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

24 May 1989

EXAMINER HEARING

IN THE MATTER OF:

Application of Phillips Petroleum Company to amend Division Order No. R-3668 by authorizing a carbon dioxide pilot project, Lea County, New Mexico. CASE 9678

BEFORE: David R. Catanach, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Division:

For Phillips Petroleum Company: W. Thomas Kellahin
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I N D E X

E X H I B I T S

MR. CATANACH: Call Case 9678. The application of Phillips Petroleum Company to amend Division Order No. R-3668 by authorizing a carbon dioxide pilot project, Lea County, New Mexico.

Are there appearances in this case?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin & Aubrey, appearing on behalf of the applicant and I have one witness.

MR. CATANACH: Any other appearances?

Will the witness please stand and be sworn in?

(Witness sworn.)

SUSAN G. COURTRIGHT,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Ms. Courtright, for the record would you please state your name and occupation?

A My name is Susan Courtright and I'm a reservoir engineer for Phillips Petroleum Company.

Q Ms. Courtright, on prior occasion have you testified before the Oil Conservation Commission or Division of New Mexico?

A Yes, I have.

Q And have you done so in your capacity as a reservoir engineer?

A Yes.

Q Pursuant to your employment as a reservoir engineer, have you made a study of Philips' Philmex cooperative waterflood project area?

A Yes, I have.

Q As part of that study were you examining as a reservoir engineer the potential feasibility of conducting on a pilot project basis the injection of carbon dioxide into that area?

A Yes, sir, I have been concentrating my efforts in developing a CO_2 flood in this area.

Q Let me have you take what is marked as Phillips Exhibit Number One and identify for Mr. Catanach what you and I understand is the Philmex waterflood area that we're going to describe in today's hearing.

A The Philmex waterflood area is shown in the -- is outlined in brown in Sections 28, 27 and 26 of

Range 33 East in Township 17 South. That compromises (sic) the majority of our Philmex lease and the order which we seek to amend is Order 3668, and that was permission to inject water into our Philmex Well No. 6, which is shown in the lower lefthand corner.

Q Does Phillips Petroleum Company also operate other waterflood areas in the Grayburg and San Andres formations of this particular portion of Lea County, New Mexico?

A Yes, they do. Two of particular interest are the Northeast Maljamar Waterflood, which is located directly north of the subject area and is outlined in red.

And we also have Lea Waterflood, which is operating in the area outlined in black.

Q Pursuant to your study have you reached certain engineering conclusions about the utilization of carbon dioxide as a means by which to improve oil recovery in this particular area?

A Yes. I feel that through CO_2 injection we'll both be able to increase our recoverable reserves and also extend the producing life of the reservoir.

MR. KELLAHIN: At this point, Mr. Catanach, we tender Ms. Courtright as an expert reservoir engineer.

MR. CATANACH: She is so qual-

ified.

Q Ms. Courtright, are there other examples either by your company or other companies in this general vicinity whereby they have already implemented or utilized carbon dioxide in either secondary or tertiary recovery operations?

A Yes, sir. On either side of us are -- to the east is our East Vacuum Grayburg-San Andres CO_2 injection project and six miles to the west of us is Conoco's Maljamar CO_2 project.

Q Let's save Exhibit Number One as an orientation display for a moment and go on to your next exhibit, which I have marked as Exhibit Number Two. Would you identify that for us?

A Exhibit Number Two is a structure map on top of the San Andres dolomite. We have two cross sections, A-A', which is the north/south cross section. and B-B', which is an east/west cross section, and these go through the pilot area which is shown in green.

MR. KELLAHIN: Mr. Examiner, I'd like to show you copies of the B-B' cross section, as well as the A-A' cross section to which she's referred.

Q As a result of an examination of the San Andres structure as identified on the cross sections, starting first with the A-A' cross section, what is appar-

ent to you?

A We have been able to identify thick sands in the Grayburg and also the San Andres. These sands are continuous and are correlatable throughout the area.

Q Are those conclusions also true and apply to an examination of the information shown on the B-B' cross section?

A Yes. That's -- those are the same.

Q Let's turn to the type log, Ms. Court-right. Is that Exhibit Number Five?

A Exhibit Number Five.

Q All right. If you'll fold out your type log, let's first of all identify for the record the name of the well from which this log was made.

A This well is Philmex No. 16. It is the well which is the intersection of A-A' and B-B'.

Q By examining that log, what does it show you about the location and number of the potential formations for flooding in the Grayburg formation?

