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:	
APPLICATION OF RANGE OPERATING NEW MEXICO, INC., FOR APPROVAL OF ITS EAST LOVING-DELAWARE LEASEHOLD WATERFLOOD PROJECT INCLUDING SIX INJECTION WELLS TO BE LOCATED AT UNORTHODOX WELL LOCATIONS AND QUALIFICATION OF THE PROJECT AREA FOR THE RECOVERED OIL TAX RATE PURSUANT TO THE ENHANCED OIL RECOVERY ACT, EDDY COUNTY, NEW MEXICO	CASE NO. 13,705

ORIGINAL

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REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: DAVID R. CATANACH, Hearing Examiner

May 11th, 2006

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Division, DAVID R. CATANACH, Hearing Examiner, on Thursday, May 11th, 2006, at the New Mexico Energy, Minerals and Natural Resources Department, 1220 South Saint Francis Drive, Room 102, Santa Fe, New Mexico, Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

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I N D E X

May 11th, 2006
Examiner Hearing
CASE NO. 13,705

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E X H I B I T S

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* * *

A P P E A R A N C E S

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By: W. THOMAS KELLAHIN

* * *

WHEREUPON, the following proceedings were had at 10:12 a.m.:

EXAMINER CATANACH: Okay, it's my understanding we're going to skip over the Pride Application which will be heard last today, and also the Marbob Corporation will be heard hopefully right after lunch.

So at this time let me call Case 13,705, which is the Application of Range Operating New Mexico, Inc., for approval of its East Loving-Delaware Leasehold waterflood project including six injection wells to be located at unorthodox well locations and qualification of the project area for the recovered oil tax rate pursuant to the Enhanced Oil Recovery Act, Lea County, New Mexico.

Call for appearances.

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing on behalf of the Applicant this morning. We have five witnesses to be sworn.

EXAMINER CATANACH: Any additional appearances in this case?

I'm sorry, and you're with what firm, Mr. Kellahin?

MR. KELLAHIN: Kellahin and Kellahin, did I not say that?

EXAMINER CATANACH: Thank you.

MR. KELLAHIN: I have identification, Mr. Examiner.

(Laughter)

MR. KELLAHIN: I do not have a passport, though.

EXAMINER CATANACH: We just haven't seen you in a while.

MR. KELLAHIN: It's a pleasure to be here.

EXAMINER CATANACH: Can I get the witnesses to please stand and be sworn in at this time?

(Thereupon, the witnesses were sworn.)

MR. KELLAHIN: Mr. Examiner, I've placed before you our exhibit book. There are subdivision tabs in the exhibit book that identify a topic, and for each tab I have placed a Division exhibit number to associate with the tab, and behind those tabs, then, there are different displays, and we'll attempt to identify the displays by what they are.

We want to present to you the background for the pilot project. The pilot project area is fee tracts, and it consists of the northern two-thirds of Section 23. And our first witness is Mr. Bobby Ebeier. Mr. Ebeier is a landman with Range. He's testified before and is here to present you the background on the land information.

We'll follow Mr. Ebeier's testimony with a geologist's presentation to set the geologic stage.

And then I have three different engineers that did portions of the project, to show you what their plan is. One is the engineer that did the C-108 preparation. The other engineer is a consulting engineer that came up with the concept for the pilot, and then the third engineer did the feasibility for the economics to see that this was a viable project.

In total, we expect that within an hour and a half we can make our complete presentation for you.

EXAMINER CATANACH: Okay.

ROBERT EBEIER,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Ebeier, for the record, sir, would you state name and occupation?

A. Robert Ebeier, Bobby Ebeier. I'm a senior landman with Range Operating New Mexico, Inc.

Q. Where do you reside, sir?

A. Fort Worth, Texas.

Q. On prior occasions have you testified and qualified as an expert petroleum landman before the Division?

A. Yes, I have.

Q. Pursuant to your employment as a landman for Range, has it been your responsibility to determine the ownership within the project area?

A. Yes, sir.

Q. As part of that effort have you also been in contact with the various categories of owners within the project area, as not only with regards to minerals but in addition the surface?

A. Yes, sir.

Q. And have you also been responsible for issuing notice of the hearing in this case to various portions of those interest owners?

A. Yes, sir.

MR. KELLAHIN: We tender Mr. Ebeier as an expert petroleum landman.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Mr. Ebeier, let me turn your attention to the exhibit book. If you'll open the book and turn to the first tab for Exhibit 1, it says locator maps. If you'll turn past the tab, let's look at the first display, which is captioned Mineral Ownership. Is this a display that you're familiar with?

A. Yes, it is.

Q. In fact, it was prepared under your direction and supervision, was it not?

A. Yes, it was.

Q. Identify for us what we are seeing.

A. Well, we're looking at Section 23, which is obviously a one-square-mile area. The red square that you see around it is the project area, basically encompasses the north three-quarters of Section 23, roughly 480 acres.

What we're showing here, the color code here is the leasehold that was leased in the late 1970s. Obviously the mineral ownership was such that -- for example, the east half of that northeast quarter is a separate lease. That was a separate mineral ownership in the late 1970s, so a lease was taken there. And then you can see different other 80-acre tracts and 120-acre tracts that were leased. So I'm trying to demonstrate here that we have different leaseholds within that 480-acre tract --

Q. On this plat --

A. -- or actually different --

Q. On this plat, have you also identified what Range proposes as their current plan for the location of the six injector wells?

A. Yes, I have.

Q. And how is that indicated?

A. Well, if you'll notice down to the -- I believe that's a dark blue circle, you'll see all of the other locations set out on this map, the dark blue circles. If

you look up in the northwest quarter of Section 23 you'll see Well Number 18. That's one of our proposed injection wells. And you'll that is a slant direction or a slant hole, slanting in a slight south southwest direction.

And if you move east of there is Well Number 19, another blue circle, and you'll see that's another slant location, with our surface location, in a south southwest direction.

And then if you move east of there, the other dark circle is Section -- or Well Number 15. Now that's the only producer that we have that we're going to convert to an injection well.

Then to the south of that, Well Number 21, and west of that Well 20, and then west of that is Well Number 17. And I think we designate them as -- SCB 23 is Section 23 -- and then by the well number, 17, 20, 21, et cetera.

And the bottom -- all of these -- the south three wells, those are all vertical wells.

Q. As to wellbore 18 and 19, Mr. Ebeier, you've called them slant holes?

A. Yes.

Q. We might refer to them as --

A. -- directional --

Q. -- directional wellbores?

A. Yeah, directional wellbores.

Q. They are being drilled directionally for what purpose, sir?

A. To accommodate surface owner reasons.

Q. Let's turn beyond that and show the Examiner an additional orientation map. This one is captioned Waterflood Injection Line. Identify what we are seeing here. Right behind the first exhibit there should be this map.

A. Well, I think I've got two of these, but I know what you're talking about.

Q. Here, turn in your book until you find this one. We'll trade you books.

A. Well, it's okay, I -- yeah, just take that one.

Q. Take this one.

A. Okay.

Q. What are we looking at, Mr. Ebeier?

A. Well, this is an aerial photo of Section 23, and what we're trying to demonstrate here is our facility layout, where our flow lines, our injection lines, are going to be laid out on the surface estate. We've worked with the surface owners in this area to accommodate their wants and needs.

And so if you'll notice on here, right where the -- in the -- I guess the southwest of the northeast quarter where that Section -- or that Well Number 3 is, right next

to that, that will be our injection station. That's where all of the lines will -- all six lines will go from that injection location out to each individual well. And then of course, then, it sets out the proposed locations of our surface locations.

