this well was down dip and wet. And then the Big Eddy Unit 60, Unique Well No. 4, projected in at the end of A-A', shows the C carbonate reservoir to not be developed.

The cross section to the south, B-B', I find has two analogous wells, two wells we have presented on the cross section to the north; specifically the Santa Fe Energy Chase State 2 No. 1 Well, which was drilled in the southwestern quarter of Section 2, Township 22 South, 27 East, is to me a very much a look-alike to the Santa Fe Vernon Well presented on cross section A-A'.

In a similar fashion, located in the northeast quarter of Section 11 of Township 22 South, 27 East, we have the Western Oil Producers Bass No. 1 in which the C carbonate reservoir is developed and is very analogous in its format and log appearance to that

encountered in Unique Well No. 1 on the cross section to the north.

Unlike the cross section to the north, where we don't have any wells between the Santa Fe Vernon and the Big Eddy Unit 65 at present, the area to the south enjoys the luxury of having an actual wellbore between the two, along which I would, from my mapping of the porosity H, recognize the location to be outside of the reservoir, and this well in effect is a well drilled by TXO, the Delta Phi No. 1, is located in the southeast quarter of Section 2 of 22 South, 27 East, and within that wellbore the C carbonate porosity as a reservoir quality is not developed. There's a little porosity, they have a couple of feet, getting up to 2 percent.

I would compare this TXO well very much so to what a well would look like if it was drilled at Santa Fe's proposed location in the northwest of Section 30.

Q Mr. Hillis, I show you now what's marked as Exhibit Eight and ask you to identify that exhibit.

A Exhibit Eight is a tabulation for the net H and porosity H data illustrated on Exhibit Six on a per well basis and it gives the depth interval, the footage involved in that depth interval, and the porosity H value attributed to that depth.

Q We've marked this next display as Exhibit

Number Nine, Mr. Hillis.

A Okay.

Q Again, before you go through your interpretation, identify for us what it is that you've depicted on various portions of the display.

A Exhibit Nine is primarily designed to illustrate the reservoir zonation within the Carlsbad Strawn East fairway within Section 30; specifically defining a gas zone, a gas plus water transitional zone, and a water zone, and this is done with several inserts to the exhibit.

In the upper left, a structural cross section and going across the area in the lower left Pickett plot and a bulk volume water plot.

Q Let's go back just a little bit, Mr. Hillis, is both the Pickett plot and the bulk volume water plot typical methods of analyzing reservoirs so that you can get a greater understanding in terms of what will happen with a gas/oil contact that is known to exist in this reservoir?

A Well, with gas/water contact --

Q I'm sorry.

A -- yes, they do.

Proceeding just to summarize the exhibit while I was on it, center -- central half we have 5-inch porosity logs on Unique Wells No. 1, 3, 5 and 6, of which we

indicated within the C carbonate reservoir any drill stem test data and/or perforations.

And finally, on the righthand side and taken from the previous exhibits, we have insets of the top of the C carbonate structure map, the net H isopach map, and the porosity H isopach map, and the only difference in this instance from the other exhibits is that here we have also indicated the actual probable porosity itself on the structure map, and we have indicated on each one the up dip limit of the reservoir as we have defined previously and the down dip limit of the reservoir which we defined with this exhibit.

Q On which of the displays in that exhibit have you shown us where the gas/water contact is? Have you shown that on one of the structure maps?

A I've shown it on the structural cross section and I can point it out to you on the structure map. The contact of gas with the transitional zone would be at -70 -- sorry, -7487. It would be parallel to the 20 percent water saturation line shown.

Q Now let's make sure we're all understanding what you're saying. The base of the gas, if you will, and the top of the gas/water transitional zone, which is the top of that yellow line on the cross section?

A It's this line here. Of the three zones

it's the contact between Zones 1 and 2, the gas zone and the gas/water zone.

Q That -- that top of the transitional zone where you have gas and water is located where on the structural portion of the display in the top right? It's found at what line?

A It's found at a structural level of -7487 on the structural contours for the reservoir porosity, top of the reservoir porosity, and in effect it's shown as a dotted line labeled the 20 percent water saturation line, and primarily engulfs, with the exception of a few acres in the southeast quarter and the northeast quarter of Section 30 engulfs the eastern half of Section 30.

Q When we look at that point in the structure where we are now low enough that we're going to produce 100 percent water, and we can no longer recover any percentage of hydrocarbons, can you find that point for us on the structure map?

A That point is indicated in a dash-dot line and everything up dip from it is colored red on the exhibit, and it is located at approximately a level of -7519 in the southern part of the field and rises to approximately -7508 in the upper part of the field.

Q If we look to the west or to the left of that area, well, the area shaded in pink, or the red, all

that area, when we are at the right margin of that area where it turns all white on the display?

A Yes.

Q No, the other margin. There you go, okay, going from there to the west, as we go through that area that's shaded in pink, are we in an area where we have recoverable hydrocarbons?

A That we are.

Q Notwithstanding the fact that a certain portion of that area is a transition zone where you also produce water.

A That's correct. We will also produce hydrocarbons

Q How did you determine the limit or the extent at which you can no longer produce hydrocarbons?

A (Unclear) limit and as a conservative limit, we will demonstrate that in the Big Eddy 65, Unique Well No. 1, the basal 32 feet in that well are transitional; however, the based of the reservoir in that well is a -7519, and thus I have been conservative in letting that be the down dip limit; in other words, making an assumption that right below that would be wet.

This is conservative because it probably would be lower than that.

Q Let's look at the log on the No. 65 Well,

which is shaded in the yellow on the display.

A That one?

Q Yes, sir, that one right there.

A The porosity over 5 percent is shaded in yellow.

Q All right. Using that display, now, Mr. Eckerty's argument about the gas/water contact for that well was what, sir?

A Mr. Eckerty's argument in here was that the top, upper three to four feet were a transitional zone of gas and water overlying water.

Q And do you agree with that?

A Not at all.

Q What, in your opinion, is occurring?

A The upper three to four feet in the well are actually within the gas column. The water saturation within that interval calculates at 17 percent water saturation. I term that in the gas column and not a transitional zone.

The lower portion, another 30, 32 feet of reservoir rock in the wellbore, the water saturation averages 32 percent. I term that transitional and would point out that although it is an average, it does not increase towards the bottom of the unit, it is relatively constant.

Q Let's focus now on the other key well

that Mr. Eckerty used in picking the gas/water contact, and that was the Big Eddy No. 2 Well, the PanAm Well just to the north.

A Yeah, that is correct.

Q All right.

A Unique Well No. 3.

Q What was his argument about that well?

A His argument was a little weak. I really didn't understand it because he did not have a lot of data from the production on the well.

He basically had shown it to be in a separate reservoir from the 65 Well and maybe had given it less regard.

He mentioned there had been log analysis done on it; likewise I have done petrophysical work on the well. It is a 1963 vintage well and unfortunately it was drilled with fresh water and as result had a dual induction log run for resistivity. This is in comparison to all the other wells in the area which have a duolateral log (not clearly understood). The dual induction is inferior for reading the resistivities within these thinner zones and to top that, the microlog on this well indicates extreme washout through the reservoir interval. Now this effectively means, the bottom line is that that induction log is of very poor qualify and you cannot be real qualitative with the

water saturation in it.

I have made an attempt to correct it and I calculate water saturations in the 45 to 50 percent range.

We do, however, have data from PanAmerican on the well. We agree that the well cumed in '63 1447 barrels of condensate prior to abandonment, and agree that there is no public information of water or condensate, I mean water and gas, but for a two week test prior to abandonment, the well produced 7,280 MCF, 360 barrels of condensate, and 379 barrels of water. This oil/water ratio would, I feel, tend to support my 45 to 50 percent water saturation.

The well was, like I pointed out, drilled in '63 and perhaps to date the well may have been produced a little longer. I feel overall the well is towards the edge of the reservoir and the lower production and the noncommerciality is because of the reservoir beginning to get tight in that area.