A The log will show you four of the six identified sands. It shows that they are approximately 7 feet thick with an average porosity of 6 percent.

Q In examining the geology have you been able to conclude as a reservoir engineer that the Grayburg formation is a likely candidate for the use of carbon

dioxide as an aid to enhancing recovery of oil?

A Yes, sir, particularly through the continuous correlate -- being able to correlate these sands throughout the area.

Q How does this particular Grayburg interval within your project area compare to the area being utilized by Conoco for their CO_2 operations?

A Conoco conducted their CO_2 pilot in only the 6 sand -- in only the Grayburg Sand No. 6 and they also conducted it in the San Andres.

It is our plan to initially target all the Grayburg Sand.

Q Is there any particular reason that there's a difference in what sands they flooded with CO_2 as opposed to what you're recommending?

A Would you repeat that question, please?

Q Sure. Conoco utilized, what was the number, 5?

A Sand No. 6.

Q Sand No. 6 in the Grayburg for their CO_2 operation. You're proposing to -- to incorporate all 6 of those Grayburg zones for CO_2 operations. Is there a material difference?

A No, sir, I believe that they -- just their initial plans were to go for the sand thicks in the

San Andres and it's our plan to target all the Grayburg sands.

Q In examining the data you don't see any reason not to include those additional sands that Conoco chose not to flood at this time?

A Oh, no, sir. They have proper thickness and porosity.

Q Let's turn to Exhibit Number Six now. Would you identify Exhibit Number Six for us?

A Exhibit Number Six is the Commission order to Conoco's CO_2 pilot flood.

Q Within that order you have identified in red certain items that I'd like to have you comment on.

First of all, let's look at the second page of their order. Their proposal under the ordering paragraph number Four proposed the drilling of four producing wells as well as two observation wells, is that correct?

A Yes, sir.

Q For your project, and perhaps we can use -- let's skip Exhibit Number Seven for a moment and use as a guide Exhibit Number Eight. When we look at Exhibit Number Eight what are we seeing, Ms. Courtright?

A Exhibit Number Eight is the 5-spot, inverted 5-spot, for our CO_2 injection project. It iden-

tifies the Injection Well No. 38 and two observation wells, No. 39 and No. 40.

Q Do the four producer wells currently exist?

A No, sir, only three of the producing wells currently exist.

Well No. 37 will be drilled.

Q In addition to approval of the CO_2 project, you're seeking approval of the injector well location?

A Yes, sir, we're seeking the approval of the injection well location along with the observation wells.

Q Why is that necessary?

A They are in unorthodox locations and we would also like the ability to not only use these wells or these well locations for observation, but also for injection or production as the field developed.

Q What is the engineering basis upon which you have selected this particular pattern for utilization in your pilot project?

A This area is representative of the field in general.

Q Is the pattern one that is conventional for the type of flooding that will be proposed for the

balance of the project if the pilot itself is successful?

A Yes, sir. This is a 5-spot.

Q Is there any particular reason that you have located or oriented the two observation wells as you've done?

A These wells are located along the shortest wing length or straight line between injector and producer.

Q How does that compare to what Conoco did with regards to their pilot project in the Grayburg-San Andres that's shown on Exhibit Number Six?

A It is very similar. They also had two observation wells located along one injector-producer line.

Q One of the other points that you've highlighted in the Conoco order is ordering paragraph No. 8. Why did you identify that for our attention?

A Conoco was granted permission for a maximum wellhead injection pressure of 2150 and we would like to have a maximum wellhead pressure of 1700 pounds.

Q If the Commission utilizes their .2 psi per foot of depth as a benchmark pressure limitation on the surface, what would that pressure be for your project area?

A That pressure would only be approximately 900.

Q 900 pounds?

A Yes, sir.

Q In your opinion, based upon your study at this point, is that going to be an adequate surface pressure in which to effectively and efficiently inject the carbon dioxide into the pilot project?

A No, sir, it certainly wouldn't be the most efficient since we are planning on taking straight from the lime and the lime pressure at our take off point will be approximately 1700, would be our maximum line pressure.

Q Take a moment and look at Exhibit Number Seven, which we skipped awhile ago. Does Exhibit Number Seven show the location of the CO_2 pipeline as it now exists?

A Yes, it does. That is shown in the green hatched line.

Q Where is the approximate takeoff point from the CO_2 line for the pilot project?