Q. Would you turn beyond this display and identify for us the next page? I'm sorry, you still don't have what I have.

A. Well, let's go back to this one right here and see if that works. I'm sorry. Okay, here we go.

Q. Do you find a tabulation of wellbore locations?

A. Yes.

Q. What does this represent?

A. This represents the surface locations or the locations of the six injection wells.

Q. Under the current plan, as you've anticipated, this is the location for these various wells?

A. Yes.

Q. Would you turn to the next page? What is shown on what is captioned Exhibit C?

A. Okay.

Q. What is it?

A. This is a list of the current producers that we have in the project area.

Q. Let's turn on to what is the Notice tab, which is

marked Exhibit 2 --

A. Okay.

Q. -- and when you turn past the tab there should be a plat.

A. There is.

Q. What do you find? What is this plat?

A. This is a plat that I've put together. It sets out all of the -- on a tract basis, on a release basis, we wanted to identify all of the interest owners on each tract. So if you follow up the second page, you'll see a spreadsheet that corresponds to each one of the letters, so you can get a quick idea who each one of the owners are, whether they're a royalty owner, a working interest owner or an overriding royalty interest owner.

Q. Is this a tabulation that you have prepared?

A. Yes.

Q. To the best of your knowledge, are you satisfied it is correct and accurate?

A. Yes, it is.

Q. Let's turn to the next two things. There's a staple on the next one, which is a certificate over my signature, and then beyond that is a notice letter, and you get to another staple that is a certificate for you?

A. Yes.

Q. When you take these two certificates in

combination, have you satisfied yourself that either you or I together have notified all the people that are entitled to notification of this case?

A. Yes, sir.

Q. In addition, does this package of notices include any surface owners?

A. Yes, it does.

Q. And will it include offset operators within a half-mile radius of any injector well?

A. Yes, it will.

Q. Let's turn now to Exhibit Tab 3, which is called Land Data. The first thing I have in my book at this point is a letter under Chesapeake's letterhead dated February 21st of this year. Do you have that?

A. Yes, sir.

Q. Who are the working interest owners within the project area?

A. The two working interest owners are us, Range Operating New Mexico, Inc., and we own 50-percent working interest. The other 50-percent working interest owner, obviously the non-operator, is Chesapeake Permian, Ltd.

Q. Do you have satisfactory agreements with Chesapeake that apply to the pilot project area?

A. Yes, we do.

Q. And who would be the operator?

A. The operator will be Range Operating New Mexico, Inc.

Q. If the Examiner cares to have more information, you have included in this exhibit tab set the additional information, including the proposed AFE for the project?

A. Yes, sir.

Q. If you'll turn several pages over, you will get to that AFE. What is the total current proposal for the project?

A. Total project cost is $5.415 million.

Q. If you'll turn past the AFE and then the well data requirement sheet, you're going to get to something that's captioned Injection Agreement?

A. Yes, sir.

Q. This is the first of three proposed injection agreements?

A. Yes, sir.

Q. Collectively give us an understanding of what you're attempting to achieve with these agreements.

A. Well, the three agreements represent the three surface owners under the six proposed injection wells that we're proposing to inject offlease water in, and so this injection agreement basically will allow us to inject offlease water into these wellbores.

Q. When was your last communication with these

surface owners or a representative of the surface owners?

A. We're still in negotiations, but my last contact was as of yesterday.

Q. If you'll turn past the three injection agreements, you're going to get to a printout of an e-mail, and it will be dated as of yesterday and it's captioned with my name. Do you see that?

A. Yes.

Q. And then right after that single page is a Division Examiner order. You see it, it's R-12,224?

A. Yes.

Q. Do you find that?

A. Yes.

Q. Let's come to this topic. Were you made aware of an objection that filed collectively by an attorney named Mr. Martin from Carlsbad on behalf of the surface owners?

A. Yes, I was.

Q. As a result of that objection, has contact been made with Mr. Martin?

A. Yes, it has.

Q. What is your understanding of Mr. Martin's position concerning objections to this Application?

A. Well, I think their concern was surface water encroachment by our saltwater injection.

Q. Did Mr. Martin propose that for this case Range

agreed to stipulations in this order that you had agreed to in a prior Division order concerning a disposal well?

A. Yes, we did.

Q. And are you in agreement to do that?

A. Yes, we are.

Q. When the Examiner reads the content of this e-mail, is that your understanding of the intent here, is to execute a stipulation that would provide for a reporting, testing and monitoring procedure associated with the disposal -- or the pilot waterflood project?

A. Yes.

Q. If we turn past the e-mail and look at the saltwater disposal order and turn to the third page of the disposal order, in a different font under finding (11) [*sic*] it recites a stipulation. Is this type of stipulation the one that you believe you've agreed to, to be applied to the waterflood?

A. Yes, sir.

Q. Are you in agreement that you and I and Mr. Martin will execute an appropriate stipulation to submit to the Division that accomplishes the intent of the parties to resolve the protest?

A. Yes.

Q. Other than that protest filed by Mr. Martin, are you aware of any other objection communicated to you by any

other group of individuals?

A. No.

MR. KELLAHIN: Mr. Examiner, that concludes my examination of Mr. Ebeier.

We move the introduction of the exhibits behind Exhibit Tabs 1, 2 and 3.

EXAMINER CATANACH: Exhibits 1, 2 and 3 will be admitted.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Ebeier, these are five separate fee tracts of land?

A. Yes, sir.

Q. And is Range the leasehold operator of these tracts?

A. Yes. Range not only operates this, we operate some contiguous leases surrounding this, this particular section and -- but in Section 23 we operate the entire section.

Q. So Chesapeake doesn't operate anything here?

A. Not in this particular section.

Q. Okay. But they are 50-percent interest owner -- working interest owner in this area?

A. Yes.

Q. And the royalty interest owners are all listed on

one of your exhibits, royalty and overriding royalty interest owners?

A. Yes.

Q. Has there been any contact with these parties, with regards to your proposal?

A. Well, some of the surface owners -- well, all of the surface owners are also mineral owners. They may not own 100 percent of the royalty, or maybe a portion of it, but yes, they are common. Other than that, there have not been any objections as far as, you know, royalty owners objecting to our operation, even any phone calls.

Q. But are they aware of what you guys are doing?

A. We've noticed them.

Q. Okay.

A. Yeah, we've noticed all of the royalty owners, overriding royalty interest owners and the working interest owners, or owner.

Q. Is your agreement with Chesapeake -- is that a joint operating agreement, or what type of agreement is that?

A. Well, yes, it is, it's a joint operating agreement. The agreement that we have that we have that -- or their concurrence to do this project that we're talking about -- is that what you're referring to? --

Q. Uh-huh.

A. -- is an AFE. We made a presentation to Chesapeake, showing them that -- what we're trying to achieve here on this pilot waterflood, and their concurrence is the signed AFE. We presented it to them in our meeting that we would be spending, you know, $5-plus-million on this project. We gave them the technical presentation and then at the same time presented them with the AFE, and their concurrence is obviously the signed AFE.

Q. So they are participating as a 50-percent interest owner?

A. Yes.

Q. Which means they're paying half the cost?

A. That's right.

Q. Let me ask you how production on these five tracts is going to be affected by this Application. Is there going to be any -- is production going to still be allocated on a lease basis?

A. Yes.

Q. So there's not going to be any type of agreement on how to split the production up among the --

A. Not at all, not at all.

Q. Okay, so it's just strictly on a lease basis?

A. That is correct. What's producing now, whoever's -- the royalty owner in each particular well will get the same interest under that same well.

Q. Okay, and the -- are all the proposed injection wells -- are those all existing, or are those going to be drilled?

A. The only existing well will be the 23-15, and that's located in the east half of the northeast quarter. The balance of the six injectors will be drilled, two directionally and then three vertically.

Q. And the reason for the directional is to accommodate --

A. -- surface owner. There's farming in this operation -- it's an agricultural area. Some of the farmers out there, they grow alfalfa, and so we're trying to accommodate some of their alfalfa fields and crops, where we can.

EXAMINER CATANACH: Okay.

MS. MacQUESTEN: Mr. Kellahin --

MR. KELLAHIN: Yes, ma'am.

MS. MacQUESTEN: -- you had a question about notice. I saw in your certificate of mailing affidavit that you received green cards back from a number of entities, but it looks as though three of the letters didn't reach their recipients?

