STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:) CASE NO. 10541

IN THE MATTER OF CASE 10541 BEING REOPENED

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: Michael E. Stogner, Hearing Examiner
Jim Morrow, Hearing Examiner

February 17, 1994

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Division on February 17, 1994, at Morgan Hall, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Deborah O'Bine, RPR, Certified Court Reporter No. 63, for the State of New Mexico.

ORIGINAL

CUMBRE COURT REPORTING
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I N D E X

February 17, 1994
Examiner Hearing
CASE NO. 10541

E X H I B I T S

A P P E A R A N C E S

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

EXAMINER STOGNER: Call next case, reopened 10541.

MR. STOVALL: In the matter of Case 10541 being reopened pursuant to Division Order No. R-9773, as amended, which order promulgated special pool rules and regulations for the East Herradura Bend-Delaware Pool in Eddy County, New Mexico.

EXAMINER STOGNER: Call for appearances.

MR. CARR: May it please the Examiner, my name is William F. Carr with the Santa Fe law firm, Campbell, Carr, Berge & Sheridan. I represent Chevron, USA Production Company, Collins & Ware, Inc., and Ray Westall Operating, Inc. I have one witness.

EXAMINER STOGNER: Are there any other appearances?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing today on behalf of Fortson Oil Company. I do not have a witness.

(Witness sworn.)

EXAMINER STOGNER: Thank you, Mr. Carr. You may proceed.

REX HOWELL,

the witness herein, after having been first duly

sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. CARR:

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

A. Yes, sir. My name is Rex Howell.

Q. Mr. Howell, where do you reside?

A. Houston, Texas, sir.

Q. By whom are you employed?

A. Today, I'm employed by Collins & Ware and Ray Westall Operating.

Q. In what capacity are you employed?

A. I'm a consulting petroleum engineer.

Q. Have you previously testified before this Division?

A. Yes, sir, I have.

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

A. Yes, sir, they were.

Q. Were you the engineering witness who testified for Collins & Ware and Ray Westall in both of the prior hearings concerning special rules for this pool?

A. Yes, sir, I was.

Q. Are you familiar with the East Herradura Bend-Delaware Pool and the status of the efforts of the operators in this pool to develop data to support permanent pool rules?

A. Yes, sir, I am.

MR. CARR: Mr. Stogner, are the witness's qualifications accepted?

EXAMINER STOGNER: They are.

Q. (BY MR. CARR) Mr. Howell, would you briefly state the purpose of your testimony at this hearing here today?

A. The purpose of our testimony here today is to present evidence to allow a permanent gas-oil ratio limit of 10,000:1 cubic feet per barrel to be set for the East Herradura Bend-Delaware Oil Pool.

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

A. Yes, sir, I have.

Q. Could you refer to what has been marked for identification as Collins & Ware Exhibit No. 1, identify this, and review it for the examiner, please.

A. Yes, sir. Exhibit No. 1 is a map of the Herradura Bend-East Delaware Oil Pool, showing the

December 1993 production data. On this map, I have shown, color-coded in orange, the 32 wells that have been completed and are currently producing in the Delaware formation.

There are two wells that have been completed but now have been converted to saltwater disposal. There are two wells that are now being completed, Fortson Oil Company's well No. 9 in Unit B of Section 36, and Santa Fe Energy's well No. 3 in Unit G of Section No. 2.

In addition, there are 13 future locations also shown on this.

What are plotted by each one of the current producing wells is the December 1993 production data from C-115's. The first number is oil production in barrels of oil per day, water production in barrels of water per day, and the third number is gas-oil ratio in Mcf per barrel.

I might review, just alphabetically, there are a total of eight operators in the field. The name of the operators and the number of wells that they operate are Bird Creek Resources has one well; Chevron has four wells; Collins & Ware has one well; Fortson Oil Company operates ten wells; Hanley Petroleum operates four wells; Santa Fe Energy has

three wells; Ray Westall has eight wells; and Harvey E. Yates Company has one well.

The discovery well for the Herradura Bend-East Delaware Field was Amoco's State GO well No. 1, which is located in Unit E of Section 2. This well was recompleted from the Bone Springs to the Delaware in 1996 -- in 1986. To date the well has produced about 11,000 barrels of oil and has been recently converted to saltwater disposal.

Q. Let's now go to Collins & Ware Exhibit No. 2, the C-115 production data. Could you review this for Mr. Stogner?

A. What this is is just, again, a list by operator, lease, well numbers, and location is the December C-115 data showing barrels of oil, barrels of water, in Mcf. And then I've converted over into daily production by dividing by 31 to show barrels of oil per day, barrels of water per day, and gas-oil ratio for each well and for the total pool.

Looking at the gas-oil ratios, the lowest gas-oil ratio is 1220 cubic feet per barrel, which is the fifth well from the top, which is Chevron's Lentini 5 well, which is located in Unit F of Section 1. The highest gas-oil ratio is greater than 100,000:1, which is Fortson Oil Company's well No. 3

located in Unit K of Section 36.

Other wells that have higher gas-oil ratio, Fortson Oil's Pinnacle State No. 1 well has a 9,600 cubic feet gas-oil ratio, and the No. 4 well has an 18,160 cubic feet per barrel of gas-oil ratio. And then going down to Santa Fe Energy's Warthog 2 State No. 1 well, it has a gas-oil ratio in December of 57,890 cubic feet per barrel.

Overall, in December of 1993, the gas-oil ratio from the pool will average 4,835 cubic feet per barrel.

Q. And you anticipate that the 4,835:1 GOR will increase over time?

A. Yes, sir, I believe over time it will increase.

Q. And you will address that with subsequent exhibits?

A. Yes, sir, that is correct.

Q. Let's move now to Exhibit No. 3, the pool performance curve. Would you review that, please.

A. What I've shown on this curve are three curves, showing the total pool production, barrels of oil per day shown with the squares, barrels of water per day shown with the diamonds, and the gas-oil ratio shown with the triangles.

The scale for the oil and water production is over on the left-hand side in thousands of barrels per day. You can see that the oil production peaked at 841 barrels of oil per day in December of 1992, a slight decline until about July of '93, and then it started increasing up to the current level of 813 barrels of oil per day in December of 1993.

This increase in production was due to drilling of additional wells, workovers, and installation of larger lift equipment. You can see that the water production has steadily increased throughout the life of the pool, and in November of 1993, produced a total of about 3,730 barrels of water per day.

Looking at the gas-oil ratio, you can see it peaked at a little better, almost 16,000 cubic feet per barrel in September of 1992 and has declined to the current level of 4,835 cubic feet per barrel in December of 1993. This decline over this period of time is primarily due to depletion of the production, gas production only, from the Westall zone.

Q. Let's move now to the structure map, Collins & Ware Exhibit No. 4. Would you identify this and then review this for Mr. Stogner.

A. Yes, sir. What this is is a structure map contoured on top of the Westall sand in the Herradura Bend Pool. Again, color-coded in orange are the Herradura Bend-Delaware producers, are colored on 32 of those wells. The proposed locations are colored in yellow, and there's 13 of those wells.

You'll recall at previous hearings, we discussed the geology of the area and stated that the production was from the Brushy Canyon section of the Delaware. Using local nomenclature, the primary producing formations were the Collins sand, the Westall sand, and the Brantley sand. These three zones occur from depths of about 5,900 to a depth of about 6,250 feet.

Now, the middle zone of these three is the Westall zone. And we have found by production data and confirmed by production logs and temperature surveys that all the production from this Westall zone is gas only. It's not a gas cap. It's a gas only zone. And since the oil zones above it, the Collins sand, and the oil zone below it, the Brantley sand, requires stimulation to get commercial production, when you stimulate these two oil zones, you get in communication with this Westall gas zone, and, subsequently, you produced at high gas-oil

ratios.

What this map shows is that the highest structure of the Westall zone is in the southeast quarter of Section 35, the southwest of Section 36, the northwest of Section 1, and the northeast of Section 2. And generally this area contains the majority of the gas-productive interval, which correlates to the higher gas-oil ratio wells which were shown in Exhibit No. 1.

Q. What we have here is, in fact, a very complex reservoir?

A. Yes, sir, it is a very complex reservoir, and there are anomalies that exist in this reservoir. For example, the Fortson well No. 3, which is the highest gas-oil ratio well in the field, the top of the Westall zone, and that well is at 2,969. This well has been very interesting over the life of it. The Westall zone and this well tested only water. It tested water at the rate of 17-1/2 barrels of water per hour. And the gas production is now currently coming from the zone above even the Collins pay sand.

The next highest gas-oil ratio well is the Fortson well No. 4, which is producing most of the gas production from the zone above the Collins sand,

which communicated during fracture treatment of the well.

Depending on how the wells are produced and so forth, the gas-oil ratio can vary from well to well over the life of the wells.

Q. Let's go now to Exhibit No. 5. Exhibit No. 5 is your pool and lease gas-oil ratio plot. Could you review the information on this exhibit for Mr. Stogner?

A. Yes, sir. There's lots of curves on this plot, but what I've shown with time from April of 1992 through December of 1993 is the producing gas-oil ratio for the eight leases and for the pool.

The pool average is shown with a dotted curve, started out the first pool production was in June of '92, and you can see the dotted line peaked at a gas-oil ratio, producing gas-oil ratio average for the pool of 15,733 cubic feet per barrel in September of 1992.

And it showed a steady decline; in fact, in August of '93, reached a level of 8,924 cubic feet per barrel. And then in May of '93, it jumped up to 11,580 cubic feet per barrel, which was due to completions of wells on the Santa Fe Energy lease and Hanley's Union 35 lease, and since then, it has

declined to 4,835 cubic feet per barrel.

The gas-oil ratio for the pool was primarily controlled by production from Westall's Santa Fe federal lease. That gas-oil ratio for the lease with time is shown plotted with the solid squares. You can see this lease got up to a producing gas-oil ratio of about 25,000 cubic feet per barrel in October of '92, and it is currently declined down to about 5,000 cubic feet per barrel.

Another high gas-oil ratio lease is Santa Fe Energy's Warthog State lease. This is shown with the open squares. You can see the gas-oil ratio peaked at about 47,000 cubic feet per barrel in June of 1993, and it is also declining. It's down to about 35,000 cubic feet per barrel.

