OIL CONSERVATION DIV.
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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. 12,265
APPLICATION OF OXY USA, INC., FOR SALTWATER DISPOSAL, EDDY COUNTY, NEW MEXICO	ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: MARK ASHLEY, Hearing Examiner

October 21st, 1999

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Division, MARK ASHLEY, Hearing Examiner, on Thursday, October 21st, 1999, 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.

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A P P E A R A N C E S

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* * *

WHEREUPON, the following proceedings were had at 8:30.m.:

EXAMINER ASHLEY: This hearing will come to order for Docket Number 32-99. Please note today's date, October 21st, 1999. I'm Mark Ashley, appointed Hearing Examiner for today's cases.

Before we call the first case, I wanted to review the docket and go over any continuances and dismissals.

(Off the record)

EXAMINER ASHLEY: The Division calls Case 12,265, Application of OXY USA, Inc., for saltwater disposal, Eddy 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, and I have one witness to be sworn.

EXAMINER ASHLEY: Any additional appearances?

Will the witness please rise to be sworn in?

(Thereupon, the witness was sworn.)

EXAMINER ASHLEY: Mr. Kellahin?

MR. KELLAHIN: Thank you, Mr. Examiner.

Mr. Examiner, OXY's witness this morning is Mr. Richard Foppiano. Mr. Foppiano is a petroleum engineer.

RICHARD E. FOPPIANO,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. For the record, sir, would you please state your name and occupation?

A. My name is Richard E. Foppiano, and I'm senior advisor for regulatory matters for OXY USA, out of Houston, Texas.

Q. In addition to your regulatory responsibilities, Mr. Foppiano, are you also a petroleum engineer?

A. I'm a registered professional petroleum engineer. I'm a civil engineer by degree.

Q. As part of your responsibilities, were you the individual with OXY that prepared and filed with the Division the Division Form C-108 seeking approval of the subject well for saltwater disposal?

A. Yes, that was filed under my supervision and direction.

Q. In addition, as part of your preparation this morning, have you obtained information to support your application and reduced it to the exhibits that we're about to look at?

A. I believe I have, yes.

MR. KELLAHIN: We tender Mr. Foppiano as an expert engineer.

EXAMINER ASHLEY: Mr. Foppiano is so qualified.

Q. (By Mr. Kellahin) Mr. Foppiano, let's look at Exhibit 1. Would you find the proposed disposal well on the plat for us?

A. It's in the northeast quarter of the northeast quarter in Section 10 there, and you can see it's the center of that dashed circle.

Q. It's the Government AB Number 9?

A. That's correct.

Q. This is a directional wellbore?

A. That's correct. You can see the surface location and then the bottomhole location is the black dot with the magenta circle around it.

Q. What is the current status of that well?

A. It's producing. It's a very marginal oil producer in the Bone Springs.

Q. Approximately how many barrels of oil does it produce a day out of the Bone Springs?

A. The last test was eight barrels of oil a day, but it's -- over the past several years it's been anywhere from three or four barrels of oil a day to more than that, so it fluctuates around that point.

Q. Okay. Why does OXY want to use this well for

disposal purposes?

A. Well, currently we produce, as you can see, from Bone Springs wells in this area. Primarily they're located on the two leases there, in Section -- One lease covers Section 10 and 11. That's the Government AB lease. You can see approximately -- well, there are four Bone Springs wells that we operate on that lease.

And then just to the north in Section 3 there is called the Government S lease, and we operate several Bone Springs wells there.

And the Bone Springs Pool here produces a couple of hundred barrels of water. We're estimating between these two leases, 300 barrels of water a day. And right now we spend about a dollar a barrel, trucking that produced water away from the batteries.

The wells are declining in their productivity, and we are at a point where we're trying to reduce our operating cost as much as absolutely possible, and of course it is much cheaper to take an existing wellbore and reinject the produced water than it is to keep paying a dollar a barrel to truck that water away.

So our proposal here is primarily to utilize the Government AB 9 as a saltwater disposal well.

Q. Does OXY operate all wells that penetrate to and through the Bone Springs formation, within the half-mile

radius of review?