As a result of the reservoir lensing into three different zones, and being a finer grained skeletal sand, I find it has -- probably has (unclear) water structurally higher within there, lending, thus, for a tilt of the contact between the transitional zone and the water zone of approximately 10 feet.

Q Let's go to your petrophysical data to

support the location of the down dip hydrocarbon limit and you can pick either the Pickett plot or the bulk volume water plot to start with, whichever is your choice.

A Okay. I like Pickett plots --

Q Let's do it.

A -- so I'll go with them first.

The Pickett plot is a log/log plot on log/log paper, where on the X axis you plot the resistivity, corrected resistivity of the formation; on the wide Y axis, the porosity.

They are designed primarily for people to point -- plot points from well data and then establish what they would call a line drawn through the most southwesterly plotted points and extend that line to the 100 percent porosity, and this at that point, the RT of that point is what we call the RW, the water resistivity, which you use in calculations from water saturations.

I work with Pickett plots the opposite way around, when I can. In this instance I've done so. The RW is not extrapolated from my Pickett plot in this exhibit. It is taken from water, measured water depth, specifically DST water on the Big Eddy Unit 65 Well, produced water from the Strawn carbonate on the Big Eddy Unit 64, located one and half miles to the southeast, and three other wells located within the vicinity to the north and west from the

same reservoir rock, and we have good control in this RW.

Basically, then, on the Pickett plot, using colors, red, green, yellow, and blue, we demonstrate that for the wells with a red circle, these are wells, primarily, the three of them being from the Santa Fe production area to the south, these are wells which are gas productive and make very little water.

They plot in the 10 or 15, up to 30 percent water saturation range.

Going to the blue triangle symbol, these are wells which in the Strawn reservoir have tested wet. We have actually five wells represented and of those five three were tested wet by DSTs, have no perfs, and two of them were judged wet solely on the log analysis, because we calculated nearly 90 percent water, and these are illustrated with having a range of water saturation from 50 percent through to the mid-90's.

Q Are you satisfied that you have sufficient information and have analyzed it thoroughly and carefully from which to reach a conclusion using the Pickett plot method of analysis to locate the gas/water contact and then the gas/water transition zones?

A Yes, we have, and the final plots demonstrate this. These are coded as a square green/yellow. The green is production from the Santa Fe Henry No. 2, which

Santa Fe has mentioned in their testimony, and also from the Santa Fe Ferguson No. 1 in that area to the south. The yellow are the actual points from the Big Eddy Unit 65 Well, and we find that these are wells which emit gas but with significant water production. They plot between wells with letter water and wells which are coded wet (unclear) transition zone. Moreover, the upper points from the Big Eddy 65, which we classify in the gas column, plot up there with these (unclear) substantiating that the top three or four feet is in the gas column and that the bottom 30 approximate feet are within the transitional zone.

Q Without going through the details of the bulk volume water plot, tell us, first of all, what is the purpose of the plot?

A Basically the purpose of the plot is to determine how constant the bulk volume water value, which is obtained by multiplying the porosity versus the water saturation on a fractional basis remains.

Q Why do you want to know that?

A The lower the number and the more consistent it stays will tend to tell you you are more the irreducible water saturation and that you will not have very much water. In that instance the wells indexed by red, the wells with little water production, form an ellipsoid in the lower half of the plot. The wells with the blue triangle, which

are wet, form an ellipsoid in the upper left, whereas the wells we have demonstrated to be gas productive with significant water production plot as an ellipsoid in between; once again an indication of the transitional nature of those wells, which includes the Big Eddy Unit 65 Well.

Q When we integrate the structure with the reservoir size, shape, and thickness, plus factor in your opinion of where the gas/water transition zone is, what is your opinion, then, about the optimum location in Section 30 to drill this initial well?

A The optimum location is to locate that well within the gas column, purely from the mechanical and economic point of view producing the gas from the reservoir, and Bass Big Eddy 102 location serves that purpose. It's 20 feet of net pay. The base of that we anticipate to be approximately 40 to 45 feet high to the contact between the gas column and the transition zone, well above our needs.

In the same context the transitional zone gas, as the reservoir pressure is drawn down from the depletion gas drive, will come out of solution and move upward towards the wellbore. So we will more economically recover the gas in the transitional zone, whereas, if we, like we see in the Big Eddy 65, have a well which penetrates very little gas column and a lot of transition zone, we're going to see a very high water cut form that well, and we are not

going to efficiently produce the hydrocarbons which are present in the area as well as the well on the western half in the gas column.

Q In your opinion are -- do we have enough structural position in Section 30 to stay out of the -- the water zone in the section?

A More than adequate.

Q And if we we go higher in the structure then your concern is that we simply move ourselves out of the reservoir.

A Very much so.

Q I show you what we've marked as Exhibit Number Ten, Mr. Hillis. What is that, sir?

A Exhibit Ten is a tabulation of the formation water resistivity data, the RW which I discussed previously on Exhibit Nine with respect to the Pickett plot. And for the upper three wells, these are taken from a publication which is quoted, the reference, and we have with us today.

Exhibit Number Eleven is a tabulation per well of the data used on the Pickett plot and the bulk volume water plot. Each well is indicated alphabetically, A, B, C, as it is on the central table on this illustration, and also the alphabetical indicators on the bulk volume water and the Pickett plot as a cross reference, and this is

the raw data used from log analyses to get these plots.

MR. KELLAHIN: That concludes my examination of Mr. Hillis, Mr. Catanach.

We'd move the introduction of his Exhibits One through Eleven.

MR. CATANACH: Exhibits One through Eleven will be admitted into evidence.

Mr. Bruce?

MR. BRUCE: A few questions.

CROSS EXAMINATION

BY MR. BRUCE:

Q Mr. Hillis, what is the production history of the Big Eddy Unit No. 65 Well?

A The production history?

Q From the Strawn formation.

A If you give me a moment I can look that through for you.

Q Okay.

A The Big Eddy Unit 65 is recognized as being in the Carlsbad Strawn East Gas Field and its production from 1981 to its abandonment in 1986 was a total of 324,609 MCF, 15,726 barrels of condensate, and 214,994 barrels of water.

Q Was it a commercial well?

A That I do not know. I do not work in that engineering department.

Q Why was it eventually -- why was the Strawn eventually shut-in?

A It was shut-in, I'm not real clear on the background, but all -- we had a large problem, which you may know, in litigation with Natural Gas Pipeline in this area and a lot of wells were shut-in and curtailed at that time.

Q Did water production have anything to do with it?

A No, it did not. The water production in the final months was very similar to the water production that we saw after about 9 or 10 months into the well life. It may have had a lot to do with it with respect to trying to get the well to perform again after it had been shut in for awhile.

Q Looking at your Exhibit Number 9, Mr. Hillis --

A Uh-huh.

Q -- particularly at the plots on the righthand side of it of structure and the porosity, am I correct in drawing the inference from that, that a well could also be drilled in the southeast quarter of the section?

A A well could be drilled in the southeast

quarter but would it encounter a gas column and transitional zone, and as I explained in my testimony, that would not be the best way to economically recover the hydrocarbons within Section 30.

It is better to drill in the gas calumn.

Q How far above the transitional zone would a well, say, in the northwest quarter of the southeast quarter be?

A How far -- when you give me a question to answer, --

Q Okay. I'm not quite sure I understand all the dotted and dashed lines, looking at the top.

A I can go through them and look through where you have a problem.

Q I see one line at 7450 that's dotted; is that just a structure line?

A This -7450 is a dashed line?

Q Yes.

A That is the structure on top of the porosity itself, the reservoir, this point here, -74 -- correlative to -7483 in the Unique Well No. 1.

Q Where is the -- which line designates your -- the edge of the transition zone?

A The edge of the transitional zone? The final edge of the transitional zone -- there are two edges.

Q Okay.

A The up-dip edge of the --

Q The up dip edge.

A -- transitional zone will be approximately on this contour here at -7451/52.

Up dip from that you will totally be in the gas column.

The line that limited the transitional zone will be this dotted line labeled 20 percent water saturation line.