A The takeoff valve is at the intersection of Sections 26, 27, 34 and 35. The X marks the location of the takeoff valve.

Q The pressure in that pipeline is approximately 1700 psi?

A That will be the maximum line pressure at that point.

Q In terms of your initial study have you determined what the missibility pressure is?

A Yes, sir. Initial tests indicate that it will be 1135 pounds psi.

Q What does that mean to you as an engineer?

A That means that that is the minimum pressure at which a missible front may be reached.

Q Okay. What is the approximate current pressure in the reservoir in its current state of depletion?

A In the pilot area our reservoir pressure is approximately 1400 psi.

Q In making your study do you see any justification to stay within the Commission guideline of the 900 pound limitation for this particular project?

A No, sir. We feel that 1700 is considerably below the frac pressure and we have evidence of this through several of our -- or many of our last completions over the last two years.

Q Well, let's look specifically at the Conoco project now. They're injecting into the No. 5 and No. 6 zones of the Grayburg?

A No, sir, they're only injecting into Grayburg No. 6.

Q I'll get it right yet, it's No. 6.

A And (unclear) the San Andres.

Q All right. Within that zone, then, the Commission has approved for Conoco a pressure limitation of what?

A 2150 psi.

Q Are you aware of or is there information available to show that that pressure limitation is causing either hydrocarbons or water or CO_2 to break out of the production formation and migrate elsewhere?

A No, sir, not to my knowledge.

Q It's not unusual for the Examiner to enter a waterflood or a CO_2 order in which he requires the operator to provide step rate tests should you desire to exceed the pressure limitation guidelines.

A Yes, sir. It's our intention to conduct the CO_2 step rate test and submit that to the Commission after -- after the well completion.

Q Do you have any preference as to the sequence in which you obtain your pressure limitation approvals in relation to the step rate test?

A Yes, sir, we would like to have the 1700 stated in the order and then we will conduct the step rate test at the time of completion.

Q What flexibility does that provide you

as an operator to have the rate already in place before you conduct the step rate test?

A It provides us with a -- certainly in the timing of our project it will aid us in beginning injection of our CO_2 in a more rapid manner.

Q You wouldn't have to pressure down off of the CO_2 pipeline pressure that currently exists?

A No, sir, we would not.

Q Do you see any risk to fresh water sources or any producing hydrocarbons by allowing that pressure limitation to be established now at 1700 psi?

A No, I don't.

Q Let me ask you what you propose to accomplish with the pilot project? What's the purpose?

A The purpose of the pilot project is to gather enough data and assess the recovery so that we can determine the feasibility of full scale CO_2 development.

Q The goals of the proposed project for Conoco shown in finding No. 4 of the order shown as Exhibit Six, are those the same types of objectives that you have as a reservoir engineer for your project?

A Yes, sir. We do plan our observation wells will help us in identifying zonal isolation and also CO_2 and oil (unclear).

Q Let me have you describe for us some of

the additional information that we have not yet talked about on Exhibit Number Seven.

First of all, what is the purpose of the half mile radius circle?

A The half mile radius circle is the area of investigation for the injection well No. 38, as stated in the C-108 form.

Q Did you prepare and tabulate the necessary information for the filing of the C-108?

A Yes, sir, I did.

Q In doing so did you identify any offset operators within a half mile radius other than Phillips Petroleum Company?

A No, sir. In the exact half mile radius of investigation only Phillips Petroleum operates; however, we did send notice to one nearby offset operator, which is shown as Harvey Yates, which is immediately north of Philmex No. 12, or I'm sorry, immediately south.

Q South. That will be the southwest quarter of the northwest of Section --

A 35.

Q -- 35. Have you received any objection from the Yates personnel?

A No, sir, we haven't.

Q Who is the owner of the surface at the

injection well location?

A This is all state land.

Q Have you received any objection from the Commissioner of Public Lands about your project or the injection well?

A No, sir.

Q Let me have you turn your attention now to Exhibit Number Nine, Ms. Courtright, and ask you whether or not you've made a study of the anticipated advantages in the recovery of additional hydrocarbons from the pilot area.

A Yes, sir, I have made the study and I have prepared this plot shown as Exhibit Nine.

Q Before you explain the conclusions and information from the display, explain to us how to read the display.

A On the vertical axis is net barrels of oil per day to Phillips Petroleum Company. This ranges from zero to 3000 barrels per day.

On the horizontal axis is simply time from 1987 until 1995.

Q When you look at that portion of the display that's identified as primary reserves --

A Yes, sir.