MR. KELLAHIN: Apparently so. And in addition, Mr. Ebeier's got some of the same problems. So our proposal to you is, at the conclusion of the presentation

we'd like to continue this to the June 8th docket, and we'll publish notice in the newspaper.

In addition, there's a typo on the county, so we're going to re-notify everybody. This should be Eddy County, not Lea County. So we'll fix those mistakes and re-notify everybody.

MS. MacQUESTEN: Okay, thank you.

EXAMINER CATANACH: Mr. Kellahin, besides the county, is there any other mistakes in the advertisement or the docket for this case that you know of?

MR. KELLAHIN: The only one I can see is, inadvertently, under the caption for the location, there's a tract 6, and if you read the Application itself, you realize that there is no tract 6. So we will correct and delete tract 6, when you look at your docket today for the hearing. That extends outside the project area, and so it's not inclusive.

EXAMINER CATANACH: Okay. Could you go through that one more time, go through the ad for the case and make sure that all the locations are correct and everything is --

MR. KELLAHIN: We will do that.

EXAMINER CATANACH: -- else is correct.

MR. KELLAHIN: We know the footages are correct, we checked those yesterday again. So our current belief

is, if we get the surface agreements, these locations will stay where they are. If we have to move them further for surface use, then we'll be back to you and ask you for modifications.

But as we understand it, the mistakes that appear on here are the wrong county, and we've inadvertently included the tract 6 that does not exist.

EXAMINER CATANACH: Okay. When you guys execute the agreement with the surface owners on the stipulation, is that going to be in the form of an agreement that you guys sign?

MR. KELLAHIN: We want to have it in the form of an agreement so that you can rely on that and put that language in the order, as was done in the disposal order. So independent of surface use, we want to deal with concerns about subsurface well control issues and monitoring.

Q. (By Examiner Catanach) Okay, but at this point you guys believe you have an agreement with these people?

A. Absolutely.

Q. Okay, so --

A. Yeah. It's verbal at this point. We'll follow up with a letter agreement.

Q. Okay, you'll provide that to us?

A. (Nods)

MR. KELLAHIN: Yes, sir.

EXAMINER CATANACH: Okay. I have nothing further of this witness.

MR. KELLAHIN: Our next witness is Martin Emery. Mr. Emery is a petroleum geologist.

MARTIN EMERY,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. My name is Martin Emery, I'm a geologist with Range Resources.

Q. Where do you reside, sir?

A. Southlake, Texas.

Q. On prior occasions, Mr. Emery, have you qualified before the Division as an expert petroleum geologist?

A. Yes, I have.

Q. And pursuant to your employment with Range, have you prepared a geologic study of the project area?

A. Yes, I have.

Q. Are the exhibits that we're about to look at, that are contained in the exhibit book behind the tab Geology, which are marked Exhibit 4, does this represent

your work?

A. Yes, I prepared the exhibits.

Q. And based upon this work, do you have certain recommendations and opinions to express to the Examiner about the project?

A. Yes, I do.

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

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Mr. Emery, to get us going, is there one of these displays in the geologic set that we can pull out of the pocket part and unfold and examine?

A. Uh-huh.

Q. Which one would you like to look at?

A. Let's start with the production map.

Q. Which is the first one --

A. First --

Q. -- it says Proposed Lease Waterflood, production map?

A. That's correct. This is a map similar to what Mr. Ebeier showed you, but it has the tracts designated inside the red outline, which is the project area.

Illustrated are all of the wells that produce from -- and color-coded, the wells that produce from the Brushy Canyon. There are six Brushy Canyon-productive

zones, and you can see the color code in the legend on the right side of the map.

Two zones that we're going to focus on in this discussion this morning are the C and D zones, the lowermost two of the Brushy Canyon producing zones.

Q. When you look over on the far right and see the color-coded subdivisions, you have prepared a geologic study of all of these different intervals?

A. Yes, I have.

Q. Can you give Mr. Catanach a short summary of what he's about to see in terms of identifying these various zones and what you're attempting to test with the pilot waterflood?

A. I will show you a cross-section or two which further identify where these zones fall within the Brushy Canyon. Our focus, again, is going to be on the C and D zones, the lowermost two of the Brushy Canyon productive intervals. That is going to be the focus of our project, based on the engineering information and data that you'll see by subsequent witnesses.

Q. Let's start, then. You have three cross-sections?

A. Yes.

Q. Find one of the three that you would like to talk to, to use it as an identifier for the Examiner, so he can

see what you're trying to accomplish.

A. The second cross-section, which is labeled in the legend West-East Structural Cross Section (Central), goes through the -- this cross-section is oriented west to east. It goes to the approximately central part of the proposed project area and encompasses existing wells along that west-east line.

Q. Let me have you take a moment, Mr. Emery. I'm going to show you a copy of the advertisement which contains the area within the vertical limits that you're seeking approval for injection. I'm going to ask you to look at this caption so that you can identify for us on your cross-section what would be a way for Mr. Catanach to find the upper and the bottom portions of the target.

A. Yes, we have oil reservoirs in the lower part of the lower Brushy Canyon, which extend from the nomenclature that we employ, which is the lower Brushy Canyon AA through D zones. So you'll see on this cross-section in light blue is the AA zone, the salmon color is the A zone, orange is B, light green is C, the dark green is the D zone. And those are the intervals which in this notice -- that we included in the vertical sense for the project area.

Q. So that we can visualize this, if the Examiner uses that descriptive language for approval purposes for that type, will that take him from the top blue line --

A. Down to --

Q. -- down to the second -- I'm sorry, the top brown line?

A. Top of the Bone Spring, correct.

Q. Taken down, then, to the base of the Bone Spring, which is the --

A. Top of the Bone Spring, which is the brown line near the lower part of the cross-section.

Q. The interval, then, sandwiched between the two brown lines is what we're seeking approval for?

A. Actually from the light blue line down to the lower brown line.

Q. Okay. Give us a general understanding of the various zones here. The point is, talk to us about lateral or spatial continuity of the reservoir suitable for flooding purposes.

A. As you can see on this cross-section, and the other cross-sections that are included in this exhibit book, laterally these intervals have general good continuity, they're very correlative across the project area, seem to be laterally continuous -- are laterally continuous.

However, within the individual zones, these are Delaware sands, they're low-contrast oil pay, and they have very little reservoir characteristics, particularly

permeability.

Shown on the cross-section, too, you'll notice intervals that were perforated and stimulated and produced, and it varies from well to well across all of the cross-sections.

Q. From a geologic perspective, we often talk in terms of the potential floodability of a zone. Do you have any way to quantify the floodability of these various zones at this point?

A. Not very succinctly, no.

Q. Would that be one of the objectives to achieve by targeting this project area as a pilot?

A. That's what our intent is. That's why we -- mainly why we intended to start it with a pilot.

Q. What are the kinds of things that you as a geologist would seek to obtain with a pilot project area such as this?

A. Well, for one we're going to drill additional wells, which will give us additional well information, the additional injector wells.

And then upon initiation of injection we will get further information about individual reservoir pressures and also the ability to inject fluids into the different entities, these different units in the lower Brushy Canyon, in the AA through D zones.

Q. I notice on your cross-section that we're dealing with a structural cross-section.

A. Correct.

Q. Is there enough displacement of the structure throughout this area to cause you concern as a geologist about how you locate your injection wells?

A. No. As you can see, the vertical exaggeration of this cross-section is five times, so the structural component is very subtle, a slight east dip across the project area.

Q. Do you have a geologic map to show us so we can see an indication of either the gross or the net distribution of sand?

A. Yes, I do.

Q. And how do we find that?

A. It will be at the back of the geologic exhibit section.

Q. And how is that map captioned?

A. It's captioned, Proposed Lease Flood, Total LBC, or lower Brushy Canyon, NHCT, net hydrocarbon thickness.

Q. When we look at that display, Mr. Emery, what are the general geologic conclusions you have for reservoir distribution within the project area?