A. Yes, we do.

Q. Will approval of this well as a disposal well adversely affect any oil production out of the Bone Springs?

A. In our opinion, no. If it has any effect, it would be positive.

Q. Let's look at the geologic and engineering data that supports that conclusion, Mr. Foppiano. If you'll turn with me to Exhibit Number 2, let's set aside Exhibit 1 and keep it as a locator plat, but turning to Exhibit Number 2, identify that for us.

A. This is an isopach map. We have isopached the ϕh of the Bone Springs reservoir, the first Bone Springs sand, and you can see that in a kind of an irregular circle there of green and pink.

This is also a structure map, and so what this shows is that this reservoir is fairly small, at least the porous and permeable portion of the reservoir is very small. And it has a gas cap; that's the pink portion of the reservoir. It's an associated pool.

And it extends -- The well we want to inject into, the Government AB 9, you can see, is in the lower right-hand corner of that group of wells with the yellow highlight around them, which denotes Bone Springs wells.

We are at the very edge of the porous and permeable portion of the Bone Springs reservoir that produces in this area.

Q. Is there a structural advantage to using the Government AB 9 as a disposal well in the Bone Springs, versus some other Bone Springs well?

A. Structural advantage, it's downdip from all the existing oil production in the area.

Q. Let's turn and have you identify the cross-section that is shown on Exhibit Number 2. The cross-section is identified as Exhibit 3.

A. Yes, Exhibit 2 does show an A-A' cross-section through the Bone Springs, and this is -- Exhibit 3 is that cross-section. It's a stratigraphic cross-section.

You can see the Bone Spring is a fairly thick section, and it's also very laminated. The porosity comes and goes, and you can see it moving from west to east. The porosity is the best right there in the middle. And over to the eastern edge, which is where our Government AB 5 is, that well has not even produced in the Bone Springs, it's considered not to be commercial in the Bone Springs.

And the Government AB 9 is the second log trace from the right, and you can see that the porosity is spread out through the entire interval there. And so -- In fact, I actually viewed a core of this Bone Springs sandstone just the other day, and I was amazed that the sand-shale

sequences in some -- in this area on this well, in fact, are as small as a quarter of an inch thick. And so it is a very, very laminated sandstone reservoir, and porosity is spread out.

And you can also see that the Government AB 9 well has got porosity that -- you can see the porosity development just -- It goes to nothing going east, which is another reason for us picking the Government AB 9. We don't believe that injection in the AB 9 would have any impact on anything to the east of that well. If anything, any response or effect would be to the west and to the north of where our Government AB 9 location is, because that's where the porous and permeable section of the Bone Springs is.

Q. Is there an opportunity for OXY to utilize this wellbore to determine the feasibility of waterflooding the Bone Springs in this area?

A. Yes, that's the secondary purpose for using this well and trying to inject this water. We quite frankly don't know if we can pump water into this Bone Springs and push oil to the producers. Analog reservoirs that we've looked at lead us to believe that it might be possible, but it might very well be that we pump a few thousand barrels into this Government AB 9 wellbore because of its low porosity and it pressures up, and we can't push any more

water into it.

So we really don't know if we're going to be able to put much water into it at all. And so the secondary benefit of attempting to do this is to try to see if we can push some oil in the Bone Springs, because as you'll see on a subsequent exhibit and through these exhibits, this could be a waterflood candidate, and there are substantial secondary reserves that could be produced if we could, in fact, find a way to push oil from one well to the other.

Q. Let me direct your attention to Exhibit 4 and have you illustrate for us what is the potential opportunity for additional oil recovery out of the Bone Springs reservoir in the event this is a suitable waterflood candidate.

A. Yes, Exhibit 4 is just some rough volumetrics. I caution that it's rough volumetrics, but the attempt of this exhibit is to show the size of the target. It's based on -- You can see the assumptions for B_o initially and B_o at abandonment and water saturation, and also the ϕh that was planimetered off of Exhibit Number 2 -- I'm sorry, the -- yeah, the ϕh.

And so we have calculated a ϕ acre-feet, if you will, of 15,895. And based on what we had produced up to the point this analysis or calculations were done, plus what we estimate will be recovered under primary from the

existing wells, you can see an ultimate recovery of roughly about a million barrels. And the volumetric calculations indicate to us that oil in place is of the order of 45 million barrels.

So the recovery factor under primary is extremely low, and that's what intrigues us about the possibility of trying to waterflood this. We think if we can do nothing more than just double the primary recovery, which is just get another 1 1/2 percent -- I'm sorry, 2 percent of the oil in place, then we can recover another million barrels of oil before these wells are abandoned.