So in other words, between that 20 percent water saturation line indicated by the dots and up-dip to the -7450 contour line, within that area if you drill a well, you will have gas column and transitional zone.

Q Do I understand you to say that you do not want to drill in that transitional zone?

A We do not want to drill in that transitional zone, as I explained, because of the high water cuts that we will have and thus would not be enabling to adequately develop the reservoir to its best efficiency.

Q Why don't you sit down again, Mr. Hillis.

A Okay.

Q Does Bass -- well, what number, A, B or C carbonate, does Bass consider productive in the Strawn?

A We consider, like Santa Fe, the C zone to

be the dominant one. The reason, if you would like me to continue, why this is on the top of the Strawn is because the top of the C carbonate is difficult to pick in wells such as the Santa Fe Henry No. 1, located in Section 26 of 22 South, 27 East.

We do have an in-house map with us on the top of the C carbonate, which I'll be glad to go through with you; it mimics this map, very much so; it conforms to that structural configuration.

Q If the top of the C carbonate varied within the Strawn, then a top of the Strawn map would not necessarily accurately reflect the C carbonate structure.

A No, that's incorrect. Like I said, in the Santa Fe Henry No. 1 you can't pick it because of the reefal (sic) clean-up and build-up within it. In other words, the C carbonate has pinched out. The shale marking the C carbonate top has pinched out laterally into the reef.

So you're going to have unique wells within there, not very many, but ones which have that reefal (sic) build-up along the shelfal (sic) edge where you cannot go through and say this is the top of a C carbonate.

Q So you're saying that the Henry No. 1 was in the Strawn reef.

A Pardon?

Q You are saying that Santa Fe's Henry No.

1 Well was in the Strawn -- is in a Strawn reef?

A It isn't within a clean carbonate build-up or Bass' A, B and C carbonates, all three together in the sense we don't have any shale. We, unlike Santa Fe, would interpret the lower porosity zone in the Santa Fe Henry No. 1 to be within the C reservoir.

Q How do you interpret the Santa Fe Vernon Well, and for your ease of reference, look at Santa Fe Exhibit Number Five.

A The Vernon Well, as we have indicated, is outside of the reservoir development. There is no reservoir development within the C carbonate.

Q You do not consider it to be in a Strawn reef?

A It depends on what people call reefs. In fact, I think all of us today are wrong in this hearing to be even using the word "reef". These tend to be more biohermal, biostromal, carbonate accumulations and not true organism-building type reefs, such as the Capitan Reef would be or the Great Barrier Reef would be.

So we're using the word "reef" purely in the colloquial sense, and if you're asking me if I would compare it to the Henry No. 1, in this particular instance, no.

Q Why not?

A Because the shaliness within the Vernon Fed depicts to me an A, B, C zone differentiation, which cannot be made in wells such as the Henry No. 1 with a lot of confidence, because of the lateral pinchout of the shales into that.

Q Is Mr. Eckerty's interpretation a reasonable one on the Vernon and the Henry No. 1 Wells?

A To compare the two?

Q Well, not to compare the two. Is his interpretation of the producing zone a reasonable interpretation, ar I understand the Vernon is not productive, is it?

A Right. I don't understand your question. You're going to have to --

Q Well, I'll call a reprise in a little while.

A Okay.

Q Getting back to your Exhibit Number Four, I understand that looking at your 70 -- 7200 foot line --

A 7200 foot line? Yes, sir.

Q -- it noses -- in Section 30 you have a -- quite a substantial nose to the east.

A I have it nosing towards the east, that's correct.

Q Could it also be moved westward?

A Not in my opinion. It is coming out to

honor the well control data east of Section 30.

Q But it is possible that it could be moved to the west?

A No, I don't -- I would not move it to the west. I would draw your attention, if you would like to look in 22, 27, on the eastern side of the nose I have depicted at that point the very extreme tightness of the contours. If I incorporate that tightness on the eastern edge of where I begin to lose this reservoir east of Section 30, contrary to moving the nose to the west, I would move it to the east; however, I can't do that until I have that one more well.

Q Your Exhibit Number Six, based on that exhibit wouldn't the two best locations for wells in Section 30 be in the southeast quarter and the southwest quarter of Section 30?

A No. Are you referring to the structure or the --

Q The isopach.

A The net H map?

Q The net H.

A Okay, would you ask your question again now?

Q Based upon your interpretation of the net H map --

A Okay.

Q -- aren't the two best locations for wells in the southeast quarter and the southwest quarter of Section 30?

A In the southwest quarter of Section 30?

Q In the -- one well in the southwest quarter and one well in the southeast quarter.

A Oh, no, not at all, because you cannot look at one ingredient to pick your well location. You have to take a group of factors. The two primary group of factors in here are the limits of the reservoir in its up-dip position and the second factor is the transitional zone location, where you want to keep the perforations in the wellbore away from the transitional zone. You want both of them to be within the gas column.

So in that context, the best location the best location was within the gas column in the southwest quarter of Section 30; then, after the evaluation of that well is complete, a north half location would be drilled incorporating that data, and it at that time could be drilled in the northeast or the northwest quarter, depending on the data from the low risk location.

Q But you do want to move up-dip from the water transition --

A Yes, of course.

Q -- at the -- Bass' proposed location in the north half unit.

A At this time our proposed location is on record as being a location 1980 from the west line and 660 feet from the north line. Now this is purely a tentative second location. We prefer to pick our second locations after we've drilled our first locations.

Q How many wells has Bass drilled in the last three or four years in Eddy County?

A In Eddy County in the last --

Q To the Strawn or Morrow formations?

A To the Strawn or Morrow formation, probably two based solely on the fact of curtailment and a current litigation with the gas pipeline company.

We have a lot of locations pending.

Q Well, despite -- other than legal issues with gas pipelines, Bass was still free to go out and drill wells, was it not?

A Not when -- if you were a little bit more familiar bit more familiar with the particular gas contract in the Big Eddy Unit, you probably wouldn't make that statement.

Q (Unclear) considerably more wells in Eddy County in the last several years to test the Pennsylvanian age --

A Oh, yes, they have been very active.

MR. CATANACH: Mr. Kellahin?

MR. KELLAHIN: No, sir.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Hillis, just one thing, if I could get you to draw in on my map the upper limit of the transition zone.

A Okay.

MR. CATANACH: Let's take about a ten minute break here.

(Thereupon a recess was taken.)

MR. CATANACH: Okay, we'll reconvene the hearing at this time.

Mr. Kellahin?

MR. KELLAHIN: Thank you, Mr. Catanach.

Our next witness is Wayman, W-A-Y-M-A-N, Gore, G-O-R-E. Mr. Gore is a consulting reservoir engineer who has been retained to make an engineering presentation for Bass.

WAYMAN T. GORE, JR.,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A My name is Wayman Gore and I'm a consulting petroleum engineer.

Q Mr. Gore, would you summarize for us what is your educational background?

A Yes. I graduated from the University of Texas in 1980 with a Bachelor of Science degree in petroleum engineering.

Since graduation I have worked in the industry, first for Tenneco Oil Company in Houston as an area engineer; next for Sanchez- O'Brien Oil and Gas Corporation as a production and reservoir engineer in charge of their producing operations covering approximately a 7-state area; and since May of 1984 I have been employed by Platt, Sparks and Associates in Austin, Texas, as a consulting petroleum engineer.

Q Have you been retained by Bass Explora-

tion and Production Company to -- I'm sorry, Bass Enterprises Production Company, to make a study of the engineering -- well, to make an engineering calculation of the recoverable reserves that underlie Section 30?

Q Yes, sir, I have.

A In addition, have you had an opportunity to examine the calculations made by Mr. Paradiso during his testimony earlier today?

A Yes, sir, I have.

MR. KELLAHIN: We tender Mr. Gore as an expert consulting petroleum engineer.

MR. CATANACH: He is so qualified.

Q Mr. Gore, let me show you what we propose to use as the first of your exhibits.

The first exhibit is Number Twelve? This one?