Q -- within what horizontal area have you

identified those reserves?

A That is the current production and forecast for all Maljamar wells completed within the total of 10,100 acres.

Q And so we would take the outline on Exhibit Number One and the outer boundary of all those cooperative lease flood areas at 10,000 acres?

A That's correct.

Q When you say "pilot response" --

A Yes, sir.

Q -- what are you projecting the area to be included within the pilot response area?

A The pilot is -- pilot response is based only on the 40-acre 5-spot that was shown in Exhibit Number Eight.

Q And then when you say "phase one response", then that's the area shaded in green?

A Yes, sir. Based on the outcome of the pilot, we are anticipating spacing our CO_2 development, this would encompass approximately 2000 acres out of the total 10,000 acres.

Q In making this analysis do you see any relation as to the time in which you ought to commence your pilot project?

A Yes, sir. It's beneficial to us to be-

gin this pilot project and therefore be able to determine the feasibility of going to full scale CO_2. Our reservoir pressure is such that we will not have to go through a secondary phase of reinjecting water to pressure up the reservoir, as we're already over the minimum miscibility pressure.

Q Is now, then, the optimum time at which to commence the pilot CO_2 project?

A Yes, sir, it is.

Q And if you wait longer, what occurs?

A Through production and depletion our reservoir pressure will decrease and we might possible fall below the minimum miscibility pressure.

Q Have you made an estimate of what percentage of primary reserves are going to be recovered in the 10,000 acre area?

A Yes, about 6 to 8 percent will be recovered through primary drive mechanism.

Q And your proposal is to skip a conventional waterflood secondary recovery phase?

A That's right.

Q Have you estimated based upon Conoco's success what might be the likely percentage of additional oil recovery attributable directly to a tertiary or a CO_2 project?

A Yes, sir. Using a pessimistic value that Conoco achieved for their residual oil saturation, we feel that it might be possible to recover an additional 34-million barrels of oil within the 10,000 acres.

Q Why have you proposed to skip the conventional waterflood phase of recovery?

A One, mainly because our reservoir pressure is such that we're above the minimum miscibility pressure and also the highest cost of the CO_2 project will be offset by the recoveries from primary, secondary and tertiary.

Q If you had postponed your CO_2 process until later, until your reservoir pressure was below your miscibility pressure, then you might have to repressurize the reservoir using conventional waterflooding.

A That's correct.

Q But if you start it now, then you can save the expense of doing so.

A That's correct.

Q Let's talk about the mechanics of the operation of the pilot project itself and let's talk first of all about the cost of the pilot project. If you'll direct your attention to Exhibit Number Ten, would you identify and describe for us what you've done there?

A Exhibit Number Ten is the summary of the

type of costs that Phillips will be incurring just to install this pilot project.

Q All right, let's specifically go to the C-108 and talk about some of the details of the operation.

One of the first attachments to the C-108, and I believe we've marked it as Phillips Exhibit Number 11, Mr. Catanach, is a plat. What have you shown on the plat?

A In yellow are outlined all the Phillips acreage and the inner circle is the half mile area of review and the outside circle is the 2-mile radius.

Q Turn to Exhibit Number Twelve and let's have you describe for us the injection well schematic.

A Exhibit Number Twelve is the proposed injection well schematic. The formation tops are noted in the lefthand column and these are approximate, since we have not drilled or completed this well.

Q Let's talk about some of the specifics. Commonly the Commission requires injector wells to have plastic lined tubing in them.

A Yes, sir.

Q And I believe you've told me that your proposing not to utilize in the injector plastic lined tubing.

A Yes, sir. We would like the Commission

to waive that requirement for plastic lined tubing since this will be a continuous CO_2 injection project. If at such time we do go and follow up with water injection, we will install the plastic lined tubing.

Q Explain for the record, I'm sure it's obvious to you but not to me, why you would have plastic lined tubing in one instance and not as you propose it to utilize for the CO_2 project.

A Plastic lined coated tubing is needed for a corrosive environment, which is generated when you have water and CO_2 combined.

Q If we eliminate the water, then, from the injection well there's no opportunity to -- to cause corrosion to take place in the tubing?

A No, sir, it won't be a corrosive environment.

Q Okay, and your pressures, then, using the CO_2 in the injection well are going to keep any formation water out of the tubing?

A That's correct.

Q Will you comply with your injector well with the typical requirements of the Division with regards to filling the annular space between the casing and the tubing with some inert fluid?

