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. 11,848
APPLICATION OF SANTA FE ENERGY RESOURCES, INC., FOR SALTWATER DISPOSAL, EDDY COUNTY, NEW MEXICO	ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: DAVID R. CATANACH, Hearing Examiner

September 4th, 1997

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Division, DAVID R. CATANACH, Hearing Examiner, on Thursday, September 4th, 1997, at the New Mexico Energy, Minerals and Natural Resources Department, Porter Hall, 2040 South Pacheco, Santa Fe, New Mexico, Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

* * *

I N D E X

September 4th, 1997
Examiner Hearing
CASE NO. 11,848

* * *

E X H I B I T S

Applicant's	Identified	Admitted
Exhibit 1	6	11
Exhibit 2	7	11
Exhibit 3	8	11
Exhibit 4	9	11
Exhibit 5	11	11
Exhibit 6	17	18
Exhibit 7	17	18

* * *

A P P E A R A N C E S

FOR THE DIVISION:

RAND L. CARROLL
Attorney at Law
Legal Counsel to the Division
2040 South Pacheco
Santa Fe, New Mexico 87505

FOR THE APPLICANT:

JAMES G. BRUCE, Attorney at Law
612 Old Santa Fe Trail, Suite B
Santa Fe, New Mexico 87501
P.O. Box 1056
Santa Fe, New Mexico 87504

FOR YATES PETROLEUM CORPORATION:

CAMPBELL, CARR, BERGE and SHERIDAN, P.A.
Suite 1 - 110 N. Guadalupe
P.O. Box 2208
Santa Fe, New Mexico 87504-2208
By: WILLIAM F. CARR

* * *

WHEREUPON, the following proceedings were had at 11:20 a.m.:

EXAMINER CATANACH: At this time I'll call Case 11,848, which is the Application of Santa Fe Energy Resources, Inc., for saltwater disposal, Eddy County, New Mexico.

Call for appearances.

MR. BRUCE: Mr. Examiner, Jim Bruce from Santa Fe, representing the Applicant.

I have three witnesses to be sworn.

MR. CARR: May it please the Examiner, my name is William F. Carr with the Santa Fe law firm Campbell, Carr, Berge and Sheridan.

We'd like to enter an appearance in this case for Yates Petroleum Corporation.

EXAMINER CATANACH: Any additional appearances?

Do you have any witnesses, Mr. Carr?

MR. CARR: No, I do not.

EXAMINER CATANACH: Okay. Will the three witnesses please stand to be sworn in?

(Thereupon, the witnesses were sworn.)

DON ROGERS,

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

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Would you please state your name and city of residence for the record?

A. Don Rogers, Midland, Texas.

Q. Who do you work for and in what capacity?

A. I work for Santa Fe Energy Resources, and I am a petroleum engineer and project manager for Indian Basin.

Q. Have you previously testified before the Division as an engineer?

A. Yes, I have.

Q. And were your credentials as an expert accepted as a matter of record?

A. Yes, they were.

Q. And are you familiar with the Application today?

A. Yes.

MR. BRUCE: Mr. Examiner, I'd tender Mr. Rogers as an expert petroleum engineer.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Bruce) Briefly, Mr. Rogers, what is it that Santa Fe seeks in this case?

A. Santa Fe wishes to deepen the Jones Canyon "4"

Number 2 to the Devonian. We propose to complete the well in the Cisco/Canyon formation, install a downhole separator system to produce oil and gas and water from the Cisco/Canyon, separate the bulk of the water and reinject it into the Devonian, or inject it into the Devonian.

Q. Okay. Let's briefly go over the injection operations. What is Exhibit 1, Mr. Rogers?

A. Exhibit 1 is the Form C-108.

Q. And you prepared this?

A. That's correct.

Q. Would you give us just a brief summary of the injection operations, the amount injected, the pressures, et cetera?

A. Okay. We anticipate producing approximately 400 barrels of oil a day from the well and about 5500 barrels of water a day, based on some offset production performance. So we would expect the bulk of that water, that 5500 barrels a day, to be injected into the Devonian.

Q. And what about the surface injection pressures?

A. We expect the surface injection pressure would be no more than 1000 p.s.i., and under the existing rules I believe at .2 p.s.i. per foot it would be about 2120 p.s.i.

Q. That would be the maximum?

A. At the maximum.

Q. And you're below that level.

A. That's correct.

Q. Okay. Now, these are fairly large amounts you're talking about injecting. Based on what you've seen in your experience, what can -- what amounts could be injected into the Devonian?