The amount of gas production from these two leases are representative of the amount of the Westall gas zone that's exposed in each one of the producing wells on this lease. The majority of the gas zone is contained in these two leases here, but I might point out that you can see that the gas-oil ratios from other wells in the field, predominantly the Bird Creek RML No. 1, which is located a long ways from the gas zone in here. The gas-oil ratio has steadily increased from about 1,200 cubic feet

per barrel up to 5,000 cubic feet per barrel.

Q. What is the location of that well?

A. That well is located in Section 26, Unit M of Section 26.

So the high gas production, it's been a combination of two things out in this field. One is the amount of the Westall gas zone that is in communication with oil zones, but also the fluid characteristics of the two oil zones in here.

This is almost a volatile crude that is being produced from these oil zones. It's 43 degrees API. The initial solution gas-oil ratio was in excess of 1,200 cubic feet per barrel. The oil formation volume factor is in excess of 1.6 to 1.

So my calculations indicate that just from the oil zone only, that the gas-oil ratio will increase and actually average about 7,500 cubic feet per barrel over the life of the reservoir. That's just from the two oil zones. And if you add into it the production from the Westall only gas zone, the average gas-oil ratio over the life of the field should average about 9,500 cubic feet per barrel.

The presence of the Westall gas zone and the projected high gas production from the oil zones is the basis for recommending the 10,000:1 gas-oil

ratio limit for the field.

Q. Let's move now to your Exhibit No. 6. Could you just identify that?

A. Yes, sir. What Exhibit No. 6 is, it's a three-page exhibit. The tabulation of the production data for the first page is the total pool. The second page is the first four leases in the pool. And the third page is the last four leases in the pool. It just shows the oil production, water production in Mcf by month since April of '92, and then a daily average for those.

Q. Are you prepared to make a recommendation to the Examiner concerning the establishment of permanent pool rules for this pool?

A. Yes, I am.

Q. What is that recommendation?

A. I recommend that the permanent gas-oil ratio limit for this pool be set at 10,000 cubic feet per barrel.

Q. Mr. Howell, in your opinion, will permanent rules for the East Herradura Bend-Delaware Pool including a provision for a 10,000:1 gas-oil ratio, be in the best interest of conservation, the prevention of waste, and the protection of correlative rights?

A. Yes, sir, it will.

Q. Will approval of this application and the establishment of these permanent rules result in the recovery of hydrocarbons that otherwise will not be produced?

A. Yes, sir, it will.

Q. Were Exhibits 1 through 6 prepared by you?

A. Yes, sir, they were.

MR. CARR: At this time, Mr. Stogner, we move the admission of Collins & Ware Exhibits 1 through 6.

EXAMINER STOGNER: Exhibits 1 through 6 will be admitted into evidence.

MR. CARR: That includes my direct presentation of this witness.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Howell, are any of these wells nonmarginal or capable of meeting either the casinghead allowable or their oil allowable at this tune?

A. No, sir, there are none capable of that at the current time.

Q. Do you visualize in the future any of these proposed wells that might bump that casinghead

allowable?

A. From the formation or from the reservoir, as I understand it, in the proposed location, I doubt if any of these wells in the future will bump the limit of it, no, sir.

Q. That sort of leads me up to my next question. And just thinking about it, should a casinghead gas allowable reflect the actual GOR, the average GOR, or should it be positioned such that perhaps the best well expected in there, the GOR that would given the pool, the production would meet that. Do you have any thoughts on that?

A. Well, sir, I would say probably the average gas-oil ratio for all the wells in the field. And, for example, I just quickly calculated it a while ago, I think the average gas-oil ratio to date, taking the total gas production and the total oil production, the average for the field has been about 9,400 cubic feet per barrel.

This correlates real close to what I calculate the average gas-oil ratio is going to be over the life of the field, about 9,450. So I think the average is probably what I would say would probably be a representative figure for the field.

Q. So the GOR should adequately reflect what

is actually being produced as opposed to being an artificial limit per se in this particular instance on a good well that could produce whatever its maximum casinghead gas allowable would be?

A. Yes, sir, I think so. I think it would show in this case, it probably reflects what has been produced and what I believe will be produced in the future, yes, sir.

Q. You were talking about the oil in the Collins sand and the oil in the Brantley sand?

A. Yes, sir.

Q. Do both of those average about 43 API, are they very similar, or is one more like 47 and the other one down to about 41 or 39?

A. No, sir, I think the lowest we found is 41.8, and the highest is 45. So they're both real close to the same thing.

Q. What do you feel the driving mechanism is in the Collins sand and that Brantley sand interval?

A. Solution gas drive only.

Q. And, again, what portion of the Delaware are these Collins, Westall, and Brantley sands in?

A. In the Brushy Canyon.

Q. In the Brushy Canyon?

A. Yes, sir.

Q. Is that the predominant member of the Delaware that's being produced in this pool?

A. Yes, sir. To my knowledge, probably essentially all of the production is coming from the Collins. There's a couple wells that have communicated up higher, but the majority of it is from those three sands, which are Brushy Canyon.

Q. In your study out there, and you touched upon it, and I'm going to work on that a little bit, as far as the other members of the Delaware member, being the Cherry Canyon and the Bell Canyon, have they been adequately tested, in your opinion, to show that they're nonproductive?

A. Oh, no, sir. In fact, I think they are productive. The Fortson well No. 3, the current production from that is from a zone in the Cherry Canyon, and I believe it's Ray Westall's well No. 5 is being produced from a zone in the Cherry Canyon.

Of course, you know, it's the easiest and the best way to start is from the bottom of the reservoir and work up. And that would be the Brantley and then coming up to the Collins. And most of these wells have been confined in there. But from mud logs and from electric logs, there are many, many zones capable, or appear to be capable of producing

oil and gas up the hole. That will be tested. Of course, with oil prices like they are right now, I'm not sure exactly when we will be doing those workovers, but there are other zones up the hole that will be productive oil and gas.

Q. That's what concerns me about this. How are those higher members or shallower members, what kind of drive mechanism do you see there? Would the gas-oil ratio set at 10,000:1 harm those particular intervals at this point?

A. Well, no, sir. Of course, we don't have any production history for me to confirm that, but it's my belief that based on the regional production in the area, what I've looked at from the mud logs and the electric logs in this area here, all of these Delaware sands are going to be solution gas drive.

And, in my opinion, some of them will be high gas-oil ratio production, and some of them won't, but, in my opinion, a gas-oil ratio limit of 10,000:1 will not detract from the ultimate recovery. Of course, that's opinion because we don't have any production from them yet in this particular field.

Q. But you're basing this opinion on your knowledge of the Delaware around this area?

A. That's correct, sir.

Q. How long have you been working in the Delaware out there with the Delaware production?

A. A long time. I started out with Amoco and Levelland, which was working this area in 1958.

Q. So you're very familiar with the Delaware, how the Delaware trend is?

A. Well, I've been exposed to it. I'm not sure I'm familiar with it, but I've sure been exposed to it.

Q. I don't have a regional map in front of me. Is this particular pool in the center of the Delaware Basin area, or is it on the fringes?

A. Can I look at my geologist and ask him?

EXAMINER STOGNER: Sure.

GEOLOGIST (Unidentified): It's more towards the center than the fringes.

EXAMINER STOGNER: You could look at him, but I didn't want him to answer the question.

MR. STOVALL: According to your geologist, what's the answer to the question?

THE WITNESS: More in the center of the pool.

Q. (BY EXAMINER STOGNER) And I guess that's what I was leading up to. In your experience out

there, taking into account some of the fringe pools or the fringe areas as the Delaware meets the reef out there, as opposed to the production in more the center of the Delaware, that's what I was getting at, and that's what I kind of wanted from you is --

A. Yes, sir. Of course, Collins & Ware has been quite active over there in the recent past. I'm drilling in the Delaware out there, and I'm familiar with other fields that they have tested, not only Cherry Canyon but up into the Bell Canyon, and we're finding similar types of production characteristics up here, oil production, gas-oil ratios that varies from low to high. And most all of them do have the common thing of having pretty high water production.

I do not think that is a water-drive at all. I think it's just mobile water in the formation.

Q. Do you know if the Fortson No. 3 and the Ray Westall No. 5 well that you mentioned of having perforations in the upper areas of the Delaware member outside the Brushy Canyon, are there any other wells -- have you done an extensive study on the perforations?

A. Not to my knowledge. Of course, I'm pretty familiar with the Fortson well, the Ray

Westall and the Collins & Ware, but none of the other wells have, the other operators. What I'm going on is the completion data reported to the Commission. And all those wells are confined to Collins sand and lower.

Q. Are these wells on pump?

A. Yes, sir.

Q. All of them?

A. Yes, sir.

EXAMINER STOGNER: Any other questions of this witness?

MR. CARR: I have no further questions of this witness.

EXAMINER STOGNER: Mr. Kellahin, I'm sorry, I forgot about you.

MR. KELLAHIN: Yes, sir. Points of clarification, Mr. Examiner.

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Howell, when we last visited this reservoir before the Division back in October of '92 before Examiner Stogner, I believe, you were the witness on behalf of the proponents of the GOR increase?

A. Yes, sir, in October of '92, and also I

believe it was in July of '93, there was another hearing.

Q. Help me remember. I think we discussed whether or not there was reservoir data, particularly PVT data by which we could determine what the solution gas-oil ratio was for the reservoir.

A. Yes, sir. At the time Mr. Fortson was collecting PVT data. He collected it on the Pinnacle State well No. 10. I have observed that data. Again, it is a data point. The analysis that I gave you, the gas-oil ratio of 1,200 was based on the PVT analysis of that well.

As you know, or maybe you don't know, that well had to be a recombined sample because you cannot get representative bottomhole samples from these wells without stimulation. And when you stimulate --

Q. That's not important to my question, Mr. Howell. What I want to know is do we have data from which we have determined, to the best of your engineering judgment, what the solution GOR is for the reservoir?

A. Yes, sir, the PVT data on the No. 10 well.

Q. That was what, 1,200 to 1?

A. 1,220 cubic feet per barrel.

Q. Is that a sample taken from that portion

of the reservoir that would have been exclusive of the gas zone, I think you've called that the Westall sand?