A. In general, there is -- and this map encompasses all of the zones, AA through D, in the lower Brushy Canyon,

so it's an amalgamation of net hydrocarbon thickness from log calculations in those five zones in the lower Brushy Canyon. And the net hydrocarbon thickness is just the hydrocarbon saturation, times the porosity, times the thickness. So that's how these values are arrived at. And there some generally thicker areas in the north and southern part of the project area.

Q. Do you find as a geologist that there's a direct correlation between an existing well's recovery and their position in terms of reservoir thickness in the reservoir?

A. In general, the fit is not very good. If we look at cumulative production or our estimations of ultimate recovery from some of the producing wells, there's not a very good agreement between the productivity of these zones and this map.

Q. Do you have an understanding as to whether any portion of the pilot project operations would provide you data to give you a better understanding of that relationship?

A. We hope that -- like I stated earlier, that additional well information, pressure -- reservoir pressure information, injectivity, which correlates to permeability, will further our understanding of these reservoir entities.

Q. If you'll keep that map unfolded and turn back to the general colored locator map, which was the very first

map in the exhibit book --

A. Yes.

Q. -- I want to ask you about the relationship of the proposed six injectors to the existing producers so that you can answer the question of whether or not in your opinion correlative rights are protected by allocating production from the tracts back to the individual tracts as is currently being done.

A. Well, the five proposed injectors to be drilled in the conversion of the SCB 23-15 in the northeast of -- quarter of Section 23, are centrally positioned amongst the producing wells. And it's my opinion, and I think it's shared by our engineering analysis, that all of the producing wells will benefit about the same -- from placing those injection wells in those positions.

Q. So the plan at this time under the pilot project is not to come up with some type of participation formula?

A. Correct.

Q. It would be to allocate primary and secondary recovery back to the individual wells that are currently being produced and for those owners that are currently being paid?

A. On a lease basis, correct.

Q. Let's talk about the relationship of the Delaware to any shallow freshwater sources. What is the deepest

known fresh water in the area?

A. The top of the evaporites in this are, which is Rustler/Salado, is about -- it ranges from about 250 to 300 feet.

It's difficult to tell in a lot of wells, because there's not log data that goes up that shallow. But for the wells that do have shallow log information, it's usually above 300 feet --

Q. For those wells that --

A. -- shallow water.

Q. For the wells that you currently operate in the project area and for future wells drilled, how deep does Range set the surface casing string?

A. We have been setting it about 500 feet.

Q. In your opinion, is that an adequate depth to ensure that you have the freshwater sands covered and protected?

A. Yes, and that was actually the depth directed by the geologist from the NMOCD.

Q. Do you see any geologic connection whereby injection fluids into the Canyon formations in the Delaware could migrate to shallower freshwater sands?

A. No, we're talking about freshwater sands less than 300 feet deep, and our gross project interval is 5750, roughly, to 6200 feet.

Q. Is this Delaware container that you've described geologically -- is that container such that hydrocarbons and fluids either produced from or injected into that container remain confined in that container?

A. Yes, we expect so.

Q. You don't see any indication that injection waters would move out of zone and impact oil or gas-producing zones elsewhere?

A. No.

MR. KELLAHIN: That concludes my examination of Mr. Emery.

We move the introduction of his exhibits behind the geologic Exhibit Tab 4.

EXAMINER CATANACH: Exhibit 4 will be admitted as evidence.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Emery, is there a type log where I can see the depth that you've outlined?

A. What was outlined in the notice is, I think -- if I'm not mistaken, it was the SCB Number 4 well, and the depths of the interval from that well.

Q. We don't have a copy of that particular log.

A. Yes, you have a copy of that log, it's on the first cross-section in the book, and it's the well

easternmost, or the well on the far right of the cross-section.

Q. Okay. Now the producing wells in the project area, they're not all producing from all of the different zones; is that --

A. That is correct.

Q. The plan, however -- Well, let me ask you. You stated that your focus was on the C and D zones?

A. That's correct.

Q. But do you intend to waterflood all the zones?

A. Our initial attempt will just be with the C and D zones.

Q. Are the C and D zones completed in all the producing wells?

A. No. And our AFE encompasses the well work that would be necessary to accommodate that.

Q. So it's going to be opened up in wells that it's not currently opened up in?

A. Correct.

Q. Okay. Why do you just want to focus on C and D at this point?

A. If I can defer that question to the engineering testimony, I think you'll have a better understanding.

Q. All right. Are the upper zones less laterally continuous, or --

A. In general, the reservoir quality is poorer and the water saturations are higher, despite the fact that some of the zones -- that AA in particular -- are quite thick.

Q. Are the C and D zones the most prolific producing intervals?

A. They have been historically, yes.

Q. So at this point, at least for the pilot deal, you don't plan on flooding the upper zones?

A. Initially, no.

Q. Is there any plans to do that later on or --

A. If we are having success, I think we would be -- we would want to investigate the floodability of the upper zones, yes.

Q. If the pilot project is successful, where do you expand to? Do you have leases outside this area?

A. Yes, we do.

Q. So it would be horizontally expanded to include different area?

A. That's correct.

Q. Now this map that we've looked at, the one with the total LBC, NHCT, that's the total thickness of all the Delaware-Brushy Canyon zones; is that right?

A. It's the total net hydrocarbon thickness for the lower Brushy Canyon AA through D zones.

It does not include the Pardue which, if you look on the production map, that's a shallower Brushy Canyon producing zone.

Q. Okay. And is there, in fact, fresh water present in this area?

A. It's very shallow. Most of the fresh water wells, I think, have a total depth -- my recollection from the waterflood -- I mean from the water injection well hearing that we had, from the State Engineer's tabulation, I think most of the existing water wells are less than 150 feet deep.

Q. Where is your disposal well located?

A. It's in -- If you look on the map that you were just looking at, it's in the northwest northwest of Section 24.

It's the Candelario Number 1 well. It has a triangle as the well symbol, indicating it's a service well. It was originally a lower Brushy Canyon oil producer, and we converted it to a Cherry Canyon saltwater disposal well.

EXAMINER CATANACH: Okay, I think that's all I have.

MR. KELLAHIN: Mr. Examiner, at this time we'll call Mr. Tom Zadick. Mr. Zadick is a consulting petroleum engineer.

THOMAS W. ZADICK,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Zadick, sir, would you please state your name and occupation?

A. My name is Thomas W. Zadick. My occupation is, I'm a consultant specializing in enhanced oil recovery, reservoir simulation and well-test analysis.

Q. And where do you reside, sir?

A. In Colleyville, Texas.

Q. Would you summarize for us your education?

A. I have a BS and MS in chemical engineering from Montana State University and an EMBA from Penn State University.

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

A. Following graduation, I went to work for the Shell Oil Company, working in the mid-continent, the Permian Basin and the Michigan Basin. I had various assignments in reservoir engineering, including enhanced oil recovery, waterflood optimization, tertiary recovery.

Following that, I went to work for, then, the Champlain Petroleum Company. I was employed there for 23

years in various reservoir engineering and management assignments. In -- about seven years ago I had an opportunity to start my own consulting practice and took advantage of it and founded Thomas W. Zadick, P.E.

Q. Mr. Zadick, are you currently employed as a consulting engineering expert for Range Operating?

A. Yes, I am.

Q. And pursuant to that employment, have you been making a study for them about the feasibility of a waterflood project in what we've talked about as being this pilot area?

A. That's correct.

Q. Are the exhibits that we're about to see prepared by you and represent your own opinions and conclusions?

A. Yes, they do.

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

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Mr. Zadick, let me have you turn to the tab that says Exhibit 5, and it says PE Study. If you'll turn behind the locator tab, there's a cover sheet. If you'll turn bast the cover sheet, there's a summary sheet saying Recommendations. Are these your recommendations?

A. They're Range's recommendations that resulted

from the work that I did for them on the waterflood feasibility.

Q. Describe those for us.

A. Well, the first is to initiate a six-pattern, five-spot pilot in Section 23, specifically in the northern three quarters of Section 23. Because of the permeability thickness expected in the lower Brushy Canyon members, it was recommended that the proper well spacing for this pilot be 20-acre spacing.