A Yes, sir, (not understood).

Q With regard to the cementing of the injector well, are you going to have a continuous string of cement all the way from TD to the surface?

A Yes, sir, in both casing strings we will circulate cement to surface.

Q Describe for us the operation of the injector well. How -- in what volumes do you propose to inject the carbon dioxide?

A We anticipate injecting at 400 MCF a day. This is an estimated rate, and our final rate will be determined after we conduct the step rate test in the injection well.

Q Now there is some difference in the physical operation that you propose for your project and what Conoco conducted in their observation or pilot project. Would you describe the difference?

A Conoco in their pilot project injected only into the Grayburg No. 6 and also into the San Andres, and these two zones were isolated with packers so that there was isolation between the two zones. It is our intentions only to perforate our Grayburg sands and inject into those sands.

Q Did Conoco also inject water in various relationships to the carbon dioxide injected into the injector well?

A Yes, sir. Before they began CO_2 injection they flooded out their pilot area with the known salinity of water. Then they followed that up with a CO_2 flood, and after that they once again flooded with water.

Q You propose not to do that?

A That's correct.

Q And again, why not?

A Our reservoir pressure is already such that we don't need a repressurization.

Q On Exhibit Number Thirteen, which is one of the attachments to the C-108, you've outlined the details of your producing wells as well as your observation wells.

A Yes, sir.

Q Okay, now how do you propose to utilize the observation wells?

A The observation wells will be used as logging wells and that is, we will be running a series of logging passes in these wells to determine if our CO_2 is staying in zone. After the CO_2 has passed these observation wells we'll be able to determine the residual oil saturations CO_2 flooding and also we'll be able to track any movement of the CO_2 and the oil.

Q How often do you anticipate running the logs on the observation wells?

A Initially we will be running these quite often as both the movement and the sweep efficiencies are unknown at this time, and certainly the later in the project, the more time in between the logging runs.

Q Can you approximate for us the life of the pilot project?

A The pilot project would certainly be productive for four to seven years and we anticipate seeing any sort of result pass the observation wells within a six month period.

Q Within six months then you should have --

A Yes.

Q -- available information from which to evaluate the success of the project and determine whether or not you'll seek the Division approval to expand it?

A Yes, sir.

Q Do you have a recommendation to the examiner as to how to implement an expansion of the pilot project?

A Yes, sir, we would like to be able to expand our project within the Philmex lease based on notification to the Commission.

Q You're seeking, then, some administrative procedure whereby you can document to the Division

without hearing the success of your project and then request administrative approval to expand a project for this particular lease area?

A That's correct.

Q And it would be that area encompassed within the provisions of Order R-3668?

A Yes, sir.

Q And that's the area identified on Exhibit One as shaded in the red outlined?

A As the zone (inaudible).

Q In further compliance with the requirements of the C-108 procedures, have you within the half mile radius identified all the wellbore information from wells that penetrate through the Grayburg and San Andres formations?

A Yes, sir, I have examined all the wells within the area of review.

Q And is that tabulation shown on Exhibit Number Fourteen?

A Yes, it is.

Q What does that show you?

A That shows that all our wells are properly cemented and the wellbores within this area are sound (not clearly understood).

Q All your wells, you -- you have the only

wells within the half mile radius?

A That's correct.

Q You don't see any of the wells that are defective to the extent that any of the injection fluids are going to go out of the Grayburg-San Andres formation and migrate elsewhere.

A That's correct.

Q Have you also attempted to identify the location and source of any produced fresh waters in the area?

A Yes, sir, and that is shown on Exhibit Number Fifteen.

Q And what did you find?

A There are no fresh water wells within the area of review; however, there are two wells which are on the outer boundaries of the 2-mile radius.

Q What type of wells are those?

A These are fresh water wells.

Q Producing stock tank water for cattle or for what purpose?

A Yes, sir, for cattle.

Q What is the formation that they produce their water from?

A I'm not quite sure but I believe it would be within the redbeds.

Q Okay, this is above the Rustler formation, is it?

A Yes.

Q At approximately what depth is that, Ms. Courtright?

A The base of the Redbeds is at 300.

Q And your top zone in the Grayburg is approximately what depth?

A Approximately 4150.

Q In making an examination of the available geology, do you find any faulting in the area or any geologic incident that would cause disposal fluids to migrate up into fresh water areas?

A No, sir.

Q What have you shown as attachments to Exhibit Number Fifteen?