Q. Let me direct your attention to Exhibit Number 5, Mr. Foppiano. What is Exhibit 5?

A. Exhibit 5 is just the C-108 that we submitted for this, to obtain administrative approval for using the Government AB 9 wellbore as a disposal well in the Bone Springs.

Q. As part of your preparation for today's hearing, did you review the tabulation of wellbore data within the area of review and update that information and reduce it to the form of another exhibit?

A. I have. The C-108 had a method of presenting the well data and cross-referencing that to a map which, after we went through it a couple of times, it was apparent it was confusing. So I've attempted to present it in what I

think is a more clear fashion.

Q. Let's turn to Exhibit Number 6, then. This is your updated tabulation of wellbore data within the area of review?

A. That's correct. This is the same well information that we submitted in the C-108, and the changes that I've made, there was well information submitted on one well that was outside of the half-mile circle, and I deleted that information, since it wasn't required and it really didn't -- It's a Bone Springs well that is adequately cemented, and -- just to hone the information down to the stuff that's within the half mile. So this table represents that.

I've also added some additional information, particularly under the "Casing-Cement" column. We've added detail on the cementing and how the tops of cement were determined, either by cement bond log, which is CBL, or temperature survey, which is TS. It's either that or the cement was circulated and that was observed by our field people when that operation was performed.

Q. For any of these wells, did you have to calculate the estimated top of cement, or was it available, either as a circulated cement top or as a measured top?

A. We either measured it, or we observed that we circulated it. So we did not have to calculate it.

Q. In examining these wellbores, did you find any wellbore that penetrated through the Bone Springs reservoir that did not have the Bone Springs interval covered by cement?

A. Yes, we found two.

Q. And identify for us on Exhibit 6 the two wells that do not have cement across the Bone Springs interval.

A. The first one would be the fourth well down into the exhibit. It's called the Government AB Number 2. You can see under "Casing-Cement" column the 5-1/2 casing, has a top of cement of 7600 feet. The Bone Spring is around 6300 to 6500 feet, so it doesn't -- cement does not cover that behind the 5-1/2 casing.

And the other well is the Government S 2, which is the second to last well down at the bottom of this table. It is a Morrow well, and based on cement bond log, its top of cement is 7400 feet, which is also below the Bone Springs.

Q. Who operates these wells?

A. OXY does.

Q. Let's look at Exhibit 1 now and find those two wells on Exhibit 1.

A. First well, the Government AB 2, is the well that is the farthest south inside the half-mile circle. It's the -- You can see it, it's right at the edge of the half-

mile circle, and it has an NBFWC with a gas symbol that denotes that it is currently producing from the North Burton Flat-Wolfcamp Pool.

Q. All right. And where is the other well?

A. The other well is the Government S 2, and it is north and west of the Government AB 9 wellbore. And you can see that right next to it is a Bone Springs well, and it is currently producing from the Winchester-Morrow Pool.

Q. All right, it's the blue dot in Unit Letter O of Section 3?

A. Yes, that's correct.

Q. Okay. Do you have an exhibit which illustrates the relationship of these two gas wells to the proposed disposal well and the other Bone Springs well within the half-mile area of review?

A. Yes, I do, and that's Exhibit Number 7. Exhibit Number 7, I'll just walk you through what this is. This is a cross-section. It shows all active wells within the area of review of the Government AB 9 wellbore. The Government AB 9 is centered right there in the middle. You can see it.

And the wells inside the area of review, their locations or distance from the AB 9 is scaled off, and this is proportional to their distance from the AB 9. So wells that are real close together are shown close together.

Wells that are farther apart are farther apart. So this is proportionately scaled out horizontally.

What you also see are three different colors, blue, yellow and green, denoting zones of interest, the first one being freshwater. Our information indicates that fresh water exists from zero to 60 feet, the Bone Springs interval, which is highlighted in yellow there, at about 6300 to 6500 feet, and the Morrow -- I forgot the Wolfcamp, but the Morrow is shown there in green and it exists at around 11,000, roughly, feet. There's also another productive zone in there, the Wolfcamp, which is shown off to the right there.

So what I've attempted to do with this exhibit is show the wells in relationship to their location to the AB 9. The wells to the left are north and west of the AB 9, and the wells to the right are south and east of the AB 9.