A. We've seen Devonian wells take as much as 10,000 to 15,000 barrels a day.

Q. And so you don't anticipate any problem --

A. No.

Q. -- with these injection rates?

The last page of your C-108 is the area-of-review map. Are there any other wells -- or are there any wells within the area of review which penetrate the Devonian?

A. No.

Q. And we have a geologist who will discuss this a little bit further?

A. That's correct.

Q. Could you move on to Exhibit 2 and identify that and discuss what it shows?

A. Okay, this is a wellbore diagram of our proposed Jones Canyon well, and what we propose to do here is go ahead and deepen that Fed well down to about 11,300 to 11,400. We would set a 4-1/2-inch liner in there, and then we would run this downhole separator unit, which is a -- in this case, is a rented AQWANOT unit.

And this is just a schematic of how that unit works and what it looks like. Basically on top you have a production pump which pumps fluid to the surface, the motor below that. And then your injection pump actually takes all of your fluid and sends it through this hydrocycling unit at the bottom where the oil and gas is separated -- I mean the oil and water is separated. The water is disposed of downhole, the oil is transferred up to the production pump through the transfer tube and then produced at the surface.

Q. Okay. Now, you've mentioned some of these production rates and water rates. Referring to Exhibits -- Why don't we just refer to them together, Exhibits 3 and 4, and --

A. Okay.

Q. -- discuss what wells they involve and what you expect when you install your system.

A. Okay. Exhibit 3 is the Jones Canyon "4" 1. This is the offset to the "4" 2. It's probably 1000 feet to the southwest of this Number 2 well, I would say. And you can see by the graph -- It shows our gas rate. These are daily rates, by the way. Gas rate, oil rate, water rate and our producing bottomhole pressure, and that is actually our pump intake pressure on our submersible pump.

And you can see that at least since, say, January

of 1995, we've had no significant drop in the bottomhole pressure, the producing bottomhole pressure, and that really corresponds with a dramatic decline in our oil and gas rates.

And so we feel like that if we can increase that withdrawal rate significantly, that we could increase our production rate significantly.

Q. Okay.

A. And then Exhibit 4 is a well a little bit further to the southwest, the Old Ranch Knoll "8" 2, and this is a well that we were successful in increasing the withdrawal rate significantly.

And if you look at the pressure responses between April of 1996 down to about January of 1997, you can see that we dropped our producing bottomhole pressure significantly there, and that corresponded to a dramatic increase in our oil and gas rates.

And so we're hoping that -- you know, if this Application is successful, that we'll be able to see similar rate increases, not only in our Number 2 well, but possibly even in our Number 1 well.

Q. And the Jones Canyon "4" Number 1 well did produce at rates of about 400 barrels of oil per day during original time periods.

A. That's correct. That's correct. And right now

the 3200 barrels a day that we're producing of total fluid is the physical limitation of the submersible pump. In other words, we can't put a bigger submersible pump in the existing casing.

Q. Are there any sources of fresh water in this area?

A. No.

Q. And did you verify that with the State Engineer?

A. Yes, I did.

Q. Are there any open faults or other connections between the disposal zone and any drinking water sources in this area?

A. Not that we're aware of.

Q. What about compatibility between the injection water and the formation water? What can you say about that?

A. Well, we don't have any samples of Devonian Montoya water, but the Devonian is used widely in this area for disposal of Cisco/Canyon water.

Q. And several companies, Marathon and others, do dispose of Indian Basin or Dagger Draw water into the Devonian?

A. That's correct.

Q. Was notice of this Application given to the offset operator and to the surface owners required by Form

C-108?

A. Yes, it was.

Q. And is Exhibit 5 my affidavit of notice?

A. Yes, it is.

Q. In your opinion, is the granting of this Application in the interests of conservation and the prevention of waste?

A. Yes.

Q. And were Exhibits 1 through 5 prepared by you, under your direction or compiled from company business records?

A. Yes, they were.

MR. BRUCE: Mr. Examiner, I'd move the admission of Santa Fe Exhibits 1 through 5.

EXAMINER CATANACH: Exhibits 1 through 5 will be admitted as evidence.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Rogers, has your company previously utilized one of these?