MR. KELLAHIN: And before we do that, Mr. Examiner, I was unable to mark this, I'll have to attach a sticker to this to mark this as an exhibit. I would like to mark it as Exhibit Twelve-A. Obviously it's an overlay, and you have your own copy there, Mr. Gore?

A Yes.

Q What I'd like you to do, Mr. Gore, is to commence and have you describe what information you have ob-

tained from Mr. Hillis, the Bass geologist, so that you could make an engineering evaluation of the necessary reserve parameters to make further engineering calculations about the recoverable reserves within the section.

In doing so, would you describe to what use you have put the overlay that we've marked as Exhibit Twelve-A?

A Yes. First of all, for my engineering study I have relied upon Mr. Hillis' geologic interpretation and his petrophysical work, his log analysis data, in describing the three separate zones, these three zones being the gas column, or 100 percent gas column; the transition zone; and the 100 percent water production, or wet zone.

The overlay, if I could turn to Mr. Hillis' Exhibit Number Six, actually goes with Exhibit Number Six.

Exhibit Twelve-A, the overlay, actually goes with Mr. Hillis' Exhibit Six, the porosity H map, and as you can tell from the overlay, I have shown the Section 30, the section in question, and if we overlay onto Mr. Hillis' porosity H map, you will see that the overlay is divided into three separate colored zones.

The red zone is the gas column, 100 percent gas, which, as Mr. Hillis testified, the bottom of which is located at a subsea depth of 7451, and it is so

marked with the dashed line.

The yellow zone, the bottom of which is marked a -7487, is the portion of the reservoir that contains both gas and transition zone, the bottom being the structural level before you go into 100 percent water.

And then, of course, the blue colored area as denoted in the area of the Bass Big Eddy No. 65 Well, is denoted by -7519. This is the structure level below which you get into the 100 percent water productive area.

For my calculation of volumetric gas in place for Section 30, I planimetered the areas and determined the porosity acre feet within each of the colored areas. You will notice on my Exhibit Twelve I show three different water saturations and three different porosity acre feet numbers.

The average water saturation, which is entitled SW-1, is the average water saturation in the 100 percent gas-bearing formation or the area colored in red on the overlay.

I have determined from Mr. Hillis' work that a very conservative estimate of water saturation for this area of the reservoir is 20 percent.

Average water saturation labeled SW-2 is the water saturation for the yellow area. This is the por-

tion of the reservoir which will contain both 100 percent gas column and transition zone.

We know from Mr. Hillis' work that the -- this particular area, if a well was drilled in the yellow area, it would encounter both gas column and transition zone, with the transition zone water saturation varying from a low of 20 percent up to a maximum of 35 percent.

So for the average saturation in this yellow area I have used an average saturation of 27-1/2 percent.

Then for the blue area, the blue area again is a portion of the reservoir which will have transition zone plus 100 percent water-bearing rock. A well drilled in the blue zone would encounter both transition zone and 100 percent water.

This area, I have determined that, from Mr. Hillis' work and testimony, that the average water saturation, again a very conservative estimate, is 35 percent.

We know that the transition zone water saturation varies from 20 upwards of 35 percent with anything greater than 35 percent being 100 percent wet, so I've use a very conservative estimate of 35 percent water saturation for the blue zone.

Q In making your volumetric calculation you

have utilized only that portion of the exhibit that's inclusive within Section 30.

A That is correct.

Q There are certain portions of your overlay that obviously extend beyond the section but you have not factored that into your calculation in determining the reserves in place as shown on Exhibit Twelve.

A That's correct.

Q What did you calculate, Mr. Gore, as being the gas in place underlying Section 30 in the Strawn formation?

A The gas in place as determined using the average water saturations that I've just outlined, and the results of my planimetering of these areas, the gas in place calculates to be 13,414,000 MCF.

Q The next step in your study is to make an investigation to determine how much of the original gas in place you can expect to recover.

A That's correct.

Q And have you made a calculation to determine volumetrically what were the recoverable reserves in the section?

A Yes, sir, I have.

Q I direct your attention to what I have marked as Exhibit Fourteen. There is no thirteen, I have

simply lost the ability to count above twelve, so forget thirteen, we're working with Fourteen.

You've got one of those?

A Yes.

Q All right, let's go through the information that you've utilized to determine what the recoverable reserves were -- are, are for the section.

A Okay. First of all, we have calculated that the gas in place is approximately 13.4 BCF.

The initial reservoir pressure in the Strawn in this particular reservoir is 5,603 psia. This was determined from a bottom hole pressure build-up ran in the Big Eddy Well No. 65 upon initial completion. This compares very favorable -- favorably with the 5600 pounds, I believe was testified to in the Carlsbad Strawn Field to the south.

Q In fact Mr. Paradiso was using the -- almost the same pressure, initial reservoir pressure that you utilized?

A Yes.

Q The -- I have used an estimated abandonment reservoir pressure of 1000 psia. Normally a rule of thumb, not knowing anything about the reservoir, an abandonment pressure would be approximately 100 psi per thousand foot of depth.

We're at approximately 11,500 feet here,

so we would expect a normal abandonment pressure to be approximately 1100 psia.

So my utilization of 1000 psia I feel is a very liberal estimate and will result in the calculation of the maximum amount of recoverable reserves under Section 30.

Q In contrast, Mr. Paradiso used 500 pound abandonment pressure?

A Yes, he did.

Q And in his calculations, then, it will result in a larger recoverable reserve volume?

A Yes, it would. If -- if you use a 500 pound abandonment pressure you will calculate larger recoverable reserves.

Q So if you use 1000 you've got a smaller number than he will calculate if all the other parameters were the same.

A That's correct.

Q All right. What else did you use?

A Secondly, I determined the gas compressibility or gas deviation factor of the particular gas in this reservoir at initial conditions and abandonment conditions.

At initial conditions, an initial pressure of 5,603 psia, the gas deviation factor is approximate-

ly 1.0372.

At an abandonment pressure of 1000 psia the gas deviation factor calculates to be 0.8746.

Utilizing these parameters, I then calculate a recovery efficiency. The recovery efficiency is defined to be the amount of gas which will be recovered as a percentage of the gas in place and this is calculated as shown by the formula on Exhibit Fourteen, which is one minus the abandonment pressure times the initial gas deviation factor divided by the initial pressure times the abandonment gas deviation factor, and the recovery efficiency calculated using an abandonment pressure of 1000 is 0.796, or approximately 80 percent.

Therefore the recoverable reserves calculated under Section 30 is 80 percent of the 13.4 BCF of gas in place or approximately 10.7 BCF.

Q Having gotten to the point where you now have established a recovery of 13.4 BCF, did you then go on to study the economics of drilling a well such as this to see whether or not it would be profitable to drill such a well?

A Yes, I did.

Q I'd turn your attention to what is marked as Exhibit Number Fifteen, Mr. Gore, and have you identify that exhibit.

A Yes, I have.

Q All right, what is that exhibit?

A That exhibit is a comparison of the estimated well costs as submitted and prepared by Bass Enterprises Production Company and Santa Fe Energy Company and I've shown, broken these estimated costs into intangible well costs and tangible well costs.

The bottom line is Bass is estimating a completed well cost to be approximately $995,000 and Santa Fe is estimating a completed well cost to be approximately $845,233.

Q In analyzing the AFE's can you identify for us the reasons there is a cost differential between the two AFE's, whereby the Bass AFE is about $150,000 more?

A Yes. There are approximately three areas that make up the majority of the differential in well costs.

MR. BRUCE: Mr. Examiner, you know, I have no questions about the well cost and I thought we had agreed previously that well cost wouldn't be an issue at the hearing.

MR. KELLAHIN; Certainly. I'm going to a different direction, Mr. Examiner. We have not told you but it is true that Mr. Bruce and I have stipulated that either of these well costs are reasonable.

The purpose of Mr. Gore's tes-

timony is to take the well cost calculation and to determine what is the range of expectations for those costs, apply it to the recoverable reserves, and see if it's reasonable to drill a well. That's what we are doing.

MR. CATANACH: Okay. You may proceed, Mr. Kellahin.

Q All right. The principal difference, then, between the two AFE's is found in the areas of the logging and formation evaluation? In other words, the logging program proposed by one company over the other?