And this is important, if you recall the cross-section and the geological testimony, that the reservoir really -- the porous and permeable portion of this Bone Springs zone really doesn't exist to the south and east of the AB 9 wellbore. Most of the productive -- or the productive portion of the Bone Spring is off to the left on this exhibit of where the AB 9 is located.

So what we've shown here are the construction details of each of the different wells inside that half-

mile circle. You can see that surface pipe on all these wells is set roughly at about 400 feet, 13-3/8 casing, and intermediate pipe for all these wells is set around 3000 feet, plus or minus a couple hundred feet, and that's generally 8-5/8 although we have one that's 9-5/8 casing.

And then for the Bone Springs wells we have 5-1/2 casing set down to the Bone Springs, and then for the deeper wells the 5-1/2 casing is set all the way down to the Morrow at about 11,000.

And shown in magenta here is the cement behind pipe based on the exhibit -- It would be Exhibit Number 6 that we showed, either cement bond log, temperature survey or observed. And just walking you through that, you can see on surface pipe the cement is circulated back to surface on the surface pipe of all these wellbores. For the intermediate casing, it's circulated back to surface from 3000 feet on all the intermediate casings.

And then on the long-string casings you can see, for instance, on the Government AB 9 it's circulated back to surface. And then moving over to the right of the AB 9 on this exhibit, you can see the Government AB 5 well that is a Morrow well, has a top of cement at 5050 feet by cement bond log, which covers the Bone Springs. And then you can see the Government AB 2, which we mentioned before, has a top of cement of 7600 feet determined by temperature

survey. And so it doesn't -- The pink doesn't go all the way up to the Bone Springs there.

And then looking over to the left of the Government AB 9 on this exhibit, we encounter a couple of Bone Springs wells, the Government AB 8 and the Government S 7, and both of those have cement well above the Bone Springs, almost into the intermediate casing, and those are determined by cement bond logs.

Then we encounter the Government S 2, which is a Morrow well that we mentioned before, has a top of cement behind the 5-1/2-inch casing of 7400 feet determined by cement bond log, so it does not cover the Bone Springs zone there. But right next to it, approximately 120 feet from this wellbore, is another Bone Springs producer, the Government S 3, which has cement that covers the Bone Springs all the way up pretty close to the intermediate.

And then finally the Government AB 7, right at a half a mile from the AB 9, is a Bone Springs producer and it has cement at 3400 feet behind the 5-1/2-inch casing.

This exhibit also shows along the bottom current producing rates from each of the wellbores, it shows where they're perforated, just for completeness. And so what it does, to me, is, it shows in a schematic fashion where the areas of concern would be about injection into the Bone Springs. And I think we've already talked about them, but

obviously there would be the Government S 2 there to the left of the AB 9 and the Government AB 2 to the right of the AB 9.

Q. Does OXY propose to conduct remedial cement operations on these two gas wells in an attempt to cover the Bone Springs interval?

A. Our proposal would be that since we don't know how much we can inject into the AB 9 wellbore, we don't know if it will have any effect at all on oil production in any of the offset Bone Spring wells. We would propose to defer any requirement to block squeeze and isolate the Bone Spring interval in the Government S 2 and the AB 2. We're going to be monitoring production on all the Bone Spring wells within this half-mile radius. Indeed, we operate them, so we monitor them anyway by well testing.

And we also think that monitoring the intermediate production casing annulus on these two wells will allow us to detect any pressure increase based on a response to the Bone Springs from a disposal into the Government AB 9.

However, you can see by the proximity of the Government S 2 to the AB 9, it's our belief that we would see some response in the Bone Springs producers well before we would ever see any kind of pressure increase at the Government 2.

And since the reservoir -- the porous and permeable section of the reservoir really doesn't go off in the direction of where the AB 2 well is located, we don't think we're going to see any response out there anyway, because there's not much porosity out there, and the only way water is really going to get out there, probably, is if we fracture the Bone Springs, and we certainly don't intend to do that.

And that well is right at the half mile, it's 120 feet from the half-mile circle. So we would propose to defer that, requiring any remedial cement operations on that well also, because it really is a substantial distance away, and we think any effect of injection into the AB 9 is really going to be felt by wells off to the left and not off to the right, on this exhibit.

