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## Trial Transcript, Vol. VIII, Afternoon Session

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File 115  
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Case # 4993

File # 115

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IN THE DISTRICT COURT FOR THE FIFTH JUDICIAL DISTRICT  
WASHAKIE COUNTY, STATE OF WYOMING

IN RE: )  
)  
THE GENERAL ADJUDICATION )  
OF RIGHTS TO USE WATER )  
IN THE BIG HORN RIVER )  
SYSTEM AND ALL OTHER )  
SOURCES, STATE OF WYO- )  
MING, )

Civil No. 4993

FILED

2/6 87

Margaret V. Hampton

CLERK

DEPUTY

VOLUME VIII

Thursday, January 29, 1981

Afternoon Session

**ORIGINAL**

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MR. MEMBRINO: I think the government is ready to proceed, Your Honor.

THE SPECIAL MASTER: All right. We will come to order.

MR. MEMBRINO: I believe where we left off, Your Honor, the State was about to begin its voir dire of the tendered exhibit.

MR. MERRILL: Your Honor, before Mr. White begins his voir dire of these exhibits through Mr. Page, I was wondering if I could ask whether or not the United States will make some of its witnesses available next week during the break between trial. There are several witnesses who will appear as part of the United States' case in chief, according to their endorsement, that we have not yet obtained the final opinions and conclusions from, and I was wondering if Ms. Sleater would make some statement regarding the availability of those people next week.

MS. SLEATER: We have had numerous off-the-record discussions with the State of Wyoming, and we have previous to this time had numerous and sundry other agreements with them.

1 It appears that it would not be possible next  
2 week to make any of the witnesses -- there are  
3 only three that have not been redeposed by  
4 the State of Wyoming, and I would point out  
5 that there is no right to final opinions anyway.

6 There is a right to discovery, as Your  
7 Honor had ordered which we complied with. In  
8 fact, we were in depositions with the State of  
9 Wyoming from January 5 on until 1:00 A.M. on  
10 the Friday before this hearing began.

11 At this time the one week before two weeks  
12 of trial, it's very necessary for the United  
13 States to go on with its work with the witnesses,  
14 getting its exhibits in order, and next week  
15 would just be impractical for us to provide  
16 witnesses and I have previously explained this  
17 to Mr. Merrill, and I'm very surprised he  
18 brought it up on the record because when I  
19 talked to him last night, he indicated he  
20 understood the problem, and he was in full  
21 agreement that that was fine with him.

22 So I don't know why this has come up at  
23 this time, but I will not be making those  
24 three people available next week.

25 MR. ROGERS: I would like to state for

1 the record that the Tribes would object to any  
2 further depositions in this matter at all. The  
3 Special Master has previously ordered that  
4 discovery would end at the beginning of trial,  
5 and up until that time there were depositions  
6 still going on of certain witnesses as Ms.  
7 Sleater has said, and Dr. Mesghinna was deposed  
8 until 1:00 A.M. Saturday morning the week before  
9 trial.

10 The State has deposed every one of the  
11 government's expert witnesses, as well as those  
12 of the Tribes', and I think that is sufficient  
13 discovery.

14 MR. MERRILL: Your Honor, I'd point  
15 out two things in response: Number one, the  
16 Tribes have, since we closed our discovery of  
17 their witnesses, endorsed additional people  
18 whom we have not deposed.

19 THE SPECIAL MASTER: Are the three  
20 you asked for some of those additional that  
21 have been endorsed?

22 MR. MERRILL: No, Your Honor. These  
23 are the continuation of depositions of experts  
24 who have been previously endorsed by the United  
25 States.



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I don't want to mislead the Court into thinking these are new witnesses because that is not the case.

In that case I seek then only an assurance from Ms. Sleater that she will not call either Tom Stetson or Michael Keene or Ron Billstein during the hearings the week of February the 9th, which is the next week of hearings scheduled in this case.

Should she be disinclined to make that assurance at this point, I will direct the Court's attention to an agreement that the State and the United States made last week, but absent that assurance, I don't think we'll need to refer to the agreement.

MS. SLEATER: Your Honor, the United States at this time has no intention of putting those three people on the stand on February 9.

THE SPECIAL MASTER: Very well.

Mr. Membrino? Oh, voir dire.

MR. WHITE: Yes sir.

VOIR DIRE EXAMINATION

BY MR. WHITE:

Q Oliver, how is that voice holding up?

page-voir dire-white

1 A I think it's okay.

2 Q Oliver, would you please open up Exhibit C-31A  
3 and take out table 2? That's the packet of  
4 tables.

5 MR. WHITE: Before I ask the witness  
6 the first question, Your Honor, I would like  
7 to inquire of the United States the purpose  
8 for which these exhibits are being offered:  
9 Are they being offered for the truth of their  
10 contents or some lesser purpose?

11 MR. MEMBRINO: They are being offered  
12 for the truth of their contents, Your Honor.

13 MR. WHITE: We then will have doubtless  
14 objections, Your Honor.

15 Q (By Mr. White) With respect to table 2 in C-31A --

16 A Yes.

17 Q -- what do you mean by Quaternary depth deposits?  
18 What does Quaternary mean?

19 THE SPECIAL MASTER: Are you referring  
20 to table 2 of 31A?

21 MR. WHITE: Yes, sir. I have table 2  
22 which is entitled at the top, "Estimated Potential  
23 Well Yields for Quaternary Deposits."

24 THE SPECIAL MASTER: Very good.

25 page-voir dire-white



1 A That term is a geologic time, a system name.  
2 If you would refer to the columnar section  
3 there, it is given under system -- it represents  
4 a period of geologic time.

5 Q It's the surface deposits?

6 A That's right, essentially.

7 Q What symbols are used for Quaternary deposits  
8 on the geologic map which is C-33?

9 A Well, they have various symbols. Qa, I recall,  
10 is the alluvium. "Q" stands for Quaternary, and  
11 "a" for alluvium. I believe they use Qt for  
12 terraces.

13 Now, on the lens, I don't recall. I could  
14 point them out.

15 Q Why don't you wander up there so we can know  
16 we are speaking the same language.

17 A Qa is the alluvium of the flood plains and  
18 related low terraces.

19 Qsa is referred to as slope wash and alluvium.

20 Qt is terraces and pediment deposits.

21 Ql last, land slides, steep-slope colluvial  
22 deposits.

23 Qtr is Travertine deposits.

24 Qtr, glacial deposits.

25 page-voir dire-white

1 Q Is that all?

2 A That's all. Not all of those are listed on that  
3 table 2.

4 Q Which of the Quaternary deposits that you have  
5 described from Exhibit 33 are included within  
6 the Quaternary deposits -- I'm sorry, I always  
7 have trouble with that word -- Quaternary deposits  
8 in table 2 of C-31A?

9 A On table 2 we are looking at Qa, and in some  
10 cases Qsa, the combination alluvium and slope  
11 wash --

12 Q I'm sorry. Go ahead.

13 A Well, on some of the minor creeks -- I believe  
14 it's restricted to the minor creeks -- the mapping  
15 didn't distinguish between the slope wash and  
16 the alluvium in the channels. It was the degree  
17 of mapping essentially, so they had the combination  
18 term.

19 Q Let's run through those alluvium units on table 2,  
20 and can you tell me which of the types of deposits,  
21 the alluvial deposits, that you have described are  
22 included within the alluvium for each of those units  
23 from which you derived those potential well units?

24 A In the Wind River it's Qa.

25 page-voir dire-white

1 Q Okay.

2 A I would like to refer to the map.

3 Q Oh, please go ahead.

4 A Because they mix in some cases. In the Little

5 Wind, Qa; Mill Creek, Qsa; Sage Creek, Qsa;

6 Owl Creek, Qa; Crow Creek, Qa; Popo Agie, Qa

7 and Qsa; Cottonwood Creek -- I can't locate

8 Cottonwood Creek, which is Qa and Qsa; Muddy

9 Creek, Qa and some Qsa; Five Mile Creek, Qa;

10 and Kirby Draw, Beaver Creek, Qsa.

\* \* \* \* \*

25 page-voir dire-white

1 Q (By Mr. White) (Continued) What about the terrace  
2 deposits and glacial deposits, what symbols would  
3 be representative of those, the areas in which  
4 you derived these yields or the G.S. derived  
5 these yields on Exhibit 33, geological map?

6 A Well, on the G.S., I cannot speak specifically  
7 which terrace deposits. They were speaking in  
8 general. There are major terrace deposits here,  
9 located up in this area, Riverton area, along  
10 the Crowheart area, Wind River. Your glacial  
11 deposits are -- are not restricted in this  
12 area here.

13 Q Southwest and central portion of the reservation?

14 A That's right.

15 Q Now, in which of those areas, if you know, do  
16 terrace deposits yield from a few to a few  
17 hundred gallons per minute?

18 A It would be the terrace deposits that are  
19 overlaying by the irrigation, and those specific  
20 ones.

21 Q Which ones are those? First of all, they would  
22 be represented by a symbol Qt?

23 A Correct.

24 Q And for purposes of the record, when we speak of  
25 page-voir dire-white



1 Qt or Qsa or any of the Qs, it's a capital Q with  
2 the following letters being small letters in  
3 subscript?

4 A That's correct.

5 Q That helps the reporter.

6 So it's Qt areas under present irrigation,  
7 present irrigated lands?

8 A Not necessarily; present or maybe past or in  
9 general.

10 Q Well, now, which terrace areas are referred to  
11 in your table 2?

12 A It would be -- it's a general term for terrace  
13 deposits on the reservation, and from my  
14 understanding, it would not be restricted  
15 necessarily to a specific terrace deposit.  
16 The terrace deposits are generally have a  
17 permeability or relative high permeability  
18 if there's a source of water to it and they  
19 were thick enough, you could get this type of  
20 yield.