Initially, we would like to target the C and D reservoirs, and I will address the reasons for this in a later slide.

Initially, there's an opportunity for expansion of this flood aerially, up into an area that Range operates south of the river that runs through the field, so that would incorporate a little over 1000 acres in that expansion. In addition, there are other areas of the field operated by Chesapeake that could be considered for unitization and expansion.

The expected incremental recovery from the waterflood pilot is 900,000 barrels if you consider only the C and D zones. And if you look at the total lower Brushy Canyon AA through D members, a little over 1.9 million barrels.

And the cost of finding using the lesser number

is less than eight dollars per barrel, so it appears to have a very good economic incentive.

Q. In your opinion, is it appropriate to include within this pilot approval at this point those upper zones, the A, AA and the B?

A. At this point, in my opinion it is not appropriate, and the reason is, as I will address later, we have RFT data that was taken on some infill wells drilled recently that shows that the C and D members have significant and consistent depletion, giving an idea that the sands within those members are more laterally extensive, whereas the shallower zones do not have consistent depletion, or no depletion at all.

Q. Is there any portion of the pilot project that seeks to obtain data from the AA and the B intervals?

A. Yes, as we initiate the flood we will take injection surveys to first make sure that our injection is being confined to the target intervals and then, as time progresses, to try to determine ways to more effectively incorporate those sands into the overall flood program.

Q. Do you have an anticipated time period in which you would expect to be able to report back to the Division whether we should go forward?

A. As we'll see on a later slide that considers the performance of some of our analogue fields, we feel that

the most likely time required to evaluate response from this pilot area is about three years, three to four years.

Q. If the project, pilot project, is able to determine the feasibility of injecting water in and increasing recovery out of the C and the D intervals, within the operational concept of the pilot plan, would you then seek to go into the AA and to the B portions?

A. Yes, that's our current plan.

Q. So that's what you're asking for approval for, is to make the operational decisions about whether you go into the AA and the B?

A. Yes.

Q. It wouldn't be your intent to come back and seek further approvals for those? That wouldn't be necessary in your opinion?

A. Not in my opinion.

Q. Are you satisfied that the northern two-thirds of Section 23 is a logical area in which to have a pilot waterflood test?

A. Yes.

Q. Let's turn to the next slide and have you help us understand why you're recommending we initiate a pilot project?

A. Yes, this slide addresses the question of why do we want to do a pilot? And in evaluation of Parkway and

Avalon, the wells showed significant difference on a per-well basis in injection rate and incremental oil response in the lower Brushy Canyon members. And the most logical reason for this difference is a significant difference in reservoir permeability.

The rate-time analysis that we did on East Loving lower Brushy Canyon indicates that it has lower permeability than Parkway.

And in comparison -- a comparison of the net pay parameters, the $S_o(\phi)h$, if you will, to cumulative recovery in the East Loving Section 23 wells does not give a good correlation.

When we looked at the RFT data in the -- Well, excuse me. The C and D intervals in Section 23 have about one-third of the original oil in place, whereas two-thirds of the oil in place is contained in the AA through B intervals. However, when we looked at the RFT data gained from infill wells in this area, the data showed consistent depletion in the C and D intervals, while other zones show little or were inconsistent depletion. And because of this, it is felt that early on the most responsive zones will be the C and D intervals.

What we hope to gain from this pilot is a more thorough knowledge of what the vertical conformance is in this field, and the injectivity. Injection is the thing

that -- injection rate is the thing that really drives the economics of this project, and we're hoping to have sufficient injectivity to show that we have an economically feasible project.

And finally, we want to see, you know, to some degree, oil response. It's possible that we might take additional pressure measurements, do additional analysis, either with normalized rate-time declines or even reservoir simulation, to try to better understand the contribution of each of the individual zones. Once we have a better understanding of the individual zones, we feel that we'll have the ability to put together -- to formulate a more equitable unitization formula, and we hope to go forward with unitization to expand the project beyond Section 23.

Q. In your comments, Mr. Zadick, you made reference to the Parkway and the Avalon. Do you have a map that shows us where those project waterfloods are in relation to yours?

A. Yes, that's the next exhibit. And the next exhibit is simply that, it's an exhibit of the -- showing the easternmost part of Eddy County, and highlighted are Loving East field to the south, and then in between, Avalon, and then Parkway.

Waterflooding in the Delaware sands is a recently new process, and the reason is because the sands are thick

and massive, they're relatively low permeability for waterflooding, and they have laterally limited areal extent in some instances. But these two fields have sufficient history to serve as good analogue fields, and so part of our study was to look at the performance at Parkway and Avalon and try to understand how their performance -- what it could teach us about how well the performance would be at East Loving.

Of the two, we think that Parkway is the better example, because it's restricted to the lower Brushy Canyon members, whereas Avalon is simultaneously flooding the Cherry Canyon and lower Brushy Canyon members.

Q. Let me have you give Examiner Catanach the benefit of your executive summary of your analogue with the Parkway, as compared to the East Lovington [*sic*] project. Would you do that for us?

A. Sure. This next slide shows the comparison of reservoir properties between Parkway and East Loving. As you can see, the initial GOR at Parkway was about 1300, whereas at East Loving it's somewhat lower, around 700.

Parkway has about 1000 acres total under flood, it has 28 million barrels in the C zone, what they call the C zone, and the total lower Brushy Canyon member about 67 million barrels.

By comparison, the AA through D zones in the

Range-operated properties are about 62 million barrels. And in the study area south of the river, the AA through D is about 41 million barrels, and the C and D zones contain 14 million barrels.

The initial hydrocarbon saturation and porosity at Parkway are slightly higher on an average basis than what we see at East Loving field In addition it appears that the permeability is higher, from normalized rate-time analysis.

The primary voidage in both fields at the end of primary is about the same level, and both fields were below the bubble point at the start of the waterflood -- will be below the bubble point at the start of the waterflood.

The formation volume factor from the literature at Parkway suggests that it has a little bit lower formation volume factor, and that would accommodate a little more oil in the reservoir.

The next slide shows the production history at Parkway. What is shown here on the X axis is time, and on the Y axis is the logarithm of the various parameters contained in the legend. The dark heavy green line is daily oil production, the blue line is produced water, whereas the magenta line on top is the daily injected water.

The red curve -- the lighter red curve is the

gas-oil ratio, the heavier red curve on this slide is the number of injection wells, and the maize curve is the number of active producing wells.

As you notice, the waterflood in Parkway was initiated in late 1993, but it wasn't until five years later when they drilled additional injection wells and initiated a fivespot pattern, a regular fivespot pattern, and fracture-stimulated all the injection wells that they started seeing significant upturn in oil production.

There are two straight lines on this curve that approximate two different estimates of primary depletion. And the reason that there are two lines is because of the period of time that occurred between starting the waterflood and fully developing the field to the fivespot pattern, and as well there were increases in the number of active wells.

We used both of those decline curves, then, as an estimation of primary recovery -- that is, how much oil would we recover if we did nothing? -- and looked at the difference between actual production and those declines as an indication of how much secondary recovery was occurring in the field.

Q. Do you have a comparison that you can share with us about the Avalon?

A. Yes, I do, and that's the next slide. And it

shows the comparison of reservoir properties between Avalon and East Loving-Delaware.

As you can see, the initial GORs are quite similar. But as I stated earlier, Avalon is flooding both the Cherry Canyon and the Brushy Canyon. And for this reason the field isn't quite as direct -- directly applicable as an analogue.

In addition, the 150 million barrels that Exxon quoted in their waterflood feasibility application is a combination of is a combination of moveable water as well as transitional -- excuse me, moveable oil as well as transitional oil. And the idea is that the transitional oil represented what they thought was available if they went to a CO_2 process. The actual waterflood moveable oil in the two intervals was more like about 80 million barrels.

The connate water saturations for the two fields are comparable. The initial pressure at Avalon was slightly lower than at East Loving. Depending on how you do the material balance, the level of depletion at the end of primary is either lower to slightly higher -- or to about the same on the two fields, and both fields went below the bubble point and developed an initial gas saturation. Formation volume factors are about the same.