Q. If the Division requires you to conduct remedial cement operations on these two gas wells prior to utilizing the disposal well for disposal purposes, what if any risk is associated with those operations as to remaining gas reserves with either gas well?

A. In our opinion, it substantially risks the remaining recoverable reserves in the Morrow, in the Government S 2. And I've got some exhibits that can show the productive history of those wells and illustrate what the problem is. But essentially the Government S 2 is a

very dry gas reservoir, and to work it over, to block squeeze the Bone Spring, is going to, in our opinion, dump water on that dry gas reservoir. And our experience with low pressure depleted Morrow reservoirs that are dry gas, we don't think that we're going to be able to get that well back.

And so we think there's a substantial risk of losing a substantial amount of otherwise recoverable reserves if we are forced to have to work over the Government S 2 wellbore.

Q. Have you prepared an exhibit, Mr. Foppiano, which illustrates what you believe to be the minimum costs associated with working over either of these gas wells, trying to block squeeze the Bone Springs?

A. Yes, the next exhibit is Exhibit Number 8, and it's just an estimate of the workover cost that would be incurred to temporarily plug off the deep gas producing zone and attempt to block squeeze the Bone Springs to isolate it.

And I say "attempt to". Anybody with much experience in squeeze cementing knows that it may require more than one squeeze to get an adequate squeeze. When you drill out, after you've perforated your casing, you may have difficulty getting a casing integrity test, so there might be some subsequent operations you need to perform.

So we've estimated $60,000, but it easily could run well more of that, you know, $100,000 or more. So this is just a real rough estimate.

Q. Have you estimated the remaining recoverable gas associated with the Morrow gas well that's at risk if the remedial action fails?

A. Yes, the next exhibit is Exhibit Number 9, and this is a production history graph, semi-log production history graph, of the Government S 2. And you can see that this well has been producing from the Morrow. Highlighted in yellow there is the daily gas rate, and the legend is off to the right there, the axis is off to the right.

We also have oil and water graphed on this, and you can see that there are insignificant amounts of liquid hydrocarbons produced from this well. It's been a Morrow producer since the early 1980s. It's been on a fairly steady decline since the days of gas proration were over, which was late 1989, early 1990s.

And based on that steady decline and an abandonment rate of about 30 MCF a day, I've estimated remaining recoverable reserves at approximately 400 million cubic feet. And we think these are the reserves that would be risked and likely lost if we have to dump water on that zones if we have to dump water on that zone to try to block squeeze the Bone Springs.

Q. Let's go back to Exhibit 7 for a moment and talk about your alternative solution to not having to take remedial action prior to injection.

First of all, the concern, is it not, that injection in the Bone Springs would move towards and over time corrode the metal on the casing, perforate that casing and allow it to be a source of migration of fluids, either above or below the disposal interval? That's the basic concept, right?

A. I think the primary concern is that uncemented intervals open -- for example in the Government S 2, would be open to fluid pressure by a water breakthrough of the Bone Springs in the Government S 2 location.

Q. All right, let's look to see where those fluids might go. Is there any opportunity or risk to freshwater sources if that should occur?

A. Not in my opinion. You can see there are two casing --

Q. That's supported by what, sir?

A. There are two casing strings cemented back to surface, protecting the fresh water from that possibility.

Q. If it's not a risk to fresh water, then the next choice of examination is to see if it risks any formation that might be oil productive or gas productive above or below the Bone Springs, correct?

A. Correct.

Q. Have you examined with the aid of your geologist to determine whether or not there are any potential oil zones above the Bone Springs?

A. Yes, I have.

Q. And what have you found out?

A. There are none. In this area, within a half mile of this wellbore, there are none. And in fact, the closest oil production above the Bone Springs is 1.8 miles to the south and east, which is some Delaware production. And that's once again off in the direction of -- That's quite a bit farther away than most every well we've got in the Bone Springs that would be monitoring any response.

Q. Do you have a statement from OXY's geologist confirming your conclusions about the absence of potentially productive oil formations

A. Yes, in preparation for this hearing, I asked our geologist to review well logs, production data, anything that he needed to see if he could determine what, if any, potentially productive zones there might be in the area of this Government AB 9 wellbore. And he did his search within a two-mile radius of the Government AB 9, and the only thing he could come up with was the Delaware production that is 1.8 miles, roughly, to the south and east of the Government AB 9 wellbore.