A Yes. As you will notice on the exhibit, that Bass is estimating approximately $127,000 for logging and formation evaluation.

Santa Fe is estimating approximately $47,000.

Q And then there's a difference of about $20,000 additional on a stimulation proposal that Bass has over the Santa Fe Energy proposal.

A That's correct.

Q All right, and then the other big difference is, I think, a transportation difference?

A Yes, approximately $20,000 difference in the estimated transportation costs.

Q What number did you apply in your economic analysis for a well cost?

A The well costs that I have used for my economic calculations are the estimated costs of Bass Enterprises of $995,000, and this is the higher of the two estimated well costs.

Q Have you made an economic analysis, then, by which you can conclude that using the highest of the two AFE's, whether or not it will be reasonable to drill a well in Section 30?

A Yes, I have.

Q Let me turn your attention now to Exhibit Sixteen, Mr. Gore. This represents your work product?

A Yes, sir, it does.

Q What have you found?

A First of all, the first sheet is a cover sheet. If we could turn to page two, this is the reserves and economic data. The third page is essentially the input data, which I would like to go over first.

Q Okay.

A Again we have already stated that a well cost of $995,000 was used. A projected initial rate for the proposed Bass Big Eddy Well No. 102 was determined to be 2500 MCF per day. This figure was arrived at by reviewing the 4-point test on the Big Eddy No. 65 Well, the only well to really produce any amount of gas from the subject reservoir.

The highest rate on the 4-point test for the Big Eddy No. 65 was 2,456 MCF per day, so I have utilized as an initial rate for the proposed well 2500 MCF per day.

Again we have shown that the recoverable reserves under Section 30 is approximately 10.7 BCF. For this economic analysis I have then taken one-half of the recoverable reserves under Section 30 and this is essentially 5.37 BCF and have based my economic evaluation on this recoverable gas figure for the one well.

Utilizing an initial gas rate of $1.30 per MCF, an initial condensate price of $15.00 per barrel, I have left these prices flat for 1988 and escalated at 5 percent, which I feel is very reasonable, if not conservative, and ran out the economics. The results, using an initial rate of 2500 MCF per day and a recoverable reserve figure of 5.37 BCF yields a well life of 26 years, which is highlighted on the previous page, and results in a yearly decline rate of 15-1/2 percent, which is very comparable to the Santa Fe wells to the south.

Then if we could flip back one page, I have highlighted some information in yellow. The bottom line using these prices and well cost data is that the discounted payout for a well of this kind is a little over half a year, between six and seven months. The net income to in-

vestment ratio discounted at 10 percent is 8.97-to-1. In other words, Bass should realize a return on their investment, discounted at 10 percent, of 9-to-1.

Q The investors that participate, then, in the drilling of the well will get their money back plus 8 times?

A That's correct. The total revenues, generated for this particular well that I've analyzed is slightly over $17-million. The present worth of this total revenue discounted at 10 percent is highlighted and is approximately $7,928,000.

Q If Mr. Paradiso is correct on his calculations of the drainage areas affected by his wells in the Carlsbad Strawn, do we have enough profitability in this economic analysis to justify the drilling of more than one well in the section?

A I'm not sure I follow you. Could you repeat that?

Q Sure. Mr. Paradiso has shown us with his calculation that he's got a well that drains in excess of 320 acres. It appears that the wells will in fact drain 320 acres.

Are the economics such in your opinion that it can be fully developed with one well or is there enough economic incentive here to justify and support with

these recoverable reserves the drilling of two wells?

A The economics show that it would be more than profitable to drill two wells in Section 30 and I think the recoverable reserves which we have shown in Section 30 show that two wells will be necessary to efficiently drain Section 30.

Q You've made that calculation on the assumption that Mr. Hillis' geologic interpretation is correct.

A Yes, I have.

Q Have you also had the opportunity today to make similar engineering calculations using the geologic interpretation that Santa Fe Energy has introduced today?

A Yes. I have reviewed their map and Santa Fe presented no figures for recoverable reserves under Section 30, so I have reviewed their map and made some ballpark estimates of recoverable gas based upon their geology.

Q Based upon their geology what do you find, Mr. Gore?

A Utilizing again, I believe, the porosity in the No. 65 Well is approximately 11 percent, I believe the average water saturation that was presented by Santa Fe is approximately 35 percent, looking at their isopach map, it appears that they're showing approximately 400 acres pro-

ductive in Section 30, slightly over half of the section. I have estimated it to be approximately 400 acres.

And using, again, reviewing their isopach map, a good portion of Section 30 they show to have 30 feet or greater thickness. So utilizing an average thickness in Section 30 of 32 feet, and using my initial gas formation volume factor, the recoverable gas is approximately 10.6 BCF based on the Santa Fe geology.

I'm sorry, I've run out several different scenarios. Using the 11 percent average porosity, the recoverable -- first off, the gas in place will be 12.3 BCF. Using an 80 percent recovery factor the recoverable reserves under Section 30, according to Santa Fe's maps, will be approximately 9.8 BCF.

So even under Santa Fe Energy's opinion of the geology, there should be sufficient enough recoverable reserves to justify and economically support the drilling of two wells.

A Yes. As you'll recall, Santa Fe estimated that the recoverable reserves for their Neeley No. 1 is 6.4 BCF and the recoverable reserves for the Weems No. 1 is 7 BCF.

I have estimated based on their geology that the recoverable reserves under Section 30 alone is 9.8 BCF.

Q As an engineer who's evaluated this area from an engineering perspective, how would you recommend that the section be developed in Section 30?

A My --

Q Have you formulated an opinion?

A Yes, sir, I have.

Q And what is that opinion?

A My recommendation is that Section 30 should be developed as Bass proposes. There is sufficient recoverable reserves in Section 30 to warrant two wells being developed. I feel, from looking at the geological presentations, that the less risky location is the Bass location.

Once that well is drilled with the information that it will provide, I feel a second well will be necessary in the northern 320 and there will be sufficient reserves to warrant the drilling of that second well.

So my opinion is that we should have a laydown 320-acre unit.

Q In applying the engineering to the geology that Mr. Hillis has presented to you, as an engineer trying to confirm how you want to place the well within the geology that he's given you, if the units are stood up where you have an east half and a west half unit, and a well is drilled in the west half, are you in a position then where

you're precluded from drilling a well in the east half, notwithstanding the fact that east half does have recoverable reserves that will be contributing to the well in the west half?

A Now, are you talking about a standup unit now?

Q Yes, sir, in that situation.

A Yes. In that situation I think you would be precluded from drilling a well in the northern 320 if you had standup units, due to the fact that you would want to locate a well probably in the northeastern corner of the northwest quarter very near where a well in the standup unit would be located.

I feel it would be better from a reservoir engineering standpoint to lay down this 320 acre unit and thus provide flexibility in locating the second well in the northern half of Section 30.

Q Were Exhidddd Twelve, Twelve-A, through Sixteen compiled under your direction and supervision?

A Yes, sir, they were.

Q And the opinions and conclusions you have expressed today are your own opinions and conclusions that you've derived based upon your study?

A Yes.

MR. KELLAHIN: That concludes my

examination of Mr. Gore.

We move the introduction of Exhibits Twelve, Twelve-A, through Sixteen, except for thirteen.

MR. CATANACH: Exhibits Twelve, Twelve-A, through Sixteen will be admitted as evidence.

Mr. Bruce.

MR. BRUCE: Just a few questions, Mr. Examiner.

CROSS EXAMINATION

BY MR. BRUCE:

Q I believe you said that your calculations are based on the geology presented by Mr. Hillis.

A Yes, they are.

Q So if that geology is not accurate, then your calculations are not correct?

A Certainly the calculations will vary as the geology varies, yes.

Q Looking at your Exhibit Twelve-A, I just want to clarify something.

Did your calculations of recoverable reserves only include the pink and yellow areas or did they include anything in the blue area?

A With reference to Section 30 only --

Q With reference to Section 30 only.