A. Yes, sir. Looking at the location of that and where it is in the structure, cross-section on that, that is mostly, should be the gas-oil ratio from just either the Collins and/or the Brantley sand, not the Westall.

Q. Set apart the Westall sand for a moment. When you look at Delaware solution gas-oil ratios, then, that 1,200:1 would be typical of what we've seen in other Delaware oil pools, isn't it?

A. I believe that's correct, yes, sir.

Q. As a reservoir engineer, what, in your opinion, is the purpose of having a maximum gas allowable in an oil pool?

A. The purpose of having an engineered, studied, maximum gas-oil ratio is to allow the reservoir to be used so that the maximum recovery of hydrocarbons can be achieved.

Q. Part of that process is to limit or control gas withdrawals from an oil pool so that we don't waste the gas drive in the reservoir; right?

A. I believe the majority of the studies will show that on the solution gas drive oil ratio, that

they are not sensitive to rate production or gas-oil ratio production.

Q. What happens if you have a high GOR well in a 40-acre offset to a low GOR well, is there going to be any adverse consequences as those two wells complete for oil reserves?

A. Well, sir, it will depend on the permeability of the formation and the drainage area. I think, from my observation of performance in this thing, that the wells are not draining more than 40 acres at all out here, and I am very doubtful if they are even draining 40 acres. And I think that can be -- I think there's performance data that truly suggests that they are probably not draining 40 acres adequately.

Q. You've answered my concern. One of the things we worry about in oil reservoirs is setting the gas cap allowable such that there's not correlative rights impairment as the operators compete for those oil reserves between the wells?

A. Yes, sir, but this is not a gas cap.

Q. I understand that. Is the Westall gas zone unique for this particular pool?

A. I believe it is. I believe it is. I'm not aware of a gas zone of this magnitude being

located between two oil zones.

Q. And the fact that it is difficult, if not impossible, for the operators, even if they want to, because of the stimulation, to keep from communicating their wells into that Westall gas zone, we're going to see higher gas rates out of this pool?

A. Oh, I think that's right, yes, sir.

Q. Based upon your study, do you have an engineering opinion as to whether or not it is appropriate to maintain the 10,000:1 GOR?

A. Yes, sir, I believe it is appropriate.

Q. Your tabulation here shows that I think the producing GOR for the pool is just short of 5,000:1?

A. That was for December of '93 only, yes, sir.

Q. And as these wells get older in the life of the depletion of the reservoir, that gas-oil ratio is going to climb?

A. That will increase, yes, sir.

Q. You have a cushion of about, I guess, 5,000:1 now, a margin, if you will, that we're not currently utilizing?

A. On December data only, yes, sir, that's correct.

Q. But, in your opinion, that's not in excess of what's appropriate for the reservoir as we continue to deplete that reservoir?

A. No, sir, it's not.

MR. KELLAHIN: Thank you, Mr. Examiner.

EXAMINER STOGNER: Thank you, Mr. Kellahin. Mr. Carr, any redirect?

MR. CARR: No redirect, Mr. Stogner.

EXAMINER STOGNER: Any questions, Mr. Stovall? If not, then I'll take this case under --

MR. CARR: Mr. Stogner, Chevron has asked that I read a very brief statement into the record.

The statement goes: "Mr. Examiner, Chevron USA Production Company, pursuant to its current drilling program for the East Herradura Bend-Delaware Field has completed four wells, is currently drilling one well, and has staked seven wells, all in Section 1, Township 23 South, Range 28 East, Eddy County, New Mexico, which lies on the southern margin of the East Herradura Bend-Delaware Field.

The economics of this drilling program were developed based on a continuation of the temporary GOR allowable of 10,000:1. The negative impact of substantially lower GOR would jeopardize continuation of this drilling program. Therefore,

Chevron requests that the OCD adopt the existing temporary rules as permanent rules for the field."

I have nothing further in this case.

EXAMINER STOGNER: Mr. Kellahin, do you have anything further?

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: Does anybody else has anything further in reopened Case 10541? If not, then this case will be taken under advisement.

CERTIFICATE OF REPORTER

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

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

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL, February 28, 1994.

Deborah O'Bine

DEBORAH O'BINE
CCR No. 63

OFFICIAL SEAL
Deborah O'Bine
NOTARY PUBLIC
STATE OF NEW MEXICO
My Commission Expires: Sept. 19, 1994

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10541 (Reopened) heard by me on 17 February 1994.

, Examiner
Oil Conservation Division

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

CASE 10,541

EXAMINER HEARING

IN THE MATTER OF:

The consolidated Application of Bird Creek Resources, Fortson Oil Company and Ray Westall Operating, Inc., for special pool rules, Eddy County, New Mexico

TRANSCRIPT OF PROCEEDINGS

BEFORE: MICHAEL E. STOGNER, EXAMINER

STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

October 1, 1992

A P P E A R A N C E S

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FOR APPLICANTS BIRD CREEK RESOURCES AND RAY WESTALL OPERATING, INC., AND FOR HARVEY E. YATES COMPANY:

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FOR FORTSON OIL COMPANY, BASS ENTERPRISES PRODUCTION COMPANY, AND HANLEY PETROLEUM, INC:

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E X H I B I T S

APPLICANT'S EXHIBITS:

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WHEREUPON, the following proceedings were had at 10:35 a.m.:

EXAMINER STOGNER: Call the next case, Number 10,541.

MR. STOVALL: The consolidated Application of Bird Creek Resources, Fortson Oil Company and Ray Westall Operating, Inc., for special pool rules, Eddy County, New Mexico.

EXAMINER STOGNER: Call for appearances.

MR. CARR: May it please the Examiner, my name is William F. Carr, with the Santa Fe Law firm Campbell, Carr, Berge and Sheridan. I would like to enter my appearance in this case for Applicants Bird Creek Resources and Ray Westall Operating, Inc.

Initially, I would like to request that Fortson Oil Company be dismissed as an applicant. I would like to withdraw my appearance for Fortson so that Mr. Kellahin can substitute his appearance for Fortson Oil Company.

EXAMINER STOGNER: Fortson Oil Company will be dismissed from -- as being an applicant but not a

participant in this particular proceeding.

MR. CARR: That is correct.

EXAMINER STOGNER: Any other appearances?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing on behalf of Fortson Oil Company, Bass Enterprises Production Company, and Hanley Petroleum, Inc.

EXAMINER STOGNER: Any other appearances?

MR. BRUCE: Mr. Examiner, my name is Jim Bruce from the Hinkle law firm in Santa Fe. I'm representing Santa Fe Energy Operating Partners, L.P. I have no witnesses.

MR. CARR: And Mr. Stogner, I would also like to enter my appearance for Harvey E. Yates Company.

MR. STOVALL: But they're not an applicant.

MR. CARR: They're not an applicant.

EXAMINER STOGNER: Are there any other appearances, interested parties, working-interest owners, land owners that would like to be a part of the record?

If not, would the witnesses please stand to be sworn?

(Thereupon, the witnesses were sworn.)

EXAMINER STOGNER: Mr. Carr?

RANDALL L. HARRIS,

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

DIRECT EXAMINATION

BY MR. CARR:

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

A. Yes, my name is Randall Harris. I reside at Lake Arthur, New Mexico.

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

A. I'm employed by Ray Westall Operating, Incorporated, as geologist and exploration manager.

Q. Have you previously testified before the Oil Conservation Division and had your credentials as a geologist accepted and made a matter of record?

A. Yes.

Q. Are you familiar with the Application filed in this case on behalf of Ray Westall and Bird Creek Resources?

A. Yes, I am.

Q. What is the relationship of Ray Westall and Bird Creek in this area?

A. We're both operators within the East Herradura Bend-Delaware field.

Q. And what is the interest of Fortson Oil Company in the area?

A. Fortson is also an operator within the East Herradura Bend-Delaware.

Q. Have you made a geologic study of this pool?

A. Yes, I have.

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

EXAMINER STOGNER: Any objections?

MR. KELLAHIN: No.

EXAMINER STOGNER: Mr. Harris is so qualified.

Q. (By Mr. Carr) Mr. Harris could you state what Bird Creek and Westall seek with this Application?

A. We ask for special pool rules for the Herradura Bend East Delaware Pool, for a special gas/oil ratio of 10,000 to 1, temporarily for six months.

Q. Will this tenth-month period permit you and other operators to develop data which you can bring back to the Commission at that time and at that time have a better handle on the characteristics of this field?

A. Yeah, six months should be adequate time to gather the additional data, drill a few more wells, and

at that time we should review the producing characteristics of the wells.

Q. Have you prepared exhibits for presentation here today?

A. Yes, I have.

Q. Would you refer to what has been marked as Applicant's Exhibit Number 1, identify that and review it for the Examiner?

A. Exhibit Number 1 is a land plat that shows the current pool boundaries. It also indicates the discovery well. That is triangle in the northwest corner of Section 2, discovered -- drilled by Amoco, called the GO State Number 1. It's currently operated by Bird Creek.

Q. When was this pool created?

A. The pool was designated 3-14-86, by R Order 8179 and subsequently extended by R Order 9709.

Q. Mr. Harris, I think initially it would be helpful if you would refer to this exhibit and review for the Examiner the interest positions of the various parties who have appeared in this case.

A. Ray Westall's interest is in Section 35, the east half, which we currently have drilled and completed the Santa Fe's 1 through 4. We have drilled the Santa Fe 5, and we're waiting on completion, and

are currently drilling Santa Fe Number 6.

Bird Creek has the Section 26 -- that's to the north -- and in that they have one well producing, the RML Number 1. They also have other parts of Section 2 to the south, including the discovery well, the GO.

Fortson Oil Company has Section 36, of which they have drilled five wells to date. The first well has been completed, 2 and 3 are in the process of completion, and 4 and 5 are waiting on completion.

Bass Enterprises has Section 25, would be to the northeast of the map. Section 25 is also within the Big Eddy Unit. They operate no Delaware wells in that section as of yet. I believe they have staked some locations, but as far as I know they have not been approved.

Santa Fe Energy owns selected tracts in Section 2, and they have no drilling wells at this point. I believe they have staked a location. I'm not aware if it's approved yet either.

Heyco also has acreage in Section 2 with no wells, and Hanley Petroleum has the west half of Section 5 with no producing Delaware wells.