And he did his research based on a correlative interval of 3000 feet to 7400 feet, and the reason why I asked him to do that particular interval is, 3000 feet is generally where the intermediate casing is set. So everything is protected down to that point. And then 7400 feet is the top of the cement -- the lowest cement bond log -- well, actually we have one at 7600 feet. But generally speaking, that area is where we have that covered with our cement behind pipe. So I was curious about that geologic interval in this area, was there anything that was potentially productive?

And as you can see from Exhibit Number 10, his review indicated there was not anything potentially productive in that interval, other than that Delaware production that I mentioned.

Q. Let's use the AB Number 2 Wolfcamp gas well as the illustration. Under OXY's proposal, then, you would seek approval to do what with the AB 2 well?

A. Our proposal would be to monitor the production in the Bone -- Well, I'll answer your question, sorry.

We would propose to install pressure gauges to monitor the annular space between the 5-1/2-inch casing and the 9-5/8 casing on that particular wellbore. And if we see any significant pressure increase, we would offer to -- or we can shut down the Government AB 9 injection

immediately and cease injection.

Q. Why is that an effective means of monitoring the movement of water injected into the Bone Springs?

A. Well, we feel like the space behind the 5-1/2-inch casing is mostly a fluid filled space, so if we see any pressure increase at all, we should see it fairly quickly by monitoring the pressure.

But here again, we don't think there's going to be any response in the Bone Springs in that direction, because that's not where the porosity and the permeability are. We think where the water injection is probably going to preferentially go is in the direction of where the production is, because that's the lower pressured area, it's where the porosity and the permeability are, and they're better developed in that area.

Q. Let's look to the northwest then. There is continual reservoir voidage and fluid withdrawals out of the Bone Springs reservoir from your current producing Bone Springs well, are there not?

A. Yes, you can see four active Bone Spring producers to the north and west of the AB 9.

Q. And if water is injected into the AB 9, what is the probable course of flow of that injection fluid?

A. Well, in our opinion it will go in the direction of where the production is and where the porosity and

permeability are. It's the path of least resistance.

Q. When we look at the Government S 2, the Morrow gas well, how do you propose to monitor that well for the occurrence of water breakthrough out of the Bone Springs?

A. Well, of course as I mentioned, we plan to monitor the production on the Bone Springs wells, and in our opinion we would see that, the production increase, on the Government -- I mean on those Bone Spring producers, well before we should see any response in the Bone Springs in the area of where the Government S 2 is located.

But additionally, we plan to monitor the annular space between the 5-1/2-inch casing and the 8-5/8-in intermediate casing on the Government S 2, and we can cease injection immediately upon any detection of a significant pressure increase in that annular space.

Q. Are the Bone Springs producing wells that OXY operates in this area situated to be effective monitor wells for this occurrence?

A. In our opinion they are, because you can see the S 7 and the AB 8 are actually closer to the AB 9. The Government S 3, which is another Bone Springs well, sits right next to the Government S 2. So if there was any pressure increase in the Government S 2, we should also see response right there at the S 3. And by continuing to produce these wells, any pressure increase that is seen in

the area of the S 2 can be depleted by production from the S 3.

Q. What is your plan concerning the surface injection pressure of the disposal well?

A. To be limited to the .2-p.s.i.-per-foot normal pressure limitation, subject to step-rate testing, increases through step-rate testing, and maintenance of the pressure at all times below fracture pressure.

Q. Mr. Foppiano, in your opinion as a petroleum engineer, will this alternative procedure suggested by OXY prevent the migration of water out of the Bone Springs formation?

A. I think so. And additionally, it provides an opportunity to recover additional reserves, prevent waste that might otherwise occur in the Bone Springs, by seeing if we can waterflood the Bone Springs. And it also will prevent the possible loss of reserves in the Government S 2 by avoiding or delaying the necessity of block squeezing the Bone Springs in that wellbore.

Q. Have you brought with you this morning documents that support the tabulation of data on Exhibit Number 6, including copies of your cement bond logs, should Examiner Ashley desire to have that information?

A. I have those, yes.

MR. KELLAHIN: Mr. Ashley, Exhibit Number 12 is

our certificate of notice. We've notified the offset operators, the owner of the surface, with regards to the proposed disposal well. And with the introduction of Exhibit 12, then, we would move the introduction of Exhibits 1 through 11.