The key thing at Avalon is reservoir

permeability, and we'll see an indication of that on the next slide.

This slide shows the production history at Avalon field, and it's similar in construction to the one we talked about earlier at Parkway. There are two things that I'd like to point out on this slide.

In the waterflood application, Exxon quoted a target of 8.2 million barrels. And if you look at this slide, the major difference between this slide and the one at Parkway is that on the tail end of the oil production -- they have the oil production line -- I've put in a solid blue line and then a solid red line, and I'll talk about those a little bit later.

The total injection into Avalon field, into both the Cherry Canyon and the Brushy Canyon, is about 4000 barrels a day, and that's into 17 or 18 wells. So the amount of oil that's -- or the amount of water that's being injected into the lower Brushy Canyon at Avalon is considerably lower than the average 500 barrels a day that's being injected at Parkway. For this reason, we believe that, you know, the lower Brushy Canyon at Avalon has significantly lower permeability.

The dotted green line on this construction is the estimated primary decline, and that's adjusted upward to take into account the increase in the number of active

producing wells.

The blue line is a shallow decline that follows the last year or so of decline at the field, and if you continue that all the way out constantly to the economic limit, you will recover 8 million barrels. But if after five years the decline rate steepens to the red line, then you recover the 3.8 million barrels. And where this is relevant is in arriving at an idea of how the secondary-to-primary ratios at Avalon compare to those at Parkway.

Q. Let's look at your forecast, then, for the East Lovington.

A. Okay, this is a -- We generated forecasts in two ways. The first was to look at analog performance at Parkway and Avalon and to adjust -- and to develop type curves for two types of wells. The first is a well that is totally confined by, or surrounded by, injection wells. The second is a well that is not confined.

So we develop two types of type curves, and then we normalize those curves based on wellbore parameters, $S_o(\phi)h$, if you will. And then we used that curve to come up with a forecast of what we thought would happen in the pilot area. In the pilot area we have two confined producers, and the balance of the producers are unconfined.

So what's shown on this curve is actually the forecast -- well, let me back up. There was a second

forecast made using a screening model that is driven by Caudle-Witt dimensionless curve analysis. And what's shown on this curve is the second forecast, is the forecast from the second method, which is the screening model. The history that's shown here is the history from just the production from the C and D intervals, for the wells in the pilot area. And then the continued decline for those wells, if we do nothing, is shown by the dotted line.

The solid dashed line, the heavy dashed line, is the incremental -- is the secondary forecast, and it peaks at a little over 380 barrels a day of incremental oil. And the heavy magenta dashed line is the expected injection rate from the screening model.

This next slide, then, looks at two things. It looks at the extrapolated primary recovery in the C and D intervals only, and if we do nothing in the C and D intervals, we estimate that we would have recovered 800,000 barrels, a little over 800,000 barrels, from the pilot wells.

If we initiate this pilot waterflood according to the screening model, and confirming the results of the analog method that we use, the recovery will be a little over 900,000 barrels, and that's about a 1.1 secondary-to-primary ratio.

Now at Parkway the expected secondary-to-primary

ratio is about 1.6. At Avalon, remember, we looked at two different endpoints, one being the 3.8 million barrels that was arrived at by some construction of different -- of steeper decline rates, and the higher number being the 8 million barrels that Exxon testified to from the modeling work. And the lower value gives you a primary-to-secondary ratio of about .8; the higher value is about 1.8. So, you know, this work kind of falls in between all of those parameters and is what we're expecting.

Q. As an engineer, what type of data would you hope to obtain from a pilot project for the project area?

A. Well, the first thing that we'll see is a measure of injectivity. That will give us a better handle on permeability in the C and D intervals. We plan to go ahead and do production and temperature surveys to see how successful we are in confining water injection to those intervals, and that will give us a better understanding of what the contribution is of the C and D intervals, as compared to the AA through B intervals.

The second thing that we hope to do is to get an idea of how the producing wells respond to this injection. You know, are we dealing with any kinds of problems with anisotropy or directional permeabilities.

And then finally -- and of course being a consultant, you know that I'm going to recommend this -- we

have the opportunity to study the field in more detail, possibly doing some reservoir simulation.

Q. Is there an opportunity, with approval of this Application, to recover oil that might not otherwise be recovered?

A. Yes.

Q. Would you recommend to the Examiner that he approve this Application?

A. Yes.

MR. KELLAHIN: That concludes my examination of Mr. Zadick. We move the exhibits that he has identified and discussed, that are contained behind Exhibit Tab Number 4 -- I'm sorry Number 5.

EXAMINER CATANACH: Five? Exhibit Tab Number 5 and all its contents will be admitted.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Zadick, one of your exhibits, I believe, referenced inconsistent depletion. Can you explain to me what that is, in your mind?

A. We took RFT data. RFT stands for repeat formation testing, and what this is is a small device that you mechanically attach to the surface of the well at a very small interval, you produce a little bit of fluid from the well and monitor the pressure buildup in this small

chamber, and you do this all up and down the hole.

And what we saw in the C and D intervals is that the reservoir showed lower pressures from the RFT data, consistently lower pressures, and -- both in a vertical sense within the C zone, and laterally in between the wells that we took the measurements on.

But when we went up to the AA through B members we did see some depletion, but it was not as low and it was not as consistent across the area.

Q. That's telling you --

A. Does that explain it?

Q. That's telling you that the wells in the upper zones are not draining as efficiently as the lower zones; is that --

A. Yes.

Q. -- basically what you're saying?

A. And so if you injected water, the question is, could we effect as much lateral sweep in the upper zones as we can in the C and D members?

Q. Now as I understand it in this Application, you're going to go -- right away inject into the C and D zones, but you guys want authority to inject into the whole interval, if you choose to do so, at a later time within the pilot area; is that right?

A. Right.

Q. Okay. Mr. Zadick, this is the first attempt at a waterflood in the East Loving?

A. Yes.

Q. Okay. And do you see any CO_2 potential in the field?

A. The fluids are amendable to CO_2. They're a little bit gassy. I think reservoir temperature and oil gravity are consistent with what would be a good CO_2 target. At this time, the reservoir pressure in the C and D zones are too low to be miscible with CO_2, so the preferred opportunity is to first use waterflooding to bring pressure back up and then initiate CO_2. Of course, I haven't discussed this with Range.

Q. Now, the secondary-to-primary ratio, that -- that you showed on one of your exhibits, that's only for C and D?

A. Yes.

Q. Did you do one for the upper zones, or can you do that?

A. The answer is no, I did not do that. Given time, I think I could, I just didn't do it.

I did state earlier that the upper side of recovery for all the zones is about $1.9 million barrels, so maybe another -- there's a target of another million barrels in the AA through B zones. But it appears to be at

much lower permeability.

Q. The Parkway -- is the Parkway -- is that the old Siete waterflood that's in there?

A. Uh-huh.

Q. Okay, I remember that one.

A. Now operated by St. Mary. And I think St. Mary is the one that actually did the expansion to develop the flood on a fivespot pattern. They've had very good luck with it.

EXAMINER CATANACH: Okay, that's all I have.

MR. KELLAHIN: Mr. Examiner, at this time we'll call Mr. Dwayne Bryant.

DWAYNE BRYANT,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. Dwayne Bryant. I'm senior reservoir engineer with Range operating engineer with Range Operating New Mexico.

Q. Mr. Bryant, on prior occasions have you testified before the Division as an engineer?

A. Yes, I have.

Q. And pursuant to your employment as an engineer with Range, have you made a study of the production and the economics associated with this pilot project?

A. Yes, I have.

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

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Mr. Bryant, if you'll pick up on the exhibit book at the display following the last one that Mr. Zadick testified to behind the PE Study tab, you're going to get a spreadsheet that shows you wells by name and production numbers. Do you see that?

A. Yes.

EXAMINER CATANACH: I'm sorry, where are we at?