Q. Now, this pool, you indicated, was approved in 1986. There has, however, been recently a flurry of

development that is really outside of the current designated pool boundary but within a mile of that pool; is that right?

A. That is correct, yes.

Q. Why are you seeking an increase in the gas/oil ratios for the pool?

A. Our wells are currently curtailed due to the GOR under statewide rules of 2000 to 1. We need 10,000 to 1 just to be able to produce liquids out of the formations.

Q. And what are the current allowable limitations for the wells in this pool?

A. Pool designations below 6000 feet, oil allowable of 142 barrels of oil a day per well, and 284,000 MCF at 2000 to 1.

Q. Mr. Harris, I'd like you to refer now to your Exhibits 2 and 3. I think we should refer to these together, the structure map and the cross-section.

If you would start with your structure map, identify the -- basically what it shows in the trace and then go into the cross-section.

A. Exhibit 2 is a structure map on top of the Westall sand. I'll explain the name in a moment. It also shows the Delaware completions, proposed well locations, and a trace, A to A prime, of the cross-

section of Exhibit 3.

Q. Okay, let's go at this point to the cross-section.

A. Exhibit 3 is a cross-section, A to A prime, which incorporates the Bird Creek RML Federal Number 1, Section 26, through the Ray Westall Santa Fe 1, to the Ray Westall Santa Fe 3, Fortson Oil Pinnacle State Number 1, and then back to the discovery well of Bird Creek Resources State GO Number 1.

The names that have been given these formations, being the Collins, the Westall, the Brantley and the Bird Creek Sands, are not official names. They're strictly localized. I believe it was Collins and Ware who have designated these names, but other than that they have no significance.

All sands are within the Brushy Canyon of the Delaware formation.

Q. Okay, let's start with the well on the left, and if you could just move across to this cross-section for the Examiner.

A. Most of the wells have been completed. In fact, all of the wells to date have been shot, acidized and frac'd in the Brantley sand. And most of the wells, being the Santa Fe's Number 2 and 4, and the Pinnacle State Number 1 of Fortson, has also been

completed in the Collins sand.

To date, no well has been actually perforated within the Westall sand.

On physical examination of samples and log calculations, we determined that the Westall sand was probably very gassy, and we were not at this point willing to have a high gas content.

After we perforated and completed the Well Number 1 and Well Number 3, we experienced extremely high GOR's, ranging from 10,000, 20,000 to 1. We ran production logs, and those are the logs beside the Santa Fe Number 1 and beside the Santa Fe Number 3. These production logs include a flowing temperature survey, a shut-in temperature survey, and an ohm-impedance log.

What these indicate to us, on the flowing temperature, we have a cooling effect from the Westall sand behind pipe to the Brantley perforation, which simply means we've communicated on frac or acid and completed into that sand inadvertently.

The ohm-impedance log shows that the top three or four perforations in each of these wells are producing 100 percent of the gas. From that we can deduce that gas is actually coming from the Westall sand, behind the pipe and into the bore hole of the

perforations of the Brantley sand.

Additionally, the shut-in temperature survey shows a cross-flow. The cross-flow is occurring from the Westall sand to the Brantley sand on the wells being shut in.

This leads us to believe that the Westall sand itself is a higher pressure, it is isolated from the Brantley. It is not a gas cap, for if it was a gas cap the pressures would be the same and you would not have any cross-flow.

We have another indication that it is a totally separate sand and that is our shale barriers above the Westall sand and below the Westall sand. Above it, it's very consistent, 10 to 15 feet. And below, between it and the Brantley, a consistent 8 to 10 feet thick. So it is an isolated individual gas sand.

Q. So what you have is a gas sand between two oil zones?

A. Yes, we have a gas sand between two oil zones.

Q. How do you actually complete and fracture these wells?

A. We completed these, what we consider a very typical low-rate, low-volume frac: eight barrels a

minute, 18,000 gallons total.

Q. So there was nothing unusual about the way you actually completed the wells that caused you to communicate into what you have designated the Westall sand?

A. That's correct.

Q. If we look at the structure map, does structure play any real role in explaining the gas/oil ratios that you're experiencing in these wells?

A. No, sir, the structure plays very little, if any, role at all.

If a gas cap was to truly exist in the Brantley or the Collins sand, we should see evidence of it as we go updip. Our two highest updip wells are the discovery well, the GO, and the Bird Creek RML, and they are both low GOR's.

Q. And so basically what you have -- Your structure map is simply a map showing the limited extent of the Westall sand?

A. Yes, you can infer a limited extent to the Westall sand itself.

Q. Could you identify for Mr. Stogner what has been marked as Applicant's Exhibit Number 4?

A. Exhibit Number 4 are flow-rate data sheets, field reports performed by Celtic Services on Ray

Westall Santa Fe's 1 through 4.

Q. And is Exhibit Number 5 that data, just presented in tabular and graphic format?

A. Yes, it's the field data that has been extrapolated to hourly and daily rates.

Q. All right. Let's go to Exhibit Number 5, and I would ask you to review first the tabular information on the Santa Fe Federal Number 1, and then explain to Mr. Stogner what you believe they show.

A. The information that we have gathered -- Actually, what this chart is, is the incremental flow rate in time and the volumes of oil and gas and water produced during that incremental flow, and it's been extrapolated out into per hour per day and eventually to our GOR per MCF barrel. Choke sizes are all in 64ths through 10 through 32.

What we see is, we -- typically what we see -- find out where I am here -- is that the smaller the choke size, the higher the GOR.

In fact, as you choke these wells back, you can produce zero oil -- zero fluids total, and just gas.

Q. So eventually you can lose, by choking it back, the potential to produce any oil from the formation?

A. Yes, by choking it back you produce no oil from the formation at all.

Q. Okay. Well, let's go to the graph for the Santa Fe Number 1, the next page on Exhibit Number 5, and could you review for Mr. Stogner what this shows?

A. Yes, this is a chart based on barrels of oil, barrels of water and MCF gas per daily rate.

The gas is stabilized. It apparently does not have any -- It produces independently of the oil and gas -- or oil and water in the formations.

As you can see the gas chart, it's irrelevant. If you're producing on a 32/64 or an 18/64, you'll produce approximately 800,000 MCF per day.

However, oil varies widely from 180 down to 20 or 30 barrels per day. Exactly the same with the water: a high of 600 barrels a day down to a low of 70 barrels a day.

So gas is being produced independently of the oil and water in the formations.

Q. Now, behind this graph you also have tabular and graphic presentations for the other Santa Fe wells?

A. Yes, the Santa Fe's 2, 3 and 4.

Q. Now, the Number 4 doesn't perform quite like the first three, does it?

A. No, the Number 2 does not perform.

Q. And why is that?

A. This test data on the Number 2 was performed approximately two days after completion, and I think the well was just too new to get a stabilized performance.

Q. Mr. Harris, based on your field and geologic study, do you have an opinion on whether the gas/oil ratios that you're experiencing could be related to the existence of a gas cap in the reservoir?

A. Based on field data and geologic information, the GOR cannot be related to a gas cap.

Typically in a gas cap, the GOR will not change with the varying size of the choke. Ratios of oil and gas will remain the same; only the volumes will change.

Q. In your opinion, what will happen to the ability of the operators to produce the reserves in this field if you are required to produce under current statewide rules?

A. Under the current rules, our rates would definitely be curtailed, and ultimately I believe that reserves would be left in the ground as you're not being able to produce the oil until you have depleted some of the -- perhaps the oil in place in the Collins

and Brantley sands.

Q. Would that result in waste, in your opinion?

A. That would -- definitely in waste.

Q. What would be the impact of approval of this Application on the correlative rights of interest owners in the pool?

A. There will be no impact if approved.

If not approved, and without the higher GOR, we'll actually be denied an opportunity to produce our share of the oil reserves in the Brantley and Collins sand zones.

Q. Is Exhibit Number 6 a copy of an affidavit of mailing confirming that notice of today's hearing has been provided to those individuals identified on Exhibit A?

A. Yes, sir.

Q. And to whom was notice sent?

A. Notice was sent to all operators in the pool and all operators of wells in the Delaware formation within a mile of the pool.

Q. Are there any unleased mineral owners within the pool boundary?

A. No.

Q. If this Application is approved, when would you request that the rules become effective?

A. Well, we are currently shut in on wells 1, 3 and 4. We'll be finished drilling well number 6 pretty rapidly, and completion of number 5.

So we would request a ruling as expeditiously as possible.

Q. Would an effective date of those Rules of October 1 be satisfactory for your purposes?

A. Yes, sir.

Q. Will the Applicants in this case also be calling an engineering witness to review that portion of the case?

A. Yes.

Q. Were Exhibits 1 through 6 either prepared by you or compiled under your direction?

A. Yes, sir.

MR. CARR: At this time, Mr. Stogner, we would move the admission of Applicant's Exhibits 1 through 6.

EXAMINER STOGNER: Exhibits 1 through 6 will be admitted into evidence.

MR. CARR: And that concludes my direct examination of this witness.

EXAMINER STOGNER: Thank you, Mr. Carr.

Mr. Kellahin, your witness.

MR. KELLAHIN: Thank you, Mr. Examiner.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Harris, let me find out from you the data that you had available to you from which to reach your conclusions about the source of the gas being produced in the well.

Let's start with the Santa Fe Federal 1.

A. Yes, sir.

Q. Second well on the cross-section. Perforated only in the Brantley sand?

A. Yes, sir.

Q. What type of logs did you have for that well?

A. We ran a CNL FDC dual micro.

Q. Any other logs?

A. A cement bond log, case log.

Q. The production evaluation logs shown in the left margin?

A. Yes, sir.

Q. What type of log was this?

A. This was a temperature -- flowing temperature, shut-in temperature, and ohm impedance.

Q. Do you develop data from this log with a spinner survey, or is that a different procedure?

A. It's a different procedure.

Q. Did you run a spinner survey on this well --

A. No, sir.

Q. -- to determine the source of production?

A. The ohm impedance determines the source of production. It is the same basic type log.

Q. Is the relevant portion of the production log what I see next to the density log shown on the display for that log?

A. Yes.

Q. Did you run any frac height logs or frac height information to determine how far you may have propagated fractures out of the Brantley sand?