21 The USGS figures are general; mine are  
22 specific.

23 Q For the purposes of this case, how would you  
24 use the value of a few hundred GPM for terrace  
25 page-voir dire-white



1 deposits? Do you have an opinion or is this  
2 not your opinion for the yields from those  
3 terrace deposits?

4 A It's not my opinion.

5 Q The terrace deposits are not your opinion?

6 A It's not my opinion, but the opinion of the  
7 U.S. Geological Survey, which is professionally  
8 accepted.

9 Q That is an opinion that you relied on?

10 A Yes, it is.

11 Q Okay. In what areas of the reservation are you  
12 relying on the USGS opinion to produce a few  
13 hundred gallons per minute in terrace deposits  
14 as you've depicted on table 2?

15 A I would --

16 Q Or do you know?

17 A Pardon me?

18 Q Or do you know?

19 A Specifically they have not been defined. We looked  
20 at the major outcroppings or major deposits,  
21 terrace deposits.

22 Q Is it fair to say then that you cannot say  
23 with any specificity or indicate with any  
24 specificity those areas that were to yield

25 page-voir dire-white

1 a few hundred gallons per minute from terrace  
2 deposits?

3 A That would be correct.

4 Q Let's talk about glacial deposits. Those  
5 would be the areas that are Qgr?

6 A Qg.

7 Q Qg, I'm sorry. Again, the values which are  
8 on table 2 are not your professional opinion?

9 A That's correct.

10 Q They are the opinion of GS?

11 A That's correct.

12 Q And where does GS say that, or in what location  
13 does GS indicate that 50 gallons per minute  
14 can be obtained from glacial deposits?

15 A Again, in this situation it is a general yield,  
16 they do not specify. Your glacial deposits  
17 are restricted to the western area, the foot of  
18 the Wind River Mountains. Your major glacials  
19 are around Bull Lake and up in the area of  
20 Dinwoody Lake.

21 Q So with respect to glacial deposits as to  
22 terrace deposits, you're unable to indicate  
23 those specific deposits which would yield  
24 50 gallons per minute; is that correct?

25 page-voir dire-white

- 1 A It would be -- have just two major deposits,  
2 it would apply to those two major deposits.
- 3 Q Is it your professional opinion that 50 gallons  
4 per minute could be derived from the glacial  
5 deposits which are located in Range 3 West,  
6 Township 3 North and Range 5 West, Township 4  
7 North?
- 8 A Yes, where they are saturated.
- 9 Q Where they are saturated. Where are they  
10 saturated?
- 11 A I don't know.
- 12 Q You don't know?
- 13 A That's correct.
- 14 Q So we're sort of going beyond the area of your  
15 investigation --
- 16 A That's correct.
- 17 Q -- as to specific locations where those yields  
18 could be obtained?
- 19 A That's correct.
- 20 Q Thank you. Isn't it true that you also do not  
21 know any areas where those yields, indicated  
22 yields in terrace and glacial deposits have  
23 actually been obtained?

24 THE SPECIAL MASTER: Actually been  
25 page-voir dire-white

1 obtained?

2 MR. WHITE: Actually been obtained,  
3 where they've actually gotten those kinds of  
4 yields.

5 THE WITNESS: No.

6 Q (By Mr. White) With respect to the alluvium  
7 units shown on table 2, then you have a variety  
8 of deposit types, is that correct, ranging from  
9 Qa or -- excuse me, there are just two, Qa and  
10 Qsa?

11 A That's correct.

12 Q And in some of those alluvium units you used  
13 Qsa and some you used Qa, and some you used  
14 both?

15 A That's correct.

16 Q What -- Would you know what the value for the  
17 Popo Agie would be if you used only Qa as you  
18 did for Crow Creek, Owl Creek, Sage Creek,  
19 Mill Creek, Little Wind River? Do you know  
20 what the yield would be just out of Qa on  
21 the Popo Agie?

22 A Well, it would not necessarily be any different  
23 than what is stated here.

24 Q Do you know?

25 page-voir dire-white



1 A Do I know what?

2 Q Have you formed an opinion that it would be the  
3 same if you eliminated Qsa from the Popo Agie?

4 MR. MEMBRINO: Your Honor, if I may.  
5 I'm concerned that this questioning is going  
6 to be out of the scope of table 2. The table  
7 is entitled Estimated Potential Well Yields from  
8 quaternary deposits. This is -- this is exactly  
9 what Mr. Page has displayed here. He wasn't  
10 called upon, nor did he need to -- to arrive at  
11 this information to identify specific sites or  
12 to break down the relative proportions of the  
13 sources for the water in the quaternary deposits.  
14 I think the exhibit speaks for itself, and I  
15 think it speaks accurately. I don't think --  
16 I don't think it should be impeached because  
17 it doesn't go beyond what it purports to do.

18 MR. WHITE: We're trying to find out  
19 what it does do.

20 THE SPECIAL MASTER: We appreciate  
21 the objection. We'll overrule it for now, but  
22 I think it's getting close.

23 MR. WHITE: I understand. I'm trying  
24 to see what this exhibit does represent, whether  
25 page-voir dire-white



1 we're mixing apples or oranges.

2 Q (By Mr. White) Do you know or have you formed  
3 a professional opinion that by eliminating  
4 those portions of alluvium from the Popo Agie  
5 represented by Qsa on Exhibit 33 that the  
6 yield would, potential yield expressed in  
7 table 2 would still be 20 gallons per minute?

8 A It would not necessarily change that yield.

9 Q Is the same true with respect to the Cottonwood  
10 Creek, Muddy Creek, Kirby Draw and Beaver Creek?

11 A That's true.

12 THE SPECIAL MASTER: They're so  
13 negligible now, all they say is a few. It's  
14 pretty hard to tell if that's effective.

15 MR. WHITE: I'm sorry, Your Honor,  
16 I'm just trying to find out that information  
17 which is necessary for me to make an objection  
18 and to prepare for cross examination.

19 THE SPECIAL MASTER: Well, when the  
20 table 2 shows that the potential yield in gallons  
21 per minute would be few from the Cottonwood, Muddy  
22 and Fivemile, the question asked, if there would  
23 be a different yield leaves little room left, but  
24 I'm not going to object to the question. Go ahead

25 page-voir dire-white

1 and answer it.

2 MR. WHITE: I think he did. He said  
3 the same thing would be true.

4 MR. MEMBRINO: I'd also like to point  
5 out that the purpose of voir dire is not to  
6 prepare Mr. White for cross examination.

7 THE SPECIAL MASTER: Mr. White prepares  
8 himself whether you let him or not.

9 MR. WHITE: I need a lot of help, Your  
10 Honor.

11 THE SPECIAL MASTER: Go ahead.

12 Q (By Mr. White) Up at the top of table 2 it says  
13 estimated. What do you mean by estimated, do  
14 you associate any particular margin of error or  
15 degree of reliability with the word estimated?

16 A No.

17 Q Okay. From a hydrogeologic standpoint, what  
18 do you mean by estimated?

19 A It means that they were determined, not necessarily  
20 wells pumping those rates where you can say you  
21 have a well pumping 900 gallons a minute was  
22 estimated or calculated or determined from the  
23 hydrologic and conditions of aquifer properties,  
24 and I use the term estimated versus a well

25 page-voir dire-white

1 that's actually being tested and proven.

2 Q So you would expect that you could put a well  
3 in these various alluvial units and come up  
4 with measured discharges roughly equivalent  
5 to the potential yields even though there isn't  
6 a well there right now, is that what that means?

7 A Would you restate that again?

8 Q Does the potential yield mean that it's your  
9 opinion that if you put a well into these various  
10 alluvium units, you would come up with, you would  
11 have a well that could produce the kind of discharge  
12 that's represented by the potential yield in the  
13 right-hand column?

14 A And the range of potential yields, yes.

15 Q Does the word "potential" in the heading mean  
16 sort of projected?

17 A No.

18 Q Or estimated?

19 A It means we don't have a well in there that's doing  
20 it. If you put a well in, it's potential.

21 Q So it's based on your professional judgment then?

22 A That's correct.

23 Q On the right-hand column, the heading is potential  
24 yield. Does that word "yield" mean the same thing

25 page-voir dire-white

1 as charge?

2 A That's correct.

3 Q In preparing table 2, did you make any assumptions  
4 with respect to the water quality of the yields  
5 or discharges shown in the second column?

6 A No.

7 Q So then you have no opinion as to the suitability  
8 of these yields for any particular purpose; is  
9 that correct?

10 A Not in relation to this.

11 Q Okay. Now, are the yields shown on table 2 the  
12 yields which would be developed by a solitary  
13 well in each of those alluvium units or a  
14 number of wells such as in well fields?

15 A It is a little of both. Let me explain.

16 Q Okay.

17 A It's a solitary well, but I allowed for some  
18 theoretical interference. For example, in the  
19 Wind River that highest value, 900 gallons per  
20 minute, that's in the Crowheart area and the  
21 U.S. Geological Survey on a single well had  
22 estimated, I believe, 1,250.

23 Q That was in table 2 of water supply paper 1576-I?

24 A I don't think it was in table 2.

25 page-voir dire-white



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Q Okay.

A I'm not --

Q Let me ask you about that. I've always been  
curious.

A If it's table 2 that -- okay.

page-voir dire-white



1 THE WITNESS: Yes, it's twelve in the  
2 front.

3 Q (By Mr. White) So when you backed off from 1200  
4 to 900, that was an attempt by you to be rather  
5 conservative in your estimates?