A These two attachments identified as Attachment 5 and Attachment Six are the fresh water analyses on these wells, the two fresh water wells.

Q Do you have an opinion as to whether approval of this application would prevent waste?

A Yes, sir, it would, both by we would be able to increase our recoverable reserves and also extend the producing life of this reservoir.

Q Do you see any opportunity to impair the

correlative rights of any other operator or interest owner in the area by approval of this application?

A No, sir.

MR. KELLAHIN; That concludes my examination of Ms. Courtright, Mr. Catanach.

We would move the introduction of her Exhibits One through Fifteen.

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

CROSS EXAMINATION

BY MR. CATANACH:

Q Ms. Courtright, let me see if I can get this straight.

You're proposing just to inject into the Grayburg and not the San Andres.

A That's for our initial pilot operations. We plan to evaluate the effectiveness of the Grayburg CO_2 injection project and after such time as we have done that, then we will open up the San Andres and evaluate that.

Q Why -- why is it that the two zones aren't being evaluated at the same time?

A In our portion of the field the San Andres is only productive in our southern region and as such it doesn't provide as large of a target for recover0

able reserves.

Q What is the approximate injection interval?

A The approximate injection interval is shown on Exhibit Number Twelve and that will be from the top of the Grayburg to the top of the San Andres, which is approximately 400 feet, gross interval.

Q So approximately 4130 to 4530.

A Correct.

Q Where is the initial well that was authorized for water injection? Where is that located?

A If you will look at Exhibit Number One, the initial injection well is shown by an arrow, which is in the lower lefthand corner of Section 27.

Q Well No. 6?

A Yes.

Q And what kind of response that you had to that?

A We have had slight response to that but, of course, that is only one injection well.

The best response that we've seen is up in -- up north in our Northeast Maljamar Waterflood and we feel that we're recovering an additional 6 to 8 percent oil in place.

Q What is the status of the producing

wells on the Philmex lease at this point? What are they producing at this point?

A An average production of these wells is approximately 10 barrels of oil a day per well, and this does place this lease as a marginal lease and we would like to implement a project to increase that production.

Q Have you done a study to -- to determine if you would recover more oil if you waterflooded first and then went to CO_2?

A No, sir, we feel that we will be able to recover the same amount of oil since we will be bypassing the residual oil saturation to water and will be going straight to the residual oil saturation to CO_2.

Q So you're not going to lose anything.

A That's correct.

Q Has Phillips operated other floods in -- well, not in New Mexico, but in -- in other places where they've attempted to do this, skip the waterflood portion of the --

A No, sir, Phillips has not.

Q Do you know of anybody that's -- that's done it successfully?

A There is one operation that was conducted by Shell in Upton in Crane County in Texas and it was, I believe it's the Possit (sic) Field, and however, they

did have slightly repressurization through gas injection before they began their CO_2 injection.

Q Before you go full scale on this, you'll have a lot of results from the pilot.

A Yes, sir, going full scale will be based upon the results of the pilot.

Q So you may not go to complete CO_2.

A That is a possibility.

Q You've estimated 34-million barrels recovery, additional recovery?

A That is a high side figure and that is for the total 10,000 acres, and that would be in the pilot area we expect a recovery of 52 percent of the oil in place.

Q 52 percent of the oil in place now or of the original oil?

A Of the original oil in place.

Q And primary was 6 to 8 percent?

A Yes, sir.

Q If the pilot project is successful will the project be expanded a small portion at a time or --

A Yes, sir, that's what we anticipate, is phasing our full scale development into approximately three phases right now. Those are only initial plans and further engineering decisions will be made at such time that it's

possible.

Q Now you said that you had evidence that the 1700 psi was below the fracture pressure for the Grayburg.

A Yes, sir.

Q What evidence do you have?

A We had -- had conducted quite an extensive drilling program over the last two years and the average fracture pressure that we noticed was well above 2000. It was probably in the area of 26-to-2700 pounds. And that is surface pressure.

MR. CATANACH: That's all the questions I have of the witness at this time. She may be excused.

Anything further in this case?

MR. KELLAHIN: No, Mr. Examiner.

MR. CATANACH; If not, this case will be taken under advisement.

(Hearing concluded.)

C E R T I F I C A T E

I, SALLY W. BOYD, C. S. R. DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division (Commission) was reported by me; that the said transcript is a full, true and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 9671, heard by me on May 24, 1989.

David R. Catanach, Examiner
Oil Conservation Division