A Yes. The blue area does contain recoverable gas; therefore the blue area was included.

As I stated before, this blue area will contain transition zone plus 100 percent water.

Referring back to my Exhibit Twelve, the porosity acre feet as determined for the blue area under Section 30 was determined to be 148.0. Knowing that this is transition zone plus water, only approximately half of the blue zone will be productive, or will contribute to gas production on Section 30.

So in the actual calculation of gas in place, you will notice that of the total 148 porosity acre feet, I have only utilized 74 porosity acre feet and this would account for the half of the blue area which is transition zone that does contain recoverable hydrocarbons.

Q Okay, and referring once again to Exhibit Twelve-A, does your -- the extreme western edge of Section 30 is indicated blank; it doesn't have any color on it.

A That's correct.

Q Did you attribute any reserves to that area?

A There are no recoverable reserves in the western portion of Section 30 that is not colored.

Q Now, if Santa Fe is correct and the en-

tire east half is nonproductive of gas, the east half of Section 30, would two wells be necessary to drain the west half of Section 30?

A Well, I believe that in my review of the Santa Fe isopach map, they show approximately 400 acres productive. This calculates to approximately 9.8 BCF of recoverable reserves.

By your own witness' testimony, the two wells to the south, which (not clearly understood) if a second well was not drilled, so yes, I think a second well would be necessary, and the economics would justify drilling the second well.

Q Well, I'm not sure I followed that all, but if the east half is nonproductive, would two wells be necessary to drain the west half?

A Again, in my review of your geologic map, which shows the eastern half to be nonproductive, so therefore, only the western, or approximately 400 acres --

Q All right, assume 320 acres.

A Well, your own map shows greater than 320 acres. I can assume 320, if you would like.

Q Yeah, I would like you to assume.

A All right. Assuming 320 there would be approximately 7.8 BCF of recoverable gas in Section 30. Again, the most recoverable reserves you show from the wells

to the south is 7 BCF, so there'll be approximately a BCF of gas located in the western portion of Section 30 that would go unrecovered.

And in order to recover that approximately one BCF of gas, a second well would have to be drilled.

Q Do you know if this is a water drive reservoir?

A Yes, sir, I feel I do know whether it is or it isn't a water drive, and my opinion is that it is not.

Q Just a minute ago you compared the Santa Fe Neeley and Weems Wells, to, say, a southwest quarter -- a well in the southwest quarter of Section 30, but did not Mr. Hillis say that the south -- or the Carlsbad Strawn was not comparable to the well in Section 30?

A Well, I believe what I testified to was that your testimony was that the Weems and the Neeley Wells should compare very favorably with a well in Section 30, and that's the direction that my testimony was aimed.

MR. BRUCE: That's all of this witness.

MR. CATANACH: I have no questions of Mr. Gore.

MR. KELLAHIN: Just a couple of follow-up questions, Mr. Catanach.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Bruce was talking with you about the Neeley and the Weems Wells, Mr. Gore.

If you'll specifically take Mr. Paradiso's Exhibit Number Seven, which I think is the Neeley Well, and that's his P/z curve, do you have that before you?

A Yes, I do.

Q If you take your estimated recovery percentage of 80 percent and adjust it to an abandonment pressure of 1000 pounds as opposed to 500, what have you calculated to be the recoverable reserves?

A The recoverable reserves based on 1000 psi abandonment pressure, using the Santa Fe Exhibit Number Seven, which again I have calculated an 80 percent recovery factor, does equate to a 1000 psi abandonment pressure.

Using this on the P/z curve shown on Exhibit Number Seven, the recoverable gas would be approximately 5.75 BCF.

I believe Santa Fe's estimate using a 500 psi abandonment pressure was 6.4 BCF, so we've got -- we've reduced the recoverable reserves by approximately 7-to-800,000 MCF.

Q When we do a similar calculation on the

Weems Well, and take that P/z curve, have you had an opportunity to plug in an 80 percent recovery factor and use 1000 pounds abandonment pressure?

A Yes, I have.

Q All right, what did Mr. Paradiso say was our recoverable reserves under his calculation?

A Under his calculations he estimated 7 BCF.

Q And you have recalculated that to be?

A I have recalculated that to be, based on 1000 psi abandonment pressure, 6.25 BCF, so we have a difference again of approximately 3/4ths of a BCF of recoverable reserves.

Q In calculating the recoverable reserves using Mr. Eckerty's interpretation of the isopach, you came up with what number?

A Using Mr. Eckerty's map, the recoverable reserves that I estimated in Section 30 is 9.8 BCF.

MR. KELLAHIN: I have nothing further.

MR. CATANACH: The witness may be excused.

MR. KELLAHIN: Mr. Examiner, at this time I'd like to call Mr. Jens Hansen. Mr. Hansen is a landman with Bass Enterprises Production Company. He re-

sides in Ft. Worth and has been previously sworn as a witness.

JENS HANSEN,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A My name is Jens Hansen. I'm a landman for Bass Enterprises Production Company.

Q Mr. Hansen, have you previously testified before the Oil Conservation Commission of New Mexico and had your qualifications as a petroleum landman accepted and made a matter of record?

A Yes.

Q And are you familiar with the Bass operations in the Big Eddy Unit in Eddy County, New Mexico?

A Yes.

Q And you have been involved for a number of years on behalf of your company in dealing with other companies to propose and work out on a voluntary basis the drilling of wells in and around the Big Eddy Unit?

A Yes.

Q And were you the landman and the principal employee responsible for discussions and negotiations with Santa Fe Energy in an effort to work out on a voluntary basis the drilling of this well?

A Yes.

MR. KELLAHIN: We tender Mr. Hansen as an expert petroleum landman.

MR. CATANACH: He is so qualified.

Q Mr. Hansen, let me direct your attention to what we've marked as Exhibit Number Seventeen. Did you cause this exhibit to be prepared?

A Yes, I did.

Q And what does it depict, Mr. Hansen?

A This exhibit depicts -- the acreage under lease by Bass Enterprises Production Company is that colored yellow.

The oil and gas leases owned by Santa Fe Energy is shown in blue.

The Big Eddy Unit boundary, the western boundary of the Big Eddy Unit is shown in orange with the partially dotted line.

In Section 30 of Township 21 South, Range 28 East, we have shown the proposed well location by Bass

with a red dot with the accompanying proration unit being the south half of the section.

We've also shown the proration unit proposed by Santa Fe Energy as that being outlined in green, which is the west half of Section 30, with two locations, two well locations, the first being 990 feet from the west line and 1980 feet from the south line, which was proposed in their October 6th letter, and that's shown in blue, as a blue dot, and a green dot with a location of 990 feet from the west line, 1980 feet from the north line, and that was proposed in their April 7th, 1988 letter.

Q In your negotiations and discussions with Santa Fe Energy, were you dealing with Mr. Green, the landman for Santa Fe Energy?

A No, I was not.

Q With whom were you dealing when you were discussing their proposal and your counter-proposal for the development of Section 30?

A Mr. Bill Schaefer.

Q And to your knowledge what was Mr. Schaefer's capacity during this time with that company?

A Mr. Schaefer had the capacity of being Exploration Manager for that Division.

Q Were you responsible for your company's response to the letter that Santa Fe Energy wrote to Bass on

October 6th, 1987?

A Yes.

Q Were you able to work out an arrangement with Santa Fe Energy for the formation of the 2-section working interest unit?

A No, we were not.

Q And what was the reason that you were unable to successfully form a voluntary working interest unit?

A Well, there were four major, fundamental flaws to the proposal.

First, when you combine into a working interest unit a Federal, Federal unit acreage, and non-Federal unit acreage, you initiate a problem created when you develop the area and specifically with disproportionate reduction to the unit owners should you have the expanding participating area procedure that is quite prevalent in these Federal units.

That was -- that's number one.

Number two, is we believed, and still believe, that to include portions of Santa Fe's acreage with portions of our Federal unit dilute Section 30 with nonproductive acreage.

Third, the 40 acres within this Federal unit that Santa Fe Energy has leased is not dedicated to the Big Eddy Unit and as a result there is an attempt to dictate

unit operations with a minor interest that's not dedicated to the unit.