A. No, but this survey gives you the same end result. It does show you from where production is coming from. So you can assume that if your production is coming from up the hole, that you have actually treated -- fractured into that zone, yes.

Q. We haven't actually perforated the Westall sand in any of the Ray Westall wells in the east yet?

A. No.

Q. The information available for the Federal 1 well tells you the likely source of the gas is going to be the Westall sand?

A. Yes, sir.

Q. When you look at the other three wells, 2, 3 and 4, have you the same type of data for each of those

wells?

A. Yes, we performed the temperature -- flowing temperature/shut-in temperature logs on the Number 2 and the Number 4.

And yes, the results are basically the same, although we have completed also in the Collins sand, so we have direction-of-flow difference. The Number 4 flows up through the Collins sand, and the Number 2 flows down to the Brantley sand. That's the only significant difference.

Q. The Number 4 well is the only one that is also perforated in the Collins sand?

A. No, the Number 2 is also.

Q. Number 2?

A. Yes, Number 2 and 4.

Q. 2 and 4 in the Collins sand, as well as the Brantley sand?

A. Yes.

Q. And the 1 and 3 are only in the Brantley sand?

A. That's correct.

Q. What do your cement bond logs tell you about the adequacy of the cement?

A. Our cement bond logs are showing virtually a hundred percent bond through this entire section. We

do not lose bonding till we get approximately 100 feet above the Collins.

We have tried everything to date to stay out of the Westall sand.

Q. Have you taken any fluid samples and submitted them for PBT analysis --

A. Not, sir.

Q. -- on any of the production?

A. No.

Q. You don't have any PBT data to work with?

A. No.

Q. Your conclusion of the data thus far is that we're not seeing a gas cap in either the Brantley sand or the Collins sand?

A. That's true.

Q. That the likely source of the gas is going to be the inadvertent communication into the Westall sand?

A. That's correct.

Q. Do you have sufficient production data on any of your wells to project ultimate recoveries for any of these wells?

A. No, sir. We have production of the 1 and 3, which are the first two wells, for approximately six weeks before we shut them in.

Well Number 4, we have approximately three

weeks of production. That is not adequate enough time to come to any conclusion on ultimate recoveries at all.

Q. In looking at the tabulation of data on Exhibit Number 5, have you and your technical people formulated an opinion about the optimum choke setting at which to most efficiently produce any of these wells?

A. Oh, yes.

Q. Okay, what is the choke setting that you would recommend?

A. It varies per well. For optimum, we have -- Since this, we have gone out there and played a little more than this actual test data.

Q. Let's just take a for instance. Take the Number 1 well and find for me the optimum choke setting that maximizes the oil production and, conversely, minimizes the gas production.

A. That would be a choke setting of 22/64, a gas flow rate of 864,000 a day, 156 barrels of oil. That would be optimum.

Q. And there's some flexibility in that, you can go to 24?

A. That's true, yes, 22, 24. However, that would be overproducing under the 142 barrels a day

allowable for the depth bracket, so --

Q. At that choke setting?

A. At that choke setting.

Q. Are you limited by the oil rate or the gas/oil ratio?

A. Both. We are limited to 142 barrels of oil a day in the depth bracket of the pool. So no, you could not produce that at 156 barrels a day on the 22/64. You would have to be somewhere between 20 and 22 to get stabilized production.

Q. Under the current 2000-to-1 gas/oil ratio, what's the maximum oil rate you can achieve for this well?

A. Very little. About 18 barrels a day, if I remember correctly.

However it's almost physically impossible on every well except our Number 1 to produce oil at a GOR of 2000 to 1.

Q. What is the 10,000-to-1 ratio justification? What's the reason for seeking that level of gas/oil ratio?

A. That is the level of which we determined on these tests that we're able to produce a sustained amount of liquid and keeping the gas at a minimum.

As we increase the choke size, of course, the

gas does not increase, but the oil volume does, and thus overproduction would occur.

Q. For instance --

A. Plus water will also come in. We have to protect the formation from the invasion of water. The more we open the chokes up, the more water you produce. That's not good.

Q. Using your most efficient choke setting and using a 10,000-to-1 gas/oil ratio, what is your equivalent oil rate?

A. Our equivalent oil rate on all four wells combined is approximately 100 barrels of oil per day.

Q. Per well?

A. Per well, at 10,000 to 1. We will be underproducing the 142, but the choke settings are so touchy that if we were to try for more oil we also -- It's not uniform. In other words, we don't go from 100 barrels a day to 110 to 120. We jump from 100 up to 200 barrels a day in one choke setting.

So it becomes a matter of playing with the wells individually to establish their optimum rate.

Q. What happens if you use a 5000-to-1 gas/oil ratio? What do you see?

A. At 5000 to 1, as you can see on every well but Number 1, you're physically -- Again, you're

physically limited that you cannot even produce the wells at 5000 to 1. Or you are able to produce them, but you're overproducing at an extremely high rate. Such as the Number 1, at 5000 to 1, which you could establish, you would be producing 168 barrels of oil per day.

On the Number 2, the lowest you can get is 6.9 -- or 6900 to 1, but you're producing 456 barrels of oil a day, definitely overproducing.

Q. Do you have data from which you are able to conclude what the bubble point of the reservoir is?

A. I would have to defer that to our engineer.

Q. As well as the solution gas/oil temperature?

A. Yes, yes.

MR. KELLAHIN: Thank you, Mr. Examiner.

EXAMINER STOGNER: Thank you, Mr. Kellahin. Mr. Bruce?

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Mr. Harris, do you have any pressure data, bottom-hole pressure data?

A. Bottom-hole pressure data just from our shut-in surface pressures.

Q. And what is that?

A. Our shut-in surface pressures --

Q. Yes.

A. -- vary from 2000 to 2400 pounds.

Q. And I think you said that the 1 through 4 wells are producing, right? Or capable of producing?

A. They're capable of production, yes.

Q. And each -- What are they producing at, each well?

A. Each well?

Q. Yes.

A. We have -- Each well is averaging approximately 100 barrels of oil per day, and anywhere from one -- the low side is the Number 1 well, producing 800,000 a day in gas, to the high side of our Number 3, 1.4 million.

Q. So the GOR has varied pretty much from well to well?

A. No, as a matter of fact the GOR is pretty well stable at about 11,000 to 1, except for the Number 1 well, and that is somewhat lower, 9000 to 1.

Q. Which well was that? The Number --

A. The Number 1.

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

EXAMINER STOGNER: Thank you, Mr. Bruce.

Mr. Carr, any redirect?

MR. CARR: Nothing further, Mr. Stogner, on

redirect.

EXAMINATION

BY EXAMINER STOGNER:

Q. In referring to your Exhibit Number 3, the Brantley sand, let me make sure I'm understanding this right. What is the reservoir mechanics and the reservoir energy, just the Brantley sand alone?

A. We're assuming that the Brantley sand is combination solution gas and water drive.

Q. If we run from this Westall sand, what would the -- would the 2000-to-1 limit be satisfactory to produce just the Brantley sand, without the induction of this Westall sand gas coming in?

A. That is up to speculation at this point. I would assume probably not, sir. Most Delaware Brushy Canyon fields do exhibit a higher GOR than 2000 to 1.

What we have seen, East Loving, which is to the south of us, it apparently is approximately 5000 to 1. The Avalon field to the north is 4000 or 5000 to 1. So I think that's generally what we see in the Brushy Canyon formation.

Q. Do you know where the oil/water contact is out here?

A. No, sir.

Q. It's foreseeable that there's some wells out

here without the influence of the Westall sand, I would assume?

A. Yes.

Q. And increasing the GOR limit for those wells, which would go along with increased GOR, is there a possibility that we may see a more premature water influx into the oil zone?

A. I don't believe so. We have two updip wells currently, both Bird Creek, and on full production -- and on pump, they do not exhibit any abnormally high GOR.

Q. What is the medium between the Westall sand and that Brantley sand? What are we looking at?

A. We're looking at shale, shale and tight sands.

Q. So we have the channeling down of the sand through -- I believe you said perforations and then through -- Well, how about the cement behind the pipe? Is that also an influence?

A. Probably not. We have excellent bond from the Westall through the Brantley, so we have communicated probably between the cement and the formation.

Q. And that was done after fracturing?

A. Yes. Well, we assume after fracturing or

after acidizing. There would not have been a communication before we acidized or frac'd, no.

Q. Do you know what the extent this Westall sand -- On the cross-section you show it to be somewhat limited.

A. To the north and south, yes, it is limited.

Q. How about to the east and west?

A. To the east it does not occur in the west half of Section 35, in the Hanley well. And to the west it has not been -- or -- yeah, to the -- east, it has not been determined yet.

Q. What's the characteristic of that Westall sand gas production? Is it high volume, low pressure? High pressure, low volume?

A. High pressure. We see the high pressure from two factors: the shut-in of the wells, which is definitely abnormal for Brushy Canyon Delaware, and from our shut-in temperature survey we do see cross-flowing from that zone to the lower Brantley sand.

So we can assume there's fairly high pressure. You're not able to put a particular amount on it because you are cross-flowing.

We assume this dries gas, with very little liquid in it.

Q. What would -- well -- You think one well

could drain if it was perforated in that Westall sand, just to drain that sand off, since it is of some -- appears to be of somewhat limited extent? Alleviate the problem instead of --

A. It's possible. Drainage pattern on a Delaware gas sand, as far as I know, has never been written where I could have read any results of it.

I don't know what the extent of drainage would be.

Q. Well, you have some indication that it's coming in out of these fractures.

Okay, you have some of the Collins sand, I believe, in that Pinnacle State Number 1?

A. Yes.

Q. At least on the cross-section. That is perforated.

What's the driving mechanism for that particular sand interval?

A. We believe that is also solution gas.

Q. No water drive?

A. We could assume a water drive. Most Delaware sands do have a water drive.

However, we have not found the downdip limit of this sand as of yet.

Q. So it's my understanding that without the

induction of the Westall sand gas and -- either into the Brantley sand or the Collins sand, that the 10,000-to-1 GOR ratio will not affect the overall production on these two reservoirs?

A. No. We believe that, hopefully in six months, that the Westall sand pressure will have come down enough to be equivalent to the Brantley or the Collins or both, to where the GOR will come down.