A. No. In fact, I think in the United States only one other unit like this has been run.

MR. BRUCE: Mr. Examiner, Mr. Rogers can answer some of these questions. I also have sworn in, although he need not testify, a representative of the company that

developed this system, if you have any specific questions.

Q. (By Examiner Catanach) The other Application is where? Do you know?

A. Rangely. Rangely field in Colorado, western Colorado.

Q. Do you have knowledge about how it's performing in that application?

A. No, I do not.

Q. What's -- Is it run on just normal, regular tubing?

A. Yes, it's very similar to a typical submersible pump except you have this hydrocycling unit attached to the bottom, which directs the separated water to the injection zone in the well.

Q. Is there a limitation on the volume that this mechanism will handle, this apparatus?

A. Well, in our case, the limitation will be approximately 6000 barrels of total fluid a day, which would effectively double our current capacity. And because you're not having to lift that fluid to the surface, you can do that with approximately the same horsepower, electrical horsepower.

Q. What caused that declining bottomhole pressure in that Number 2 well? Is it just --

A. Well, you're just declining -- that's declining

producing pressure, so that's not necessarily indicative of the bottomhole pressure. But it is the producing bottomhole pressure.

And I think -- Well, we just increased our rate from 1800 barrels a day up to about 2500 barrels a day, and -- But you can see that in January of 1997 that pressure decline has basically stopped, and we're stabilized there at about 800 or 900 pounds, or about 900 pounds. And from that point forward you can see that the production has started to decline again.

Q. Is this an existing well we're talking about?

A. The Jones "4" 2?

Q. Yeah.

A. Yes, it is. In fact, we drilled the well in February of 1996, but we were unable to complete the well because of our facilities limitations. The Jones "4" 1 and wells further up on our system produce so much more water than we expected that they overloaded our system to the point that we couldn't complete the well.

And this is one way that we think we can get around that. If we don't have to bring so much fluid to the surface we can add more wells into the system.

Q. So this well hasn't produced at all?

A. No.

Q. Has it been tested?

A. No.

Q. How did you determine the potential production from this well, the 400 barrels of oil per day?

A. Well, the 400 barrels of oil per day is just what we saw in the Jones Canyon "4" 1. It produced at rates over 400 barrels a day initially and declined rapidly from there. But we believe that we could nearly double the water rates in this thing. We haven't seen any pressure decline, significant decline, in the "4" 1, even though we've produced a tremendous amount of water out of the well.

Q. Okay. If you had to complete this well conventionally, would you have the same limitations as the other well, the 3200 barrels --

A. Yes, we would.

Q. If you had that limitation, what do you anticipate the oil production would be in this well?

A. I would anticipate something similar to what the Number 1 well is making now. In other words, somewhere between 100 and 200 barrels a day.

Of course, the 5000 barrels a day of water that you're injecting you'd have to pay disposal on too, so it would be a great savings and increase the productive life of the well as well.

Q. Will there be any way to test this casing to see

if it had mechanical integrity?

A. Which casing?

A. Well, I'm not sure, the liner. I guess the liner.

Q. Well, the liner will be tested, and of course we'll circulate cement with the liner and test it. Of course, the production casing is new. It's never been perforated.

Q. Would that Devonian necessarily -- would it take it on a vacuum in this area?

A. It does, based on surface pressures, it normally takes it on a vacuum. So it's generally underpressured.

Q. Do you know what the efficiency of that separation unit is?

A. No, I don't, but the --

EXAMINER CATANACH: Okay. I guess that's all I have at this point.

JOHN HUMPHREY,

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

DIRECT EXAMINATION

BY MR. BRUCE:

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

A. John Humphrey.

Q. And where do you reside?

A. Midland, Texas.

Q. Who do you work for and in what capacity?

A. I'm a senior geologist with Santa Fe Energy Resources.

Q. Have you previously testified before the Division?

A. No, I have not.

Q. Would you please outline your educational and employment background?

A. I received my bachelor of science in geology from the University of Texas Permian Basin in 1983 and my master of science in geology from Texas Tech University in 1985.

I was employed as a geologist from 1985 to 1992 by Sun Exploration and Production Company, which later became Oryx Energy. From 1992 to May of 1997 I was employed by the Eastern Group, a gas company based in Alexandria, Virginia. As of May, 1997, I took a position with Santa Fe Energy Resources as a senior geologist.

Q. Does your area of responsibility at Santa Fe include this area of southeast New Mexico?

A. Yes, it does.

Q. And are you familiar with the geological matters pertaining to this Application?

A. Yes, I am.

MR. BRUCE: Mr. Examiner, I would tender Mr.