And fourth, we believe that one well in the west half of Section 30 would result in the non-recovery of unitized substances.

Q Santa Fe Energy proposed to you a revision from the original proposed well location. The first location is the blue dot in the southwest quarter of the section?

A That's correct. That was the first proposal.

Q And then in March and April of '88 Mr. Schaefer proposed to you an alternative location?

A Yes. What was the discussion about moving the location, then, to the northwest quarter of the section?

A Mr. Schaefer called me on April 6th, 1988, advised me that they had made a decision to move the location to the northwest quarter and that we would be receiving a letter proposing that new location.

That proposal was received by Bass under their April 7th, 1988 letter.

Q When did you first learn, Mr. Hansen, that Santa Fe Energy now proposes to return back to the original location originally proposed in October 6th of '87?

A I learned that today.

Q From Bass' perspective does that make a difference to you in determining how the section ought to be developed?

A No, it does not.

Q There is still a disagreement about the well location?

A Yes.

Q Let me turn your attention now for just a minute to what is the underlying basis for the approval of the Big Eddy Unit itself, Mr. Hansen, when we look at Section 30, exclusive of the 40-acre tract on the southwest of the southwest. Let me direct your attention, sir, to what I've marked as Exhibit Number Eighteen.

What have you -- what have you compiled and proposed as Exhibit Number Eighteen, Mr. Hansen?

A This exhibit is a copy of the unit agreement for the development and operation of the Big Eddy Unit Area, dated April 10th, 1952.

Also attached to the Big Eddy Unit agreement is a copy of Order No. R-152 by the New Mexico Oil Cooperation -- excuse me, New Mexico Oil Conservation Commission that ratifies and confirms the Big Eddy Unit as a plan of development.

Q Under the plan of development and the or-

der entered by the Commission, what are the constraints on Bass as operator for the development of the interest in Section 30?

A The constraints and charges are found on Page 8, I direct you to Page 8. It's been outlined there for you in a pink color and I'll read:

"Rights and Obligations of the Unit Operator. Except as otherwise specifically provided herein, exclusive right, privilege, and duty of exercising any and all rights of the parties hereto, which are necessary or convenient for perspecting (sic), producing, storing, allocating and distributing the unitized substances are hereby delegated to and shall be exercised by the unit operator as herein provided."

Q Under the obligations and constraints of the order, as well as the operating agreements approved by the BLM, is anyone other than Bass entitled to or required or obligated to develop and drill on the unitized acreage?

A No. The unit operator is given the discretion to discern which operations should and should not be conducted and under that charge Bass Enterprises Production Company has, since 1952, carried out the unit operations of this unit.

I'd also like to direct you to Page 14 of that same unit agreement, provision number 13, which is en-

titled, "Development or Operation of Nonparticipating Land or Formations. Nonparticipating land or formations in this provision refers to areas outside participating areas." So it's unitized acreage outside the participating areas, and it states, "Any party hereto owning or controlling the working interest in any unitized land having thereon a regular well location may with the approval of the Supervisor as to Federal lands, the Commissioner as to State land, and the Commission as to privately owned land, at such parties sole risk, cost, and expense, drill a well to test any formation for which a participating area has not been established."

In this particular situation the well proposal that Bass has proposed is on Federal acreage. The Supervisor has approved this operation and under 13 we are -- we are obligated to conduct that operation.

Q If Santa Fe Energy wants to drill either one of the locations they've proposed on the Big Eddy Unit, what are the things that they must do?

A First they must obtain a designation of agent, which the operator must execute under the BLM rules and regulations, and we would then have to file an amended plan of development that changes the well location to their prescribed location, and then they would be entitled to drill the well after they had an approved APD.

Q Under the terms of this, the structure of

the unit, is under -- is Bass under any obligation or requirement to designate Santa Fe Energy or anyone else as an operator or an agent to drill this well?

A No, and especially under conditions where we do not deem that the operation is a prudent operation.

Q In addition to having Bass consent to have Santa Fe Energy drill the well on the unit acreage, what else must they have? An approved APD, must they not?

A Yes.

Q All right. To the best of your knowledge has Santa Fe Energy obtained an approved APD for the west half of Section 30?

A No.

Q Mr. Hansen, have you caused the necessary forms to be filed with the Bureau of Land Management proposing the well as Bass proposes it, showing a south half orientation for the spacing unit and filed that as an application for permit to drill with the Bureau of Land Management?

A Yes, we have.

Q And has that permit been fully complete in terms of the requirements that Bass must fulfill in order to have that permit processed?

A No, we also filed an amended plan of development, which is also -- which was approved.

Q All right, so you have, in fact, completed all the requirements that the Bureau of Land Management's placed upon Bass to have your Application for Permit to Drill, dedicating the south half of Section 30, using your proposed location 1980 from the west and the south lines.

A That's correct.

Q Let me show you what is marked as Exhibit Number Nineteen, Mr. Hansen, and ask you if you can identify that?

A This is the Application for Permit to Drill that was filed by our Midland office for the drilling of the Big Eddy Well No. 102, to be located 1980 from the south line and 1980 from the west line.

Q And would Bass, you on behalf of Bass, have dealt with what individuals at the Bureau of Land Management concerning your application?

A The application was sent to the Carlsbad office of the BLM, a Mr. Shannon Shaw, I believe is his name, handled that through our office in Midland, who -- who -- at which office one of our personnel handled it on that level.

Q Have you obtained from the Bureau of Land Management, Mr. Hansen, the approval of Bass' Application for Permit to Drill for this well, dedicating the south half

of the section to the well?

A Yes.

Q And what is the date of that approval?

A The date of that approval is April 21st, 1988.

Q And that's shown as the last entry on the cover sheet to Exhibit Number Nineteen?

A That is correct.

Q Let me show you what is marked as Exhibit Number Twenty, Mr. Hansen --

A Uh-huh.

Q -- and ask you to identify that exhibit.

A This is -- this is the first amendment to the 1988 plan of development for the Big Eddy Unit that we filed on -- that we sent on April 21st, 1988, to the Bureau of Land Management, Commissioner of Public Lands and the New Mexico Oil Conservation Division.

Q And this is one of the items necessary in order to complete the processing for your permit to drill the well?

A That is correct.

Q As of this time, Mr. Hansen, do you have an opinion as to whether or not Bass has taken all the necessary requirements to obtain necessary approvals from the Bureau of Land Management for the drilling of the well?

A Yes.

Q And you have?

A Yes, we have.

Q In the event Santa Fe Energy elects not to participate with its 40-acre interest in the spacing unit, do you have a recommendation to the Examiner as to what the overhead rates ought to be applied against that interest on a monthly basis for a producing well or a drilling well rate?

A Yes.

Q And what --

A $5500 for a drilling rate, $550 for an operating rate per well.

Q When does Bass propose to commence the well, Mr. Hansen?

A Bass proposes to commence the well at such time as we have a release from the gas -- our gas company, who -- under this section for release to the contract, gas contract, NGPL, Natural Gas Pipeline Company.

Q And is that being processed?

A Yes, and we believe that will be forthcoming within thirty to sixty days.

MR. KELLAHIN: That concludes my examination of Mr. Hansen.

We'd move the introduction of

Exhibits Seventeen through Twenty.

MR. CATANACH: Exhibits Seventeen through Twenty will be admitted as evidence.

Mr. Bruce?

MR. BRUCE: Just a few brief questions.

CROSS EXAMINATION

BY MR. BRUCE:

Q When did Bass first propose the south half unit to Santa Fe?

A Let's see, formally, are you talking about formally or through conversation?

Q Formally.

A I believe it was our March, March 18th letter, I believe. Yes, March 18th, 1988. That was our first well proposal.

Q And on what date did Bass apply to the BLM for the APD?

A Let's see, I believe that's March 22nd, 1988.

Q So in essence there was really no room for negotiation with Santa Fe in there.

A No, that wasn't the case at all. We had negotiated up until about March the 18th to try to find some

way to resolve this thing, if we could.