EXAMINER ASHLEY: And 12?

MR. KELLAHIN: Yes, sir.

EXAMINER ASHLEY: Exhibits 1 through 12 will be admitted as evidence at this time.

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

EXAMINATION

BY EXAMINER ASHLEY:

Q. Mr. Foppiano, do you know of any other similar cases like this in New Mexico?

A. I was presented with a Marathon case yesterday, but I -- Without reviewing the case file, I can't determine whether or not it was a similar case or not.

MR. KELLAHIN: My recollection, Mr. Ashley, is that there is a Marathon case that raises this issue, and I haven't found it, and I'll continue to search for it. I should be able to find it here in a day or two. But I believe we had this kind of conversation in the past.

EXAMINER ASHLEY: When you find that information, could you get me a copy of that.

MR. KELLAHIN: Yes, sir, I'd be happy to.

EXAMINER ASHLEY: Okay.

Q. (By Examiner Ashley) If this is allowed and then you find that you do -- that it is working effectively to increase production in the offset wells, then you would propose, or come before the Division proposing to possibly waterflood the whole field?

A. Yes, unitize and waterflood. There are multiple leases, multiple operators we'd have to unitize. And we would use this information as a basis for our feasibility study for waterflooding the Bone Springs.

Q. Okay. Say you got to that point and you decided that it was feasible to waterflood. What would you do with these two wells at that point, these two wells that don't have cement across the Bone Springs?

A. That's a fair question. I asked that question myself, and we would look at -- The feasibility study would encompass the probable loss of reserves that might result from having to workover not only this well but maybe one or two other wells. I haven't investigated, I don't know what their cementing situation is.

But you'll notice from Exhibit 1 that we have several deep gas wells in this area of the Bone Springs. So we might have a similar problem, we may not. I don't know. But the feasibility study would encompass the cost,

strictly from a cost-benefit standpoint, that we might have to take that risk to squeeze that interval off and risk those reserves. We might just have to take that.

But at that time we feel like we've got some evidence that the Bone Springs is floodable. Right now, we have really no evidence that we can pump water into this Bone Springs interval. So this is kind of a -- We're kind of a little pilot project. We're anxious to try to see if we can pump any water into it. But by that time we will know.

Q. It seems to me that if you can think these two wells are okay the way they are, then if you did pursue a waterflood, then you would want to just leave them the way they are, that you wouldn't have a reason to go back and squeeze these wells. But what you're saying --

A. Well, I guess we more or less assumed that the Division would not allow that, regardless of what we wanted to do, and so we -- Perhaps I made a wrong assumption there, but my assumption was that if the Division approved our Application here, which is essentially for a term injection, that it would be with the caveat that if we go later on and try to waterflood, that we'll have to fix this problem or deal with this problem.

However, we'd certainly be interested in looking at it from the standpoint of, is it possible to avoid the

risk of losing these Morrow reserves, not only on this well but any other well we might have this problem with, if there is not the potential for contaminating otherwise potentially productive zones in this area.

I mean, as you can see from the geologic evidence, there just isn't anything productive in this area that would be affected or could be affected by water injection into the Bone Springs if we were able to institute a large-scale waterflood project.

So with that, it may well be, if the Division is amenable to that, that might be an alternative approach, is to institute a waterflood project without requiring block cementing of the Bone Springs in this area. I don't know. We haven't look at it from the large scale, because we really don't know if this is going to even be possible, to have a waterflood project here at all. So maybe we can just defer that till when we get to the feasibility study.

Q. I guess what I'm saying is that you say, Well, we don't feel like we need to cement this right now, but if we were to institute a waterflood we would cement them right away, we wouldn't even second-guess what the Division requires for cementing, we would cement those wells.

A. I made the assumption that we would be required to, but perhaps that was wrong on my part to make that assumption.

Q. Okay.

A. I think the primary issue, the primary concern there, would be, right now we could inject a little bit of volume into this Government AB 9 wellbore. The Bone Springs pressures up, and that's the end of that. That test is done. And so it hasn't really affected anything very far away from the Government AB 9 wellbore. So it hasn't even gone over to where the Government S 2 location is, or the AB 2.

However, if it does an area larger than that, such that there is oil being pushed and there is a response seen at the Bone Springs producers, and then we go institute a large-scale waterflood project, certainly there is going to be the potential for there to be pressure increase in that annual space that is uncemented. And that will be a very real concern.

Right now we don't think that's a real concern because of this situation of monitoring that we've got out there and the fact that we don't know if we can pump water in there. But when we have a waterflood project that concern is elevated, because we know then we can push oil, that that interval will be exposed to pressure increase.

So at that time, it might be that the Division's concern is that, Okay, it is going to experience pressure increase, so we do want it cemented in these wells. But

right now, since we don't know we can even do this, we think it's kind of premature to worry about it.

Q. Do you have any idea, or have you made any kind of assumptions, on how production might increase in the Bone Spring?

A. Other than the ballpark volumetrics that you saw. It's a very poor reservoir from the standpoint of primary recovery, and a rule of thumb is, if it's poor for primary it's not going to be real good for secondary. So the need is going to be to utilize existing wellbores. And certainly -- It probably won't support drilling a bunch of wells.

So it's real hard to estimate what we would have. We don't really have much of an analogue or even anything in this area that we can say, this is what we might get from waterflooding, other than look at the original oil in place and the low primary recovery and just speculate that if we can at least do -- if we can double our primary recovery, we've got a million barrels of a potential target.

But it's a fairly sizeable target, you see, of 45 million barrels. It's not an insignificant amount of oil that is possible, that could be -- a portion of which could be recovered, either through secondary or even tertiary.

Q. Okay, you said you were going to be monitoring

both of those wells, the Government AB 2 and the Government S 2, for pressure; is that correct?

A. Yes, for pressure.

Q. And what about -- You're also going to be monitoring the Bone Springs producers there too?

A. Correct, the -- I don't know if I referenced it, but Exhibit Number 11 details what we're proposing as an alternative solution, monitoring water breakthrough in any of the Bone Springs producers within a half a mile, and then at the same time monitoring and trying to detect any significant pressure increase in the annular space on the two wells where the cement doesn't cover the Bone Springs, and then terminating the injection in the AB 9 immediately upon either of those two situations occurring.

Q. What would you do if you had breakthrough in either one of the -- the AB 2 or the S 2?

A. The AB 2 or the S 2? If we had pressure increase -- We don't think that it's likely it's going to affect the area of the Bone Springs around the AB 2, because there's not much porous or permeable interval in the Bone Springs over in that direction. So the S 2, it's likely we would see water breakthrough at the Bone Springs producers well before we would see even a pressure increase in the Government S 2 annular space.

But let's suppose we saw no impact on the Bone

Springs wells. If we saw a pressure increase, meaning there was just a pressure response around the area of the Government S 2, then we're proposing to just shut the injection down at that point. The only way that could happen, really, is if there was almost like a direct channel from the AB 9 over to the S 2 wellbore. But by monitoring that pressure in the annular space, we should be able to detect that pretty quickly.

Additionally, any pressure increase in the Bone Springs in that area will be immediately depleted by continuing to produce the Government S 3, which is located right next to it. And likely we would see an increase in production on the Government S 3 at the same time, so...

Q. So you think that any pressure increase you might see or problems in the Government S 2 would be taken care of possibly by the Government S 3?

A. Yes, and by monitoring the production on the two -- on the Bone Springs wells that are even closer to the AB 9 than where the S 2 is.

I think if you look at Exhibit 1 you can see where the Bone Springs producers are located, and so you can see there's one to the north, there's one to the northwest, and there's one to the west of the AB 9. And so if there's any effect of water injection, it's going to be in that area where the reservoir is located, where the

pressure has been depleted, and we should really see it at those Bone Springs producers, since that's where the pressure sinks are, that's where we're producing it.

EXAMINER ASHLEY: Okay, I don't have anything further. Thanks a lot.

THE WITNESS: Thank you.

EXAMINER ASHLEY: Mr. Kellahin?

MR. KELLAHIN: No, sir, that's all.

EXAMINER ASHLEY: There being nothing further in this case, Case 12,256 will be taken under advisement.

(Thereupon, these proceedings were concluded at 9:25 a.m.)

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I do [illegible] the foreg[illegible] e co[illegible] the proc[illegible] the [illegible] hearing of Case 12256 heard by me on 10-21 99

[illegible], Exam[illegible]
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 October 31st, 1999.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 2002