Humphrey as an expert petroleum geologist.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Bruce) Mr. Humphrey, would you identify Exhibit 6 and describe its contents for the Examiner?

A. Exhibit 6 is a structure map of the top of the -- subsea structure map of the top of the Devonian. There are only three wells within this 1-to-4000 map area that penetrated the Devonian, so you don't have a lot of control here, but the control points are indicated in red on the map.

And this also shows cross-section A-A', which will be Exhibit 7, which we'll discuss in a minute.

The only well of the three control points that's currently disposing into the Devonian is the Marathon Indian Basin Water Disposal Unit 1 in Section 23, 21 South, 23 East. And the other two wells were either plugged or produced out of other intervals, and the Devonian was not tested.

Q. Okay, but the Devonian isn't productive in this area?

A. No, it is not.

Q. Would you move on to Exhibit 7 and describe what that shows?

A. Exhibit 7 is a stratigraphic cross-section hung on top of the Woodford shale, which is the interval above

the Devonian. Basically all I'm trying to illustrate here is that there is sufficient porosity development in the Devonian to take the quantities of water which Santa Fe intends to inject into the Jones Canyon "4" Fed 2.

You can see on the dry hole to the southeast, you have a maximum of 18-percent porosity in the Devonian. And the well to the northwest of the Jones Canyon "4" Fed 2, you have upwards of 24-percent porosity. And Marathon did not log the Devonian after they deepened it.

Q. Okay. So from a geologic standpoint, you don't see any problem injecting water into the Devonian formation?

A. Not at all.

Q. Were Exhibits 6 and 7 prepared by you or under your direction?

A. Yes, they were.

Q. And in your opinion is the granting of Santa Fe's Application in the interests of conservation and the prevention of waste?

A. I believe it is.

MR. BRUCE: Mr. Examiner, I'd move the admission of Santa Fe's Exhibits 6 and 7.

EXAMINER CATANACH: Exhibits 6 and 7 will be admitted as evidence.

I have no questions of this witness.

MR. BRUCE: That's all I have, unless you have specific questions of the company representative.

EXAMINER CATANACH: Let's do that.

PETER J. SCHRENKEL,

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

DIRECT EXAMINATION

BY MR. BRUCE:

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

A. Peter Jack Schrenkel.

Q. And who do you work for?

A. Reda Pump Company. It's a division of Camco.

Q. And what is your job with that company?

A. I'm the product manager for the downhole dewatering systems.

Q. And you're familiar with this pump that Santa Fe proposes to use in this well?

A. Yes, sir, I am.

MR. BRUCE: Mr. Examiner, I would just pass the witness on to you for any particular questions you may have.

EXAMINATION

BY EXAMINER CATANACH:

Q. Okay. The previous witness had mentioned something about another application in Colorado. Are you

familiar with that?

A. Yes, sir.

Q. Can you go into that, or is it a similar type situation?

A. It is similar. It was installed in Rangely, Colorado. It ran for on the order of seven or eight months, and it was pulled after that period of time.

What specifically would you like to know about it?

Q. I mean, was it the same type setup in the wellbore --

A. Yes.

Q. -- production from higher zones?

A. The only difference, it was a one-pump system. The system you're looking at here is what we call a two-pump system. The other system didn't have a production pump on top. There is enough energy in the reservoir to cause the oil to be -- well, to flow to surface, basically.

Q. Okay. Was it successful?

A. It was -- I'd call it a qualified success. We didn't get the rates we anticipated because the injectivity index was much lower than what we had anticipated. But it was successful in separating oil and water.

Q. Okay. What can you tell us about the efficiency of that operation?

A. Well, generally the efficiency of a hydrocycling package is, the oil and water that goes into the underflow is on the order of 500 p.p.m. And to give you something to compare that with, typical surface separations are probably 200 p.p.m. oil carryover into disposal systems.

Q. And yours is 500 p.p.m.?

A. Yes.

Q. Are there other --

A. I guess --

Q. Go ahead.

A. I guess I should add, just for clarity, there is a range involved. It's not exactly 500 p.p.m. all the time. It depends on some other things like the viscosity of the oil, the bottomhole temperature. You know, things like this influence the separation efficiency.