Q Exhibit Eighteen, the OCD order and the Big Eddy Unit Agreement --

A Yes.

Q -- of course that has no applicability to Santa Fe's acreage, does it?

A That's correct.

Q One last question. If Bass does not get a release from Natural Gas Pipeline Company of America from its contract, will it drill the well?

A We may; depends on gas marketing.

MR. BRUCE: Nothing further.

MR. CATANACH: I have no questions.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Hansen, Mr. Bruce has made inquiry about the first written proposal of Bass to Santa Fe Energy, which was March of this year.

Are you satisfied that you've done all you can do in order to try to formulate on a voluntary basis the development with Santa Fe Energy for the drilling of the well in Section 30?

A Yes, with the inherent problems that fol-

low a working interest unit of unitized and non-unitized acreage. We have done everything we can do within what we consider minimizing the risks to work a deal with Santa Fe, and it -- we just couldn't work a deal.

Q In fact, Mr. Schaefer of Santa Fe is a good personal friend of yours, is he not?

A Yes, very good friend.

Q And you fellows have talked for months trying to figure out some solution to getting this section developed, did you not?

A That's correct, and a big part of the problem is the 40 acres that is not dedicated to the Big Eddy Unit and when you have a small acreage interest like that in a Federal Unit that does not participate, they are doing one of two things: They are either going to develop their minerals on -- on their own basis, or they will be included within unit operations on some manner and not participate in the participating area procedure. That's their only two options and they cannot -- they have not been and cannot dictate unit operations.

Q There certainly is no dispute that either Santa Fe Energy or Bass are both competent professional operators at all levels of their operations.

A Not in my mind, no.

Q How did we ever get where we are with

this case, Mr. Hansen?

A It's just two oil companies that could not make a deal because one of the companies was making a proposal that had fundamental flaws to it, and possibly did not understand Federal units.

MR. KELLAHIN: Nothing further.

MR. CATANACH: I have no questions. The witness may be excused.

Would counsel like to make closing statements? Mr. Kellahin?

MR. KELLAHIN: Mr. Examiner, we do appreciate the time that you've given us today and in fact a good part of the whole day you've devoted to this case. It is not a case that we've taken lightly. There has been considerable effort by both companies to work out a resolution of this issue in order to determine how best to develop the section.

From my own perspective, though, I think there are a few essential points, or at least points that I think are essential that stick out in my mind as a lay person, as the nontechnical person that has seen these displays for the first time yesterday afternoon, and from my own perspective I would like to urge you to take into consideration some of those points.

For Bass this is a forced pool-

ing case in the traditional, logical sense of the word. We have done all that is necessary or could be done to formulate a voluntary basis for providing a spacing unit for the well.

I think it is significant that out of 640 acres we control all but 40 acres. In basic fairness it appears to me that the interest owner, with some 87-1/2 percent of that interest, ought to be the party that determines how to spend the money and where to locate the well.

Santa Fe Energy, on the other hand, has 12-1/2 percent. They want to tell the operator with an overwhelming majority of not only the money to spend but the responsibility for developing the section where to locate their well.

From Santa Fe Energy's perspective, it does not matter how that unit is oriented, if you look only at Section 30. If it's a laydown, it's still 12-1/2 percent. If it is the west half, it's still 12-1/2 percent.

What in the world is there to gain for Santa Energy wanting to take a small, minority interest and determine and go to great lengths to argue over where this well is located?

Mr. Hillis has provided you

with voluminous research on how he has convinced himself, persuaded Bass, and I hope convincingly shown you how to locate the well.

This is not a forced pooling case for Santa Fe Energy. They've got an entirely different objective in mind when it comes to developing this section and Mr. Eckerty told us what it was.

If you'll look at his Exhibit Number Four, you can see how he has turned the reservoir in the north half of Section 25, he has got greater structural position in the north half of 25, acreage outside the unit, controlled by Santa Fe Energy. He's got better structural position. He's got just as much or more of the reservoir volume for a well. He is farther removed from the gas/water contact that gives him so much concern, and yet why doesn't he drill his location over here first?

It's obvious. He told us. He wants to take his minority interest in the west half of Section 30 and dictate then where Bass explores and develops not the unit, no, the offsetting acreage, and that's exactly what they're trying to do. They want to force a well located close to their property in 25 to explore and develop and prove up their reserves, thereby minimizing the risk in a spacing unit where they will have the majority of the interest.

And that's exactly why we're here today.

Their application must be denied, Mr. Examiner. There is nothing else that you can do with their application. As a matter of fact, I'll be very candid with you, if you grant their application, they still can't drill the well. The unit provisions and the approval by the Bureau of Land Management absolutely preclude Santa Fe Energy from drilling on the unit.

There are two conditions that they must have in addition to an Examiner pooling order, and that is they must have an approved APD from the Bureau of Land Management. Not only have they not filed it, Mr. Green says they haven't filed one.

It doesn't matter. Bass has got an approved one. We already have a south half already approved. They cannot in any way get an APD approved. That is precluded to them.

The other pre-condition they must have is they must have a designation of operator or agent by Bass to drill on the unit. Mr. Hansen has told us there's no way they're going to get it. They cannot get it. Bass wants to drill the well where they've picked to drill the well. They can't do it.

In my mind you're within your

rights to dismiss the application of Santa Fe Energy as a matter of course, because under the pooling statute they must, as a pre-condition to filing their application have the right to drill, and they are proposing to drill at a location in which they have no right at all.

But you can decide this on the merits and I suggest that you may do so with full confidence and comfort that Mr. Hillis has found a location with infinite patience and tremendous detail and analysis, and found a location that will not only protect Bass and the tremendous investment they have in the unit, but will certainly protect and benefit Santa Fe Energy, and we would suggest, sir, in closing, that you approve the forced pooling that Bass has filed and that you correspondingly deny the Santa Fe Energy application.

MR. CATANACH: Thank you, Mr. Kellahin.

Mr. Bruce?

MR. BRUCE: Mr. Examiner, you see quite a difference in the geological information regarding this area, but Santa Fe's information is based on the analogous Carlsbad Strawn Field to the southwest, and based on that Mr. Eckerty's Number Four Exhibit, we believe correctly depicts the geology in this area and further shows that the entire east half of Section 30 is wet and nonpro-

ductive.

For that reason a well at Bass' proposed location runs an undue risk of being noncommercial and being shutdown too soon, just like the Big Eddy Unit No. 65 Well in Section 31.

For that reason Santa Fe's location should be approved because it has a higher probability of resulting in a good commercial well.

In addition, the best evidence shows that one well will drain at least 320 acres and the only result in drilling at Bass' location will be to spend another million dollars in the northwest quarter or the northeast quarter of the section, probably in the northwest quarter, as Mr. Hillis said, drilling an additional, unnecessary well.

We believe that the economic waste requires that Bass' application be denied and that Santa Fe's application be granted.

As was noted, Santa Fe's interest in the unit basically remains the same; there is little variation because of the acreage, but Santa Fe is willing to leave Bass as operator and, of course, Bass' interest doesn't change, either.

Now, Mr. Kellahin talks about Santa Fe's only reason for drilling the well in Section 30

is to prove up it's acreage in Section 25. It should be noticed that, I think even Mr. Hillis would agree, that the first well logically should be a step out from the Bass or the Big Eddy Unit No. 65 Well rather than traversing more than a mile or so territory to drill somewhere in Section 25, especially considering the fact that the Santa Fe Vernon Well is already a dry hole in Section 25.

Now Bass should not be allowed to cause waste merely because it's the majority working interest owner in Section 30. We believe that upon reviewing the data Bass' application should be denied. Mr. Hansen said one company made a proposal with a fundamental flaw. We think he's right. We think Bass' proposal is flawed because it will result in a noncommercial well.

Thank you.

MR. CATANACH: Anything further in Case 9372 or 9374?

MR. KELLAHIN: No, sir.

MR. CATANACH: If not, they 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 that 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

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 9372, 9374 heard by me on May 11, 1988.

David R. Catanach, Examiner
Oil Conservation Division