6 A That, and I might have used slightly different  
7 aquifer characteristics, permeability values  
8 for very specific ones.

9 Q I still could not understand. Does table 2  
10 mean you could have an unlimited number of wells  
11 yielding this amount?

12 THE SPECIAL MASTER: He said a little  
13 of both, Mr. White, singles and some yields.

14 THE WITNESS: Okay, I can answer that.  
15 It means that proper well spacing to limit the  
16 mutual interference of the wells, you could  
17 have that.

18 Q What assumption did you use in developing table 2  
19 with respect to the well spacing that would be  
20 required to allow you to maintain these yields  
21 from the wells -- are the alluvium units  
22 involved?

23 A I did not assume a well spacing, I assumed  
24 limiting the interference, and I am recalling  
25 page-voir dire-white

1 this, I believe, to a foot of interference.

2 Q Could you explain to the Court what you mean  
3 by one foot of interference?

4 A When you have adjacent wells and they are pumped,  
5 a cone of depression is formed. This cone expands  
6 out to a point where it's intercepted sufficient  
7 recharge to equal the recharge. That means that  
8 the well, you have the greatest drawdown or the  
9 greatest drop in the water level. It diminishes  
10 as you go out. So if you have another well in  
11 that cone, you are going to have a drop of water  
12 well due strictly to that other pumping well,  
13 and that would, in turn, go back on that.

14 Q That assumption also includes that you have  
15 uniform continuous and homogenous saturated  
16 material, doesn't it?

17 A Oh, yes, it does.

18 Q Have you confirmed that assumption in these  
19 particular alluvia?

20 A You will notice the range is twenty to nine  
21 hundred. That twenty not only takes into account  
22 if you've put the well on the edge, it also  
23 takes into account the saturated thickness.

24 Q Except as shown by an asterisk on table 2, did  
25 page-voir dire-white

1 you develop the potential well yields or dis-  
2 charges yourself?

3 A Yes, I did.

4 Q What is the source for the potential yield  
5 of a few gallons a minute for Cottonwood Creek?

6 A That is from the U.S. Geological Survey's  
7 asterisks.

8 Q What particular reference did you use?

9 A Oh, water supply paper 1576-I.

10 Q I hand you a copy of 1576-I, and I suggest you  
11 not be misled by the paper clips, and tell me  
12 where you found that particular estimate.

(Brief pause.)

13 A It may take a few minutes.

14 Q While you are looking --

15 A I believe it's in the text.

16 Q While you are looking through there, I would  
17 ask you the same thing for all of your other  
18 asterisked items on table 2, so if you pick up  
19 something else along the way, just let me know.

(Brief pause)

20 A It's on page 149 and it reads, "Alluvium  
21 in the valleys of Fivemile, Muddy and Cottonwood  
22 Creeks is relatively fine grained. Sand and  
23

24 page-voir dire-white  
25

1 silt are predominant; clay, gravel, and pebbles  
2 are present in lesser amounts. Yields of a  
3 few gallons per minute are available from  
4 some of these rocks."

5 Q Do you know the basis upon which the USGS made  
6 that projection or estimate of the yields?

7 A Not specifically.

8 Q How many creeks did that involve on page --

9 A It included Cottonwood, Muddy and Fivemile.

10 Q How about the values for Kirby Draw, Beaver  
11 Creek for terrace deposits, glacial deposits?

12 A On Kirby Draw and Beaver Creek, I 47 says,  
13 "Part of the alluvium was well-sorted sand and  
14 very fine gravel that would probably yield as  
15 much as twenty gallons per minute."

16 Q Do you know the basis on which the USGS reached  
17 this conclusion?

18 A Probably on the property of the aquifer -- I  
19 mean, the grain size present from well logs.

20 Q Did they use the Johnson graph to do that,  
21 do you know?

22 A I have no idea.

23 Q So you don't know --

24 A I don't know the specifics.

25 page-voir dire-white



1 Q You don't know the analysis?

2 A I can just draw a conclusion from what they  
3 say.

4 Q How about the terrace and glacial materials?

5 A Terrace is I 47. Do I need to read it?

6 Q No, you don't need to read it, Oliver. I'm sorry.  
7 You really don't need to read anything, let's  
8 save your voice. Just tell me what pages they  
9 are on.

10 A I 47, paragraph 1.

11 Q That's for both terrace and glacial?

12 A No, that's terrace.

13 MR. MEMBRINO: Your Honor, I think  
14 the sources cited by Mr. Page is enough information  
15 for Mr. White to consider having him point it out.  
16 He is taxing his voice and it is simply redundant  
17 to the exhibit or the material he submitted,  
18 and --

19 THE SPECIAL MASTER: I appreciate that,  
20 Mr. Membrino, but I still have to allow an inquiry  
21 to probe into the truth of the exhibit. Mr. White  
22 might be pretty much at the end of it, I think.

23 MR. WHITE: I am, Your Honor. Go ahead.

24 THE WITNESS: I 13 in the table here

25 page-voir dire-white



1 under what is table 1, potential water supply.

2 Q (By Mr. White) Okay. Again, is it true that  
3 you do not know the facts and data upon which  
4 the USGS relied upon making those determinations?

5 THE SPECIAL MASTER: He answered that.  
6 You don't have to answer that again.

7 Q (By Mr. White) Okay. Back on table 2, would you --  
8 well, excuse me.

9 As I recall your testimony, you indicated  
10 that you developed the values that are not  
11 marked with an asterisk, and I would like to  
12 ask you to describe the general methodology that  
13 you used. If I may, I'll get back 1576-I before  
14 I lose it because it's out of the State Engineer's  
15 library.

16 A I need another copy of that.

17 Q Would you tell me that methodology, please?

18 A Yes. One moment, please.

19 (Brief pause.

20 Q (By Mr. White) Would you like to take a little  
21 break?

22 THE SPECIAL MASTER: That just sets  
23 him back, I'm afraid.

24 MR. WHITE: I don't want to be accused

25 page-voir dire-white

1 harassing the witness, Your Honor.

2 THE WITNESS: It seems to get worse  
3 when I stop talking.

4 MR. WHITE: Well, keep talking until  
5 the break is over.

6 THE WITNESS: Essentially the technique  
7 involved determining the saturated thickness of  
8 the alluvial deposit. This was obtained from  
9 water level information in the wells, in existing  
10 wells; then with the saturated thickness, a  
11 determination of the permeability of the deposits.  
12 This permeability was determined from existing  
13 well test information, and from that we determined  
14 the transmissivity, and in that water supply paper,  
15 1576-I, the USGS had a relationship between  
16 specific capacity and permeability or transmissivity,  
17 whatever.

18 Q Is that one of the graphs?

19 A No, it's a formula.

20 Q Could you point out that formula to me?

21 THE SPECIAL MASTER: In view of his  
22 condition and fairness, if you can do anything  
23 to kind of compress it, I would be grateful to you.

24 MR. WHITE: I will, Your Honor, if he

25 page-voir dire-white

1 can just tell me the page number it appears on.  
2 I will ask him more leading questions, then.

3 THE WITNESS: On page I 37.

4 Q (By Mr. White) That's on page I 37 about a  
5 quarter of the way from the bottom?

6 A That's correct.

7 MS. SLEATER: Your Honor, at this time  
8 may I approach the witness and give him some  
9 hot coffee?

10 THE SPECIAL MASTER: He has a pitcher  
11 full of it, I think.

12 MR. WHITE: Not of hot coffee, Your  
13 Honor.

14 MS. SLEATER: I think the heat will  
15 probably help his throat.

16 THE SPECIAL MASTER: I object to the  
17 precedent that he gets it and I don't, but that's  
18 the story of my life.

19 MS. SLEATER: I'm sorry, Your Honor.  
20 Next time I'll bring two.

21 THE SPECIAL MASTER: No problem.

22 MR. WHITE: Bring three, Your Honor.

23 MS. SLEATER: I will bring a pot.

24 MR. WHITE: Why don't you swig on that

25 page-voir dire-white

1 coffee a little bit, if you would like to.

2 THE WITNESS: That's okay. I got a  
3 pill in my mouth right now. Let me dissolve it.

4 Q (By Mr. White) Okay. With respect to the Wind  
5 River alluvium unit that shows on table 2 --

6 A That's correct.

7 Q -- what saturated thickness of the alluvial  
8 deposit did you use?

9 A I believe -- I'm trying to recall this. Can  
10 I refer to some notes if you want the specific  
11 numbers?

12 Q Sure.

13 A It was five to forty feet.

14 THE SPECIAL MASTER: Was that answer  
15 five to forty feet?

16 MR. WHITE: I believe so.

17 THE WITNESS: Pardon me, eight to  
18 thirty-two feet.

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page-voir dire-white



- 1 Q. (By Mr. White) What was the water level in  
2 the existing well that you used?
- 3 A. I didn't use a single existing well, and they  
4 varied, anywhere from a foot below the ground  
5 surface to what I'm aware there are some less --
- 6 Q. I'm sorry?
- 7 A. I'm aware there are some less than a foot or a  
8 foot and deeper.
- 9 Q. What was the source then of your saturated  
10 thickness value if you did not base it on the  
11 information available from an existing well?
- 12 A. I did base it --
- 13 Q. I'm sorry. I thought you said you didn't.
- 14 A. The source of my saturated thickness?
- 15 Q. Yes.
- 16 A. What we did -- and by "we" I mean our staff  
17 under my direction -- we looked at every well  
18 that we had a driller's log, something to indicate  
19 whether they penetrated the unconsolidated deposits,  
20 the alluvial deposits, and penetrated the Wind River or a  
21 more consolidated rock underlying it, where we also  
22 considered logs that never totally penetrated,  
23 and we looked at these on a basis from -- we plotted  
24 these on a basis of upstream to downstream; in other  
25 page - voir dire - white



1 words, in various reaches.

2 Then where we didn't have something we  
3 interpolated between these and we obtained our  
4 saturated thickness from these actual well  
5 values and interpolations between them.

6 Q. How many well values did you have?

7 A. I do not recall.

8 Q. Is it also true that you cannot remember at  
9 this time the particular wells that you --

10 A. That's correct.

11 Q. What value for permeability did you use with the  
12 Wind River alluvium unit?

13 A. We had three values spaced out from the Crow  
14 Heart area -- that was that USGS test, and Table 2  
15 you showed me -- I believe we converted their  
16 information into a permeability value, using that  
17 formula that you had.

18 I pointed out we had our pump test at the  
19 vicinity of the Pilot Butte, which I should correct  
20 the record now. The water pumped from -- the  
21 water located next to the pipe is used for injection  
22 at Steamboat Butte.

23 THE SPECIAL MASTER: I think you are in such  
24 a condition that we ought to give some thought to  
25 page - voir dire - white

1 either deferring your testimony until your  
2 throat is better, because I think you are  
3 in pain.

4 THE WITNESS: It's just annoying.

5 THE SPECIAL MASTER: If you are not in pain,  
6 we can stand the annoyance.

7 MR. WHITE: Oliver, at any time you want to  
8 stop, you let us know. We certainly appreciate  
9 your effort to keep going.

10 THE SPECIAL MASTER: It's okay with me to  
11 continue.

12 MR. WHITE: Let's go then.

13 A. So we had a pump test there which was more extensive  
14 than the USGS pump test, and we obtained a  
15 permeability of 1300 gallons per minute -- I'm  
16 sorry-- 1300 gallons per day per square foot.

17 Now, I'll see if my notes will have the USGS  
18 values that we determined -- then the USGS in the  
19 Riverton area had another pump test, and with those  
20 three points -- okay, yes, in the Riverton area  
21 we interpolated the USGS pump test for a permeability  
22 of 300 gallons per day per square foot in the Crow  
23 Heart area there. We interpolated it at 2400 gallons  
24 per day per square foot, and ours is about mid-way

25 page - voir dire - white

1 in between, was 1300 gallons per day per square  
2 foot.

3 We looked at those and we interpolated  
4 between them -- okay, to give a variance downstream  
5 based on the premise that generally your coarser  
6 materials are deposited upstream.

7 You could expect a higher permeability  
8 in those deposits. Your finers would be deposited  
9 down towards Riverton, so with those three values,  
10 we interpolated between to give us a variable range  
11 down the river.

12 Q (By Mr. White) That's what I was curious about.  
13 I wanted to know whether or not you had broken  
14 the river into segments.

15 A. We did.

16 Q What value of transmissivity did you develop for  
17 the Wind River alluvium unit?

18 A. Transmissivity is a product of the permeability  
19 saturated thickness, so for these various compartments  
20 or units -- let me backtrack.

21 Q Okay.

22 A. We broke the river into compartments on our storage  
23 calculations, not the well yield because we got  
24 variable well yields down the river, in other

25 page -- voir dire - white

1 words, but we used those permeability -- we took  
2 our estimated and determined measured saturated  
3 thicknesses, our permeabilities. That product  
4 gave us the transmissivities.

5 Q. You said you had a range of transmissivities, then?

6 A. That's correct, yes.

7 Q. With respect to the Little Wind, what saturated  
8 thickness did you develop?

9 A. We had saturated thicknesses ranging from nine  
10 to 25 feet.

11 Q. What permeability values?

12 A. We used a constant permeability of 1800 gallons  
13 per day per square foot, and I believe that was  
14 based again on a USGS pump test. We had no other  
15 information on permeabilities in there.

16 Q. What was the source of the saturated thickness?  
17 Was it the same source --

18 A. The same way we determined for ourselves in  
19 existing driller's logs and well data.

20 Q. Is it true that you were unable to recall the  
21 number of wells which you used for the specific  
22 identity of those wells?

23 A. That's correct.

24 Q. Thank you. What saturated thickness did you

25 page - voir dire - white



1 develop from Elk Creek?

2 A. Eighteen to 26 feet.

3 THE SPECIAL MASTER: Mr. White, may I  
4 inquire is it your intention to go through the  
5 remaining five categories from Elk Creek  
6 through Popo Agie with exactly the same  
7 questions?

8 MR. WHITE: Yes, sir.

9 THE SPECIAL MASTER: What is the purpose  
10 of those questions if the information is already  
11 in the US Geological Survey and will be identical  
12 to the previous two? What is the purpose?

13 MR. WHITE: I'm sorry, Your Honor. These  
14 are areas where he said he did not rely on  
15 USGS surveys but made his own estimates, and  
16 I believe we are entitled in voir diring the  
17 exhibit to learn the values which he used and the  
18 sources of those values where he did his own work.

19 THE SPECIAL MASTER: Well, I would hope that  
20 you could establish a sufficient belief from the  
21 first of these --

22 Q. (By Mr. White) It's not that I don't believe  
23 you, Oliver. It's just that I would like to know  
24 what value you used for Elk Creek?

25 page - voir dire - white

- 1 A. Again, 1800 gallons per day.
- 2 Q. You don't need to give me the units if you don't
- 3 want to.
- 4 The source is the same as for the Wind
- 5 River and the Little Wind?
- 6 A. Yes, I see both 1800 used. I believe there were
- 7 pump tests by USGS in each one. It would be
- 8 listed in Water Supply Paper 1576-I.
- 9 Q. Would that be in Table 3 of 1576-I?
- 10 A. No, I think it's 2.
- 11 Q. Okay. It's 2 then?
- 12 A. Well, they are not labeled. They are creeks, but --
- 13 Q. I can figure out which creek is which.
- 14 A. Essentially, other than our pump tests, they
- 15 were derived from this information.
- 16 Q. On Sage Creek what value for saturated thickness
- 17 did you use?
- 18 A. Twenty to 30 feet.
- 19 Q. And permeability?
- 20 A. A thousand.
- 21 Q. The same sources?
- 22 A. No, that was based on my professional opinion.
- 23 I did not have a pump test in there.
- 24 Q. Saturated thickness on Owl Creek?
- 25 page - voir dire - white

- 1 A. Twenty.
- 2 Q. Permeability?
- 3 A. A thousand.
- 4 Q. Same sources?
- 5 A. My professional opinion.
- 6 Q. Crow Creek, saturated thickness?
- 7 A. Eleven to 20.
- 8 Q. Permeability?
- 9 A. A thousand.
- 10 Q. The same sources?
- 11 A. Professional opinion, yes.
- 12 Q. Popo Agie, saturated thickness?
- 13 A. Ten.
- 14 Q. Permability?
- 15 A. A thousand.
- 16 Q. Professional opinion or a pump test?
- 17 A. Professional opinion.
- 18 Q. The last question on Table 2, what degree
- 19 of accuracy did you award to the values shown
- 20 on the right-hand column?
- 21 A. I haven't assigned a degree of accuracy.
- 22 Q. Do you have an opinion as to the accuracy of
- 23 those values?
- 24 A. I considered them accurate, but I don't have a
- 25 page - voir dire - white

1

number.

2

Q. Let me ask you is it greater than 50 percent?

3

A. I can't answer you. I don't know.

4

Q. Any additions or deletions you want to make

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with respect to your answers concerning Table 2?

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A. I don't believe so.

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1 Q (By Mr. White) (Continued) Let me renege  
2 on what I said and let me ask you one more  
3 question about table two.

4 The potential yields that you listed  
5 here, isn't it true that they are estimated  
6 to last only for the period that the pump  
7 test upon which they were based?

8 A No.

9 Q So the pump test was for 120 minutes only?  
10 These potential yields are good for more than  
11 120 minutes?

12 A No. On the case of -- they were determined,  
13 permeability based on that general relationship,  
14 that formula. It was not -- and I considered  
15 their factor in there conservative on my pump  
16 test I conducted on the Wind River, which  
17 lasted 24 hours. I determined -- let me back  
18 track. That equation has a K factor in it,  
19 which is -- that you constantly multiply by.  
20 They have 1,500 in there.

21 Q What did you use?

22 A I used their 1,500, but my test on the Wind  
23 River came out at around 2,200, and as a rule  
24 of thumb, I've used -- professionals in my  
25 page-voir dire-white

1 field used around 2,000. It varies, of course,  
2 with each area. So I felt that was conservative,  
3 1,500, it gives you a conservative enough well  
4 yield to offset the result of this short test  
5 time.

6 Q So you used 1,500?

7 A I used the 1,500.

8 Q Can you find table one in Exhibit 31-A, please?

9 A Right.

10 Q Are the sources on the bottom of table one,  
11 sources from which all the information on table  
12 one was derived?

13 A Information on table one is derived from these  
14 sources with the exception of the last column,  
15 development potential. Not all this information  
16 is in each source.

17 Q But the information, all the information on  
18 table one is found in one of those four sources?

19 A With the exception of development potential,  
20 and I must add this, distribution, the distribu-  
21 tion column.

22 Q How did you try to show on table one any  
23 qualification or limitations which were contained  
24 in the reference material, the references sources?

25 page-voir dire-white

1 A Well, you see the wording, prints under well  
2 yield, A, yield water to springs. There are  
3 the limitations. I believe where the source  
4 had a limitation it should have been included  
5 in here.

6 Q Isn't it true that the potential well yield  
7 information came out of 1576-I, Water Supply  
8 Paper 1576-I?

9 A Much of it did.

10 Q Isn't it true that that information is based  
11 on limited local well data and is not  
12 generalized?

13 A Information is based on the U.S. Geological  
14 Survey's conclusions from the information they  
15 had.

16 Q But isn't it true that that information is based  
17 on limited local well data, on data concerning  
18 the quality of well field water and data con-  
19 cerning water in the same or similar lithological  
20 units in nearby areas? It is not generalized  
21 to the formations or stratigraphic --

22 A Speaking of groundwater quality --

23 Q I'm talking about potential well yields as well  
24 as general groundwater quality.

25 page-voir dire-white

1 A It was based on the information they had  
2 available. Whether it was -- how limited it  
3 was, I'm speculating.

4 Q I direct your attention to page I-21, Water  
5 Supply Paper 1576-I, and ask you if you would  
6 read to yourself footnote 3, and determine  
7 whether or not I've correctly read that and  
8 whether or not that footnote applies to the  
9 information contained in the columns on table  
10 one, entitled Potential Well Yields and General  
11 Quality of Groundwater?

12 THE SPECIAL MASTER: Potential Well Yields  
13 and what?

14 MR. WHITE: General Quality of Groundwater.

15 THE SPECIAL MASTER: It would be two  
16 columns?

17 MR. WHITE: Yes, sir.

18 THE WITNESS: I only see that footnote  
19 applied to potential water supply.

20 Q (By Mr. White) Didn't the potential water  
21 supply column in 1576-I contain the information  
22 that's split between potential well yield and  
23 general quality of water on table one?

24 A Okay, yes, I understand.

25 page-voir dire-white



1 Q Have I accurately characterized that footnote?

2 A Yes.

3 Q And that footnote should then apply to the  
4 columns on table one for potential well yields  
5 and general quality of groundwater?

6 A I am checking to see if I made some modifi-  
7 cations.

8 Q Sure, take your time.

9 MR. MEMBRINO: Your Honor, I have a  
10 suggestion at this time. I think the purpose  
11 of the voir dire, although we've used it for  
12 other things, for example, cross-examination  
13 preparation, is simply to determine the  
14 admissibility of the exhibit. Now, Mr. Page --

15 THE SPECIAL MASTER: To determine what?

16 MR. MEMBRINO: The admissibility of the  
17 exhibit. Mr. Page is referring to geological  
18 sources that are relied upon by people in his  
19 profession. The question of their credibility  
20 does not extend to the question of admissibility  
21 of this exhibit. And if we could confine our  
22 discussions to the voir dire, given Mr. Page's  
23 condition, I think we could move this along a  
24 little faster.

25 page-voir dire-white

1 MR. WHITE: Your Honor, I don't know what  
2 to do about Mr. Page's condition, but I am entitled  
3 to know whether or not table one accurately sets  
4 forth the information that is listed in the sources  
5 that's reported on the bottom of this table. And  
6 this is an example of where a footnote that very  
7 much limits the validity of the information in the  
8 table was excluded from the table, and the offer is  
9 for the truth of their contents. And the truth of  
10 the contents ought to indicate it's based on local  
11 data.

12 THE SPECIAL MASTER: I have permitted  
13 questioning thus far for that reason, and that reason  
14 along. I think you're pretty close to the limitations,  
15 but go ahead for the time being. I'll overrule it  
16 for the time being.

17 THE WITNESS: To answer your question, on  
18 the footnote, it applies to this portion taken  
19 from this. There are some references from Owl  
20 Creek, regarding Owl Creek which was from a  
21 different report. So, in other words, it's not  
22 verbatim in all cases.

23 Q (By Mr. White) Do you know what portions of  
24 the table should have the limitations?

25 page-voir dire-white

1 A Let's say Bighorn Dolomite. There's a state-  
2 ment reported it contains little or no water  
3 in the Owl Creek area. I would, without pre-  
4 cisely recalling it, I would believe that came  
5 from Water Supply Paper 1519.

6 Q Page 10?

7 A That's correct. So some of this information  
8 is interspersed into this table.

9 Q Okay. Generally what sort of information is  
10 included in table one that's found in Hydrologic  
11 Investigation Atlas 270. I'll give you sheet 3  
12 if you'd like.

13 THE SPECIAL MASTER: Is the document you  
14 have in your hand, Mr. White, one of those  
15 footnoted on table one?

16 MR. WHITE: It is, Your Honor. It's sheet 3.

17 THE WITNESS: Without reading it in  
18 detail, I did refer to this, did incorporate  
19 some of this. Now, if we want to look at each  
20 specific one, it will take awhile.

21 Q (By Mr. White) I'd just like to know generally  
22 what you pulled out of this?

23 A I looked at the way this was prepared, this was  
24 prepared, this was prepared, the very beginning  
25 page-voir dire-white

1 of the investigation to put all these formations  
2 in perspective. We looked at this source,  
3 the source of these two books which all had  
4 similar type tables. We took each formation  
5 and pulled their information from each source  
6 side by side, looked at it. If one contributed  
7 something new we incorporated it. If it was  
8 a lot of duplication we then -- as I recall,  
9 if there was a lot of duplication we stuck with  
10 this one.

11 Q What happened in the case of conflict between  
12 the information of the various sources?

13 A I can't recall if there was conflict. I would  
14 have, I believe I would have included it. If  
15 you have a specific example.

16 Q I've got to save that for cross.

17 THE SPECIAL MASTER: Mr. White, I'm going  
18 to ask you to kind of hold it down because  
19 you really have exhausted the inquiry on these  
20 exhibits. He can't keep up, he can't survive  
21 the afternoon.

22 MR. WHITE: I might suggest, Your Honor,  
23 that we might want to break early with this  
24 witness because there will be a long

25 page-voir dire-white



1 cross-examination concerning the groundwater  
2 study.

3 THE SPECIAL MASTER: I'm trying to save  
4 his voice for that.

5 MR. WHITE: I know, Your Honor. It's going  
6 to be a long period, we're talking about  
7 tomorrow as well as today.

8 MR. MEMBRINO: We have no -- We make no  
9 exception to the long cross-examination, but  
10 if we could keep the trial going in a discreet  
11 fashion and commit voir dire to voir dire we'll  
12 be better off.

13 THE SPECIAL MASTER: We're trying to.

14 Q (By Mr. White) Mr. Page --

15 THE SPECIAL MASTER: We might even have  
16 a night session tomorrow night because we're  
17 not going to be in session tomorrow afternoon.

18 Q (By Mr. White) Mr. Page, are you sure that you  
19 used Water Supply Paper 1375 as one of your  
20 sources?

21 A What was the title?

22 Q It's the last source of information listed on  
23 the bottom of table one.

24 A I used it in the preparation. It contributed  
25 page-voir dire-white

1 very little. I'm not -- I will not be  
2 positive in the final addition that much of  
3 that is included in here. Then again it was  
4 one of the four sources.

5 Q Are there any changes, additions or deletions  
6 that you'd like to make in any of your  
7 answers concerning table one?

8 A I don't believe so.

9 Q Mr. Page, I was handed two different table  
10 three's and I couldn't tell which one you were  
11 testifying about. I wonder if you could tell  
12 me which one of these two that I have in my  
13 hand we are talking about.

14 A This one, right here.

15 Q That's the one that has --

16 A Under surface water, surface water should be  
17 deleted. Without looking at it specifically,  
18 it should be, surface water should be deleted  
19 from that.

20  
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1 Q (By Mr. White) So the table three that is your  
2 exhibit is the one that has the source David  
3 M. Dornbusch on the bottom?

4 A That's correct.

5 Q In the title of table three, what is the  
6 difference between the term "Groundwater" on one  
7 hand and "Subsurface underflow" on the other hand?

8 A Groundwater in table two refers to the water,  
9 the groundwater -- well, in this case, essentially  
10 the Wind River Formation, those that are not  
11 hydraulic, continuity -- one of the major streams.

12 Q So what we are talking about, then, are those  
13 water sources --

14 THE SPECIAL MASTER: You didn't get a  
15 chance to finish, did you?

16 MR. WHITE: I'm sorry.

17 THE WITNESS: Yes, I did, but it died  
18 there, but as major rivers or streams.

19 MR. WHITE: I'm sorry, I thought you were  
20 pointing towards Exhibit 32, and I was trying  
21 to help you out by saying, does groundwater  
22 mean those formations in blue on Exhibit 32  
23 which are below the surface deposits, is that  
24 what you are talking about?

25 page-voir dire-white

1 A For the most part.

2 Q What are the exceptions then?

3 A The exceptions would be any groundwater and  
4 terrace deposits or glacial deposits. It's  
5 a distinction between the subsurface -- the  
6 subsurface underflow with the flow in the  
7 alluvial channel, the sands and gravels in that  
8 confined channel that are either discharged or  
9 are recharged to the particular river above it.

10 MR. MEMBRINO: If it will assist you -- may  
11 it please the Court, it might assist the witness in  
12 making his explanation if he could use the chalk  
13 board.

14 THE SPECIAL MASTER: That is up to you.  
15 You can also use whispering only if you want to.

16 MR. WHITE: Why don't you --

17 THE SPECIAL MASTER: It might help with  
18 the throat problem.

19 THE WITNESS: Let me check one little thing.

20 (At this time the witness  
21 is drawing on the chalk  
board.)

22 If we had -- we have a river channel here  
23 (indicating); so this is the Wind River Form-  
24 ation, here's ground surface, we have the river  
25 page-voir dire-white



1 flowing in here. This is sands and gravels  
2 of your alluvium along the particular channel.  
3 This might be consolidated rock, Wind River  
4 Formation. Definitely it is permeable. Well,  
5 then you can have your groundwater, but we  
6 are talking about underflow if the groundwater  
7 flowing in this channel in these alluvial  
8 deposits with -- you are looking at some connection  
9 with the river, either a discharge or recharge  
10 situation.

11 THE SPECIAL MASTER: Those would be sub-  
12 surface underflow?

13 THE WITNESS: Or if it wasn't connected,  
14 if it was an intermittent stream, it would still  
15 be underflow, underflow still includes the  
16 water flowing at generally the same direction  
17 as the stream, and semi-gradient.

18 THE SPECIAL MASTER: Mr. White, you will  
19 never have a better definition, given his strain.

20 MR. WHITE: I appreciate it, Your Honor.  
21 I have grown very fond of the witness during  
22 several depositions, and I look forward to the  
23 cross-examination.

24 Q (By Mr. White) So the subsurface underflow, then,  
25 page-voir dire-white

1 would be QA, the areas that are QA on Exhibit 33?

2 A Yes, the QA, and where they didn't differentiate  
3 it might include some QSA. You would have to  
4 look at each specifically.

5 Q Do you know how the values were developed for  
6 the water requirements shown on table 3, or  
7 was that information simply provided to you by  
8 Mr. Dornbusch?

9 A It was.

10 THE SPECIAL MASTER: You mean table 3?

11 MR. WHITE: I meant to say table 3, I'm  
12 sorry.

13 THE WITNESS: It was provided to me by the  
14 Dornbusch people.

15 Q (By Mr. White) What information on table 3  
16 represents a professional opinion on your  
17 part?

18 A None of it in that case. It's just something  
19 used -- the purpose of the table was to show  
20 quantities of water that are taken from either  
21 of these two groundwater sources.

22 Q But of no knowledge with respect to the pre-  
23 paration of the table other than the informations  
24 given to you by Dornbusch?

25 page-voir dire-white

1 A That's correct.

2 Q And there is none of your work in this table?

3 A That's correct.

4 Q How did you rely on this table in developing  
5 any opinion which you testified to?

6 A I relied on this table mainly to indicate the  
7 magnitude of community water use on the  
8 Reservation. We had that slip-over chart --

9 MR. WHITE: I will get it over here.  
10 Just a second. Jim, could you help me?

11 (Brief pause.)

12 THE WITNESS: It's the one underneath, isn't  
13 it?

14 Q (By Mr. White) So you relied on that information  
15 in table 3 to develop the relative size --

16 A No.

17 Q -- of these circles?

18 A No.

19 Q No?

20 A The size of those circles are based on population,  
21 which didn't -- which would be proportional, but  
22 does not tell you the water being produced.

23 This gives you, in the case of 1980, will give  
24 you an indication of the magnitude of groundwater

25 page-voir dire-white

1 use from -- for those communities. Those are  
2 population.

3 Q Well, how did you rely on that magnitude in  
4 forming any of the professional opinions that  
5 you have given?

6 THE SPECIAL MASTER: I wonder if that isn't  
7 argumentative? He said he did.

8 MR. WHITE: I thought he said he didn't,  
9 Your Honor. I'm sorry.

10 THE SPECIAL MASTER: The question was how  
11 did you rely, was it not --

12 MR. WHITE: Yes, sir.

13 THE SPECIAL MASTER: -- on the magnitude  
14 of those problems to form your opinion, and I  
15 feel the question leaves a little to be desired.

16 THE WITNESS: To my knowledge, a pro-  
17 fessional opinion, it was just presented as  
18 the magnitude of groundwater produced for these  
19 various communities.

20 Q (By Mr. White) So it's Dornbusch's figures for  
21 the magnitude and not yours, is that right?

22 A Right.

23 THE SPECIAL MASTER: I thought he answered  
24 it about five minutes ago by saying "Yes."

25 page-voir dire-white



1 Q (By Mr. White) Any additional deletions,  
2 changes to your answers with respect to  
3 table 3 --

4 A No.

5 Q -- that you would like to make?

6 Would you turn, please, to table 4. Is it  
7 correct that your work on table 4 is limited  
8 to the last two columns on the right?

9 A That's correct.

10 Q Is it true that the continuous pumping rates  
11 in the next to the last column simply arith-  
12 metically derive from the peak annual water use?

13 A That's correct.

14 Q Are those pumping rates the amounts -- strike  
15 the question.

16 Could you describe the methodology which  
17 you used to determine the information in the  
18 last column, water sources?

19 A It was the culmination of my general ground-  
20 water investigation of the Reservation. I  
21 relied on the geologic map there, and that  
22 overlay, we showed the location of the water  
23 uses.

24 Q Are you familiar with the Statement of Claims  
25 page-voir dire-white

1 in this action?

2 A Not in detail, but yes, I'm familiar with the  
3 Statement of Claims.

4 Q Would you be able to show me where the values  
5 listed on table 4 appear in the Statement of  
6 Claims?

7 A I believe some of them have been revised.

8 Q Okay. Could we --

9 THE SPECIAL MASTER: Is that the United  
10 States' Statement of Claims --

11 MR. WHITE: Yes.

12 THE SPECIAL MASTER: -- or the Tribes'?

13 MR. WHITE: It's the United States', Your  
14 Honor.

15 MS. SLEATER: Your Honor, I'm afraid I  
16 would like to at this time --

17 THE SPECIAL MASTER: I'm going to sustain  
18 the objection. It has little to do with voir  
19 dire and might be more appropriate on cross.

20 MR. WHITE: Your Honor, I was just trying  
21 to determine the relevancy of the exhibit to  
22 this action which is based on whether it has  
23 something to do with the Statement of Claims.

24 THE SPECIAL MASTER: It has nothing to do  
25 page-voir dire-white

1 with voir dire of the exhibit.

2 MR. WHITE: I was voir diring table 4,  
3 Your Honor.

4 THE SPECIAL MASTER: Table 4, he stated  
5 his water source for the purposes to which  
6 they were listing an activity and water use,  
7 and if there is a distinction between this and  
8 the pleadings, that's for you to bring out,  
9 but I don't think that affects this witness'  
10 exhibit, Mr. White. I don't mean to go too far  
11 on this thing, but --

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1 Q (By Mr. White) Mr. Page, let's turn to Exhibit C-32.

2 A. Okay.

3 Q. You listed five sources of information at the  
4 bottom of that columnar section. Is it true that  
5 that columnar section is based primarily on WSP  
6 1576-I?

7 A. That would be correct, yeah.

8 Q. Does it accurately represent the information  
9 contained in WSP 1576-I?

10 A. I believe so, yes.

11 Q. Have you checked it?

12 A. Yes, I did.

13 Q. Based on --

14 MR. WHITE: I'm sorry, Your Honor. That would  
15 be cross.

16 Q. (By Mr. White) I'm curious about a couple of  
17 items in Exhibit C-32. What is the Gross Venture  
18 Formation? Is that the Gros Ventre?

19 A. I'm not familiar with the name Gros Ventre.

20 Q. Let me give you 1576-I and direct your attention  
21 to page I-20.

22 A. A misspelling.

23 Q. Do you want to change the exhibit, or do you want  
24 to leave it like it is?

25 page - voir dire - white



1 A. I would want to verify the spelling. I'm not  
2 sure this is (indicating) --

3 Q. Is the exhibit correct as it stands, or is that  
4 a misspelling, or is it a different formation from  
5 the Gros Ventre?

6 A. It's the same formation as the Gros Ventre, but  
7 what I'm wondering --

8 MR. MEMBRINO: Your Honor, I think what the  
9 witness is talking about --

10 THE SPECIAL MASTER: The Court knows what  
11 he's talking about, and the Court is losing  
12 its patience that that would be considered --  
13 it has been misspelled a thousand times, and no one  
14 knows whether it's Big Wind or Big Belly, and  
15 it's hardly a thing to be raising.

16 MR. WHITE: These exhibits are being offered  
17 for the proof of their contents.

18 THE SPECIAL MASTER: I surely know what they  
19 are being offered for, Mr. White.

20 Q. (By Mr. White) Was this surface deposit of zero  
21 to 150 taken from 1576-I?

22 A. That specifically was not derived directly from  
23 this. We combined them, which shows alluvium can  
24 be as much as a hundred plus or minus feet.

25 page - voir dire - white

- 1 In this you have alluvium. It is just an  
2 illustrated figure up there.
- 3 Q. So the figures on Exhibit 32 are illustrative  
4 rather than being precisely accurate?
- 5 A. They are in the case of the surface deposits,  
6 and otherwise I believe they would be from this --
- 7 Q. Isn't it true that the Dinwoody Formation, for  
8 example, isn't part of the Chugwater Group?
- 9 A. That appears to be the case.
- 10 Q. And the symbols in the right-hand side are  
11 representative of sort of classical geological  
12 symbols. They are not supposed to represent  
13 the makeup of those formations?
- 14 A. No, not in the sequence they are shown.
- 15 Q. So these are illustrative?
- 16 A. They are just based on the basic description of  
17 rock, type of rock in there.
- 18 Q. Is there any place on the Reservation that you  
19 know of where this precise or these precise  
20 sets of stratigraphic units occur in the order  
21 shown here, or is this a hypothetical column?
- 22 A. They would occur in the order, but some may be  
23 missing, and I cannot say a specific location where  
24 all are present.
- 25 page - voir dire - white

1 Q. So this is a hypothetical column; is that correct?

2 A. That is correct.

3 THE SPECIAL MASTER: Is it not a column based  
4 on geologic age?

5 THE WITNESS: It is in their sequence and  
6 their relative undisturbed relationship is correct  
7 as shown on there.

8 Q. (By Mr. White) Turning your attention to Exhibit C-33,  
9 is this a map which is comprised of Plate 2 from  
10 our supply paper 1576-I?

11 A. That's correct.

12 Q. And are its contents or the representations made  
13 on that map correct and accurate?

14 A. To the best of my knowledge, they are. There  
15 are a few mislabelings on, I believe, where the  
16 color code doesn't match the letter T.

17 Q. Isn't it true that the geologic contacts on that  
18 map are approximate rather than being very accurate?

19 A. In some cases they would be. Other cases they  
20 would be accurate on the larger scale. I mean, they  
21 would be precise.

22 Q. You have got 1576-I up there. Would you please  
23 take a look at Page I 3?

24 A. All right.

25 page - voir dire - white

- 1 Q Doesn't it there say that all geologic contacts  
2 must be considered approximate?  
3 A. Considered approximate, correct.  
4 Q Doesn't it also indicate that this map was  
5 developed from existing maps?  
6 A. That's correct.  
7 Q And isn't it true that the existing maps upon  
8 which Exhibit 33 were based -- or was based or  
9 is based -- do not cover the entire area of  
10 Exhibit 33?  
11 A. It's indicated down there on the right.  
12 Q Sure, there's a big area right up in the northern  
13 part of the Reservation for which there is no  
14 source material for this map; isn't that correct?  
15 A. Yes, that indicates, yes.  
16 Q Do you wish to change, add or delete anything  
17 from your answers with Exhibit 33?  
18 A. (Witness shook head)  
19 Q No?  
20 A. No.  
21 Q Mr. Page, is it true that you used Exhibit 33A and  
22 33B, the overlays, as a basis for reaching the  
23 professional opinions that are included in the  
24 last two columns of Table 4?  
25 page - voir dire - white



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A. Not the overlays, per se; the original maps they were traced from.

\* \* \* \* \*

1 MR. WHITE: Okay. Your Honor, at this  
2 time we would object to the admission of United  
3 States Exhibit WRIR C-31A on the following  
4 grounds. I should put a footnote there and  
5 say these objections are based on the offer  
6 being the truth of the exhibit's content. The  
7 witness was not able, with respect to table 2,  
8 to indicate the location of the yields which  
9 he estimated for terrace deposits and glacial  
10 deposits.

11 The witness was not able to indicate whether  
12 or not the degree of accuracy of potential yields  
13 listed in the second column were greater or  
14 lesser than fifty percent.

15 THE SPECIAL MASTER: I don't recall  
16 him answering that question like that. I  
17 remember him saying they were accurate.

18 THE WITNESS: I considered them  
19 accurate, but I was not going to put a percentage --

20 MR. WHITE: And I believe I asked him,  
21 Your Honor, could he say whether it was greater  
22 or lesser than fifty percent and he said he  
23 couldn't.

24 THE SPECIAL MASTER: So in your opinion  
25 that makes this exhibit untrue?

1 MR. WHITE: No, it's impossible to say  
2 that it's accurate --

3 THE SPECIAL MASTER: He just said  
4 it's accurate.

5 MR. WHITE: How could it be accurate --

6 THE SPECIAL MASTER: In his opinion.

7 MR. WHITE: I understand that was his  
8 opinion, but it's your opinion that counts, and  
9 I suggest or I would ask that you say it's not  
10 accurate for the truth of its contents if the  
11 witness cannot indicate that it is significantly  
12 greater than fifty percent likely to be true.

13 THE SPECIAL MASTER: Mr. White, let  
14 me ask you a question. Do you know anything  
15 in the science of hydrology or geology that  
16 can give you a more accurate figure on testing  
17 the thickness and values of the Wind River  
18 alluvium sands and of the reservation where  
19 we've gotten figures like this?

20 MR. WHITE: Yes.

21 THE SPECIAL MASTER: Without going to  
22 specific wells and specific places and pinpointing  
23 it down right to the acre?

24 MR. WHITE: The answer to your question  
25 is, yes, there is a better way. You've indicated

1 that way and the reason that it's important  
2 for the State to be very exacting in its  
3 objections here is that the stakes are very,  
4 very large. The witness's testified that  
5 there are approximately 365 acre-feet of  
6 water in storage. The claim purports to  
7 extend to the reserve right for groundwater,  
8 and I know as well as I'm standing here that  
9 when proposed findings of fact are submitted to  
10 you, it's going to be said, well, look at all  
11 the groundwater that can be gotten out of these  
12 formations.

13 The burden of proof is on the United States,  
14 and the stakes are incredibly large, and it seems  
15 to me that this Court is entitled to have  
16 information to sustain that burden that's better  
17 than a witness that can say he doesn't know  
18 whether it's greater than or less than fifty percent.

19 MR. MEMBRINO: Your Honor, I think Mr.  
20 White is arguing about the credibility of the  
21 exhibit, not its admissibility. Mr. Page has  
22 prepared this exhibit and is talking about estimated  
23 potential well yields. We're not talking about  
24 anything else at this stage. There is nothing  
25 in this voir dire that indicates that the exhibit



1 doesn't represent precisely what Mr. Page said  
2 it does, and with -- to a very reliable degree.  
3 It's qualified in terms of the range of  
4 potential yield, and I think it's a perfectly  
5 satisfactory exhibit and ought to be admitted.

6 MR. WHITE: Your Honor, if it were  
7 admitted to illustrate Mr. Page's opinion, I  
8 wouldn't have that particular objection, but  
9 it's not.

10 THE SPECIAL MASTER: Go ahead with  
11 your other objection; I know you got more.

12 MR. WHITE: In addition, Your Honor,  
13 the witness was unable to disclose the facts  
14 and many of the facts and data upon which  
15 he developed the saturated thickness and  
16 the permeability upon the values in column two  
17 of table 2 were based.

18 With respect to table 1 in Exhibit C-31A  
19 we would object to its admission for the truth  
20 of its contents as opposed to being illustrative  
21 of Mr. Page's opinion since Mr. Page is unable --  
22 excuse me, since Mr. Page has indicated that  
23 qualifications such as the information being  
24 based on local data or data from areas other than  
25 that covered was not included, those limitations

1 were not included in table 1. He's unable to  
2 indicate with any precision where the information  
3 came from in table 1 except that it was based  
4 primarily on 1576-I, and with some input from  
5 the other areas. And I didn't press into the  
6 specifics of that input simple because of Mr.  
7 Page's voice problem. But I think the fact that  
8 it failed to include the footnote 3 out of 1576-I,  
9 which is a great limitation on the information  
10 contained in table 1, shows that it is not true  
11 and it's not, does not accurately represent  
12 the source as shown there. It may show --  
13 represent Mr. Page's opinion, and if it were  
14 offered to illustrate his opinion, we would  
15 have no objection to it.

16 With respect to table 3, if it's offered  
17 for the truth of its contents, I think that  
18 it's a misoffer because all Mr. Page said was  
19 that he relied on the information in table 3  
20 upon which to base his opinion, and if it were  
21 offered to illustrate the information upon  
22 which he bases his opinion we'd have no objection,  
23 but it's being offered for the truth of its  
24 contents and Mr. Page is simply unable to  
25 verify the truth of its contents since he didn't

1 prepare it.

2 With respect to table 4, we would object  
3 to table 4 in that it goes far beyond the  
4 issues which are relevant to the trial in  
5 this case. The claims in this case are  
6 substantially less than the values shown on  
7 table 4. For example, on the oil development  
8 on table 4 where 6,580 acre-feet were claimed  
9 or shown; the claim was for 2,000.

10 For natural gas, the values are 695 and  
11 4,250 added up to 4,351 acre-feet, and about  
12 one-sixth of that was claimed, 766 acre-feet.

13 With respect to coal, it adds up to 5,300  
14 feet, and the claim was for 3,000 acre-feet less.  
15 We have no problem with uranium. We do, I  
16 would object to the phosphate rock claim, which  
17 the exhibit shows to be 830 acre-feet. The  
18 Statement of Claim was for about half that, 318  
19 acre-feet. And we got no problems with the  
20 amount shown for gypsum. So the basis of my  
21 objection to table 4 is its relevancy and  
22 materiality because it goes beyond issues raised  
23 by the pleadings in this case.

24 With respect to the generalized columnar  
25 section, which is the U. S. Exhibit WRIR C-32,

1 we would object to the admission of the truth  
2 of its content, not to illustrate an opinion,  
3 but to the truth of its contents, in that it  
4 does not accurately portray the information  
5 contained in the references. It contains  
6 generalized classical symbols on the right-hand  
7 side which Mr. Page indicated are just  
8 generally illustrative of what may be in those  
9 stratagraphic units. Mr. Page indicates that  
10 it's a hypothetical, and not an actual columnar,  
11 and while I respect Mr. Page's opinion very much,  
12 he has quite candidly said that there's no place  
13 on the reservation he could point to and say  
14 that that occurs.

15 That is a consolidation or a compilation  
16 of stratagraphic units and a description of those  
17 units from a variety of places. They all exist  
18 on the reservation, but not in any one place,  
19 and as he says, it's hypothetical, and therefore  
20 if it's offered for the truth of its contents,  
21 we object. If it's offered for illustrative  
22 purposes, generally what's happening, we've  
23 got no objection.

24 With respect to the geological map, it also  
25 is offered for the truth of its contents.



1 The publication from which it is derived says  
2 that the geological contacts or contact areas  
3 which are the areas between these various  
4 colors are only approximate, yet it's being  
5 offered for the truth of its contents. It's  
6 got a large area right up in here which has  
7 geologic contacts or geologic formations  
8 shown on it, and yet, as Mr. Page very candidly  
9 says, the map, this map is based on several  
10 other maps. And yet there is no other map  
11 for this white area. I don't know if the  
12 Court can see it from there, but it's this  
13 white area along this part, which includes  
14 generally this area in here (indicating).

15 And since this is an area of high mineral  
16 development, it becomes pretty important to  
17 know whether or not this map is true and we  
18 would object to it being accepted.

19 THE SPECIAL MASTER: Didn't the matter  
20 you're pointing to show the very omission  
21 you're pointing to?

22 MR. WHITE: That's true.

23 THE SPECIAL MASTER: It shows the  
24 omission.

25 MR. WHITE: That's correct, but the

1 contents in this northern central area can't  
2 be true because it shows a great white gap here,  
3 and so long as those contacts are shown as  
4 anything but a blank on this map, it's not an  
5 accurate representation of the sources. In  
6 addition, as I mentioned before, the publication  
7 from which this is derived says that these  
8 locations, the contact points between these  
9 various areas are only approximate. And the  
10 reason I'm concerned about the truth of the  
11 contents of the map is that we'll find Mr.  
12 Page made some analyses of the water and storage  
13 in the Wind River alluvium, and the accuracy  
14 of the location of these contact zones becomes  
15 all important because he calculated the area  
16 of water storage based on this map.

17 MS. SLEATER: Your Honor, I object  
18 to a preview of the testimony --

19 MR. WHITE: He's already testified,  
20 Your Honor.

21 MS. SLEATER: This is supposed to be  
22 limited to a discussion of the exhibits which  
23 should contain only the information on the  
24 exhibit as proper grounds for the objection.

25 MR. WHITE: Your Honor, he already

1 testified about calculating the water and  
2 storage before the exhibits were offered, and  
3 in addition, as you'll notice, there are  
4 mineral resources areas that are located in  
5 that blank area. And so we would object to  
6 Exhibit 33 as being offered for the truth of  
7 its contents because the main map on  
8 Exhibit 33 simply does not accurately represent  
9 the contact points between these geologic  
10 types, and it does not accurately represent  
11 what the source material in the lower right-hand  
12 corner would show.

13 Now, I think, Your Honor, I would have a  
14 technical objection on the ten day rule, but  
15 I'd be hard pressed to convince the Court that  
16 I didn't have plenty of time to look at these,  
17 so I'm going to waive the objection.

18 THE SPECIAL MASTER: The Court's ready  
19 to rule on the voir dire.

20 MR. PARISH: Your Honor, I do have  
21 several questions I would like to ask on voir  
22 dire.

23 THE SPECIAL MASTER: All right, proceed.

24 Would the reporter's want a break or are you  
25 all right?

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MS. RACINE: We would appreciate a  
break, yes.

THE SPECIAL MASTER: All right, we'll  
proceed in ten minutes.

(Thereupon a 10 minute recess  
was taken.)

\* \* \* \* \*



1 THE SPECIAL MASTER: Are we ready, ladies  
2 and gentlemen? Okay, would you proceed, please.

3 MR. WHITE: Your Honor, I just want to  
4 add one more grounds to my objection, and that's  
5 the standard one about reserved rights not applying  
6 to groundwater, and I will sit down.

7 THE SPECIAL MASTER: All right.

8 MR. PARISH: Your Honor, although I sort  
9 of have a feeling how you are going to rule on Mr.  
10 White's motion, I have to ask a few questions on  
11 behalf of the City of Lander, but none of my questions  
12 have to do with that. I will just put it there  
13 for the record.

14 VOIR DIRE EXAMINATION

15 BY MR. PARISH:

16 Q Mr. Page, I'll turn your attention to table 4  
17 of Exhibit C-31-A. Now, I simply have a  
18 question. I don't know exactly what that is  
19 stating as far as the right-hand column labeled  
20 "Water Sources." Is that -- does that column  
21 purport to say that the amount of water that  
22 is claimed to be necessary for the particular  
23 activity in the left-hand column can be gotten  
24 from those formations or that the water from  
25 page-voir dire-parish

- 1 those formations is a useable source for the  
2 activities specified?
- 3 A The answer to your question would be both.  
4 It is a useable source and it can be obtained.
- 5 Q So in other words, to take the first one there,  
6 the Wind River underflow and --
- 7 A That's existing already.
- 8 Q Okay. So are there any water sources listed  
9 there for any particular type of activity  
10 that are not in current use? You will have  
11 to forgive me not being here for the other  
12 days of the trial.
- 13 A Well, you can look on the second column from  
14 the left, the top three are marked "Existing"  
15 in parenthesis.
- 16 Q I see, okay.
- 17 A And then the rest are --
- 18 Q Okay. The rest are prospective only?
- 19 A That's correct.
- 20 Q Have you performed any tests or do you know  
21 of any tests for the ones other than the  
22 existing uses to tell whether that -- those  
23 water sources listed there, the water contained  
24 in those sources, would be useable for that  
25 page-voir-parish

- 1 particular prospective activity?
- 2 A Our conclusions on that column were based on
- 3 the culmination of the groundwater study where
- 4 we had specific information. It was a pro-
- 5 fessional conclusion based upon my overall
- 6 study of the Reservation.
- 7 Q So it was your professional opinion the water
- 8 in those listed sources can be used for those
- 9 activities, is that correct?
- 10 A That's correct.
- 11 Q Was that based upon any actual tests of the
- 12 quality in composition of those waters?
- 13 A In one case. For instance, the pump tests
- 14 there near the -- on the Wind River, we indicate
- 15 for the electric generating plant in the same
- 16 general area. There would be a test in that
- 17 area.
- 18 Q There was --
- 19 A That was an example where we had a test.
- 20 Then we looked at existing data that was avail-
- 21 able in the other areas, and then based pro-
- 22 fessional conclusions.
- 23 Q But in some areas there was no actual test of
- 24 the quality of the waters coming from those
- 25 page-voir dire-parish

1 particular aquifers?

2 A You mean quality, water quality, chemical  
3 quality?

4 Q Well, yeah. What I'm getting at is I would  
5 assume, perhaps, you can only use water with  
6 certain types of chemical compositions for  
7 uranium development or something.

8 A That was not a specific consideration, the water  
9 quality for industrial purposes in the selection.  
10 This is for a physical availability of water.

11 Q So then the right-hand column, except for  
12 the existing uses, perhaps, does not purport  
13 to say that water from those aquifers could  
14 actually be used in those activities?

15 A From a water quality standpoint?

16 Q From a water quality standpoint.

17 A That's correct.

18 Q Okay. What are some of the factors that go  
19 into determining what the yield of a particular  
20 well will be from an underground source? I  
21 don't even know the terminology.

22 MR. MEMBRINO: Your Honor, I think that  
23 line of questioning was examined by Mr. White  
24 in describing how Mr. Page arrived at the figures  
25 page-voir dire-parish



1 in his, I believe, table 2.

2 THE SPECIAL MASTER: I thought he went into  
3 this in detail with the wells on the Wind  
4 River, the wells on the alluvium and down through  
5 the seven or eight classifications.

6 Q (By Mr. Parish) Okay. Let me -- I think what  
7 they are is something having to do with trans-  
8 missivity and permeability and saturatedness  
9 and all that sort of stuff. Can those qualities  
10 change over time in one given formation?

11 A Specifically it could stay in an unconfined  
12 aquifer you could have as water levels drop your  
13 saturated thickness would drop, your trans-  
14 missivity would drop.

15 Q In an unconfined aquifer. In a confined aquifer  
16 would it change?

17 A If you do not dewater or drop your potential  
18 metric surface below the top of the aquifer  
19 itself, it remains saturated.

20 Q But there are at least some potential circum-  
21 stances under which those qualities could  
22 change in almost any given aquifer?

23 A I wouldn't say almost any given. It's a little  
24 too broad.

25 page-voir dire -parish

1 Q Okay. But at least the possibility of change  
 2 is not what you would call a remote thing,  
 3 it can happen?

4 A Change occurs in some situations, yes.

5 Q And those factors can also be affected by  
 6 development of the surrounding land, can it  
 7 not?

8 A Could you be more specific?

9 Q Well, I don't know. I would assume if you  
 10 built a city on it -- on a piece of ground and,  
 11 therefore, kept, let's say, the precipitation  
 12 from seeping into the ground, that that would  
 13 have some affect upon things?

14 A In this particular area it wouldn't because  
 15 your direct recharge from precipitation is  
 16 very small.

17 Q Very negligible, but if you have heavy industrial  
 18 development, would that have an affect upon  
 19 these factors?

20 A You mean just of the existence of the industrial --  
 21 no, I can't say unless you have a specific  
 22 example in mind.

23 Q I think what you are probably trying to say is  
 24 it would probably take quite a bit if it was  
 25 page-voir dire-parish

1 going to affect it?

2 A No, I don't -- you know, I'm not -- I cannot  
3 say quite a bit at all. Right now I can't  
4 picture the situation you are describing on  
5 how it would affect the groundwater, just the  
6 existence of this industry, without being  
7 specific.

8 THE SPECIAL MASTER: Do you want the  
9 record to reflect that if you were to drill  
10 40 wells to serve a coal slurry pipeline, that  
11 in 50 years it might affect the recharge capacity  
12 of the aquifer?

13 MR. PARISH: It has political overtones,  
14 but that's what I'm talking about.

15 THE SPECIAL MASTER: I mean, it's a  
16 geological fact, that's what you're trying to  
17 say?

18 THE WITNESS: That's how I understand it.

19 MR. PARISH: Like I say, I don't know how  
20 to state it. Let me get on to my point here.

21 Q (By Mr. Parish) Okay. Most of your data, at  
22 least for table 1 and for about half of table 2  
23 on Exhibit C-31-A came from some U.S. