STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO

9 September 1987

EXAMINER HEARING

IN THE MATTER OF:

Application of Ray Westall for salt water disposal, Eddy County, New Mexico.	CASE 9189

BEFORE: Michael E. Stogner, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Division:	Jeff Taylor Attorney at Law Legal Counsel to the Division State Land Office Bldg. Santa Fe, New Mexico 87501
For the Applicant:	Chad Dickerson Attorney at Law DICKERSON, FISK & VANDIVER Seventh and Mahone/Suite E Artesia, New Mexico 88210
For Grace & McCausland:	Ernest L. Padilla Attorney at Law PADILLA & SNYDER P. O. Box 2523 Santa Fe, New Mexico 87504

I N D E X

I N D E X CONT'D

RANDALL HARRIS RECALLED

E X H I B I T S

MR. STOGNER: We are now ready to call Case Number 9189.

MR. TAYLOR: The application of Ray Westall for salt water disposal, Eddy County, New Mexico.

MR. STOGNER: Call for appearances.

MR. DICKERSON: Mr. Examiner, I'm Chad Dickerson of Artesia, New Mexico, on behalf of the applicant and I have one witness.

MR. STOGNER: Other appearances?

MR. PADILLA: Mr. Examiner, Ernest L. Padilla, Santa Fe, New Mexico, for Corinne Grace.

I have two witnesses.

MR. STOGNER: Are there any other appearances in this matter?

Will all the witnesses please stand at this time to be sworn?

(Witnesses sworn.)

MR. STOGNER: Is there need for opening remarks this morning, gentlemen?

MR. DICKERSON: I don't think so, Mr. Examiner.

MR. STOGNER: Mr. Padilla?

MR. PADILLA: None, Your Honor.

MR. STOGNER: In that case, Mr. Dickerson?

RANDALL HARRIS,

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

DIRECT EXAMINATION

BY MR. DICKERSON:

Q Mr. Harris, will you state your name, your occupation, and where you reside?

A My name is Randall Harris. I am an independent consulting geologist and I reside in Artesia, New Mexico.

Q And have you previously testified, Mr. Harris, before this Division as a petroleum geologist and your credentials are a matter of record?

A Yes, they are.

Q You are appearing on behalf of the applicant, Ray Westall, in this case as consulting geologist?

A Yes.

Q And in this capacity have you examined the geological data surrounding this application and compiled the Form C-108 submitted to the Division as Application for Authority to Inject in this case?

A Yes, I have.

MR. DICKERSON: We tender Mr. Harris as an expert petroleum geologist, Mr. Examiner.

MR. STOGNER: Mr. Padilla?

MR. PADILLA: No objection.

MR. STOGNER: Mr. Harris is so qualified.

Q Mr. Harris, will you please briefly summarize the purpose of the application that Ray Westall filed in Case 9189?

A The purpose is to inject the produced water from his producing Delaware Canyon, Delaware wells into a nonproductive Delaware sand.

Q Okay. Will you summarize for the Examiner the information that you have compiled and show in Exhibit Number One, the C-108, surrounding the proposed injection well? Just tell us the location of the well and the mechanics of the proposed completion for injection purposes?

A The lease name is the Ray Westall Merland No. 1. It's location, the footage is 990 feet from the south line, 1870 from the east line, Section 24, Township 22

South, Range 26 East, Eddy County, New Mexico.

The well was originally drilled in 1979. Its TD is 4,527 feet. It's originally purpose was a Brushy Canyon oil well.

There is 8-5/8ths casing, 24 pound J-55, set at 399 feet. Cement is circulated to the surface.

5-1/2 inch J-55 15.5 pound casing is set at 4527. The top of the cement by temperature survey and bond log is at 1420.

We propose to plug this well back to a nonproductive Cherry Canyon sand. The current interval producing is 4322 through 4476. We propose a cast iron bridge plug to be set at 4320 and dump 100 feet of cement on top.

We will the propose to inject at an interval from 3670 through 3720.

We also propose a Watson J-Lok packer, nickel-coated, to be set at 3660, which 2-7/8ths upset tubing, plastic-lined, will be then seated in.

Q Mr. Harris, is this an expansion of existing project?

A No, it is not.

Q You have attached as part of Exhibit Number One, Mr. Harris, a map, or two maps, actually, that identify all wells and leases within two miles of the proposed injection well and with a 1/2 mile radius circle show-

ing the lease information within this well's area of review. Let's let the Examiner and ourselves turn to those maps and will you orient us with regard to the injection well and the surrounding leasehold and surface ownership?

MR. DICKERSON: Mr. Examiner, I'm attempting to proceed through the information on the C-108 in the order presented on the front of that form. The information compiled is obviously a little voluminous but it is compiled in the same order with reference by Roman numerals to the sections of the C-108, and while it's not indexed by thumb tabs or anything, it is set forth in that order.

MR. STOGNER: Thank you.

Q Mr. Harris, refer to these maps you have attached and orient us along the lines that I stated.

A The first map is a current landholding map. There is a one-half mile circle drawn around the subject well, the Merland No. 1 of Ray Westall, and a 2-mile circle drawn around the well, also.

The second map is a blowup, if you will, of the land map to give a little bit more detail to the locations and clarify, perhaps, some of the ownerships.

Q Okay, let's refer to the second map, Mr. Harris, the one that is blown up or magnified. How many wells have penetrated the proposed injection interval within

that one-half mile area of review?

A There are eleven wells total that have been drilled within the area of review, ten of which have penetrated it.

Q Okay. Why don't you point out for us the proposed injection well and tell us very briefly something about the ownership and any other pertinent information that you have concerning the other wells within the area of review that relevant to our purpose today?

A The proposed injection well is in the center of the half mile circle. The half mile radius line is drawn from the half mile circle to this well to point it out very -- where it's at.

The ownership of this 160-acre tract is Ray Westall. He is the operator of record as far as the Delaware is concerned.

Deeper rights are owned by other individuals.

Q And who is the owner of the surface?

A Mary F. Merchant is the owner, also known as Merland, Incorporated.

Q Okay. Mr. Harris, you have attached, have you not, a tabulation of data on all wells located within this area of review and that tabulation of data follows the second map that you have presented. Can you with-

out belaboring the point, summarize for the Examiner the pertinent completion data surrounding those other wells within this area?

A Yes. Every well drilled, all eleven, have the well's type, the construction, the date drilled, location, depth, record of completion, C-105, and a schematic of the well as it exists today.

There is -- to summarize all of them briefly, every well is cemented at least 500 feet below my proposed injection zone and at least 2000 feet above.

Q So that all of the wells within the one-half mile area of review are cased and cemented across the proposed injection interval.

A Yes.

Q You have attached as part of the C-108, portion VII, Mr. Examiner, certain information -- or Mr. Harris, certain information reflecting the details of your proposed operation. Turn to that and tell us what your proposed average and maximum daily rate and volume to be injected is anticipated to be.

A Our average daily injection rate is anticipated at 400 barrels per day.

Our maximum rate would be 1000.

Q And is this system open or closed?

A It will be a closed system.

Q You stated your proposed average and maximum injection pressures, or did you?

A Our average injection pressure is unknown at this time. A sustained injection rate, of course, cannot really be anticipated until such time as the well is tested. We anticipate it to be under 300 pounds.

Maximum injection rate -- injection pressure will be under 650.

Q What is the source of the produced water that is proposed to be injected into this disposal well?

A It is produced water from the Ray Westall Delaware wells in the area.

Q Is this intended or designed to be a commercial disposal system or is this one to be operated by the operator solely for his benefit in economically disposing of produced water from his wells in the area?

A It is not intended for commercial but only for on lease and his wells in the area.

Q You have attached, have you not, an analysis of the produced water proposed to be injected as an exhibit?

A Yes, I have. The produced water from the Cherry Canyon and the Brushy Canyon from Ray Westall wells in the area, showing that the chloride content is ranging from 54,000 to approximately 80,000.

Q Now your proposed disposal operation will dispose of produced water into the Cherry Canyon, correct?

A Yes.

Q Are there any producing wells within that Cherry Canyon Sand in that vicinity?

A In that particular sand, no. It is the last sand of the Cherry Canyon and I have found no production anywhere within two townships.

Q From the water analyses that you have examined and attached as an exhibit, is there any indication that there is any problem with compatibility of the fluids to be injected with any fluids that may exist in the formation at the present time?

A No. Because the -- the production, the water above this zone and the water below the zone are very compatible.

Q Okay. Let's go to Roman numeral VIII, Mr. Harris, and summarize for us some of the information regarding the geological formations which we are concerned with here for this injection well.

A The name of the injection zone is the Cherry Canyon formation.

The top of the Cherry Canyon is at 2800. The base of the Cherry Canyon is at 3795.

The Delaware Group as a whole and this

sand in particular is comprised of a medium grained sandstone. The porosity in this particular sand is approximately 18 to 20 percent. The thickness of our injection zone is 54 feet. Its average thickness throughout the township is 80 and the range in thickness of this sand is from 40 to 120, very continuous in its nature.

Q Mr. Harris, some of us may not be as familiar as you are with some of the terms you've used. Tell us, first of all, what encompasses the term that you used, the Delaware Group or the Delaware Mountain Group, to you as a geologist?

A The Delaware Mountain Group actually consists of three major zones or formations: The Bell Canyon, the Cherry Canyon, and the Brushy Canyon.

Q And that is in order from closest to the surface down?

A Yes.

Q So you anticipate disposing of water into the middle formation of that Delaware Mountain Group, which you have identified as the Cherry Canyon formation.

A Yes.

Q Okay. Tell us about the -- in general terms, the lithologic detail of this injection interval, this Cherry Canyon Sand of the Delaware Mountain Group.

A It's -- it's -- the sand itself is a med-

ium grained sand, very loose, unconsolidated, to a point, to a very, very, friable sand. It has impermeable shale and sandstone between the major sand zones.

Its main depositional environment would have been fluvial and probably turbidite flows.

Q Approximately how thick at the location of your proposed injection well is this Cherry Canyon sand that you have identified?

A 54 feet.

Q Okay, what is the average thickness of that zone in the area?

A 80.

Q And is there a variation in the range of thickness in the Cherry Canyon?

A Yes, the range is from 40 to 120 feet.

Q Over what geographical area does that range occur?

A I have ran this for over two townships around this immediate well.

Q The Delaware Mountain Group and the Cherry Canyon sand as a member of that are widespread, Permian-age deposits --

A Yes.

Q -- throughout this area of southeastern New Mexico and west Texas?

A Yes.

Q Mr. Harris, tell us about the source and location of any known potable or fresh water availability in this area.

A Well, I contacted the State Engineer's Office and they report all fresh water to occur from the surface to 200 feet. It is in the Quaternary alluvium.

There is no known fresh water below where we're at.

Q Okay, have you attached as Roman numeral XI portion of our Exhibit Number One certain information regarding the location of these freshwater wells in the area?

A Yes.

Q Would you turn to that portion and describe for the Examiner something about the source of fresh water that you're speaking of?

A There are approximately 45 fresh water wells within one mile of the proposed location. That is from the State Engineer's Office.

The two that I have listed, there is a map of the Walling Heights Subdivision of Carlsbad. These two were producing wells and the closest ones that were obtainable from the landowners.

Q What sort of wells are these?

A These are windmills.

Q And what's the purpose that this water is put to?

A Watering the front lawns.

Q These are domestic wells?

A Yes.

Q Used by the -- by the parties who live in the area?

A Yes. And with this marking location of Water Well 1 and Water Well 2 is the water analysis.

Q From two of those wells.

A From two of the wells, yes.

Q And who took the water samples from these wells?

A I took the samples.

Q Is there any reason to suspect that the water analyses based on the samples that you took from the two wells is not representative of all the fresh water wells occurring in the area?

A No, there is not reason to suspect that it's not.

As yuou can see, the -- the calcium is identical between the two wells. The magnesium does vary slightly, but all in all it's very similar type water.

Q So that there are enough wells in the area in your opinion to -- that a careful monitoring of

these wells could identify and locate any problem with contamination of fresh water should it occur from this injection well or any other --

A Oh, yes.

Q -- well in the area. Is there any indication from the analyses that you have attached of any chloride contamination in the water in this area at the present time?

A Well, the chloride content is a little high. It is potable. They say anything under 10,000; however, the chlorides in this area are at 3550, which I don't believe is contamination. I think it's just a little salty.

Q In your opinion as a geologist could that be explained by the alluvial nature of the deposits in which this fresh water occurs --

A Yes.

Q -- in the proximity to the surface?

Mr. Harris, describe the proposed stimulation program that Mr. Westall intends to use in the completion of this disposal well.

A We propose to simply shoot two shots per foot from 3670 through 3720 and acidize with 2500 gallons of 15 percent hydrochloric acid.

Q Now the appropriate logging and test data

on the test well and on the other wells which have been -- or on the injection well and on the other wells which have been completed within the area of review are on file in the office of the --

A Yes.

Q -- Oil Conservation Division, are they not?

Mr. Harris, have you examined all available geologic and engineering data and from that examination have you found any evidence of any open faults or any other hydrologic connection between your proposed disposal in the Cherry Canyon formation and any underground source of drinking water in this area?

A None.

Q And do you as a geologist and based on your examination of this information, and in view of the completion and cementing programs which have been used in all the wells within the immediate area of the injection well, have any hesitation in whether or not there is any risk of -- of contamination of fresh water or migration of this disposed water into any zone other than this Cherry Canyon zone?

A I have no reservations whatsoever.

MR. DICKERSON: I have no further questions of -- I will introduce all my exhibits. The

others, Mr. Examiner, are fairly straightforward, or I'll let Mr. Padilla cross examine at this time and proceed again, but I would move admission of Applicant's Exhibit One at this time.

MR. STOGNER: Any objection?

Exhibit One will be admitted into evidence.

Mr. Dickerson -- I'm sorry, Mr. Padilla, your witness.

MR. DICKERSON: Why don't I -- it may save time if I just proceed and introduce the remainder of the exhibits and then let Mr. Padilla see it all?

MR. STOGNER: Is that --

MR. PADILLA: That would be fine.

MR. STOGNER: Okay, let's do it that way, Mr. Dickerson.

Q Mr. Harris, identify for us what we have submitted as Applicant's Exhibit Number Two.

A Applicant Exhibit Number Two is the withdrawal of Merland, Incorporated's objection, which is the surface owner, to the application of the C-108 of Ray Westall.

Q And refer to Exhibit Number Three and tell us what that is.

A Exhibit Number Three is the reason why the withdrawal of Merland -- of Exhibit Number Two.

It's an agreement set forth -- made between Ray Westall and Merland, Incorporated, of the manner in which the well will be converted to water disposal. It provides right-of-way, the right to inject into the well, and payments to the landowner at the rate of 3/16ths of 25 cents per barrel or 4.6 cents per barrel compensation to the surface owner.

Q So subsequent to the objection filed by the surface owner and through negotiation between Mr. Westall and the owner of the surface, this agreement was entered into which led to the withdrawal of their objection to this application.

A Yes.

Q All right, identify for us and tell us what Exhibit Number Four is.

A Exhibit Number Four is the affidavit of mailing. It includes the letter of transmittal to all offset operators and to the surface owner. This is accompanied with the return receipts.

Q Reflecting by receipt of all those parties of notice of this hearing --

A Yes.

Q -- a copy of application, and so forth,

as required by the rules.

Before I leave you, Mr. Harris, let me ask you one or two other questions.

Let's return to the map which you previously identified and you referred to certain other wells within your one-half mile area radius, area of review, which are operated by Mr. Westall.

Identify those wells for us, please.

A Of course, the -- the proposed injection well is the Merland No. 1, which is in the southwest quarter of the -- of the southeast.

The Baseball Park No. 1 and 2 are both on the west side of the southwest quarter.

Well No. 4 is in the southeast of the northeast quarter.

The Well No. 3 is listed on this map as a dry hole. It's in the north -- southwest quarter of this. It is not a dry hole. It is temporarily abandoned at this time.

Q Why don't you tell us something about the productive capability of Mr. Westall's wells?

A Well, the Baseball Park 1 and 2 are very commercial at this point. They produce approximately 4500 barrels of water per month and 1600 barrels of oil.

Q What is done with this water at the pre-

sent time?

A It is disposed of in a local disposal well.

Q And what is the cost of that disposal?

A The trucking cost is 69 cents a barrel and disposal is 20 cents a barrel, bringing a total of 89 cents per barrel of water disposed of.

Q Okay, with regard to the Baseball Park No. 3 Well, you say that -- what is the -- you say that it's shut in at the present time but what is the capability --

A It's shut in at the present time.

Q -- of production of that well?

A Very marginal at this point. It was tested for approximately 60 days. Plans have been abandoned until we can do something with the water. It will produce approximately 200 barrels of water per day at this point.

Q And how much oil, if you know?

A None.

Q With reference to the Baseball Park No. 4 Well, tell us specifically something about the economics of productivity of that well given the 89 cent per barrel cost of disposing of water?

A The Baseball Park No. 4 was shutin in November of 1986. It has not produced since that time. The last two months of production was 215 barrels of oil versus

a little over 6000 barrels of water per month. Based on just strictly economics of hauling the water and disposing of it, we were losing over $2000 per month by operating this well, and that's based on $20 oil, which we do not have.

Q By trucking and disposing of the water.

A Yes.

Q If this application is granted, Mr. Harris, and Mr. Westall can then dispose of water under the terms of his agreement with Merland, Inc., the surface owner, what, if anything, will that do to the economics of oil production in this area on these -- in these wells that you've identified?

A It will make it commercial again. The surface owner would receive approximately $528 for the amount of water that is now costing us $5,224. So the well then becomes commercial and making a profit of approximately $2700 a month.

Q Can you go through the calculation that you have made to illustrate that to the Examiner?

A Yes.

Q Price for oil, and so forth?

A I used $20 oil just to be optimistic of the future and the Baseball Park No. 4 only produced 215 barrels of oil for two months in a row, so that's a pretty good average and --

Q And what would be the total revenue from that 215 or 430 barrels of oil?

A Well, I broke it down into a monthly average. A monthly average, the oil would be $225 based on 75 percent NRI.

Q Net revenue --

A Net revenue interest --

Q -- to the working interest operator of these wells?

A Yes.

Q All right, and those wells, for one month what was the water production for those two months that you're referring to?

A The two months I'm referring to is November and October of 1986.

October, it produced 7825 barrels of water and Novewmber, 3915 barrels of water. I do not have an average of those two months; however, it does figure out at 89 cents a barrel to dispose of, to a $5,224 to dispose of this water.

Q As compared to what dollar amount received total by the working interest?

A $3,225. So a net loss of $1,999 and that does not take into account pumping expenses, lifting costs, well maintenance, so it could very well go over $2500 a

month loss.

Q Is that the well -- is that the reason that that well has been shut in --

A Yes.

Q -- for eight or nine months at the present time?

And if you perform that same analysis, assuming the 5 percent per barrel cost of disposing of the water, what if anything does it do to the economics of producing the oil from that well?

A It becomes economical again. We'll have over $2700 a month in profit to the working interest owners.

Q Now you referred to the Baseball Park 1 and 2 Wells, which you said that even given the current disposal costs of 89 cents per barrel are still producing a profit to the working interest. If you go through a similar analysis of the cost reduction for disposing of the water produced from those two wells, what, if anything, does it do to the economics of continuing to produce those two wells?

A It again makes it definitely more economical even though they're economical wells, but it reduces the cost of water disposal from $4000 a month to about 80.

Q In your opinion, Mr. Harris, would the approval of this application be in the interest of conservation, the prevention of waste, and the protection of cor-

relative rights?

A Oh, yes.

MR. DICKERSON: Move admission of Applicant's Exhibits One, Two, Three, and Four, Mr. Examiner, and I have no further questions of Mr. Harris.

MR. STOGNER: Are there any objections?

MR. PADILLA: No objections.

MR. STOGNER: Exhibits Two, Three, and Four will be admitted at this time.

Mr. Padilla, before I turn it over to you I have some clarifications.

CROSS EXAMINATION

BY MR. STOGNER:

Q On this big, large map, the wells that will be -- the water from the wells that are producing to be injected are the Baseball Park 1, 2, 3, and 4, is that right?

A Yes, sir.

Q Okay, and the 1 and 2, are those on the east half of the southeast quarter?

A Yes.

Q Okay. And the Well No. 4, that's in the southeast quarter of the northeast quarter?

A Yes.

Q Okay, and the Well No. 3 is that one over there in the northeast quarter of the southwest quarter?

A Yes.

Q And those are the only wells.

A Those are the only wells, yes.

Q And they're all producing from the Brushy Canyon.

A Brushy and Upper Cherry.

Q Brushy and Upper Cherry. Will the water be trucked over there or is it your proposal to run lines?

A Proposal to run lines.

Q Okay. The surface owner, when we talk of surface owner, this Mary Merchant, does she own the whole quarter section --

A Yes, she does.

Q -- or is she just a lot owner?

A She owns the entire quarter section.

Q Okay, so now you said this was in a subdivision area, is that correct?

A Yes, it is in a subdivision of Carlsbad.

Q Okay, and --

A Or pretty close to one, yes. There are no houses immediately around these wells.

Q But those -- is there any houses in the

southeast quarter of Section 24?

A No.

Q You said there was 45 wells within a mile, water wells?

A Yes, that's -- the State Engineer said approximately 45 water wells within a mile.

Q Okay, how many of those are in the southeast quarter of Section 24, do you know?

A The only two that I could find, there are -- there were some others I was able to find by knocking on doors but they were not operational at this time, they have all gone to a water supply system and so the wells are just shut in or as they broke they just never repaired them.

Q Okay, now when I look at, I guess this is part of Exhibit One, it shows to be a subdivision.

A Yes, sir.

Q It seems to be in Section 11, is that correct, fresh water analysis?

A Yes, it's in Section 24.

Q Okay.

A Same section as the -- and I have a reference marked of the Baseball Park No. 3, to the water wells or to the edge of the Section.

Q Now does any of this subdivision extend over to the southeast quarter of the section?

A No.

Q How would you describe the surface over there in the southeast quarter of 24?

A It is fairly flat with rolling sands. The reason it's called Baseball Park is because the Carlsbad Baseball Park is right there in the area but as you get away from the parkind area and the park itself it's rolling sands.

Q And nobody is living there --

A No.

Q -- in that quarter section. Is there any businesses, any buildings?

A The baseball park.

Q Just the baseball park. I just had some clarification. That's all I have.

MR. STOGNER: Mr. Padilla, your witness.

CROSS EXAMINATION

BY MR. PADILLA:

Q Mr. Harris, have you made application to the City of Carlsbad for permission to inject salt water in this well?

A No, I have not.

Q What's the total amount of water that is

produced from the Baseball 1, 2, and 3, and 4 Wells?

A Approximately 280 barrels per day. Well, I have to exclude 3. 3 is not a commercial well at this time and there is no actual pool link test on it where I could state how much water it did produce.

Q Your application states that you intend to have as much as 1000 barrels a day of injection. How do you arrive at that figure?

A That is based on if we were to have trouble with the injection well we will have two 500-barrel tanks holding the water and that's the capacity of the tanks and we'll have to shut the wells in if we do have trouble with the water well or with the injection well, and once it was reactivated we'd have 1000 barrels capable of disposal, and that's how that figure was arrived at, and you -- you mentioned 400 barrels is also how many I put per day, that's giving Ray Westall leeway to drill another well or two in this area and assuming about the same water production.

Q Do you have anticipations of drilling other wells in the area?

A It is being considered at this point, yes, another replacement well for the Merland.

Q Is that part of the consideration in getting this agreement with Merland, Inc.?

A Yes. It's in consideration. If Ray

Westall is to drill any other well on offsetting leases, he will drill a well on their lease first as a replacement well.

Q To what formation would that well be projected?

A Brushy Canyon.

Q The agreement doesn't state anything concerning that well with Merland, Inc., does it?

A It, yes, it does. It does touch on that, yes.

Q Will you tell me where it says that?

A Paragraph VII, Additional Well. Operator represents to owner that prior to his drilling any new well on any acreage continuous to the property, which well will be completed in the Cherry Canyon formation, he will drill one additional well in the southeast quarter of Section 25 under the terms of the oil and gas lease described in paragraph A above.

Q What was the source of the objection by Merland, Inc.?

A The reason for the objection?

Q Yes.

A They wanted to make sure that their surface was protected and that they would receive some sort of compensation as surface owners.

Q Now the Baseball Park No. 3 Well, what's the well equipment that you have on that?

A There is a pumpjack, rods, and tubing.

Q Do you have holding tanks for oil there?

A Yes.

Q In your calculation that you testified to, did you consider the cost of making this well a salt water disposal well?

A The No. 3?

Q The Merland well.

A Oh, no, I have not. That's -- no, I have not worked out the economics.

MR. PADILLA: I believe that's all I have, Mr. Examiner, and I would call Mr. Gillham at this time.

MR. STOGNER: Okay, are there any further questions for clarification of Mr. Harris at this time?

MR. DICKERSON: One question.

REDIRECT EXAMINATION

BY MR. DICKERSON:

Q One question. In your brief economic analysis of current costs of disposal of this water, you also in addition not consider the cost of converting the disposal

well, you did also not consider, did you, Mr. Harris, overhead costs and other actual cost involved in operations. You simply isolated your analysis to the cost of disposal without considering any other factors, whether it would go to increase or decrease total cost of operations.

A That's true.

MR. DICKERSON: No further questions, Mr. Examiner.

MR. STOGNER: Okay.

RECROSS EXAMINATION

BY MR. STOGNER:

Q Mr. Harris, before I let you go, of the 10 wells that penetrated this formation and running through your schematics, I show a few of them that didn't have any tubing. Does that make -- I mean as I to assume that these wells are not producing at this time?

A Oh, they're producing. I did -- I did not put the tubing on any of the wells. I just simply put the depth interval that they're producing from.

Q Okay. Now, are any of these wells plugged and abandoned?

A Just -- just one, sir. That is the Jenkins in the Queen. That is a dry hole. It is in the northeast quarter of Section 25. It is also the last

schematic in my exhibit. It did not penetrate the zone of interest. Its TD is 2255.

Q So none of the wells that did penetrate the zone of interest are not plugged and abandoned at this time.

A No.

Q Okay, now you showed one that was temporarily abandoned. Which one was that?

A The Baseball Park No. 3.

Q And that was the one that you specifically alluded to a little earlier.

A Yes, sir.

Q When were most of these wells drilled in this area?

A Over about a 20-year period.

Q The oldest being?

A The oldest being the Jenkins & McQueen, 1953.

Q They appear to be around the seventies, mid-seventies.

A Yes, mid-seventies to -- to 1984.

Q Okay.

MR. STOGNER: Okay, that's all I have.

Are there any further questions

of Mr. Harris?

If not, he may be excused.

Mr. Dickerson, do you have anything further?

MR. DICKERSON: Nothing further at this time, Mr. Examiner.

JIM GILLHAM,

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

DIRECT EXAMINATION

BY MR. PADILLA:

Q Mr. Gillham, will you please state your name and where you reside?

A My name is Jim Gillham and I live in Roswell, New Mexico.

Q Mr. Gillham, would you please tell us -- well, first of all tell us what your connection with Corinne Grace is in this hearing?

A I'm a consulting engineer appearing on behalf of Corinne Grace.

Q Mr. Gillham, have you had a chance to study the application of Ray Westall made here today?

A Yes, I have.

Q And have you investigated the land positions of Corinne Grace and are you familiar with those?

A Yes, I have and I am.

Q Have you previously testified before the Oil Conservation Division?

A No, I have not.

Q Tell us, sir, when and where you received your education in petroleum engineering.

A I have a petroleum engineering degree from the University of Tulsa.

I've worked nineteen years with private industry as a petroleum engineer and manager of production in Texas, Oklahoma, Kansas, Nebraska, New Mexico, Montana.

Q For whom did you work during that time?

A I worked for the Devonian Company, which merged into Warren Petroleum Corporation, and when they merged into Gulf Oil Corporation I went with an individual, William H. Pine.

Q And after that time what did you do?

A Then following that I have sixteen years service with the USGS, MSS, and BLM, and I retired from -- from the government and have been in private consulting work for the past fifteen months.

While I was in private industry and government, I have testified before the Texas Railroad Com-

mission, the Oklahoma Corporation Commission, and the South Dakota Board of Natural Resources.

Q While you were with the Minerals Management Service were you -- what did you do?

A Well, while I was with the USGS I was District Supervisor in Roswell, New Mexico, which had jurisdiction over southern New Mexico and west Texas.

Q Does that include the area covered by the application?

A Yes, it does.

Q Go on, Mr. Gillham.

A I think I've just about covered it.

MR. PADILLA: We tender Mr. Gillham as an expert petroleum engineer.

MR. STOGNER: Mr. Dickerson, any --

MR. DICKERSON: No objection.

MR. STOGNER: There being none, Mr. Gillham is so qualified.

Q Mr. -- let me go on a little bit further with his qualifications, if I may, Mr. Examiner, since he's going to testify concerning Mrs. Grace's ownership in this area.

In your work with the government and private industry, have you made -- do you work with land titles

A Yes. While with the -- with the government I did a lot of abstracting of Federal leases and the approval of oil and gas units and (unclear) agreements; also whenever APD's approved I worked with land instruments, contracts with private industry. I've done title work since I've been in private consulting work.

MR. PADILLA: Mr. Examiner, we tender Mr. Gillham also as a landman or a practical oilman in regard to land titles.

MR. DICKERSON: I would like to ask him a few questions along that line, Mr. Examiner.

MR. STOGNER: Mr. Dickerson.

VOIR DIRE EXAMINATION

BY MR. DICKERSON:

Q Mr. Gillham, in your experience with the USGS or in your previous experience with the private firms and industries that you described, have you worked as a petroleum landman in fee oil and gas titles?

A Not as a -- not as a petroleum landman but I was -- worked with a small independent, William H. Pine, who was an individual, so in those kind of capacities you would do land work along with your petroleum engineering work.

Q Let me ask you, Mrs. Grace in here, is

she not?

A That's correct.

Q Would not her knowledge of her ownership of leases in the area of this proposed injection well be superior to any of that gained by you through whatever investigation with whatever expertise you may have, or at least equal to yours?

A I would say it would probably be equal.

Q You have spent your professional life as a petroleum engineer, though, have you not?

A I was a petroleum engineer, manager of production, supervisor of oil and gas operations on Federal lands and a pretty varied type of experience.

Q But in your capacity as District Supervisor of the USGS in Roswell, you were not concerned, nor did you have any occasion to investigate information furnished to you by operators on Federal lands except with regard to the Federal ownership which were reflected in your office's files, were they not? You did not go out and examine the records if offices of the County Clerks.

A No, no, not with the government, but I'm talking about since I've been out I've gone to the county records, done title work for banks. When I was with private industry I worked with county records.

Q Do you have any professional degrees or

professional training for that type of work and analysis?

A No.

MR. DICKERSON: Mr. Examiner, I have no objection whatsoever. I've known Mr. Gillham for several years, and I have no objection whatsoever to him testifying as a petroleum engineer or to the areas within his expertise and work experience, but Mrs. Grace is here to testify and her knowledge, we can all safely assume, I think, would be at least equal to if not superior to any of that gained by Mr. Gillham, and I would suggest the best evidence of any ownership she has could be stated most accurately by herself, and so I would object to Mr. Gillham testifying in any capacity along the lines of a petroleum landman. There's no foundation established that he's qualified by training, education, or experience to do so, and we have the person present in the room who could most ably testify as to what she owns in the area.

MR. STOGNER: Mr. Padilla?

MR. PADILLA: Mr. Examiner, Mr. Gillham's testimony is going to be limited to his -- to the interest of Corinne Grace and with respect to the application.

He obviously has to familiarize himself with the ownership that Mrs. Grace has in the area in that regard and that's the only testimony he's going to

present. We're not going to ask him to testify absolutely as to the exact ownership of all land titles in the area.

MR. DICKERSON: Let me ask one question of Mr Padilla, Mr. Examiner.

In the event that I am faced with answers that I don't know are something substantially similar to that and I desire to call Mrs. Grace as a witness in this proceeding, Mr. Examiner, is there -- or Mr. Padilla, is there any objection to doing so?

MR. PADILLA: I would -- I have no problem with that.

MR. STOGNER: Okay, in that case, let's proceed.

DIRECT EXAMINATION CONTINUED BY MR. PADILLA:

Q Mr. Gillham, would you refer to the -- first of all, can you generally tell us what the general nature of the objection that Corinne Grace is to this application?

A The primary reason that we're appearing here in behalf of Corinne Grace is that we are concerned with the possible damage to her Morrow well that is directly 900 feet north of the proposed disposal well. We're concerned that this well not be damaged and the well is capable of

producing approximately 500,000 MCF a day and we do not want to see that jeopardized.

Also there -- there -- we feel that there possibly are other safety hazards involved with this well inasmuch as there is a baseball park within a quarter of a mile of this well. There are a lot of people out there at the ballgames and young people and people of all ages, and for that reason we're appearing.

Q Okay, let's go on now to what we have marked as Exhibit Number One and tell us -- tell the Examiner what that is?

A Exhibit Number One is a contract between Corinne Grace and Morris Schertz.

Q Mr. Gillham, would it help if you also referred at the same time to what we have marked as Exhibit Number Two?

A Well, it possibly would.

Q Tell us what that is and what it contains?

A Exhibit Two is a plat of Section 24, Township 22 South, Range 26 East. It also has a portion of the northeast quarter of Section 25.

On this plat it depicts what is contained in this contract. The contract gives Corinne Grace 2-1/2 percent override on the --

Q On what lands?

A In the southwest quarter of Section 24.

Q How are they depicted on Exhibit Two?

A And they are colored green and this applies down to the base of the Delaware.

The contract also provides that she has an option for a 12-1/2 percent working interest in the southwest quarter down to the base of the Delaware.

Now, it so happens that she does own a 12-1/2 percent interest in that well shown as the Baseball Park No. 3 in the northeast of the southwest.

She also owns 50 percent working interest in the Grace Atlantic Well, which encompasses the south half of Section 24. So she owns 50 percent of the working interest of all the formation below the Delaware.

She owns or she has the right of first option, right of first refusal, to the Grace GoPoGo No. 2 and the Grace GoPoGo No. 1.

The GoPoGo No. 2 is located in the southwest quarter of the northeast quarter of Section 24 and it has the north half dedicated to that well.

The GoPoGo No. 1 is in the southwest of the northeast of Section 25 and it has the northeast quarter dedicated to that well.

Q When you say that she has a first option,

what do you mean by that?

A She has the right whenever -- if -- if the operator of that well decides to sell or dispose of it, she has the right to acquire it before it is disposed of.

Now that's 100 percent of the working interest in those tracts.

Q Okay. Let's go on now to the -- let's refer to the application of Ray Westall, the application itself, and to shorten the time that we spend on this thing, let's just simply proceed to have you tell us what the gist of your testimony is going to be concerning the application and then move right into the application itself.

A The primary thing that I have done is taken this application and examined it closely. Some of the application -- some of the reports or exhibits in this application I went to state records and got some additional information, additional reports.

Q What state records?

A The sundry notices, primarily to see how these wells were cemented; what kind of problems they encountered when they were doing cementing, and those type of things.

In all of the wells in this area they have had trouble with cementing operations. There's lost circulation zones, cavernous areas, and in some cases in the

surface pipe they've had to run one-inch casing in order to get the cement to circulate. In all cases in the area when they run intermediate pipe they run light cement, flow seal, lost circulation type material, and the salt in order to speed up the setting time of the cement, in order to combat this lost circulation problems which are prevalent in this area.

Now, with these type of situations in this area where you have lost circulations zones and cavernous areas, they have designed -- tried to design the best type of cementing operations that they can come up with but in all -- but in all cases they are -- there are very good chances that you have areas in there that are not covered with cement. You have areas that you don't have good cement because of movement in the lost circulation zones.

Q Mr. Gillham, let's go on now and have you explain in more -- with more specificity those concerns that you have with regard to the wells in the area.

A Okay, the first -- the first well is shown as the propose injection well, the Ray Westall Merland No. 1, in that the sundry notice you'll notice that they did have trouble circulating the surface pipe. They did have to run one inch in order to get the cement back to the surface.

The --

Q What effect does that have on the cemen-

ting job?

A Well, --

Q In having to use the one inch pipe.

A It's not as good a job as if you had the cement circulated on initial go-round. The one inch job will get your cement back to the surface but it doesn't necessarily imply that you've got good cement all around the casing.

However, that's on the surface pipe.

In the production string in that well they ran 5-1/2 casing and they cemented that with 300 sacks of light cement and 200 sacks of 50/50 poz, indicating that there is areas of lost circulation in this area and trying to get a better cement job.

Q What does 50/50 poz mean?

A Well, it's 50/50 poz, a light type material added with regular cement.

Q And does that enhance the circulation of cement or --

A Well, with the cement being lighter in weight, then it's a better chance that it will come up the hole rather than going to some of these low pressure zones, or lost circulation zones.

And I also notice on that particular report, it seems to have been added later in pen, that the top

of the cement was at 1420 from the bond log, and it didn't appear that that was in the original submittal.

Q Okay. Move on to the next well that you have a comment on, Mr. Gillham.

A Okay. Well, the Grace Energy Company, the GoPoGo Well No. 2, you notice that they ran intermediate pipe in that well and they run 1500 sacks of Tri light weight cement and 400 sacks of Class C cement, indicating that there again they had lost circulation problems.

And I also notice on that particular one that they show that that circulated in pen after the report was apparently filed.

In that particular well I have calculated that the Class cement -- Class C cement, which is 400 sacks, probably the top of that is around 4000 feet on that intermediate casing and the injection interval is going to be at 3670 to 3720, which is above the best cement or the neat cement.

Q When you say neat cement, what -- is that a heavier cement or what is that?

A Well, it's all cement. In this case it was a Class C cement.

Q Where are you going to now?

A Go next to the Grace Energy Grace Atlantic Well No. 1.

Q Now is this --

A No, that was just the well that we were on. Okay, the Kuklah Baby No. 1, JPG Kuklah Baby No. 1.

Q Wait a minute, Mr. -- did you bypass the Grace Atlantic Well?

A No, that's the well I just got through talking about.

Q I thought you were talking about the Grace Energy --

A Well, I got those two -- okay, the GoPoGo No. 2, it used -- no, I covered that one.

Q Okay, did you cover the Grace Atlantic No. 1, then?

A Then the Grace Atlantic No. 1, I show that I had 1250 sacks of light cement and 400 sacks of Class C cement and I showed where I thought the top of the Class C cement was in that particular well on the intermediate casing, which was at about 4000 feet, which is below the proposed injection interval.

Q How far is this well from the proposed injection well?

A This particular well is approximately 900 feet north of the proposed injection well.

Q Okay.

A Okay, now we're to the --

Q Now, we're to the --

A --Kuklah Baby No. 1, the JFG Kuklah Baby No. 1. Okay, in that particular well in checking the sundry notices with the state commission, it does show that they used a light cement, 162 sacks of poz mix A, 2 percent gel, 16 sacks of salt, and in this case they didn't run intermediate pipe.

Q What -- what -- you've added another ingredient here now, a salt. What does that do?

A The addition of salt is to speed up the or accelerate the setting time of the cement so that when you're pumping the cement around you have a chance for it to set up and take the initial set that it will not move off into these lost circulation zones and you'll have a better cement.

If you get movement of the cement while it's in the process of setting up, you don't have good cement.

So the salt speeds up the setting time.

Q Okay.

A Okay, in the JFG Merland No. 1 they used poz mix A, 2 percent gel, and also salt in that particular well.

Q Is that indicated on this completion report attached to the application?

A No, it's not. I determined this from the sundry notices on file with the Commission.

Q Okay. Move on to the next well, if you would, please.

A The Baseball Park No. 1. In this particular well, checking the -- the records on file with the Commission, sundry notice shows that they did run 800 sakcs of pacesetter light cement; 800 sacks of Class C. They had salt in that and other lost circulation materials.

And in that particular well they apparently did get circulation of the production string.

The Ray Westall Baseball Park No. 3, here again --

Q You're talking about the Baseball Park No. 2 Well?

A Baseball Park No. 2.

Q Okay.

A In that well they used 700 sacks of pacesetter light, 900 sacks of Class C, indicating that you're still in the area where you have lost circulation zones, cavernous areas, and the chances where you're going to have -- that you're not going to have good cement on the whole casing string.

Q Was 1-inch pipe used on this well, also, in the Baseball Park No. 2?

A Yes, it shows that -- on that report that they used 1-inch with 200 sacks of pacesetter light in order to get that production string to circulate.

Q Okay, go on to the next well now, please.

A The Baseball Park No. 3 is the newest well completed out in this area. It's the well that Grace owns 12-1/2 percent working interest in, and in that one there again they used light cement, salt, in that particular cementing job, and they have a temperature survey that shows the cement came within 400 feet of the surface.

Q I notice a notation on this sundry notice for the Baseball Park No. 3 that says that this -- they've used Cello-seal. What is that?

A Cello-seal is just a cellophane, small particles of cellophane mixed in with cement for a lost ciculation material.

That's added in the cement mixture and goes down the casing with the cement.

The -- the next one would be the -- these are kind of our of order here, but the Baseball Park No. 4. Now the particular completion report that is attached to this application just says that they used 650 sacks on the 5-1/2 but in looking at the sundry notice on file with the Commission they used 350 sacks of light cement, a quarter pound of Flo-seal, 300 sacks of 50/50 poz, and also salt.

Q Okay.

A So indicating that the conditions in all these wells are the same. The -- the Jenkins & McQueen Well, it's an old well that was plugged back in 1952, and it's bottomed above the projected disposal interval, however, if you'll note the plugging of that well, there are cement plugs with heavy mud in between, fairly large open areas.

Q When you say heavy mud in between, that means there's no cement between the wellbore and the casing?

A This is just open hole here.

Q Okay.

A That would be, yes, just mud in the hole, supposedly supporting the next plug above.

Q Could water migrate up and down that hole through that mud?

A Well, of course, if there were -- if the water became in contact with this wellbore and those mud areas, why, certainly it would circulate through there. It would not hold back the flow of fluids.

Okay, and then going on to the water analysis of the producing wells, the Baseball Park No. 1, which produces from the Cherry Canyon, it shows a pH of 8-1/2, which is basic for alkaline type fluid. That particular well was produced in May. It says this particular sample

was obtained on May the 19th, and that particular well was produced 31 days in the month of May, 1987, on, according to the C-115.

The Merland No. 1, which produces from the Brushy Canyon, also taken on May the 19th, 1987, does not show that it was produced on the C-115 for the month of May, 1987. So supposedly this sample was taken from the wellhead. It shows a pH of 8.

Baseball Park No. 3, also sampled on May the 19th, is not carried on the C-115. In fact this well does not have a completion report on it, but it was not carried on the C-115 and it doesn't show that it was produced during the month of May, but that produces from the Brushy Canyon and it has a pH of 6-1/2, which is just very slightly basic or alkaline.

The Baseball Park No. 2, which produces from the Brushy Canyon, it was produced 27 days during the month of April -- month of May, 1987. It showed it had 1665 barrels of water. It was sampled on May the 19th and it shows a pH of 4, which is highly significant in that this apparently is a good sample taken from a well that was producing and it shows a pH of 4, which is very highly acidic.

Q What -- what -- what significant does that have to --

A Well, anything that's acidic will react and eat up cement, casing, whatever it comes in contact with.

Q In relation to the Grace Atlantic Well, what could be the effect of this type of water injection?

A Well, if this is the -- if this is the type of water that is being produced from the Brushy Canyon, this is the type of water that is going to be injected into the Cherry Canyon, this well could very easily come in contact with the Grace well only 900 feet north of the proposed injection well, could contaminate or could eat up the cement, cause corrosion to casing, which would be the intermediate casing in this case. It could even further damage the production casing and at least it would cause a lot of expense to the operator to repair that well and possibly lose whatever remaining hydrocarbons are present in that Morrow formation.

Q In your experience, Mr. Gillham, have you seen as a result of waterfloods or salt water injection operations damage to other wells such as we have here from this type of operation?

A Yes, I have seen wells that have been corroded, casing corroded, wells damaged, wells lost as a result of salt water injection around old waterflood areas in southeast New Mexico.

I think that pretty well covers the application except that this one exhibit that they have here showing that this is part of the townsite, or platted area of Carlsbad. The baseball park is, I suppose, in about the Lots 15, 16, 17, 26, 27, 28, somewhere along in that area, cover that area. There are several baseball parks here and I think that there are, there is a trailerhouse there with a caretaker that kind of looks after the area. I'm not sure but I've noticed that there was a trailerhouse there, and that's only less than a quarter of a mile from the proposed injection well.

Of course in the baseball season, the summer season, why there are a lot of people out there at the baseball park and naturally you have a lot of young people that's running around and maybe not looking at the games and running around and it will be -- could be a health hazard with the salt water operation that close.

Q Mr. Gillham, do you have anything further concerning any comments that you may have with respect to the application itself or the materials attached to the application?

A No other comments on the -- on the application.

Q Okay. Let's move on to what we have marked as Exhibit Number Three and have you tell the Examiner

what that is.

A This is Exhibit Three?

Q Yes, sir.

A Okay, Exhibit Three is a copy of Chapter Nine from the Monograph Volume IV, put out by the Society of Petroleum Engineers.

This Chapter Nine primarily deals with squeeze cementing and the principal things to note in this copy is Figure 9.12, which appears on the last page, and it shows that the general conception of when you're squeeze cementing, that you have a -- pretty much of a radial type flow of cement around the wellbore and it says that that is not the general case. In most cases, not in all cases, but in most cases, the flow of the cement is going to be in a general north/south direction.

Q Why is that?

A Primarily it has to do to the tectonics involved in the formation of the continents that you have the folding and the faulting that your planes of weakness generally run in a north/south direction.

Q Would the -- would the -- how would this apply to a salt water disposal operation?

A Well, squeeze cementing and when you're injecting water would be the same type of operation, you're pumping fluid under pressure down into this formtion, and in

that case then you would be possibly, very possibly, directing this fluid primarily in a north/south direction, northwest/southeast direction, rather than radially around that wellbore.

Q Would it then run at the Grace Atlantic Well?

A Well, it would then -- in that case, it would just reach the Grace well sooner than if it was migrating around radially.

Q Is that all you have concerning Exhibit Three?

A Yes.

Q Let's move on to what we have marked as Exhibit Number Four and --

A Okay. Exhibit Number Four is merely a tabulation of the production from the Ray Westall wells taken from the C-115's on file with New Mexico.

I'd like to direct your --

Q This is compiled from data before the Oil Conservation Division that is filed as a matter of course?

A Yes, this is official records filed by Westall with the Conservation Division and is official records.

Q Okay. What do you have to tell us concerning this Exhibit Four?

A Well, the first thing I would to direct you to is the tabulation on the Ray Westall Merland No. 1.

This shows the water production, the oil production, gas, and days produced, as taken from the C-115 for the year of 1985.

If you'll note, the first five months of 1985 you had a fairly uniform water production of something in the order of 1500 barrels a month and fairly uniform oil production.

In the month of June the water increased by 3000 barrels or more and in about three months the oil production had declined to practically nothing.

Now, the oil went from about 13 barrels a day to less than a barrel a day and the water increased drastically in one month's time is not a normal type operation for wells in this stage of their life, so it appears to me that from this production data there is possibly -- was some mechanical failure or something occurred that affected this production this drastically. Could be -- it could be casing leaks; could be tubing leaks; any number of things.

At any rate, it makes you look -- makes you think sufficiently that there is something wrong with this particular well.

And then the compilation of the produc-

tion data from the Baseball Park No. 4, the Baseball Park No. 2, the Baseball Park No. 1, the daily average of those wells only shows 91 barrels of water per day production, as shown from these reports, an average of 43 barrels of oil per day and 91 barrels of water per day, and we feel like that with 91 barrels of water per day that it was a little bit suspicious that they were requesting tenfold increase in their volume to 1000 barrels a day.

Q The primary reason for showing this exhibit is with regard to the Merland No. 1, is that correct?

A Right.

Q What would be necessary in order to ascertain whether or not there is something wrong with this well?

A Well, first of all you'd have to pull the rods and tubing our and check those over to see if there's anything wrong with that equipment and then possibly check your casing.

Q Mr. Gillham, do you have anything further to say concerning this application?

A Well, in summary I would just like to say that -- and knowing the area, that you're down in -- close to Carlsbad, which is a cavernous area where you have a lot of trouble with cementing operations, the chances for a good cement job are not as good, and with this disposal well only

900 feet from the Grace proposed -- or Grace's Atlantic Morrow producing well, we feel like it is a real hazard to that well, and for that reason we object to the application for this disposal well.

Q Do you also object because of the adjoining acreage where Mrs. Grace owns 12-1/2 percent?

A Yes. If this -- this particular well is allowed to dispose of water, you will be pressuring up the Cherry Canyon formation, which will increase the development costs for Delaware production in the area.

MR. PADILLA: Nothing further. We offer Exhibits One through Four.

MR. STOGNER: Are there any objections?

MR. DICKERSON: No objection.

MR. STOGNER: Exhibits One through Four will be admitted into evidence at this time.

Mr. Dickerson, your witness.

CROSS EXAMINATION

BY MR. DICKERSON:

Q Mr. Gillham, I understood from your testimony that your objections to the application in this case are roughly twofold. Number one, you fear possible damage to the Grace Atlantic No. 1 Well 900 and some odd

feet --

A Right.

Q -- away from the proposed injection well.

Number two, you fear possible injury, death, inconvenience, whatever, to the anonymous attendees a the baseball games during the summertime and children running amok unsupervised by their parents, and what not.

Is there any -- I caught a lot of "mights" and "possibly" and "maybes" interspersed in your testimony and I'm just wondering if there's any other specific identifiable objection that you know of that Mrs. Grace may have to the proposed injection of water into this disposal zone as opposed to the injection of this same produced water in another well in the area where it's currently produced. Do you have any knowledge of any other possible, more specific objection to this application?

A I think that our principal objections are as stated, I feel like that, you know, if there is any thoughts as to objection for the disposal of Westall water in her disposal well, she only produces -- I mean they only produce 91 barrels a day, which is inconsequential.

Q Ah, you say "her injection well". Are you saying that Mrs. Grace has an injection well in this area?

A Approximately a mile and a half south of

this operation.

Q I see. Would this perhaps be a commercial disposal operation?

A Yes, it is.

Q You heard Mr. Harris' testimony, did you not, that Mr. Westall at the current time disposes of all his produced water in a commercial well in the area, or in another well in the area?

A Yes.

Q Do you know whether or not that would be Mrs. Grace's well?

A Yes, it is, and as I said, I feel that that is very inconsequential in that they only dispose of 91 barrels a day.

Q How long has Mrs. Grace's well been in operation?

A Quite a number of years. I'm not sure just --

Q Do you know how long?

A I'm not sure just how long. Let's see --

Q You've examined a lot of information concerning our application, I'm just wondering if you happened to come across anything concerning Mrs. Grace's commercial discovery well that might of interest to us here. Would that be the Salty Bill No. 1 Well?

A Yes. Well, I just have a little information here. It don't say when they first started that particular well.

Q Well, if I said that my information indicates that that particular well was completed on April the 10th, 1972, would --

A I think that's probably correct.

Q Would you happen to know the location of Mrs. Grace's commercial disposal well, the Salty Bill?

A Well, it's not shown on this particular map that's included with this application, but it's just almost on it.

Q Is it shown of any of the exhibits referred to in any of these exhibits that you have presented on behalf of Mrs. Grace today?

A No.

Q Do you know whether there are any other disposal wells available to the operators in this area at the current time other than the commercial well operated by your client?

A None that I know of.

Q Have you located in response to my previous question anything to indicate the location of her Salty Bill No. 1 Well?

A It's located in Section 36, Township 22

south, Range 26 East.

Q To be a little bit more specific, is it --

A In the southwest quarter.

Q -- in Unit C of that section? Approximately how far away from the proposed injection well in this proceeding is that commercial disposal well?

A It's approximately a mile and a half.

Q You're looking at your -- looking at the map attached to our Form C-108, are you not?

A Yes, that's what I'm looking at.

Q Okay, let's orient the Examiner and locate for him on our small scale map, the one with the large circle on it, can you indicate approximately on -- in Section 36, tell us where the Salty Bill No. 1 Well is located?

A You said in Unit C.

Q Yes, sir.

A So that would be, let's see, well, I believe it would be the northeast of the northwest.

Q I misspoke, Mr. Gillham. I think that well is in Unit G of Section 36.

A Well, that's what I was thinking, yeah.

Q So --

A A, B, C, D, E, F, G.

Q So it's actually located on what quarter

quarter section?

A Okay, so it's actually located on the southwest quarter of the northeast quarter.

Q Are there any other wells in the general -- what are the closest oil or gas wells in the area to Mrs. Grace's commercial disposal well?

A There are some gas wells located to the south in the -- one well located in the northeast of the southwest, and one well located in the northeast of the southeast of Section 36.

Q And my map shows one of those wells to be the "Airport Grace Well" --

A Right.

Q -- is that correct? That's one of the wells you're referring to?

A Uh-huh.

Q And who operates that other well that you referred to?

A I'm not sure whether that's Corinne Grace or Michael Grace.

Q So Mrs. Grace's own commercial disposal well is located fairly close, is it not, to her own gas well?

A Not as close as the proposed disposal well to the Atlantic Well.

Q Do you know how far from her Grace -- or Airport Grace Well it is to the Salty Bill, their water disposal well?

A Well, it would be kind of a diagonal across those two quarter sections, so it would be, probably somewhere around 1500 feet. Probably somewhere around 1500 feet.

Q I wonder if you have any knowldge as to the cumulative amount of water that Mrs. Grace has disposed into that Salty Bill Well over the years following its completion, from April 10th of 1972?

A I don't have the exact figure but it's on file with the Commission and I know that it's -- that it's a sizable number.

Q If I told you that our check of the Commission files as of April 1st, 1987, Mr. Gillham, shows cumulative disposal by Mrs. Grace into that well of 3,471,430 barrels of water, would you have any reason to doubt the accuracy of that information?

A No, I would not. It's on file with the Commission.

Q Do you happen to know the cost of disposal in that well which Mrs. Grace charges to the operators in the area?

A I don't know what she charges, no.

Q You heard Mr. Harris testify, did you not, that Mr. Westall pays 20 cents per barrel for disposal of his water into that well?

A Yes, I did.

Q 20 cents per barrel, assuming that would be the charge made uniformly to all operators in the area who utilize Mrs. Grace's disposal well, if that is the amount that's been charged on the almost 3-1/2 million barrels of water disposed of into the well, that would appear to be a very profitable operation for Mrs. Grace, would it not?

A It would appear so.

Q Do you, as a petroleum engineer, or in your experience with land matters, and what not, or in your common sense as an individual, feel that possibly Mrs. Grace might have some objection to the applicant's proposed injection well in this case because of her economic interest in continuing to dispose of water in this area in her own commercial disposal well?

A I do not.

Q You don't think that enters into it to any extent?

A No, because as I -- as I pointed out previously, that Westall only has 91 barrels of water per day, which is a small volume compared to the amount of water that

has been disposed in that well. So whether, whether that goes in there or not is inconsequential.

Q Your 91 barrels per day, if I understood your Exhibit Number Four, I think it was, is based on your calculation of the average daily water over the life of all of those four wells, is it not?

A No, it's not over the life. No, it's over the -- the average over the last --

Q A period beginning in 1985.

A Yeah, in 1985; since 1985.

Q Okay, you heard Mr. Harris testify as to the current water production from those wells. Now I understood your testimony that you surmise or think that possibly there may be or might be or could be or whatever, some problem with the Merland No. 1, for instance, which has lead to the increased water production but would you concede that regardless of the reason for the water production, your 91 barrel per day average does not accurately reflect the current water problems Mr. Westall has in the area as opposed to the average water problem that he has had over a longer period of time?

A These volumes are taken from the Commission records that's been filed by Westall and I feel they are accurate. The previous witness said something on the order of 200 barrels a day but that is -- we have seen no-

thing to indicate that there are 200 barrels a day water (unclear) in that area.

Q Well, I mean is this your opinion that Mr. Harris was simply wrong or testified incorrectly, was confused, or --

A Well, I don't know. He may have been talking about producing the Baseball Park No. 3, I don't know, but that well has not been produced according to the C-115's and has no production.

In fact, you know, I'm not sure that it is a producable well since there is no completion report on that well and they've indicated that it is an abandoned well.

Q One more question concerning Mrs. Grace's commercial disposal well, are you on her behalf, or do you konw whether she, as operator of the Airport Grace Well, relatively close to her Salty Bill water disposal well, does she have any concern about the disposal of the so far 3-1/2 million barrels of water into that well as having any possibly adverse affect upon the casing or corrosion of the cement surrounding the casing, leading to horrendous problems of possibly having to squeeze and repair the well at great expense to the operator in the Airport Grace Well? Is she concerned about that because of her disposal operations or not?

MR. PADILLA: Mr. Examiner, let me object at this point. I've allowed the -- Mr. Dickerson's line of questioning. I don't think that there's -- we're trying to hide the fact that Mrs. Grace has a salt water disposal well there. At this point it's getting beyond the realm of relevancy as to whether or not those other wells have any significance to the Airport Grace.

MR. DICKERSON: Mr. Examiner, they're disputing our figures and I'm going to recall Mr. Harris to testify of his own knowledge as to what the figures are concerning the current water problem Mr. Westall has in this area. This whole line of questioning was caused by Mr. Gillham's characterization of our water problem as 91 barrels a day and the possible affect of us wanting to dispose of 250 or possibly up to 1000 barrels of water per day in our proposed injection well and it's possible impact upon Mrs. Grace's Grace Atlantic Well 900 and some odd feet away.

I'm simply, and I think there is no question that I am entitled to cross examine Mr. Gillham upon an analogous situation, that being the Airport Grace Well, located very close in proximity to Mrs. Grace's own disposal well, which has been producing for -- or disposing of produced water for over fifteen years, and invite his expert testimony as to whether or not any consideration or concern is expressed by his client as to the pos-

sible adverse affect upon her own well. It seems perfectly relevant and pertinent to this case to me.

MR. STOGNER: Whenever I look at this large map with the two circles on it, what is that two mile circle, Mr. Dickerson? What does it (unclear)?

MR. DICKERSON: I'm not sure, Mr. Examiner, what we consider it.

MR. STOGNER: I mean the C-108 asks for two mile identification, is that not right?

MR. DICKERSON: Right, and that's --

MR. STOGNER: And it was your -- Mr. Westall's testimony that this particular formation extends out beyond this half mile circle, is that not right?

MR. DICKERSON: Yes, sir, I think over a widely --

MR. STOGNER: I'm going to allow this line of questioning since this area is -- this particular well is within the two mile radius and the testimony was, and so far I haven't heard it disputed, that the formation characteristics extend far beyond this half mile radius.

Continue, Mr. Dickerson.

Q Okay, you understood my question, Mr. --

A Yes, sir.

Q -- Gillham? Okay, --

MR. PADILLA: Maybe you should repeat it.

MR. DICKERSON: He said he understood it.

A I understood it and the Grace disposal well is completed in a different formation, disposing of water in a different formation than the formation that's being proposed.

Q What formation is that?

A It's above the Lamar marker zone and it's in an upper part of the Delaware Group.

Q Part of the Bell Canyon.

A Yes, which is above the Capitan Reef in here, and being a shallower well and drilled expressly for a disposal well, it was designed for disposal, not for production, and consequently I feel that they probably got a better cement job on that well, that they paid more particular attention. It was not as deep, and were able to get better cement around that well.

With it being in a shallower formation, naturally if you -- if you've got any kind of a failure in the cement or anything of that nature, it's going to be coming to the surface, the fracture will be up, and therefore I -- we do not feel that the hazards from that disposal well are as great as the one proposed.

Q Even with the fact that 3-1/2 million barrels of oil or water have already been disposed of into that well.

A Well, we feel that that's probably a good example that in this particular case they did have good isolation of the injection water.

Q Okay, let's talk about the Airport Grace Well, Mrs. Grace's owned and operated gas well --

A Uh-huh.

Q -- in close proximity to the injection well that she operates.

Have you reviewed the completion information and cementing history and casing information regrding that well?

A No, I did not.

Q You did it for all the wells that you wanted to talk about about our application but you have not done it on her behalf --

A Within the half mile circle.

Q But you have not done it at all to consider any possible adverse affect on -- for her own good from her own disposal operation of her own gas well?

A No, I did not look at the well records on that particular well, but inasmuch as the wells were not damaged, there was no reason to look at that.

We were looking at primarily, at what was being proposed.

Q Let me ask you, we're concerned, as I understand your objection, you are concerned with the dangers inherent in a salt water disposal operation, particularly with regard to the people that attend the baseball games in the area.

There is existing oil and gas production in the area, is there not, as we've all reviewed in connection with our own application?

MR. STOGNER: Why don't you speak up, Mr. Gillham?

A Yes.

Q So the oil and gas productions and operations are underway and according to the previous testimony have been underway in this area for a great number of years, have they not?

A Yes.

Q In your opinion as a petroleum engineer, can you weigh for us the relevant dangers and risk inherent in operations for oil and gas, the production of volatile, flammable, oil and gas fluids as compared to that experienced in the normal operation surrounding the disposal of produced water?

A Well, you know, looking at the analysis

that they said it's 89 cents a barrel to dispose of this water, and they were going to save I don't remember now, $3000/$5000 -- they've considered no costs of laying lines or anything of that nature, so I would be assuming that they'd probably be trucking this water to the location, with trucks operating in there at different hours of the day and night to haul this water, it would be more hazardous to people in the area than would the normal oilfield operations.

Q So you're talking about the hazard from trucks trucking this water.

A Possibly.

Q Based on your assumption that trucks are going to truck this water.

A That's one of the things --

Q Did you hear Mr. Harris testify that Mr. Westall is going to engage trucks to truck this water?

A No, I did not, but in his calculations he did not say that he had figured any cost of lines or anything else, so I figured that it must be trucking.

Q You're right, he said, as I recall, that he did not figure in the cost of any of those operations nor other costs inherent in it, and it seems to me that your unduly concerned with the cost to Mr. Westall. You understand, don't you, that Mr. Westall has to bear all the cost incurred in connection with his proposed water disposal

operations?

A Sure.

Q So it costs Mrs. Grace nothing.

A That's right.

Q And it's actually of no consequence or concern to Mrs. Grace or you on her behalf as to what cost Mr. Westall incurs in doing it.

A That's right.

Q And so you have made an assumption that he's going to truck water here but you don't have any evidence that he is in fact going to truck water, do you?

A No. I didn't say that necessarily, I said there's a possibility that there would be danger; that, you know, if there is trucking and that sort of thing, you have water spills, salt water spills --

Q But just comparatively speaking, common sense understanding, comparing the dangers inherent in oil and gas production to the dangers inherent in a water disposal operation, let's compare it to Mrs. Grace's water disposal operations. Relatively speaking are there more dangers, in your opinion, from the operation and production of oil and gas or in the operation of a water disposal well?

A If it's strictly a disposal it's probably not much more dangerous; only whenever you start having trucks hauling the water around, but this -- this particular

disposal well is closer to a location of people than the Grace well is.

Q I'm still fascinated, you'll forgive me, Mr. Gillham, by Mrs. Grace's well more than I am Mr. Westall's well. Do trucks operate to and from Mrs. Grace's disposal well?

A Yes.

Q Would you have any idea as to how many trucks per month on an average go to that well?

A I don't know. I don't know the number but I'm sure that there are quite a few.

Q Would you have any knowledge as to the route those trucks follow from their sources of that produced water to the injection well or anything of that nature that might help us here?

A They would be going down the highway and turning in to that disposal well.

Q Okay. Mrs. Grace operates, or by reason of her disposal operations, trucks operate to transport water to that Salty Bill Well. Is there anything inherently different, even if trucks operate to carry water to Mr. Westall's proposed well, which you heard the testimony that he's going to dispose at the present time current intention water from four wells, do you have an opinion as to which well would receive more truck traffic?

A For production operations or disposal operations?

Q Disposal operations. I'm trying to get you to compare Mrs. Grace's own disposal operations to Mr. Westall's.

A Well, I don't think it's a natural comparison.

First of all, her well is removed from all types of human activities.

Q Okay, removing that consideration, then, from our discussion, if just generally speaking we're comparing the dangers and the risk in the operation of an oil well to a salt water disposal well, which is relatively more dangerous?

A I'd say it would probably not be much different.

Q Danger is equivalent and you agree that we have existing oil and gas production in the area.

A Right.

Q To your knowledge, are you aware of any instances where the spectators at the baseball games or any other innocent visitors upon the lands or in the vicinity have been damaged by the previous oil and gas operations over the years in which they've been conducted?

A Not to my knowledge; however, that (un-

clear) well, which is the closest well to the -- to the baseball park, hasn't been operated for some years.

Q Okay. Your first concern and your foremost concern you've expressed since we covered the other two, is of possible damage to Mrs. Grace's Grace Atlantic --

A Uh-huh.

Q -- Well. You went over well by well with reference to Mr. Westall's application the cementing program; pointed out some additional information that you had discovered in the -- your investigation of the reports on file.

You were not seeking, I'm asking, were you or were you not seeking to intimate that the application is incomplete or false in any manner or anything of that nature?

A No way. No, I am not indicating that at all.

Q So there's no implication along those lines to be drawn from your testimony.

A Well, the application fulfills the requirement of what is required.

Q Okay.

A But I was just looking at what is shown and showing where some of the information is not as complete as -- in other words, would mislead someone looking into the

prior reports.

Q And you did not mean to imply, did you, when you made reference in a couple of instances to the pen notations or the in hand notations upon those reports that those were placed upon the reports by the applicant or anyone acting on his behalf of anything of that nature, did you?

A I just pointed it out. I don't know it was done.

Q Those notations were on the original records in the files that you examined, as well?

A No. I didn't -- well, I didn't look at that particularly on the -- in the official records.

Q Well --

A I just noticed it was on displays.

Q Our copies.

A And you can tell that it was not on the original inasmuch as it was added with the pen.

Q Right, and that's what I'm after, is there any implication that we should draw or perhaps we should investigate a little to make sure that we or anyone acting on behalf of the applicant, you're not insinuating or implying that we in any manner changed or falsified the reports as they exist on file in the records. You have simply not examined those records. You've looked only at our

copies submitted.

A As I've testified to.

Q You well by well went through the fact that in some of the wells salt was used and mixed with the cement for the purpose of speeding up the setting process of the cement.

With regard to that, in your opinion and based on your experience with the USGS involving such operations over the years and your familiarity with this area, is there anything unusual about that or would that be something found in the -- generally in the wells operated in this Delaware Field?

A Well, I think that's pretty much common practice in this particular area because it is an area where you have cavernous situations, lost circulation, and it is a problem to get good cement jobs.

Q So that would be --

A And when -- when I was with the Survey, any number of wells, we had trouble with getting cement to circulate; any number of wells that had to use a one inch pipe to get the cement to circulate.

And just knowing the general area from past experience, I know that you have more difficulty in gettng a good cement job in this particular area. That's the reason they use these different types of additives to

the cement, but just because they use these different types of additives doesn't mean that you're going to get 100 percent job.

Q The area that you're looking at encompasses a much larger area than, let's say, the half mile area of review surrounding this disposal well, doesn't it? I mean the area that you're thinking of in which these lost circulation, cavernous problems exist.

A (Not clearly understood.)

Q Right. A much larger area than we're directly concerned with today.

Okay, does, in your opinion and your experience, the prudent operators who drill and are charged with the responsibility of completing these wells under the supervision of the state or federal agencies, the activities that you described with reference to the wells within the half mile area of review, they're consisten with what all prudent operators do in the area?

A Yes. As I've stated, these are additives to help get a better cement job and it's what all the operators do. But the cement jobs you get for a producing well do not have to be quite as great as for a disposal well and you might have a cement job that's perfectly satisfactory for normal producing operations, yet whenever you start injecting water under pressure back the other way, plus caus-

tic waters, acidic waters, then you are going to have a lot more problems, and then -- and your weaknesses in formations, cement, are going to show up.

Q Mrs. Grace is an oil and gas operator in the same area that encounters these problems, as well, is she not?

A I testified to that.

Q In her -- so the answer is yes?

A Yes.

Q So in her own activities as a prudent operator, completion cementing programs would be followed which would be on no material difference than those with regard to the wells that you've testified to here today?

A That were covered here in this application.

Q Right, and my question is, there's not any -- anything unusual or out of the ordinary or wrong with that, that's the way it needs to be done in the area by a prudent operator?

A Right. But I pointed out that the requirements would be different for injection operations than it would be for producing operations.

Q In a couple of instances, Mr. Gillham, you referred to the cementing or the completion of the cementing jobs on the surface casing, for instance on the

GoPoGo No. 2 Well --

A Uh-huh.

Q -- specifically, that the operator of that well was forced to -- or no, the Merland Well, it was necessary to -- to complete the final stage of cementing in order to get cemet to the surface of the surface string in that well. You used one-inch pipe to do that?

A Yes.

Q And you looked at the portion of our application submitted that reflected that that in fact had been done, ran one inch down 150 feet.

A Right. Right.

Q Now what that form actually shows is that temperature survey run following the completion of the cementing job found cement 150 feet from surface. That indicates, does it not, that cement failed to circulate all the way to the surface?

A Right.

Q Now cementing so that it does circulate all to the surface is the preferred method, correct, and it's required by the regulatory rules.

A But the thing that this shows is the fact that they had enough cement to circulate this well if all factors were considered. It would have circulated on the initial application unless the --

Q So some of the cement went somewhere else and that's the reason that the cement got only to within 150 feet of the surface.

A Right, but when you have some of the cement go to other areas, and to avoid areas, lost circulation zones, then you're going to have movement in that cement, for that cement to go there, and you're not -- that cement, when it sets up, is not going to be as good normally.

Q And when that occurs -- that occurs in this area, it's not unusual for that to occur, is it?

A No.

Q Fairly common to --

A That's what I thought we pointed out.

Q And the procedure that the operators at that point much comply with in order to cement as well as can be done, is to finish the completion of the cementing by running one inch pipe from the surface and filling up that --

A Yes.

Q -- casing annulus.

A That's the normal, accepted procedure.

Q And can you point out to us anything based -- let's speak specifically with regard to that Merland No. 1 Well, since that's one of the ones that you spec-

ifically pointed out the necessity to circulate from the top down through one inch pipe. Is there anything directly or any evidence or knowledge that you have specifically, that you can tell us about, that throws any doubt upon the adequacy of the cement job below that 150 feet, from the bottom of that surface hole up to within 150 feet of the surface?

A There is -- there is nothing positive that you can cite and you know that you have cement up within 150 feet of the top. You cannot say that you've got good, solid cement around that casing up to 150 feet. The likelihood is that there's a large area where you don't have good, solid cement. Whether it's by movement of that cement in the process while it's setting up or whether it's because of the casing laying over one side of the hole and you just don't have any cement there.

Q Well, you're speculating, are you not, Mr. Gillham? I'm asking you to point to some specific evidence, if you have seen any or come across any, that there's any doubt regarding, other than your speculation, regarding the adequacy of the cement job in the Merland No. 1?

A Well, what I'm -- what I'm pointing out is the fact that from experience and knowing the area, knowing -- using common sense, if nothing else, that you're not going to have 100 percent cement jobs in this area on all the wells.

Q Is there any test that can be run to determine this?

A There are some, yes.

Q Expensive, are they not?

A But they are very, very expensive and would not be worthwhile in doing it.

Q I've asked the question twice and I don't want to belabor it, but it has not been answered. Can you point to any specific evidence that throws any doubt upon the adequacy of the cement job in the Merland No. 1 other than your speculation?

A I think that I can, you know, you can't make a positive statement that you're going to have this or that, just like you cannot make a positive statement that everything is perfect. Everything is all right. Can you -- can you say positively that everything is all right?

Q Fortunately I get to ask the questions and don't have to answer them.

MR. DICKERSON: I've asked him three times and it's not been answered. I give up, Mr. Examiner, no further questions.

MR. STOGNER: Okay. Let's take a five minute recess at this time.

(Thereupon a five minute recess was taken.)

MR. STOGNER: The hearing will come to order.

Mr. Padilla.

REDIRECT EXAMINATION

BY MR. PADILLA:

Q Mr. Gillham, just a couple of questions.

If the Grace Atlantic Well is damaged, who will pay for that?

A Grace, Corinne Grace, the operator of that well.

Q Mr. Dickerson in a number of questions, as a matter of fact numerous questions, asked you about your concerns relating to the populated areas in the area of disposal and specifically children and people who frequent that area.

What is in relative importance, what does this concern -- is this a major importance to Mrs. Grace?

A Oh, no, it's not the major importance. It's just a concern that I pointed out.

Q What is the major concern?

A The major concern is the protection of her Morrow producing well.

MR. PADILLA: I believe that's

all, Mr. Examiner.

CROSS EXAMINATION

BY MR. STOGNER:

Q Mr. Gillham, are you questioning all or do you have -- let me rephrase that.

Of the eleven wells in the half mile radius you questioned the cement job on some of them. Are you questioning on all eleven of them or just a few of them?

A No, I think that the conditions are the same in all eleven wells in that you have lost circulation areas within this area, and they've all used the same types of light cement and lost circulation material, salt, and everything, so that in general the cement on all the wells in that eleven wells there will be primarily the same, except that in some of them you'll have -- you may have some bad cement in one area and in another well you may have some bad cement in another area, but in general the conditions are the same in all the wells.

Q Where normally is this lost circulation zone?

A It would be within the top 2-to-300 feet, 1000 feet.

Q I'm sorry, of the injection well or the injection interval?

A Of -- in that whole area.

Q So about 1000 feet --

A 2000, and so forth. See, they have -- they have --

Q What formation, let me put it that way?

A Well, it's various formations under the surface there. And what, you know, you have the Carlsbad Caverns down there. You have the -- I don't have the -- do you have that cross section?

It would be in the salt sections, the Castille, the Rustler, all through that area.

Q Okay.

MR. STOGNER: I have no further questions of Mr. Gillham.

Are there any other questions of this witness?

MR. DICKERSON: Just one along the lines that you brought up, Mr. Examiner.

MR. STOGNER: Mr. Dickerson.

RECROSS EXAMINATION

BY MR. DICKERSON:

Q The lost -- as I understand your testimony, Mr. Gillham, lost circulation problems occur frequently throughout a large area in the general vicinity

of this proposed injection well. That large area would --

MR. STOGNER: Let me ask, was that a yes or no?

A Yes.

MR. STOGNER: Okay.

Q That large area would -- that statement would also applyl to the area in which Mrs. Grace's disposal well is located, would it not?

A Yes, I think I testified to that, the fact that her well is shallower. It was designed as a disposal well to start with.

Q As I understood your statement in response to Mr. Stogner's question, then, the lost circulation problems exist throughout this area --

A That's correct.

Q -- from --

A That's correct.

Q -- from an area how close to the surface, if you can state that approximately?

A Well, I'd say in 100 feet, 150 feet.

Q Of the surface.

A Of the surface.

Q Down to what area?

A Down to 2000 feet, or so.

Q So there are lost circulation problems

inherent in operations in this area from 150 feet down to --

A That's correct.

Q -- 2000 feet. So those lost circulation problems do not exist only within the one-half mile area of the proposed injection well, they likewise exist in Mrs. Grace's disposal well or anywhere else in the general vicinity.

A I think I've testified to that.

MR. DICKERSON: No further questions, Mr. Examiner.

MR. STOGNER: Okay, Mr. Dickerson.

Any further questions of Mr. Gillham? If not, he may be excused.

MR. PADILLA: We call Tim Kelly, Mr. Examiner.

TIM KELLY,

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

DIRECT EXAMINATION

BY MR. PADILLA:

Q Mr. Kelly, for the record would you state your name, please?

A Tim Kelly.

Q Where do you reside, Mr. Kelly?

A I reside in Albuquerque.

Q And what is your occupation?

A I'm a hydrologist, a consulting hydrologist with GeoHydrology, Associates, in Albuquerque.

Q Are you retained by -- have you been retained by Mrs. Grace in this case to testify in this hearing?

A Yes, sir.

Q Have you previously testified before the Oil Conservation and had your credentials accepted?

A Yes, I have.

Q Have you testified before Examiner Stogner before?

A No, I don't believe so.

Q Briefly state your educational background and work experience, please.

A I have a Bachelor's and a Master's of Science degrees from the University of Dayton and the University of Kansas.

I completed my Master's in 1961 and was employed by Standard of Texas, or Chevron, for approximately two years, after which I was hired by the Water Resources Division of the Geological Survey and I worked for them from

-- as a hydrologist from about 1963 to 1975, at which time I resigned as a supervisory hydrologist and established a consulting firm in Albuquerque and I have since that time been self employed.

Q Have you reviewed the application of Ray Westall in this case?

A Yes, I have.

Q And you're familiar with the water sources and geology in the area of the application?

A Yes, sir.

MR. PADILLA: Mr. Examiner, we tender Mr. Kelly as an expert in hydrology.

MR. STOGNER: Are there any objections?

MR. DICKERSON: No, Mr. Examiner.

MR. STOGNER: Mr. Kelly is so qualified.

Q Mr. Kelly, in general would you state your comments regarding the application in general?

MR. DICKERSON: Mr. Examiner, I'm going to object in the interest of me trying to keep up with what's being said here to an open invitation to comments. We customarily ask direct questions and in response to those direct questions a witness is testifying. It's ex-

tremely difficult for any us, myself in particular, to keep up with open-ended questions such as that, and I'd be --

MR. PADILLA: I'll withdraw the question, Mr. Examiner and rephrase it.

MR. STOGNER: All right, Mr. Padilla.

Q Mr. Kelly, have you reviewed the water samples as contained in the application?

A Yes, I have.

Q In particular I'd like for you to refer to the water sample for the Baseball No. 2 Well.

A Yes, sir, I have that.

Q Tell me, sir, what in your opinion or in your experience or no, withdraw that question.

What does pH 4 mean as contained in that water sample?

A Well, pH 4 is a highly acidic solution which would border on battery acid. I have never seen a natural pH of less than 5 and most -- and they're seldom less than 6.

This would be tremendously acidic water which would certainly have the capability of destroying any calcium carbonate which cement is -- that's the primary ingredient of cement. It would certainly eat up pipe and it's my understanding that the Baseball Park No. 2 is one of the

wells from which fluid is going to be injected into the proposed disposal well.

Q Let's go on now to the fresh water samples contained in the application and have you review those for us.

A These were submitted by the applicant of analyses which were submitted or lab sheets, apparently, from Dowell. They are somewhat unique. Both of them have a pH of 6.5, which is certainly reasonable, and the specific gravity of 1.0 is what you would expect from a fresh water analysis.

The anomalous balance of anions and cations, however, lead me to believe that either there is something tremendously wrong with the sample or the analysis is in error. I'd like to draw your attention to sodium in both analyses, which is listed as zero. If that were blank I would assume it hadn't been analyzed.

So that in both of these samples the major cation is magnesium and the major anion is chloride. Magnesium chloride water is highly unusual, so for my own edification I obtained a couple of reports on fresh water in that area. One of these is a report of the -- it's Groundwater Report No. 3 published by the State Bureau of Mines. It's the Geology and Groundwater Resources of Eddy County.

In this report they list 79 analyses of

water from Eddy County and not one of them is a magnesium chloride water. So I thought, well, perhaps it's a local phenomenon, so I checked this other report by the Water Resources Division of the USGS by Bjorklund and Motts, entitled Geology and Water Resoures of the Carlsbad Area and in this report they listed 140 fresh water analyses and again, and these are just from Carlsbad vicinity, and again not one of these is a magnesium chloride water.

Therefore, my conclusion is that -- that the analyses are questionable.

Q Let me now hand you, Mr. Kelly, what we have marked as Exhibit Number Five nd tell the Examiner what that is.

A This is a cross section which was prepared in part by Mr. Bill Hess of the USGS of a series of wells extending from Section 22, I think that's 24 South, 26 East, to Section 19, 22, 25 East, I believe, and --

Q Is it easier if I put that up on the wall?

A Yes, sir, it would be.

This is a cross section as I've described of borehole geophysical logs which -- with the area in blue being the reef deposits that are associated with the Capitan Reef.

Q What's the Capitan Reef, Mr. Kelly?

A Capitan Reef is a large bioherm.

Q What's a -- what's a bioherm?

A A reef. It's a large geologic deposit of reef origin which is characterized by numerous fossils, very high porosities and permeabilities. It is the source area of Carlsbad Caverns and it is the major aquifer for the City wells at the City of Carlsbad.

It is a -- it is shown here in this small diagram, which again is by Hess, which shows an extension of the reef which essentially acts as a tube of fresh water extending from the Guadalupe Ridge, or Guadalupe Mountains, in a northeastwardly direction and then swinging southeasterly into Texas and throughout this area it produces large quantities of fresh water.

There are also inter-tonguing, as shown by this lower profile, of the Cherry Canyon and Brushy Canyon formations with the reef deposits or the lower reef deposits.

Q In relation to these or this cross section, where is the disposal well -- or which one of these is the disposal well?

A This Well Number 3, I don't know whether to put my glasses on or off, I think it's Well Number 3 is Ballpark No. 3, No. 4 -- it's one of the Ballpark wells.

So this well right here is --

MR. STOGNER: That is Well Num-

ber Three, right?

A The Well Number Three is located in the quarter section which we're discussing.

Q Mr. Kelly, significant previous questions were asked by Mr. Dickerson concerning Mrs. Grace's salt water injection well. In relation to these wells where is that well?

A It's completed above the reef deposits, right in this zone, near the Lamar at the base of the Castillo and above the tongue, the reef tongue or upper reef tongue.

Q What separates the reef from the injection interval of the Grace well?

A Well, it's -- the Grace well -- pardon me, what separates the reef from the Grace well? The Lamar group in here, which primarily -- it's a very tight zone in there below -- but it's below the evaporite deposits which are -- which contain no potable water and it's above the reef deposits and it's separated by this very tight zone in the Lamar.

Q What is the danger to the reef if this well is allowed to be used as a salt water disposal well?

A Well, in my opinion, particularly if it's got water with a pH of 4, the injection zone for the proposed injection well is down around 3700 feet, I believe,

down in here.

Because this is a zone of lost circulation, because of the chemical quality of the water, any rupture in a casing further up or any channeling is likely to lead to migration of the disposal water upward through the annular space or through fractures into the reef deposits. That would not happen with the Salty Bill, which is completed above and therefore any movement would go upward rather than downward.

Q Given the kind of cementing that is done as a necessary -- in connection with drilling wells here, in your opinion do you believe that the probability is that there will be channeling upwards along these wellbores?

A I believe that that's a good possibility. Yes, sir.

Q How strong a possibility do you believe that is?

A Well, I don't know that I could put a number on it, but the path of least resistance is upward, so any fracturing or any migration is going to move upward along that annular space.

We know that the cement jobs in that area traditionally are not very good and so I would say that there's a strong possibility that movement could occur.

The other thing would be that if -- if

something did happen down in here at the proposed injection zone, there would be no way of knowing until it turned up in the city water supply that the brine was in fact going -- channelizing its way up into the reef deposit.

The -- if -- I might mention that I believe that Mr. Harris testified that the porosity at the zone that they're talking about is on the order of 18 percent. The porosities in these rocks are phenomenal, tremendously high, and so that would certainly be an area where any movement would occur.

In fact it would probably seek those zones.

Q Mr. Kelly, do you have anything further concerning this exhibit?

A No, I don't.

MR. PADILLA: I believe that's all the questions I have, Mr. Examiner.

We tender Exhibit Number Five.

MR. STOGNER: Are there any objections?

MR. DICKERSON: I would like to ask Mr. Kelly a few questions regarding Exhibit Number Five, Mr. Examiner.

VOIR DIRE EXAMINATION

BY MR. DICKERSON:

Q Mr. Kelly, who prepared Exhibit Number Five?

A Actually the -- that is a compilation of data from various sources. It was actually prepared -- I'm not sure who prepared it.

Q You didn't prepare it.

A I did not prepare it.

Q You, I caught the name Bill Hess, USGS, and I understood you to say he prepared it.

A I said that what -- this is a compilation of data some of which was prepared by Bill Hess. These -- these two diagrams right here showing the areal extent of the Capitan Reef and this cross section of the Capitan Reef are from a Geological Survey publication by Bill Hess.

Q Okay, will you -- I'm a little bit lost geographically.

This is the trace of the cross section shown by these logs?

A That's my understanding, yes, sir.

MR. STOGNER: Which trace are you referring to, Mr. Dickerson?

MR. DICKERSON: On the --

A A-A'.

MR. DICKERSON: Showing on the purported boundaries of the Capitan Reef prepared by the anonymous Mr. Hess, who, if he's here, I haven't heard him introduced.

Q And this portion of the exhibit is what?

A This is a highly diagrammatic north/south stratigraphic section showing the position and relationship of the major litho-facies in the rocks of Capitan -- of Guadalupian age eastern New Mexico.

Q And what is the source of that map?

A Adapted from several sources including Kite and others, 1962, Silver and Todd, 1969, and especially Messner, 1972.

MR. STOGNER: This is the diagram in the lower righthand corner of Exhibit Number Five, is that correct?

A That's correct.

MR. STOGNER: Okay. Continue.

Q I'm a little confused, Mr. Kelly, as to if you didn't prepare this exhibit, who did?

A The exhibit was given to me by representatives of Grace Oil Company and asked -- and they asked me to review it and see if I agreed with the data contained therein, and I checked the various sources, I checked the

individual logs, checked the locations. I checked Hess' report and that map up there is also included, so I did not have a problem with the content of that cross section.

Q Okay, the -- the colored areas in the cross section, as I understood, are the pick of the Capitan Reef in these electric logs?

A They are reef-like deposits which directly inter-tongue with the reef itself.

Q They are not in the Capitan Reef proper, then.

A I don't know where you would draw the ine between the Capitan Reef and where it interfingers with a basinal facies of the Capitan Reef, assuming that they're both biohermal deposits.

Q Well, my question is directed to your connection with this exhibit. Have you made an independent analysis of this? Was it your testimony that you want us to understand that the colored sections, the zones colored on this Exhibit Number Five are the source of fresh water for the City of Carlsbad, New Mexico?

A It is my testimony that the portions colored in blue on that cross section are hydraulically continuous with the water supply for the City of Carlsbad.

Q Do you know who colored the sections that have been picked as being this reeflike material?

A No, I don't.

Q Do you -- can you calculate porosities from electric logs as a hydrologist?

A I have. I didn't on this particular case; however, I do have -- have a number here that might be of interest to you in the Groundwater Report No. 3.

Q That's one of the reference sources that you previously referred to?

A Yes, it is.

Q What's the publication date of that reference source, Mr. Kelly?

A 1952.

Q 1952. Okay.

A I would like to read this statement so that counsel doesn't think I'm misquoting.

MR. STOGNER: Is that included in this exhibit? It's marked Number 5. I assume it's Number 6?

A No, it's not. This reference has not been submitted as an exhibit.

MR. STOGNER: And how long of a passage are you fixing to quote us?

A One sentence and then I'll probably expound on it.

MR. STOGNER: All right, and

what page?

A 56.

MR. STOGNER: And that was published in 1952.

A 52.

MR. STOGNER: From the New Mexico Bureau of Mines, is that correct?

A Groundwater Report Number 3.

MR. STOGNER: Okay, thank you, Mr. Kelly.

A The quote is as follows: "A pumping test of Carlsbad City Well No. 4, made by Hale in 1939, indicated a transmissibility of 428,000 gallons per day per foot and a specific capacity of 275 gallons per minute per foot of drawdown."

Reference is given at the end of the sentence, "Hale, 1945, page 43."

Now, just for the purposes of enlightenment, if this is converted to oilfield terms, this well is capable of producing 1.8-million barrels per day of water.

Q Where is that well located, that City of Carlsbad Well No. 4?

A It is located in Township 23 South, 25 East, and I believe that's Section 2.

Q Would you know how far that well is from

the proposed injection well involved in this application?

A No, sir.

Q Considerable distance, is it not?

A Oh, we can get out some maps and try and measure it off, if you'd like.

MR. DICKERSON: The purpose of my testimony, Mr. Examiner, is merely voir dire to this witness' qualifications to testify. He qualified and I had no objection and still have no objection to this witness testifying as a hydrologist.

What we have before us here is an exhibit compiled from a compilation of different things and then in addition to that we're hit with quotations from other sources, the only one that we've heard a date for so far is 1952, and the line of my inquiry is directed to this witness' entitlement to testify with respect to the conclusions he drew from this exhibit.

I believe this line of questioning got off from my last question, which was, can you calculate, are you by training and experience qualified, Mr. Kelly, to calculate porosities from electric log data?

A As I mentioned, I was formerly employed by Standard of Texas. I have been through the Schlumberger training course but it's been many years since I've done that. I would not attempt to do it today.

Q You do not feel you're qualified to do it today?

A For porosity? For permeability?

Q Or for water saturation or any other of the information reflected from electric logs?

A I'm certainly qualified and do on a regular basis use electric logs for subsurface correlation but for making calculations as to reservoir characteristics, I would not attempt to do that.

Q The Exhibit Number Five, which is before us, though, you have made on independent calculation or pick of the zones colored in blue based on your own expertise and experience and training in doing so?

A Of what?

Q Of the zone colored in blue. Some-- I understood you to say somebody else colored that and you don't know who.

A I agree with the correlation, the picks and the correlations that are presented there in blue.

Q But you did not make the picks nor do the correlation. Someone else --

A That's correct.

Q -- did that work.

A That's correct.

Q And so by agreeing with it you are assum-

ing the correctness of that third person's calculations and the conclusions that he reached.

A Mr. Dickerson, are we talking about porosities and permeabilities or are we talking about correlation of electric logs?

Q We're talking about your qualifications, Mr. Kelly, to testify to the conclusions that you've testified to.

A I agree with the content of that report, which does -- of that illustration, which includes nothing about porosities and permeabilities. If it did, I would not concur in that, or not feel qualified.

Q I understand, and I'm -- nothing personal intended but my questions are directed to the credibility that this examiner should place on the fact that you agree with this, and I'm inquiring into the extent of your experience and expertise in doing so.

When did you first examine the map that you have attempted to introduce as Exhibit Number Five? When was your first confrontation with that map?

A Oh, approximately a week ago. Wait a minute, of that illustration it was approximately a week ago; however, the work which Hess did was done while we were both working as hydrologists with the Geological Survey in the early seventies, and his data is widely published. The

crux of this problem is the position, the stratigraphic position, of the limestone deposits which are lateral equivalents to the Capitan Reef and the position of the wells under discussion and their completion intervals.

One is completed above the reef deposit; one is completed below the reef deposit. One is within approximately a mile of the reef, from any number of published sources, and the other is several miles from the reef.

Q What was the publication date of the Geology and Water Resources Carlsbad Area publication that you referred to?

A This is an open file report from the State Engineer's Office, dated December, 1959.

Q Have you since you first examined this exhibit approximately a week ago made any independent investigation of any data that may have been accumulated and available to a hydrologist on which to base an assumption which may have occurred since 1952 or 1959, respectively?

A Well, yes, I have. My first reason for doing this was that although I believe the porosity does not change within a matter of 20 or 30 years within a formation, I did go to the trouble of contacting people at the WIPP site, for whom we are currently under contract, and asked them if they were aware of any work that had been done in the area or any published data on porosities or permeabili-

ties, aquifer yields, in the Capitan Reef, and there have been a number of studies done, identifying the position of the reef, and even collecting water samples from it, but there have been no valid tests, to my knowldge, since Hale made his, and which I quoted.

Q There is later information available concerning the boundaries of the Capitan Reef as have since been ascertained by drilling?

A No, I didn't say that there were changes. I said that -- I said that the data -- there has been data collected which establishes the validity, basically, of the previous work.

Q Have you examined that?

A Yes, I have, and the reef hasn't changed.

Q My question again is have you independently, yourself, gone and done any work in this area through library research or otherwise, or going out and obtaining fresh water analyses or production water analyses or location of City of Carlsbad wells or anything on which you can base your testimony here today?

A Mr. Dickerson, my testimony is based on the data which I've presented here; literature search, which I have done in my office; I've been to the site. I've been to the site of all these wells, but we are not here as the applicant. It is not our position to provide water quality

data to me, as I understand it.

MR. DICKERSON: Well, notwithstanding Mr. Kelly's lecture to us, Mr. Examiner, on what we're here for, I object to the admission of Applicant's Exhibit Number Five. It's prepared by someone, obviously, but it's definitely not this witness. There's no foundation established other than his own self-serving conclusionary (sic) statements that it reflects anything of any inherent believability that we ought to go off on a rabbit trail concerned with here today.

I simply submit that the evidence or the foundation has not been laid in accordance with the customary rules of this Division for one witness to waltz in here and testify with such alacrity as to the work of some anonymous third party who we don't even know his name nor when it was done nor where he went to school or did he go to school, and object to the admission of Exhibit Number Five.

MR. PADILLA: Mr. Examiner, Mr. Kelly testified he examined each and every one of these logs. He has testified that the symbols on the other portion of the exhibit are published by -- and are a matter of public record by the U. S. Geological Survey.

I think Mr. Dickerson has, through his questioning has established the foundation as to

Mr. Kelly's ability to testify from this exhibit.

MR. STOGNER: Looking at this exhibit, we have cross sections which are available here, maps obtainable in this office. The lower righthand corner map showing the reef is a well known illustration, simple as it is, of the reef deposit in this particular area. I wouldn't know where to get that number two portion of the map, but Mr. Kelly, your qualifications are such that you can attest that the blue line in your opinion is the extension of the reef in there, is that correct?

A Yes, sir.

MR. STOGNER: And as far as the middle illustration, I believe you said something, a tube-like feature that extends into southeast New Mexico, is that correct, or what exactly is that?

A That's the areal extent of the reef proper in the subsurface.

MR. STOGNER: And do you know what publication that is from?

A That came from a publication by William L. Hess of the Geological Survey. I can't give you the exact reference right now.

MR. STOGNER: You recognize it and you can attest to its validity and you obviously agree with the basic concept that it's trying to show, is that

correct?

A Yes, sir.

MR. STOGNER: Mr. Dickerson, I'm going to overrule your objection on that.

MR. DICKERSON: Mr. Examiner, with all due respect, I make my objection and I would submit that this is not the type of exhibit that we routinely admit into evidence in these proceedings.

MR. STOGNER: Mr. Kelly made it clear to me what he was intending this to show.

Your objection has been so noted.

Exhibit Number Five will be admitted into evidence.

Mr. Padilla, do you have anything further?

MR. PADILLA: Nothing further.

MR. STOGNER: Mr. Dickerson, do you have anything further of this witness?

MR. DICKERSON: Yes.

(Thereupon a recess was taken.)

MR. STOGNER: The hearing will come to order. Mr. Padilla?

MR. PADILLA: I believe it's Mr. Dickerson's turn.

MR. STOGNER: Mr. Dickerson.

CROSS EXAMINATION

BY MR. DICKERSON:

Q Mr. Kelly, directing your attention to your previous testimony concerning your concern over the pH, the high pH, low pH, reflected by the water sample from the Baseball Park No. 4 Well?

A Yes, sir.

Q Have you had experience in this area with oil and gas production and produced water which is produced associated with that oil and gas in the Delaware Basin of Eddy County?

A Yes. As I mentioned, I've testified before the Commission on a number of occasions and most of these instances it had to do with the establishment of brine disposal units, and so we have done quite a bit of work with that and also, as I mentioned, with the Sandia Corporation, a subcontract with them, on their concerns as to the source of potential contamination in the vicinity of the WIPP site in eastern Eddy County.

Q Did you in connection with your preparation for this hearing examine any other water analyses of produced water other than those attached as part of the applicant's exhibit in this case?

A Well, only these somewhat in excess of 200 analyses that were published. I did go through those, that tabulation of data.

Q Did I understand the thrust of your testimony concerning the pH content of this water based on the water analysis submitted as part of our exhibit, that that is anomalous to any other produced water in the area that you have come across?

A Yes, it is.

Q So based on the review of the information you have reviewed, this is kind of one of a kind or unique water from that well?

A Yes, sir. Or -- or there is something wrong with the analysis or there was something wrong with the sampling. I don't know.

Q If there were water analyses of produced water, you've heard the previous testimony concerning the 11 wells within one-half mile radius of the proposed injection zone. Evidently no one has at this point examined water analyses, all that may be available or have obtained additional samples which may be available, but let's assume that

those additional samples were obtained from producing wells in the area and that water pH of 4 or thereabouts was reflected. What, if any, effect on your conclusions would that have?

A If it were proven to me that the water did in fact have a pH of 4, then I would say that it was a highly anomalous and a very acidic environment.

Q Now the other water samples that you examined did not -- you did not express that concern about them because the pH was relatively higher, is that right?

A Yes, sir, it was more -- it was closer to the neutral range.

Q 5 or 6?

A 6 or 7, 8.

Q So the concern you have if we have a pH reflected of 6, 7, or 8, does not apply as compared to the situation when we have a pH reflected of 4?

A That's correct.

Q So you have some doubt as to the accuracy of the sample itself.

A Yes, sir.

Q Could that doubt be remedied one way or another by simply reconducting the water analysis?

A Yes, sir. I think if someone were to ask me to do it, what I would do is obtain a sample, split it,

and send it to two different labs, send one to this lab and one to an independent lab, and get verification.

Q Okay, now with reference to the fresh water in the area as opposed to the produced water, as I understood your testimony you find that fresh water is somewhat unusual as well?

A Yes, sir.

Q As reflected in your review of the literature and your knowledge in the area.

A Yes, sir.

Q And it was unusual on -- in what characteristics?

A In the total absence of sodium.

Q Total absence of salt or what a layman would call salt.

A No, sodium is a cation. Salt is a combination of an anion and a cation, which is sodium chloride.

Q What are the chlorides reflected in those fresh water analyses? Did you draw any conclusions from --

A The chlorides are quite high. I would not agree with the testimony that was presented earlier, that it is potable and it certainly is not potable, and it exceeds the environmental improvement standards by a factor of 10.

Q The water would not taste good to drink.

A I don't think cattle would drink it; not with three -- not with 3500 parts per million chloride.

Q You heard Mr. Harris' testimony with reference to the shallow producing wells in the area. Did you -- do you have any knowledge that would contradict what he said about the source of the underground water that does exist in this area?

A I don't know that he testified to the source of the shallow groundwater.

Q I think that his testimony was that the source of the shallow groundwater in the area was above 200 feet below the surface.

A My investigation, independent investigation, certainly supports that.

Q What about -- what about fresh potable water below that depth?

A With the exception of the Capitan Reef and its lateral equivalents, I am not aware of any once you get much below 200 feet. It would depend on the stratigraphic section.

Q If it were possible to obtain additional data reflecting the boundaries of the Capitan Reef in which fresh water, drinking water, does occur, and if those boundaries are outside the area of concern regarding this proposed injection well, what effect would that have on your

testimony?

A I don't really know how it would affect my testimony. I simply said that there are -- that these wells in Section 24 penetrate a unit which is hydraulically continuous with the water source, and so any contamination that gets into that is hydraulically continuous with the source of the City of Carlsbad water, so I don't know how it would change my testimony.

Q So I -- I'm just trying to understand the thrust of your testimony. The thrust of your testimony is that if this produced water gets into the zones colored blue on Exhibit Number Five, is it your testimony that that water will migrate into the Capitan Reef and contaminate the fresh water to the City of Carlsbad?

A Yes. Yes, sir, that's my testimony.

Q Based on your examination of Exhibit Number Five and other information --

A Yes.

Q -- that you've referred to.

A Yes, yes, sir.

Q I wonder if you would step to Exhibit Number Five, Mr. Kelly.

You have shown as one well on that cross section, have you not, the proposed injection well, the Merland?

A Well, I believe that's true.
Q This is the Merland No. 1.
A Okay, this will be Merland No. 1.
Q Indicating the fourth well from the left --
A Yes, sir.
Q -- on Exhibit Number Five.
A Yes, sir, well number four on the cross section.
Q And the well number five on the cross section is -- do you know what well is indicated --
A Ballpark No. 2.
Q Okay, directing your attention to the colored blue zone in the Ballpark No. 2 Well, can you tell us the approximate porosities in that zone?
A No, sir.
Q What additional information would you need in order to tell us that information?
A Well, I suppose either a core or an aquifer test.
Q It cannot be done from the electric log?
A You asked me what kind of information I would need. Someone might be able to do it from the electric log. I could not.
Q You don't feel comfortable with calculat-

ing it from this electric log?

A No, sir. I don't know if we've got the -- (unclear) everything else that you need to do it, but I would not feel comfortable.

Q What about permeability contained in the zone of interest that we're looking at in these wells shown on your cross section. Can you or anyone calculate and tell us something about the permeability of that formation?

A To my knowledge there is no method of calculating from a borehole geophysical log permeability. That is why in the report which I quoted to you a value of transmissivity was given, which is a term used by hydrologists in order to come up with a permeability value which you normally don't get from oilfield data, oilfield tests, so there is permeability data available based on the transmissivity value which is given here.

Q But both porosity and permeability of this zone have to be taken into question, do they not, when we're looking at the ultimate question of whether and to what extent any fluid injected into that zone will migrate to a fresh water zone?

A Permeability does. I don't think porosity does.

Q But from your --

A Porosity is -- is void space within a

rock. Permeability is interconnected and therefore something moves through it.

It doesn't move through porosity particularly.

Q So to get -- to get to the ultimate thrust of your conclusion, though, that fluids injected in -- if they migrate in some fashion and are channeled into this blue colored zone on Exhibit Number Five, is a function of permeability as to whether and to what extent those fluids can physically migrate to contaminate possible fresh water.

A That's correct.

Q Are you aware of rules surrounding operators or promulgated by the regulatory agencies regardng completion of oil and gas wells in zones of the Capitan Reef fresh water aquifer in this general area?

A No, sir, I'm not.

Q Do you -- are you aware of whether or not any such rules exist?

A I presume from the amount of work we do with the State Engineer that they do exist.

Q If you were to later find that they do in fact exist and they do not -- they are not applied and are applicable to this area, would that tell you anything which would reflect upon the conclusions that you've expressed here today?

A Well, I think that if they were considered on an individual basis of this particular application and the conclusion was that it did not present a problem, I'm just a taxpayer. I can't make -- I can't force the State Engineer or anybody else to change the rules and regulations.

Q But you -- you recognize both as a hydrologist and based on your experience in things related to the oil and gas industry, that protection of fresh water aquifers is of really paramount concern to everybody --

A Yes, it is.

Q -- that operates in these areas.

A Yes, I do.

Q Let me ask you to elaborate a little bit, Mr. Kelly, on -- on the factors that lead you to testify that in your opinion there is some possibility or probability to whatever extent that the injection by Mr. Westall of produced water into a zone at approximately 3700 feet beneath the surface can in any manner migrate up into the zone of concern colored in blue on Exhibit Number Five.

A I believe that Mr. Gillham testified to that. I'm not a petroleum engineer. I do know from my experience in the past that any fracturing will occur along a path of least resistance and that's upward, not downward, so my testimony should be directed ot the fact that this

particular area where the well is going to be completed, is underlain by rocks which are hydraulically continuous with the aquifer or are actually part of the aquifer. How the water gets there is not a matter of my expertise.

Q Are you, when you refer to fracturing, are you referring to natural fracturing or artificial fracturing or both?

A Both.

Q Do you of your own knowledge have any information regarding the existence or extent of any fracturing, natural or artificial, in this particular wellbore?

A The crust of the earth is fractured. There are always voids or fractures in the crust of the earth amd they're referred to as joints, and this, whenever you drill a well you offset the natural lithostatic pressure which -- which further can create fracturing.

Q Okay, you heard Mr. Harris' testimony, I think, or no, Mr. Gillham's, that he agreed, I believe, with the statement that Mrs. Grace's Salty Bill Well disposed of water into the Bell Canyon formation?

A I think that he did testify to that.

Q And as I understood your testimony, you disagree with that?

A No. I don't know. I didn't review the construction of the Salty Bill other than to examine the

electric log and see what the depth of completion was.

Q Is there an electric log in existence on the Salty Bill Well?

A I believe there is.

Q Do you have a copy of it?

A Yes, I do.

MR. DICKERSON: We'd like to see it, Mr. Examiner. Any objection?

MR. STOGNER: It's a public record.

A No objection.

Q What I'm -- what I'm getting after, Mr. Kelly, is, is it your opinion that the Salty Bill is disposing of produced water into not the Bell Canyon but the Lamar limestone?

A In comparing the gamma log, in comparing the gamma log on that hole with the other logs which are available, it was my conclusion that the Salty Bill is running about 180 feet deep and was terminated approximately 100 feet shallower than --

Q Continue, go ahead, I'm listening.

A And is completed approximately 100 feet shallower than the top of the deepest limestone, which is connected with the reef.

Q Do you know the -- now the Salty Bill is

an open hole completion, is it not?

A I don't know. I was not asked to review the Salty Bill.

Q But you did review the log of the Salty Bill for the purpose of your testimony?

A I correlated the gamma curve with other logs, yes.

Q Okay, I'll simply show you a copy of OCC Form C-105, which we pulled from the files, which shows intervals from 1948 to 2208 feet as open hole and it is respecting this Salty Bill water disposal well.

If you assume that the injection interval is that 1948 to 2208 feet, can you look at the electric log in front of us and can you isolate that zone for me from this log?

A Why, sure. What's the depth?

Q 1948 to 2208.

A 1948 to 2208?

Q 2208.

A 20, 21, 50, 60, 70, 80, 90, 2208 would be right about there.

Q Now, I realize you're not a geologist but as a hydrologist you have to be somewhat familiar with the terms of the geological formations in the area in which you deal, do you not?

A Generally with fresh water-bearing zones that's true.

Q From this electric log can you pick the top of the Bell Canyon member of the Delaware Mountain Group?

A No, sir, I can tell you that by looking at this log, that this is primarily an evaporite section.

MR. STOGNER: I don't know what you say when you say this is an evaporite section. What depth are you talking about?

A I'm sorry.

MR. STOGNER: Mr. Dickerson, what line of questions are you getting at? Could you speed it up a little bit?

MR. DICKERSON: You know, Mr. Examiner, I'm extremely sorry that this is taking so long but we heard the testimony and I'm simply attempting to elicit from this individual what knowledge he has about this. It seems to me that we're boiling down to does this Salty Bill inject into the Bell Canyon or does it inject into the Lamar Lime, because if it --

MR. STOGNER: What depth does it inject into?

MR. DICKERSON: According to the information that I have, 1948 through 2208 feet through

open hole.

MR. STOGNER: Okay, 1994 to what?

MR. DICKERSON: 1948 to 2208, and -- and I apologize that it's me that has to dig this out. This is not our well and we don't know everything that there is to be known about this well but I think it's pertinent to the dispute that this Division has to resolve.

MR. PADILLA: Well, Mr. Examiner, let me point out that I think Mr. Dickerson is focusing his investigation on the Salty Bill which is not a matter of the application. Again, we're not trying to evade or do anything with regard to the Salty Bill; however, if he's going to prevail I guess it's got to be on the basis that he's got to point a finger on the Salty Bill Well.

That's just a comment.

MR. DICKERSON: Maybe one or two more questions, Mr. Examiner. I'll just state where I'm attempting to lead and I don't know where we're going. It appears to me based on my information, which I am just like you, this is the first time I've seen it, as well, that there may be some possibility that the -- that the Salty Bill Well is injecting directly into the zone indicated in blue on Exhibit Number Five. It's considerably up the hole. I think Mr. Kelly's finger pointing upon his presentation of

the exhibit indicated somewhere up there but the only information we have is that injection takes place in an open hole interval from 1948 feet to 2208 and you're an engineer and have considerably more expertise than I do to establish such things and I'm trying to simply put some information in the record from which you may derive some benefit when you have a transcript and attempt to make a decision in this case.

MR. STOGNER: Well, I'll tell you what, that's an interesting point. Mr. Kelly, is it injecting into your blue portion?

A No, sir.

MR. STOGNER: Where is it injecting at, above or below?

A About the bottom of the Salty Bill by my correlation of the gamma curves on this and other holes, indicates that it is injecting a minimum of 80 feet higher than the blue portion and from there up the hole.

Q But even according to your calculations and perhaps in the interest of time and to not further belabor the point, then, according to your own testimony Mrs. Grace's injection well is -- is going into a zone possibly as close as 80 feet -- as within 80 feet to the area indicated in blue on Exhibit Number Five?

A It is being injected in a zone 80 feet above any of the intervals shown in blue on Exhibit Number

Five.

Q Okay, and approximately, can you tell us how far below any of the intervals shown in blue on Exhibit Number Five is the injection interval in the applicant's proposed well?

A Do you -- what is the interval of the -- never mind.

On log number four of the cross section, Exhibit Five, is a log of the Merland No. 1. The base of the deepest zone hydrologically connected with the Capitan Reef is at approximately 229 -- excuse me, 2330 feet --

Q Subsurface.

A Subsurface, and the injection zone is at -- the top of the injection zone is at 3670.

Q So in excess of 1200 feet --

A Yes, sir.

Q -- further down.

A Yes, sir.

Q As compared to the 80 feet difference in Mrs. Grace's well.

A Yes, sir.

MR. DICKERSON: No further questions, Mr. Examiner.

MR. STOGNER: Thank you, Mr. Dickerson.

Mr. Padilla?

MR. PADILLA: Nothing. Nothing, Mr. Chairman, Mr. Examiner.

MR. STOGNER: I have no other questions of this witness. He may step down.

Mr. Dickerson, do you wish to recall or call any other witnesses?

MR. DICKERSON: I wish to recall Mr. Harris very briefly, Mr. Examiner. I'll try to keep it short.

MR. STOGNER: Mr. Padilla, do you have any further witnesses?

MR. PADILLA: No further witnesses.

RANDALL HARRIS,

being recalled as a witness and remaining under oath, testified as follows, to-wit:

REDIRECT EXAMINATION

BY MR. DICKERSON:

Q Mr. Harris, you heard the testimony of Mr. Kelly, did you not?

A Yes, I did.

Q And during his testimony you have examined for yourself the data reflected on Mrs. Grace's Exhibit Number Five?

A Yes.

Q Will you with reference to that exhibit tell us what you as a geologist and based on your experience from looking at that log know with respect to the zone colored in blue, which is the area of interest we're concerned with?

A Well, for one, since there is no electric -- CNL/FDC or the neutron porosity was not pooled through this colored blue zone up here --

Q You're indicating in the Merland Well.

A -- in the Merland Well, I cannot attest to its porosity, but I can to the one offsetting it.

Q Indicate for the purpose of the record which -- that you're indicating the fifth well from the left of the cross section, identify that well for us and tell us what you see.

A Ray Westall Baseball Park No. 2, and on a cross plot this is a density porosity and a neutron, compensated neutron, density porosity log. Cross plot porosity in less than 2 percent and 2 percent generally will not allow any fluid to migrate through it at all.

Directly below it we have some porosity

in the sand above 20 percent, so if any migration of fluid was up the hole, it would not seek out a 2 percent porosity limestone but more the 20 percent porosity sand, and not only that particular sand, scattered up and down the hole from our proposed injection well all the way up, there are sands that can -- are well over 20 percent and any migration of fluid up the borehole, which I don't believe will happen, will surely seek out a higher porosity sand to migrate through rather than a very low porosity limestone.

Q Let me ask you, you heard Mr. Kelly testify with respect to the meaning of permeability and the necessity for permeability in order to fluid -- for fluids to migrate through a formation such as this. Can you as a geologist tell us or calculate anything with respect to permeability of formations or what information do you need in order to make such calculations?

A With this type of log profile you'd also need a dualatero log with a micro to get a relative permeability indication. It is not an exact -- I think it is correct that you do need a core analysis or some other means of drawdown to determine exact permeability.

Q Is there any of that data available?

A None that I'm aware of.

Q Let me ask you, you stated that you disagree with Mr. Kelly's statement and conclusion that there

is some risk or probability that fluids will in fact migrate from the proposed injection zone sought by the applicant in this case up into the area colored in blue on Exhibit Number Five.

A Yes.

Q You disagree with that.

A I disagree.

Q On what factors is your disagreement based?

A On the nature of the cement that was run, of the cement, the type of cement that was run in the borehole in all these wells to quote Mr. Gillham, he is in the contention that a neat cement is a better quality cement than the light or poz mix cements that were run in all these boreholes.

I have gone through some pretty good research myself on cement natures. I am no a cement man. I have obtained this information from Halliburton on the resistant qualities of Halliburton light, which in the case was run in the well in question and all the other wells, in fact, in the area through this interval. It may be called poz mix, 50/50 poz, Halliburton light, or poz mix 140, it makes no difference, it's all a pozlin (sic) type cement and if I may, I would like to read a little bit form a Halliburton excerpt on the nature of pozlin cements.

Q Mr. Harris, let me save us a little time here and say that we can supplement the record with the Examiner's permission with any data that we need. In the purpose of brevity here, let me ask you to recall that Mr. Kelly, as I understood his testimony, was concerned with fractures, natural or artificial, through which this migration would take place up the hole.

Let's talk about fracturing for the moment as opposed to migration across the cemented zone behind the pipe in all of these wells.

A I submit to Mr. Kelly that we do have fracturing throughout the entire world. The whole crust is fractured but to fracture a loose to very finely cemented sand, goes against its general nature.

It's compacted through time. It is not compacted to such rigidity that it will fracture. The nature of the Delware itself is a loose, fine grained to medium grained sand.

Q And your previous testimony that when you're talking to the Delaware itself you're talking of a group of formations but hey include, do they not, the Bell Canyon, the Cherry Canyon, and the Brushy Canyon members of that group.

A Yes.

Q With reference to the log fourth from the

left of Exhibit Number Five, can you tell us approximately just for the sake of clarity of the record and our understanding, where on that log approximately does the Delaware Group, the top of the Bell Canyon to the base of the Brushy Canyon extend?

A The top of the Bell Canyon is directly underneath his area shaded in blue. That is the top of the true Bell Canyon.

He has marked Lamar and Lamar is actually a member of the Delaware Group, also, so Lamar, Bell Canyon, Cherry Canyon, Brushy Canyon. This limestone member he has in here may be part of the Lamar Lime. That is what it is called, Lamar Limestone. It is a very, vey tight, low porosity lime which this log indicates, less than 2 percent.

This perhaps is the Lamar Lime itself that he's got colored in blue.

Q If you assume for the sake of your testimony here that that in fact is the -- the portion colored in blue is a part of the Lamar Limestone, would you agree with Mr. Kelly's contention that any of the evidence which is available or to which you have access would indicate any material risk of migration of fluids from that zone into sources of fresh water for the City of Carlsbad?

A Not of 1700 feet of cased hole with circulated cement.

Q Have you -- have you had experience in drilling and completing oil and gas wells in the Delaware Pool?

A Yes, as a matter of fact I was on the Baseball Park No. 3 and No. 4.

Q In your experience in completing and testing these wells have you ever seen any direct evidence of migration such as Mrs. Grace fears in this proceeding?

A No, I have not.

Q So is it your testimony that that migration is not probable or likely or even possible?

A It's not probable. Anything is possible but highly improbable for any migration to occur, and if the zone was all that high of porosity, since we drilled these wells with a 90+ brine water, we would lose circulation sooner, as soon as we hit a high porosity limestone. We would lose circulation and we do not. So I don't see any relative high permeability to 90+, 95+ brine water, and these are drilled without lost circulation control and we had no trouble with losing circulation.

The reason the cement occasionally loses is the hydrostatic pressure of the cement itself breaking down a zone. This area is not cavernous and as we testified to, we can look at the -- the -- well, the borehole size from the open hole logs and see there is no void. It may be

washed out slightly in the higher porosity sands but we have no cavernous area in this. It simply breaks down under the higher hydrostatic pressure of cement, hence the use of the poz type cements which are lighter.

Q I see, Mr. Harris. Leaving the subject of Mr. Kelly's testimony, let's -- let me ask you, do you recall Mr. Gillham threw some doubt on the need for water disposal of Mr. Westall in this area and the extent of the problem that he has, the quantity of water?

A Yes.

Q The figures that you'd earlier testified and the application that we have filed seeks in excess of 91 barrels, or states that we have an intention of disposing of substantially in excess of 91 barrels per day.

Will you tell us how you, and what you base your projection on , as to the quantity of water that Mr. Westall intends to dispose of?

A I put -- since January the 1st of this year I've got the matter of water produced on the Baseball Park No. 1 and 2 and ran an average of the past seven months, which is 4500 barrels of water per month. I'd have to break that down into a daily figure, but for a 30 day month that's 150 barrels of water a day, just on the one well, or the two wells together.

The Baseball Park No. 4, which is shut

in, but it's last production of 10 and 11 of '86, one month it produced 7825 barrels of water. November of '86 it produced 3,915. That's a total of 11,740 or 5870 barrels a month, assuming another 30 day month, that's 195 barrels. That's pretty close to my 400 barrels that I had requested.

Q And is it your -- so I understand from your testimony that the principal object behind the application in this case is merely to more economically dispose of this quantity of disposed -- of produced water than can be done at present --

A At present with the trucking and disposal costs, yes.

Q And in the event that the application is granted so that the cost of disposing that water can be greatly reduced, would that have any effect on the viability of the production of oil in the area?

A Oh, tremendously so. The Baseball Park No. 4, which has been shut in since 11 of '86, would then become commercial and be able to be turned on and make more oil for everybody.

Q Last question, you heard Mr. Gillham's speculation or assumption that there would be a great deal of truck traffic in connection with the operation of the Applicant's disposal well.

Do you know Mr. Westall's intentions re-

garding transportation of this water across the surface?

A Mr. Westall's intention is to lay pipeline from the wells, producing wells, to the injection well.

Q Both under the rights granted to him under Exhibit Number Three --

A Yes.

Q -- and any additional rights-of-way that he may need in order to get the right to lay such a pipeline.

A Yes.

Q So in the operation of that well there's not going to be substantial truck traffic involved.

A And it's a fenced location and it will remain fenced and it will not increase pad size.

Q What about the surface facilities for that well, are they already there?

A Yes.

Q The tanks and whatnot, storage tanks?

A Yes, I believe -- we may include a larger heater-treater or a separator.

Q Okay.

MR. DICKERSON: I have no further questions of Mr. Harris.

MR. STOGNER: Thank you, Mr. Dickerson.

Mr. Padilla.

RECROSS EXAMINATION

BY MR. PADILLA:

Q Mr. Harris, you did lose circulation on the Baseball 3, didn't you?

A Baseball Park No. 3. I believe we lost it at the surface, yes.

MR. PADILLA: I don't have anything else, Mr. Examiner.

MR. STOGNER: Mr. Dickerson, do you have any further questions?

MR. DICKERSON: No further questions, Mr. Stogner.

RECROSS EXAMINATION

BY MR. STOGNER:

Q Mr. Harris, questions were raised on the water analysis on the Baseball No. 1 and the Baseball Park No. 3, as far as the dates go and could you enlighten me a little more on that?

A We went out to the wellsite and we turned the pumpjack on and let the fresh water run out.

MR. DICKERSON: Produced water.

A Produced water. I admit these wells have

been shut in for quite some time but we turned them on and got the water.

Q One of the analyses was or showed a very acidic --

A Yes.

Q -- water. Do you care to comment further?

A I would surmise that is a mistake, that the Dowell engineer who ran this analysis probably was in error and Mr. Kelly is totally correct in a pH to 4 is fairly close to battery acid and probably does not exist.

If we look on the other side of the page we'll see that the sodium, calcium, magnesium, the chloride and the sulfate and bicarbonates are relatively the same on the other water analyses, so since everything else seems to be remaining about the same within certain parameters, I would assume that the pH number on this well is wrong.

Q Okay, would you be willing to get another test and Mr. Kelly suggested maybe two samples, send it to them and let them get another analysis done and then you get a re-analysis?

A No objection whatsoever.

Q Okay. Do either one of you propose to bring any more witnesses forward at this time?

Okay. There's been some questions raised

about the calculations of the cement behind the casing. Some portions of Mr. Harris' testimony show temperature surveys and bond logs where ran.

Mr. Gillham did his by calculation; however, I do not have any real hard copies or evidence to show me figures either way. I propose that Mr. Harris, you prepare me whatever it takes, a bond log, temperature log, calculations, if necessary, an explanation of the calculations.

Mr. Gillham, I suggest you do the same based on what you have, what calculations you're using, what factors you're using and such, and present those as evidence.

Now we can do it one of two ways. You get your information together and send it to them and let them have time to rebut or we can come back here and vice versa, or we can come back here on October 7th and cross examine each one's testimony.

What do you propose, Mr. Padilla, and Mr. Dickerson?

MR. DICKERSON: I'd just as soon Mr. Harris respond, Mr. Examiner.

MR. STOGNER: Mr. Padilla, do you wish to respond?

MR. PADILLA: No, I don't have any objection to having some kind of a period within which

each of us would respond the other's information.

MR. DICKERSON: Mr. Examiner, let me ask, Randy, or Mr. Harris tells me the sole source of the information he has is from OCD files, C-103's in most cases, that are prepared by the operators and then furnished to the OCD.

Is it -- is it your request to be furnished with, for instance, when a C-103 reflects a temperature survey was run, that we attempt to obtain from that operator in a particular instance, a copy of the temperature survey or bond log, whatever may have been run and submit it to the OCD?

Mr. Harris tells me that he does not have any such thing. We don't have any objection to attempting to locate it. I just don't know when all this --

MR. STOGNER: Well, I guess I was under the impression that on some of these wells you had run them.

MR. HARRIS: Oh, yes, I could obtain them from Mr. Westall, of course, but the eleven wells here and I'm familiar with five.

MR. DICKERSON: Let me suggest that --

MR. HARRIS: The rest of them

come from the OCD C-103's on -- reported cement tops and by what method, and I think (not clearly understood.)

MR. DICKERSON: Let me suggest, I understand that we have some of these. We have absolutely no objections to furnishing what we have, furnish it to Mr. Padilla, furnish it to the OCD, and prior to October 7th, Mr. Padilla and I will confer and decide and inform your office as to whether or not we feel there is any necessity to come back or whether we're both content to have you decide it based on the record and let you do so at that time.

MR. STOGNER: Mr. Padilla, do you have any problem with that?

MR. PADILLA: No, sir, that's fine.

MR. STOGNER: Okay. Plus the water analysis on that Baseball Park No. 4.

Mr. Harris, now you mentioned a little while ago that there will be lines going into your well and that it would be fenced.

MR. HARRIS: Yes.

MR. STOGNER: I'd like a diagram or diagrammatic sketch of this proposed operation out there submitted at that time also.

MR. DICKERSON: Of the surface facilities.

MR. STOGNER: Of the surface facilities.

MR. DICKERSON: And fences, and whatnot.

MR. STOGNER: Right. And with that I'll hold the record open either to the October 7th date or until I hear word from both you, Mr. Dickerson, Mr. Padilla, on supplying me with that additional information.

Is there anything further at this time?

There being none, we are through with this case.

(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. 9189, heard by me on 9 September 1987.

, Examiner
Oil Conservation Division