Q. Have you taken a look at the oil that's going to be produced from this reservoir and kind of made a judgement on what the range would be in this --

A. Yes, it's high-gravity oil, and it's also fairly warm bottomhole temperature. So those conditions should provide excellent separation.

Where we've had some problems with this separation is in wells up in Canada that are very cold and have API gravities on the order of 14, 15.

Q. Are there other companies making this type of

pump at this time?

A. There is one other company that is just now getting into the market.

Q. So there's only been -- As far as you know, there's only been well that this has actually been tested in?

A. Oh, no, we've installed this system in 16 wells around the world, just one in the United States.

Q. Okay.

A. Most of them have been installed in Canada, we've also installed one in Indonesia, and then we've got one going in next week in Germany.

The technology was developed in Canada, and that's the primary reason the utilization -- most of the applications, most of the installations have been in Canada. I would say of the 16 units that have been installed, 13 have been installed in Canada.

Q. Does this actually inject -- Would this inject fluid at a pressure?

A. Yes, the pump generates the pressure necessary to force it through the separation system, and there is a small pressure drop going through the separator, but, you know, the pump creates the pressure required to overcome the injection pressure into the reservoir.

Q. Do you know what the max pressure that pump

generates is?

A. Well, the system limitation for a two-pump system is, we have a high-pressure seal that sees a maximum differential pressure of about 3500 pounds. Okay? But what the pump is actually generating is a differential pressure.

And so it's really a little bit misleading to talk about the absolute pressures that you can inject into, because it depends not only on your reservoir injection pressure but also on the producing pressure that's above it, because what the pump generates is a differential pressure.

But, you know -- Well, I guess I really can't clarify it any more than that.

Q. Well, have you calculated what pressure -- what injection pressure you might be working at in this well?

A. Yes, sir, what we're anticipating for an injection pressure in the Devonian, I believe the number was on the order of 3300 p.s.i. That's what the static pressure would need to be required to get fluid into the formation.

And then we'll also have some hydrostatic above the pump from the Canyon. I think the bottomhole pressure in the Canyon, if I remember right, is about 1200 pounds. And so therefore the differential pressure that the pump

would have to generate is the difference between the two. So it's going to be on the order of 2600 pounds.

Q. So 2600 pounds is going to be the pressure at the -- in the Devonian --

A. Yeah --

Q. -- at the Devonian?

A. No, that's the pressure the pump will have to generate.

Q. Okay.

A. The pressure in the Devonian will be something, somewhat higher than the anticipated 3300 pounds reservoir pressure.

Q. And that unit is sealed so that it can't -- water can't escape into the annulus; is that correct?

A. Well, the way the system works, there is a packer. And, you know, the fluid comes into the intake of the pump, and the pump forces it down through the hydrocycling separator --

Q. Uh-huh.

A. -- and the oil reject, as it's referred to, comes out of the top of the separation unit, and it's piped around the motor into the upper pump if one is required. And then the clarified water goes on down through the separator and through the packer.

So, you know, one of the things that, you know,

you have to have in this system is zonal isolation. So you've got to have a functioning packer and also have, you know, good cement behind pipe. And also formations between the producing zone and the injection zone with good integrity.

What the annulus will see is the pressure from the producing zone.

Q. That won't be in communication with the bottom, with the Devonian perforations?

A. No, sir. If it is, the system won't work.

Q. Uh-huh. Is there any way to -- There's not a method to determine what volume you're injecting into that Devonian?

A. Well, there is metering that is available, and we're planning on running downhole monitoring on this system.

What that amounts to is two pressure measurements with a venturi sandwiched between the pressure measurements. And so knowing the differential between the pressures, you can calculate the flow. That has also been successfully installed in Canada.

Q. Do you propose to run that on this well?

A. Yes.

Q. What do you calculate? A daily rate from that?

A. Yes, an instantaneous rate.

Q. And will you be able to tell at any given time what pressure is being generated for water injection?

A. Yes.

EXAMINER CATANACH: I have nothing further of this witness, Mr. Bruce.

MR. BRUCE: I have nothing further in this case, Mr. Examiner.

EXAMINER CATANACH: Mr. Carr, did you have anything?

MR. CARR: I do not.

EXAMINER CATANACH: Okay.

All right, there being nothing further in this case, Case 11,848 will be taken under advisement.

(Thereupon, these proceedings were concluded at 11:53 a.m.)

* * *

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 11848, heard by me on September 1997.

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 September 7th, 1997.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1998