Q. What would be the danger during the six-month period of putting a perf into the Westall sand directly?

A. There would be no danger at all.

Q. Other than the additional cost?

A. That would be correct, yeah, other than the additional cost.

Q. At the end of the six-month period, if the Westall sand appeared to be losing its pressure and volume to a sufficient amount, do you think a lower GOR would -- could be given to this pool?

A. Yes, sir.

EXAMINER STOGNER: Any other questions of this witness?

MR. STOVALL: Just one other.

EXAMINATION

BY MR. STOVALL:

Q. As far as, you know, if you were to take the option of perforating and producing the gas out of the Westall sand to eliminate the source of gas, given the realities of costs and everything else, what would be the best way to do it? To take one well and set a packer or something and perforate it and produce it, or --

A. Well, we have communicated on all four of the Westall wells already. We are communicated to the Westall sand.

Q. Uh-huh.

A. So you're going to deplete that zone whether you've perforated it or not on our four wells.

Perforated, sure, your gas will come into the bore hole directly opposite the sand.

I don't see what difference it would make if we did perforate it or just leave it alone. I am not opposed to perforating it.

EXAMINER STOGNER: I'm sorry, sir, you just told me you didn't know what the reservoir characteristics was in the Westall sand.

Now you're saying without perforating that you can alleviate it.

I'm sorry, I'm confused here. You just confused me altogether. You contradicted yourself.

THE WITNESS: No, I --

EXAMINER STOGNER: You need to straighten me out here.

THE WITNESS: Okay, I'm not -- I didn't -- I don't know where I --

Q. (By Mr. Stovall) Well, let me back you up and try this again.

If I understand what you just said, the answer to my question was that regardless of whether you perforate the Westall sand or continue to produce through your existing perfs, the Westall gas is going to be drained off?

A. Yes.

Q. It's either going to flow through that shale member and get down to the Brantley and be produced, or if you perforate directly it will perforate -- you'll produce it out of that sand?

A. Yes.

Q. Now, I think what Examiner Stogner was referring to before was, you had indicated that you didn't know if you were to perforate, say, one well in that Westall, how much area you would effectively drain just of the Westall, with the Westall well?

A. Oh, that's correct, that's correct.

No, I don't know how much we would drain off

of --

Q. Was that what you meant before when you said you didn't know the characteristics of that particular sand?

A. I don't know the drainage pattern off the sand.

Q. Does the problem appear to be primarily on your -- I'm sorry, is that the Santa Fe lease?

Is that what that east half of 35 is? Is that what you're calling that?

A. Yes, sir.

Q. And that's where the problem primarily seems to be --

A. That's where --

Q. -- at least as far as you can tell?

A. Yes.

Q. Now, back to my question again.

If there were some concern about raising a GOR and its broader effect in the pool, would it be possible to take, say, the -- it wouldn't matter which well -- one of those six or seven wells in that east half of 35, set a packer below the Westall, perforate the Westall, get the gas out, would you expect to see, then, that you'd have a pressure drop in the Westall and that it would therefore -- you would have less

cross-flow down to the Brantley, and therefore you would lower the GOR in the oil wells in the Brantley?

A. Yes, if you could --

Q. Is that too much of a --

A. If you could effectively drain more than that 140 acres, yes, you would see a pressure drop in that sand.

Q. Do you have any -- Looking at your logs, can you tell from the permeability whether you would expect to --

A. The logs indicate fairly good relative permeability.

Of course, that's not even calculatable. It's just assumed by the amount of distance between the micro -- the shallow and the deep ladder logs.

Q. And that's a sand formation, right?

A. Yes, sir.

Q. Given you have kind of a general geologic presumption that gas is going to drain a larger radius than oil, then conceivably you could put -- take one of these wells right in this -- Look at the 2 or 3 for example, or the --

A. Conceivably, yes, you could drain the gas off with one well.

Q. And I guess given the amount of gas that

you're seeing, it really could be economically viable to go ahead and produce that gas for a short time and move it out and --

A. Oh, yes.

Q. -- kind of protect the Brantley portion of the formation, right?

A. Yes.

Q. The bottom line is, is that is a viable option?

A. Yes.

Q. Given the -- It wouldn't necessitate expensive drilling of another well or anything else. It could be done as a...

A. (Nods)

Q. Bottom line, in your opinion, either -- The Westall sand is going to be drained of gas either through the cross-flow to the Brantley, or if another perforation in that sand were required -- That gas is coming one way or the other.

A. That gas is overriding everything else in the other two oil zones, yes.

MR. STOVALL: I don't think I have any more questions.

EXAMINER STOGNER: Any other questions of this witness?

MR. KELLAHIN: One follow-up, Mr. Examiner.

EXAMINER STOGNER: Mr. Kellahin?

FURTHER EXAMINATION

BY MR. KELLAHIN:

Q. Is there any direct measurement of the composition of the hydrocarbons in the Westall sand?

A. Yes.

Q. Show me which well has been perforated --

A. No, no, no, no --

Q. -- exclusively in the Westall sand.

A. No, no, not exclusively, no, no.

We do have analyses of the gas itself at the higher rates, and our engineer will --

Q. But that's gas that we cannot specifically quantify --

A. That's correct.

Q. -- as being produced only out of the Westall sand?

A. No, we cannot quantify that, no.

Q. So we don't know if the Westall sand will classify itself as a gas sand or not.

The presumption at this point is that it should?

A. Yes. From all evidence with the ohm impedance, with all the gas coming in the top two or

three perforations, yes, it's a pretty good assumption.

Q. And the way you've mapped the Westall sand, it's going to extend beyond the Westall leases, and it should be present in the Fortson Oil Company's Pinnacle State Number 1?

A. Yes, sir.

MR. KELLAHIN: No further questions.

FURTHER EXAMINATION

BY MR. STOVALL:

Q. And in response to that, follow-up question to that is that Fortson could then perforate a Westall -- one of its wells in the Westall and get its share of that gas, correct?

A. That's correct.

MR. STOVALL: I have nothing further.

EXAMINER STOGNER: Anything further of this witness?

MR. CARR: Nothing further.

EXAMINER STOGNER: You may be excused at this time.

Mr. Carr?

MR. CARR: At this time we call Rex Howell.

REX HOWELL,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name and place of residence?

A. My name is Rex G. Howell. I reside in Houston, Texas.

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

A. I'm an independent petroleum engineering consultant being retained by Collins and Ware at this time.

Q. Could you briefly review your educational background and work experience?

A. Yes, sir. I graduated with a bachelor of science in petroleum engineering from the University of Texas in 1958. I went to work for Amoco as a junior petroleum engineer in Levelland, Texas, and then worked through many offices and many different engineering positions for about 17 year with Amoco. At that time it was Pan American Petroleum.

I left Amoco in 1974. I was division reservoir engineer and supervisor in charge of all the reservoir engineering operations in Texas, New Mexico, and the mid-continent.

Joined the Energy Reserves Group as the

division production manager responsible for all production activities in the southern half of the US.

And then in 1982 I joined H & G Oil Company in Midland, Texas, as the executive vice president, served in that capacity until about 1985 when Inter North and Houston Natural Gas merged, and was named the executive vice president of the merged companies, Enron Oil and Gas Company, served in that capacity until early 1989 and then took early retirement from Enron and have been an independent petroleum consultant since that time.

Q. What interest does Collins and Ware have in this pool?

A. Collins and Ware has interest in both the Westall-operated wells in Section 35, and also the 14 wells operated in Section 36.

Q. When were you actually contacted about this particular question in this pool?

A. This particular question came up in mid to late August. Mr. Collins called me and wanted me to update and do a reserve analysis for all of his properties, and then particularly look at this field because it was a recent, new discovery, and attempt to assign reserves to these wells.

Q. And you've reviewed this pool as part of that

effort?

A. Yes, sir, I have.

Q. When did you become aware of the potential for a separate gas zone in this pool?

A. When I first got to Midland in late August out there, they had all the logs hung up, and a map, on the wall, and were telling me that they had a high -- or high gas/oil-ratio wells in the Delaware, and they thought it was coming from a gas sand between two oil zones.

Q. And then what have you done since that time to evaluate these properties and, in particular, determine whether or not there is a gas -- separate gas sand in this area?

A. All right, sir, I've looked -- attempted to look at all the available data to Collins and Ware, including looking at the well logs and all the production history in attempting to make reserve estimates.

Q. Have you reached certain engineering conclusions that you're prepared to present to the Examiner today as a result of this study and review of the pool?

A. Yes, sir, I have.

MR. CARR: We tender Mr. Howell as an expert

witness in petroleum engineering.

EXAMINER STOGNER: Any objections?

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: Mr. Howell is so qualified.

Q. (By Mr. Carr) Mr. Howell, I think it would be helpful if you would now in detail review exactly what you studied and what processes you went through with the limited data available to you to determine whether or not you did have a separate gas sand.

A. All right, sir. At the time I started my study on the Westall lease in Section 35, I had well log data on five logs, the logs on Santa Fe wells number 1 through 5. I also had log data on three of the Fortson wells, wells number 1, 2 and 3. So I had logs -- complete electric logs and porosity logs on eight wells in the field.

We also had production history from Mr. Westall's four wells -- at the time wells number 1, 2, 3 and 4 -- and a short production history on the Pinnacle Federal Number 1 well.

Taking that data, then what I did in using the geological nomenclature that this reservoir has been divided into, the three sands, the Collins sand, the Westall sand and the Brantley sand, I then made a

log analysis foot by foot for each zone there, determined the porosity, the water saturation, and then from that developed a hydrocarbon pore volume for each zone.

That would allow me to determine the original oil in place and the original gas in place for each one of the wells and for each one of the zones.

Once knowing the original oil in place, derived by log calculations, I had to go in and make several assumptions. That was really about the end of my real hard data.

But I made the assumption that a Delaware well could drain 40 acres.

I further made the assumption that a well completed in the Collins sand would have a primary recovery factor of 15 percent of the original oil in place.

I made the further assumption that a well completed in the Brantley sand would only have a ten-percent recovery factor of primary oil.

Q. And what were you basing that on?

A. Well, it's just really looking at the log characteristics here.

The average porosity in the Collins sand was higher than it was in the Brantley sand. The Collins

sand is a lot more uniform, you can correlate it from well to well better.

The Brantley sand is, as I say, lower porosity and seemed to be more heterogeneous than the Collins sand there.

So I assumed a lower recovery factor. It was an assumption to try to take into account either lower drainage or lack of good pack.

And for the Westall sand, what I did was use the -- calculate bottom-hole pressure from surface shut-in pressures. I assumed an abandonment pressure of 500 p.s.i. and then calculated the original gas in place, and using a 500-pound abandonment pressure you would come up with a recovery of 85 percent of the gas in place for the Westall zones.

Q. Now, what other information did you have available to you?

A. Well, we don't have a fluid sample on this thing and it's really unfortunate, because it's really key to some of the conclusions that we've drawn on this thing.

We know that the oil gravity is 43 degrees API. We do know that.

On one of the Fortson wells, they had an early test out of the Brantley sand with a producing

gas/oil ratio of 1500. Now, I assumed that the solution gas/oil ratio for this reservoir, then, was 1500 cubic feet per square barrel.

Knowing the oil gravity of 43 degrees, assuming a solution gas/oil ratio of 1500, and knowing the bottom-hole temperature of the gas gravity, then I could calculate a reservoir volume factor of 1.65.

Now, that's a pretty high reservoir volume factor, and -- almost indicating a volatile oil. But what it indicates to me is that this is a real high-quality hydrocarbon being produced out of here, a light crude, and it's with a lot of gas in just the Collins and just the Brantley sands, in addition to probably being essentially all gas out of the Westall sand.

Q. Now, admittedly you're working with limited information?

A. Yes, sir, very limited information. And like I say, we don't have a bottom-hole sample. You would like to have a -- say, a recombination sample on that thing.

But to really get meaningful fluid properties out of it, you've got to know what proportion to combine the gas back with the oil. And with all the evidence out here of communication with the gas zone, it's really difficult. And about the only way I would

know to get a valid fluid sample out of this thing, a bottomhole sample -- and I think the operations people would not look on this kindly -- is maybe to drill stem test just the Collins sand there, and then you might could get a true fluid sample and do it.

I'm not advocating that, but I don't know how to get a good bottom-hole sample or a -- or what proportions to recombine the gas and oil to come up with the correct fluid properties.

Q. With the information available, and based on the assumptions that you've had to make, have you been able to reach conclusions concerning the producing gas/oil ratios for this pool?

A. Yes, sir, just taking -- on these assumptions, and there are many assumptions in here -- for just the Collins sands and the Brantley sands, which are the oil sands in here, and based on these assumptions that I've outlined, I think the average producing gas/oil ratio of those wells, of the wells completed in just those sands, with no communication, will be in the vicinity of 7700 cubic feet per barrel, over the life of the properties.

Q. And this is just from the solution gas only?

A. Yes, sir, that's just from production of solution gas in those two oil sands.

Q. Have you attempted to factor in what you understand to be the Westall sand?

A. Yes, sir, again taking into account an 85-percent recovery factor, which is assuming a 500-pound abandonment pressure, then I calculate in just the eight wells that I analyzed, assuming they'll drain 40 acres, that there's about 2.6 BCF of gas in the Westall sand.

So when you add that to the 2.6 BCF to the gas, solution gas that's going to be produced, you're going to come up with about an average gas/oil ratio of 9700 cubic feet per barrel over the life of these properties.

Q. Do you have an opinion as to whether or not it would be prudent to independently produce the Westall sands?

A. Well, sir, I -- I don't think it would be -- I don't think you can independently produce the Westall sand, just as I don't believe you can independently produce the Brantley and the Collins.

I know that the Westall sand has good productivity, following stimulation by a frac from the lower zone. But just because a well has good initial bottomhole pressure and initial deliverability doesn't indicate it's going to be a big well and drain a large

area there.

But your question, specifically, I don't know how you would do that, because in my belief, by looking at the log characteristics of that well -- we don't have any cores and no permeability measurements there -- I think the Westall sand is going to have to be stimulated.

So if you stimulate the Westall sand, you go into the Brantley sand and the Collins sand. So I don't think you can independently produce the Westall sand.

Q. Based on your understanding of this reservoir, do you see evidence of a gas cap?

A. No, sir, I do not see any evidence. And when we first -- when I first went to Midland and they told me about a gas zone between two oil zones, it didn't seem right to me. And I thought, Well there's a zone that's got a gas cap in it; that's their a problem there.

But after reviewing -- And this is a sample log from a cross-section there. But reviewing all of the logs available out there, you can see that there is a good shale barrier between the Westall interval and the Brantley sand. And in my opinion, that is a good geologic barrier there.

Right above the Westall sand there is another good shale barrier. In fact, it's thicker than the one between the Brantley. Again, it exists in all the wells over there, and so I think that's the thing there.

Now, why there's just gas in the Westall zone, I can't answer that.

But -- And then I further looked at the -- Based on log analysis only, I cannot calculate or locate a gas/oil contact in either the Brantley or the Collins zones. Consequently, I can't locate an oil/water contact.

Now, I can locate zones that have high water saturation scattered through there, much higher than I would suspect connate water or irreducible water, and I suspect some water production in here.

But I cannot locate, in these wells that I've seen, I cannot locate either a gas/oil contact nor an oil/water contact in either of the zones.

Q. In your opinion, would approval for six months of a gas/oil ratio on a temporary basis of 10,000 to 1 dissipate reservoir energy?

A. No, sir.

Q. In your opinion, would denial of this Application ultimately result in oil being left in the

ground?

A. Yes, sir.

Q. In working with this information, did you come across any other data or information that would support the existence of a separate gas zone in the reservoir?

A. Yes, sir, we did. We looked at some gas analysis that was available.

One, the first one here, what I've got is produced gas analysis from three wells. All three of these wells produce from the Brushy Creek section of the Delaware here.

The first one, what I've looked at is the heating values and the liquid content of the gas.

And you can see on the Ray Westall well the heating value in BTU's per MCF is about 1167, where the other two wells, again out of the Delaware, are 1571 and 1431.

In other words, a much dryer gas reflected by the heating value.

This is also reflected and shown by the liquid content of the gas. Five gallons per million for the FM pluses in the Ray Westall well, 13 gallons per million in the Bird Creek well, and in excess of 10 gallons per million in the Myrtle Meyer Number 2 well.

So to me -- And this is only three samples. But to me, this indicates that the Ray Westall well is a much dryer gas and is really not representative of what you would expect casinghead gas to be in a normal Delaware reservoir.

Q. Could you just summarize for Mr. Stogner the conclusions you've reached from your work with this pool?

A. Yes, sir. What I've concluded from looking at the data -- and I admit that it's limited here -- that we really have three geologically separate zones out here, two of them being oil and the third one being in the middle of the two oil zones, being a predominantly gas zone.

That when you try to stimulate either the upper oil sand or the bottom oil sand, you're going to get communication with it, and that, consequently, the gas contributed by that zone is going to contribute to a higher gas/oil ratio in this field.

And that I do not believe that the well can be -- that the field can be efficiently depleted at a gas/oil ratio limit of 2000 to 1.

Q. Is 10,000 to 1 needed to do this efficiently?

A. Yes, sir, in my opinion a period of six months here will allow us to collect other data and see

if this is the optimum gas/oil ratio to produce this field at.

Q. Admittedly, there's a lot of activity in the area right now?

A. Yes, sir, there's many wells, as you heard, being drilled.

Q. And it's your recommendation that if this Application is approved it should be re-opened and reviewed again in six months?

A. Yes.

Q. Was Exhibit Number 7 prepared by you?

A. Yes, it was.

MR. CARR: At this time, Mr. Stogner, I would move the admission of Applicant's Exhibit Number 7.

EXAMINER STOGNER: Are there any objections?

MR. KELLAHIN: No objection.

EXAMINER STOGNER: Exhibit Number 7 will be admitted into evidence.

MR. CARR: And that concludes my direct examination of Mr. Howell.

EXAMINER STOGNER: Thank you, Mr. Carr.

Mr. Kellahin, your witness.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Howell, give me a checklist, if you will,

sir, of what type of data you would propose the operators gather from their wells so that in six months when we come back to the Examiner we will now have sufficient data to satisfy the issue of the appropriate gas/oil ratio for the reservoir.

A. You know, let me think of the things that would be ideal from a reservoir engineering standpoint.

From an operator's from an operator's standpoint, looking at costs --

Q. No, sir, my question was for the reservoir engineer, what do you see?

A. I think a complete core analysis of the whole -- of all three sands out here would be quite helpful in determining permeability, porosity and hopefully coming at some answer of what drainage areas might be.

Q. We don't have any core data yet for the reservoir?

A. Not to my knowledge. Now, I think maybe one of the Fortune wells has had the upper sand cored. I have not seen that analysis yet.

But I would like to see core analyses on all three sands, a full core analysis.

Q. All right, sir. What else?

A. I'd like to see relative permeability data obtained from those things so we can make not only some

primary recovery calculations, I believe that these sands really have a -- quite a potential for waterflood and even tertiary. So I'd like to see some oil/water relative permeability rates.

So I'd like to see relative permeability, gas/oil and oil/water.

Q. All right, sir. What else?

A. I'd like to see a bottomhole flood analysis. Now, I think that's going to have to be some thought of how we're going to collect that. Is anybody willing to drill stem test?

Once you get through the Collins sand or penetrate that shale below the Collins sand, I'm not sure you can get a representative sample of just the oil.

Q. When you're looking at a fluid analysis, do we have to take them for multiple wells in the reservoir in order to have an accurate reflection of the reservoir?

A. Well, the more you have, the better. The more data points you have. I would think if you could get one good -- one good -- I guess if we could get one sample that kind of fit what we thought it should be, I would be kind of comfortable with that.

If it doesn't fit what I want, then I would

want to take a couple. But the more you have, the better. But a fluid sample would really be helpful.

Q. All right, sir. What else?

A. I think, of course, daily production histories on all the wells of the choke sizes and the -- as the operators normally get. All rates, all gas/water, the pressures and the choke sizes, and I think that could help on that thing.

Pressure data would also be helpful too.

Q. What kind of pressure data would you propose to gather, over what intervals?

A. Well, on the flowing wells, if you could run bottoms in there, you know, I think that would be appropriate, to run bottoms, if the operators, you know, would consent to running bottoms on the wells. There's always a chance of losing the bottom, and you don't like to do that.

But, you know, if you could take pressures fairly early -- and I think what we're seeing here, they're going to be pretty representative over there. But if you could get, say, a well every 80 acres, every other well, like that, pressures over the history here -- You know, in six months and if this reservoirs are as good as I expect it to be -- I don't like -- I don't expect to see a lot of pressure drawdown in these

wells out here. But I think we do need to get some pressure data on as many wells as are feasible.

Q. Let me ask you to respond to a question that Mr. Stovall introduced into the topic a while ago, and that is whether one of these operators could simply selectively perforate the Westall sand, get all the gas out of that sand and not somehow disrupt the reservoir. Is that a solution for us?

A. Well, in my opinion it's not. And as I told Mr. Carr, I don't think you can find your withdrawal point to just the Westall sand.

And further, just because you have good initial productivity doesn't indicate you're going to drain the world on that, and so I think you could get gas out of a well by perforating it there.

But I think if you had to stimulate it, in my opinion, if you have to stimulate you're going to get, also, some oil out of the Collins and the Brantley zone. And just because you get the well at this 40 acres, I don't think you lose the problem from the other 40 acres, in my opinion.

Q. You introduced the topic just now of potential future pressure maintenance for the reservoir?

A. Yes, sir, I think this really has a lot of

potential for secondary by waterflooding and tertiary by CO_2. And that's based on -- When I joined H & G Oil Company, we were operating the Delaware Field in Loving County, Texas, and we bought the field from Mobile after it had been successfully waterflooded. Not a great waterflood, but a successful waterflood.

And we picked up CO_2 and compressed it and carried it 26 miles there. And when I left, we had already recovered 4 million barrels of tertiary oil from that field.

And looking at the quality of sand, particularly the Collins sand is much better than that one. So if this field responds under primary, as I suspect it will, I think secondary by waterflooding would be quite feasible and followed by CO_2. So I think this is a very valuable reservoir, yes, sir.

Q. Part of a scheme for pressure maintenance would be control of pressure by limiting the gas withdrawals from the reservoir, would it not?

A. Under primary, I think you could -- I don't think you'll want to ever -- You can slow the rate of pressure decline, but you will stretch the life.

In other words, if this zone, on the solution gas drive reservoir, which I think is the predominant producing mechanism, and you deplete it down to the

balance pressure, the economic limit, under a 2000-to-1 gas/oil ratio, you can do this.

I think it's going to take 25 to 35 years to do it. You're going to get to the same point and essentially the same ultimate recovery as under a 10,000-to-1 gas/oil ratio, but you can shorten the life by roughly a fivefold increase to do that.

So I don't think you're going to conserve energy by not producing the gas/oil ratio.

Now, I think everyone realizes or believes -- the reservoir engineers do -- that the quicker you start a waterflood and less the shrinkage of crude, the better your ultimate recovery.

Q. Let me ask you this: Does it impair the opportunity for success of the pressure maintenance project by increasing the gas/oil ratio to the 10,000-to-1 rate for a six-month period?

A. No, sir, not in my opinion.

Q. If this is truly a solution gas/oil reservoir and we were not going to develop a gas cap or make an existing gas cap larger in any of these zones, then it's not rate-relative?

A. That's correct, sir.

Q. So at a solution gas/oil ratio reservoir, we're not going to leave oil in the ground by

manipulating the gas/oil ratio?

A. No, you can stretch the life out a lot.

Q. Anything else on data-gathering for the reservoir in order to come back in six months and have an answer to the issue?

A. There's probably other things, but that's all I can think of right now, sir.

MR. KELLAHIN: Thank you. No further questions.

EXAMINER STOGNER: Thank you, Mr. Kellahin.

Mr. Bruce?

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Mr. Howell, you said you did look at log data on Fortson wells 1 through 3?

A. Yes, sir.

Q. Did the Westall zone extend eastward to the number 3 well?

A. Yes, sir, it did.

Q. And what kind of production history data did you have? What kind of production data did you have when you did your study?

A. I had -- On the Westall wells I had the four tests that were submitted there, and then on the Fortson Pinnacle Number 1 I had one test that had been

submitted to Mr. Collins, who's a working interest owner under that unit, one test only, and it was a fairly short-term test.

Q. Okay. Do you recall what the Fortson test showed?

A. No, sir, I do not recall. I'm sure we could find it.

Q. Okay. And there wasn't any pressure data on the Fortson wells?

A. No, sir.

MR. BRUCE: I don't have anything further, Mr. Examiner.

EXAMINER STOGNER: Mr. Carr, any redirect?

MR. CARR: No redirect.

EXAMINER STOGNER: Mr. Carr, I have a few questions for Mr. Howell, and then I would like to come back to Mr. Harris.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Howell, this -- In answering Mr. Kellahin's questions, I jotted down what he had asked you. I call it a sort of a reservoir engineer's wish list --

A. Yes, sir.

Q. -- core data and such as that.

In your opinion, is that type of information and data feasible on a lease basis for -- in this area?

A. You mean can it be collected? Yes, sir, I believe it can. Now, Mr. Westall, I don't know -- I know he's drilled well 6. I don't know if 7 and 8 are available to be drilled. But, you know, at that time they could be cored.

Q. Let me -- Can it be collected by one operator on his lease?

A. Yes, sir. Yes, sir.

Q. It could. Would it be better if a conglomeration of operators collected this data?

A. Yes, sir. The more data points you have scattered out across the field, the more better it would be.

Q. So this would be information that perhaps you would like for unitization, say?

A. Oh, I think ultimate unitization and secondary recovery, yes, sir. Just proper maintenance of the field, operation of the field to develop a real optimum plan of depletion, the more data you get, the better that you can do the design work.

EXAMINER STOGNER: I have no other questions of Mr. Howell. Are there any questions of this witness?

MR. CARR: No.

EXAMINER STOGNER: I'd like to recall Mr. Harris at this time.

MR. CARR: Mr. Harris?

RANDALL L. HARRIS (Recalled),

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

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Harris, you are employed by which company?

A. Ray Westall Operating.

Q. Before proposing this today, was there a meeting with the operators in this particular pool about what was going on, about your proposal, about what you have presented today?

A. Yes, sir. We've had several meetings. One was just a joint operating meeting between Fortson Oil and Great West Oil and Collins and Ware. That was, I believe, September the 1st or 2nd.

Q. And that was just of the three original Applicants?

A. That's correct.

Q. Has there been any communications with -- Let

me go back. How many operators are out in the pool? How many operators have wells that are -- have production from this pool or dedicated to this pool?

A. Just Bird Creek, Ray Westall and Fortson.

Q. Okay.

A. We have shown the data, however, to Bass and to Hanley and to Heyco as a matter of courtesy before this hearing. We've basically presented our case to them for their nod of approval or not object before we appeared here today.

EXAMINER STOGNER: So gentlemen, and Mr. Kellahin, Mr. Bruce, Santa Fe, Hanley and Bass, and Mr. Carr, Harvey Yates is appearing here today as a working interest in this pool?

MR. KELLAHIN: Yes sir.

MR. CARR: Correct.

EXAMINER STOGNER: I just wanted to make sure I was clear on everything.

MR. BRUCE: I'm not sure where Santa Fe's interests are. I think they're within a mile of the pool.

EXAMINER STOGNER: But they're not -- Your client is not an operator?

MR. BRUCE: I believe not at this time.

Q. (By Examiner Stogner) Has there ever been

any talk that you're aware of, of unitizing this area?

A. Yes, in our first initial meeting with Collins and Ware and Fortson, it was discussed that the quality of the reservoir, especially the Collins sand, did appear to have the characteristics of secondary recovery, so it was touched on that ground, yes.

As far as unitization, you would just assume unitization if you were going to go into a joint waterflood project at some time in the future.

Q. Getting away from that line of questioning, the wells -- I don't want to use the word "caused" -- well, yeah, I will -- that causes communication with the Westall sand, you have narrowed it down to which four wells, in your opinion?

A. The Santa Fe Federals 1, 2, 3 and 4.

Q. And when I look at Exhibit Number 2, which is a map, it's those four wells marked 1, 2, 3 and 4 in the east half of Section 35?

A. Yes, sir.

Q. Wells 6 and 7 are proposed locations?

A. Number 6 is currently -- I just got a late report. We are running casing on it as -- right at the moment.

Q. Okay. Now, when I look up north, there's a well number 5.

A. Yes.

Q. That wasn't on the cross-section.

A. No, that is a new well that we were in the process of still completing.

Q. A geological question: We have used and we have continually used your nomenclature. I'll say the Collins sand, the Westall sand, Brantley sand and Bird Creek sand.

Are these -- You've mentioned already that these names are not recognized but only localized for today's case. Do they correspond with any other known sand intervals that have been named or designated out there as such?

A. No, sir.

Q. Okay. So any reference to these names today in an order subsequent to this is just for that particular purpose; it is not, nor do we -- nor is the Division advocating naming any pools, parts of or sands, intervals or producing sands?

A. No, sir. Every company has their own designation, generally of their pay sands within the Delaware.

EXAMINER STOGNER: Okay, I want that clear that if these -- we recognize these names today, we've utilized them but nor are we in any way advocating the

designation of any pools or parts of, other than the normal accepted procedures of naming after formations such as geographical area.

I have no other questions of Mr. Harris. Are there any other questions while he is on the stand?

MR. KELLAHIN: No, sir.

MR. CARR: No, sir.

EXAMINER STOGNER: Mr. Carr, do you have anything further?

MR. CARR: I have nothing further in this case.

EXAMINER STOGNER: Mr. Kellahin?

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: Mr. Bruce?

MR. BRUCE: No, sir.

EXAMINER STOGNER: Is there any need for closing statements at this time?

MR. CARR: No, sir.

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: Does anybody else have anything further in Case Number 10,541? If not, this case will be taken under advisement.

(Thereupon, these proceedings were concluded at 11:55 a.m.)

* * *

CASE 10541 — Hanagan Exhibit 1

CERTIFICATE OF REPORTER

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

I, Steven T. Brenner, Certified Court Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Division was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL October 10th, 1992.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1994

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10541, heard by me on 1 October 1992.

Examiner
Oil Conservation Division