MR. KELLAHIN: We're behind the engineering study tab, and we're looking at the black-and-white spreadsheet that's captioned Lovington East Well Summaries.

EXAMINER CATANACH: You're not on Tab 6, yet? Is that what you're talking about?

MR. KELLAHIN: On Tab 5 --

EXAMINER CATANACH: Tab 5.

MR. KELLAHIN: -- Tab 5, turn till you see no more color tabs, then it's the first black-and-white display. I think you've got it right there.

THE WITNESS: I believe it's the previous one.

MR. KELLAHIN: There you go.

EXAMINER CATANACH: Okay, got it.

Q. (By Mr. Kellahin) Okay. Did you prepare this?

A. Yes, I did.

Q. What's the source of the data?

A. This table shows the 14 producing wells in the study area, their cum production from all of the Brushy Canyon intervals, estimated remaining recoverable reserves and the ultimate recovery. It also shows what the wells are currently producing and the GOR for each.

And as Tom and Martin pointed out in their testimony, in their presentation, there's some inconsistencies with -- appear to be some inconsistencies with the $S_o(\phi)h$ and the ultimate recovery. I'd like to point out just two -- the two best wells in this area do not have the highest $S_o(\phi)h$. The 23-1, if you'll notice, has an EUR of about 265,000 barrels; and the 23-5, 222,000 barrels. Those are the two best Brushy Canyon wells in this 480-acre tract, but they're not in the highest $S_o(\phi)h$ area of the field.

And as shown on the -- the total remaining reserves of 413,000 barrels, these -- this is the estimate I used in evaluating the remaining value of these wells if no waterflood is attempted. This should be the remaining recoverable reserves from the Brushy Canyon.

Q. Mr. Bryant, let me ask you some questions about what you as an engineer would hope to obtain from a pilot project. What kind of data would you obtain?

A. Well, I would hope to obtain additional bottomhole pressure data from the new wells that we had drilled, the injectors, which has been real critical in the past, like has been mentioned before, the C and the D especially, which has been real critical in the C and the D, the pressure has been so low, and we need to learn about the injectivity in the well to see if we would expect to achieve a waterflood, as well as any profile surveys that we might need. We need to know about the vertical conformance of the sands.

So there's various information that we would look forward to getting there.

Q. Let me ask you about the location of these six injectors in relationship to the producing wells, and the issue is, are correlative rights fairly protected if production associated with the producing wells, whether it's primary or secondary, continues to be paid only to the owners of those producing wells?

A. Yes, I think it's --

Q. The relationship is such that you're going to see sweep efficiencies --

A. Right.

Q. -- that would benefit all the parties appropriately?

A. I think so. The injectors are in close proximity to the lease lines, and the geometric distribution has been taken into account across the pilot area in terms of the injectors and producers. So we appear -- it appears to be equally spaced and, as we can best determine, should be an equitable distribution.

Q. Taking the production information, the analysis Mr. Zadick did for you, and your knowledge about how to calculate the economics of a project, have you been able to calculate and conclude that this project is economically viable if the Examiner will approve it for you?

A. Yes, we have.

Q. Do you have a summary display that will explain this?

A. It's the next one, labeled Economics Table. The first column represents the current operations, as the complete stand now. There are a couple zones -- a couple wells where the C and the D have not been opened up, but we feel like that they will not contribute much because of the low pressures that we've been seeing so far. But under the current operations we estimate 413,000 barrels recoverable oil and 2.8 BCF, which have an undiscounted value of $25.3 million on a 100-percent-working-interest basis, and a PV

10 of 16.3.

Based on Tom Zadick's reservoir study, he's concluded that we could expect 915,000 barrels incremental waterflood oil and approximately .3 of a BCF of gas. The estimated capital expenditure is $5.415 million, which includes facilities, conversions of existing wells and drilling injectors, et cetera, and this would generate an undiscounted income of $30 million and a PV 10 of almost $13 million, just the incremental flood revenue.

And these economics were based on the prices you see below there, which change all the time, but they're based on NYMEX, based -- less transportation charges and that sort of thing.

But it does appear to be a viable project economically.

Q. One portion of the Application, in the event the project qualifies for the New Mexico enhanced oil recovery tax rate credit -- do you have a forecast that the Examiner might use as a baseline for judging this project so he would later on -- if you came back and showed a positive injection response for the project area, he would have a way to quickly come back and check the forecast?

A. Right, the next slide --

Q. Yes, sir.

A. -- demonstrates that. This represents the C and

D forecast under the primary conditions, and the forecast that we have in our evaluation, which is based on Parkway. As you can see, the peak is around 300 barrels a day and then falls off. This is based on Tom Zadick's review of the East Loving, based on the Parkway analog, because we feel like it's the best analog to use, because the other one had injection also in the Cherry Canyon as well as the Brushy Canyon. And so we felt like this represented the Loving projection better, so this is what's in our economics.

Q. In conclusion, then, if we go back to the first display, which is the general locator map for the project area, at this time there are six proposed injection wells, and they're unorthodox insofar as they're closer than 330 to a quarter-section line. In your opinion, is it necessary to put these wells approximately where you've placed them on this map?

A. Yes, it is. We believe it's necessary to maintain equity and have a better distribution.

Q. Is it logical to assume that these approximate locations would give you a pattern that will give you the chance to produce data that would be useful in deciding whether to further expand and develop the project area?

A. Yes, it would.

MR. KELLAHIN: That concludes my examination of

Mr. Bryant. We move the introduction of his displays that are shown behind the remaining portion of Exhibit Tab 5.

EXAMINER CATANACH: Those remaining items behind Exhibit Tab 5 will be admitted.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Bryant, the production forecast you've got, that is actual production from that field, right?

A. That's right, on the graph there.

Q. Yeah, from that pilot area?

A. Right, that's extra production, yes.

Q. Okay. And the green solid line is forecast?

A. Right, right.

Q. Okay. As far as the recovered oil tax rate, it's my recollection that that kicks out at a certain oil price.

MR. KELLAHIN: Well, we hope to be above it, as we are now.

THE WITNESS: About 28 --

Q. (By Examiner Catanach) Yeah, I think it's -- Is it 30?

A. It's around 30. It may be 28 to 30.

Q. Okay. I was going to ask you how you developed your forecast for your future price of oil?

A. For the future price of oil?

Q. Yeah.

A. Well, it changes all the time, for one thing. And it's based on the NYMEX, lists appropriate transportation charges, and that -- we get one of those every week, usually.

Q. But you've got it pretty flat over the next --

A. Yeah.

Q. -- decade or so.

A. Yeah, that's --

Q. Is that what you guys truly think is going to --

A. After 2015, we're just holding it flat because we feel like we don't have any -- it's just -- it's just going to be anybody's guess beyond that.

EXAMINER CATANACH: That's all I have.

MR. KELLAHIN: We ask that Mr. Bryant be excused, and we'll call at this time Mr. Andrew Tillis.

ANDREW TILLIS,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. Andrew Tillis, completion engineer for Range Resources.

Q. Mr. Tillis, on prior occasions have you testified

before the Division?

A. No, I have not.

Q. Summarize for Mr. Catanach your education.

A. I have a BS in agricultural engineering from Texas A&M in 1996 -- and you said work history?

Q. Yeah, how about your work history?

A. Out of school I went to work for Halliburton Energy Services in east Texas, and I was -- worked pumping services there, cementing, stimulation, everything you do at Halliburton I did. Did that for four or five years, then I went to a small oil and gas company in Dallas named Matador Petroleum Corporation as a completion engineer there and was subsequently bought out a couple years later by Tom Brown, and another eight months or so later bought out by Canada, and then I went to Range Resources shortly after the Canadians took over.

Q. Is it within your area of responsibility to be the engineering personnel that's assigned to preparation of the Division Form C-108?

A. Yes.

Q. And have you done that?

A. Yes, I have.

Q. And you're familiar with the completion and operational aspects of these wells?

A. Yes.

MR. KELLAHIN: We'd tender Mr. Tillis as an expert witness.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Let me direct your attention to the balance of the exhibit book, which are the documents contained behind Exhibit Tab Number 6, and we'll get to the first page of the Form C-108. Let me ask you some general questions about the content of this package, Mr. Tillis.

Can you direct our attention to an area-of-review map? I think if you turn two pages back --

A. Two pages back --

Q. -- you're going to -- Mr. Catanach, in you exhibit book I have given you a color copy foldout that's large enough that you can actually read it.

Within this area of review, meaning the half-mile radius around each injector well, Mr. Tillis, have you tabulated all the wellbores?

A. Yes.

Q. Is there any wellbore within the area of review that's been plugged and abandoned?

A. Yes.

Q. Can you find that for Mr. Catanach on one of the maps or on one of the spreadsheets?

A. Yes, on the -- on that large foldout map, the -- in the southwest quarter of Section 23, it didn't -- the

name didn't come up good, it's kind of over the top of another name. You'll see the very -- the corner to the very -- the well to the very most southwest, the SCB 3. It will be the well that's over and up one, it has -- no, actually the well direct due east of that one, would be the Brantley Com Number 1. It will be a P-and-A well. So it's the second one from the east on the very bottom.

Q. Have you examined the records for that well?

A. Yes, I have. I calculated cement top, but I -- it slipped my mind that it had been plugged, so I don't have a schematic of what the plugging operation entailed, so --

Q. We'll come back to that in a second.

Attached to the very end of this, if you'll unclip the three-ring binder, there's a foldout on legal paper of a tabulation of data. Do you have that?

A. Yes, I do.

Q. Does this represent your work product?

A. Yes.

Q. Have you gone through all the data as best you can do to tabulate all this data?

A. Yes, I have.

Q. Give us an example, without reading all the information, of the general character of the data that you've looked at that's shown on this display.

A. Most of the wells in the areas of review are pretty standard 5-1/2 at the bottom, 12, 8-5/8 surface, 5-1/2 to TD. There are some wells in there that are Morrow and deeper -- to deeper horizons, that have various casing programs with the 9-5/8 and 7-5/8 across our zones of interest in some instances.

This sheet is divided out, it's just a -- some of these are repeat wells. At the very top of each page is the name of the well that's -- that these -- that the tabulation for that page belongs in its area of review. So the first page is the 23-18, would be our injection well. All the wells on that page will be in its area of review. And of course, there's a lot of repeat wells. I just took every single well that was in the circle and put it on the page for that particular well.

And the very far right is the calculation of the top of cement, which I used --

Q. Let's talk about problem wells. When I say problem well, I'm looking at a well within the area of review that has been drilled and completed in such a fashion that there's not adequate cement above and below and across the injection interval. Do you find any problem wells?

A. No, I don't.

Q. When you look at all wells in the area of review,

do you have data from which to show measured tops of cement or data from which you can calculate top of the cement?

A. Yes, I do.

Q. When we look at your spreadsheet, how do we distinguish a wellbore that has a measured top of cement from one in which you have done a calculation?

A. These are all -- on the spreadsheet, everything is a calculated top of cement, based off of well records from the amount of cement put in the well.

Q. So when I look at your spreadsheet on the first page and look at the far right, and I read down and the second one says zero, what's the zero mean?

A. It means that the cement will be to surface.

Q. Okay. All these calculations were made by you?

A. Yes.

Q. What numbers or assumptions are you making in your calculations so that Mr. Catanach will know how you did that calculation?

A. I used gauge holes for whatever size -- whatever the hole size was, and I used a yield of 1.32 and a 50-percent -- I reduced the amount of cement by 50 percent.

Q. Okay. And so the number that's displayed on here will represent that?

A. Yes.

Q. Do you find any instances where you have less

than 500 feet of cement across the top of any of these adjoining wells within the area of review?

A. No.

Q. Is there any indication from examining the records that there are any waterflows on the surface associated with any of these wells?

A. No.

Q. To the best of your knowledge, what is the deepest known freshwater in the area?

A. I just know the depth that we set our surface casing, so I can't --

Q. And what is that?

A. Our surface casing would be to 500-plus.

Q. And that's required by the Division District Office?

A. Yes.

Q. Do you have a schematic in the C-108 that will show Mr. Catanach how you propose to complete -- drill and complete and set up the injector wells?

A. Yes, there's an injection well data sheet for each injection --

Q. Turn to one and let's go through one quickly, as an example.

A. The first one is the 23-15, which is an existing well, and it will be -- okay, so it will be -- that one

would have 8-5/8, 578 feet, 5-1/2 down to 6424, which would be similar -- I would expect similar depths on all the injection wells that this existing well has. Anyway, we ran a DV tool on it. You don't always have to run a DV tool in this area, but with some of the depletion we saw, we had to run DV tools on, and some of the wells we tried infilling here, so I expect we'll probably have to run DV tools on all of our injection wells.

And then after we've drilled the well, we would perforate in the C zone, and we would have a packer with plastic-lined tubing in each one, for injection.

Q. Are you familiar with the operations of Range with regards to their saltwater disposal well?

A. Yes.

Q. Are you having any trouble with that disposal well?

A. We're getting close to our limitational pressure on the disposal well right now.

Q. If the Examiner uses the Division standard of limiting your pressure to 0.2 p.s.i. per foot of depth as a starting point for your injection pressure limitation, is that at this point acceptable?

A. Yes, it is.

Q. If he provides an administrative procedure for you submitting step rate tests, is that acceptable?

A. Yes, it is. We're not -- I don't know that we can use a disposal well as an analog. It's going into a different interval than the Brushy Canyon.

Q. I was interested in the concept of the pressure limitation.

A. Oh, yes.

Q. So you're familiar with that?

A. Yes.

Q. And if we start out with the Division benchmark of 0.2 p.s.i., we're all right?

A. Yes.

Q. Are there any special operational problems associated with running or operating these six injection wells?

A. To me, it's all a specialized case, but I don't see anything unusual about the operation. We will have, of course, you know, lines going to each injection well that will have pressure on them, and that's something we'll have to take into account, be careful about, because when that's the case you have to be careful, because if you get a leak it'll be -- you'll have to watch for spills with pressured lines with saltwater.

Other than, no, I don't see any -- any problems with it.

MR. KELLAHIN: That concludes my examination of

Mr. Tillis. We move the introduction of his exhibits contained behind Exhibit Tab Number 6.

EXAMINER CATANACH: The exhibits under Exhibit Tab Number 6 will be admitted.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Tillis, why is it necessary to run a DV tool in some of these wells?

A. We can't -- It'll be difficult to get cement back to surface. With low reservoir pressures we'll end up losing circulation, and we won't get cement to surface. We'll have run a DV tool in two stages so you have less hydrostatic on the lower zones that are depleted, in order to get cement to surface.

Q. Now on the area-of-review tabulation, you calculated a top of cement for the production casing?

A. For the casing string that was crossing our zone --

Q. Right.

A. -- that we'd be injecting.

Q. Did you look at the surface casing to see if that was --

A. I did not calculate that.

Q. Okay, but generally is that circulated in this area, generally?

A. Yes, back to surface. I would expect all of those to be back to surface, but I can perform that calculation.

Q. No, that's not necessary. And you mentioned something about a plugged well that you didn't have a schematic for.

A. No, I do not. The well is on our lease, so we have the well records. I just --

Q. Okay, can you provide that to us?

A. Yes, sir.

EXAMINER CATANACH: Okay. I don't have anything else. Mr. Kellahin?

MR. KELLAHIN: All right, sir. That completes our presentation for today, Mr. Catanach. We would ask that you continue this case to the June 8th docket, and we'll take care of the details that we talked about a while ago.

EXAMINER CATANACH: Okay, this case will be continued to June 8th. And -- okay, that does it.

MR. KELLAHIN: Thank you.

EXAMINER CATANACH: Thank you.

(Thereupon, these proceedings were concluded at 11:45 a.m.)

* * *

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 13705, heard by me on May 11, 2006.

David R. Catanach, Examiner
Oil Conservation Division

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 May 28th, 2006.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 16th, 2006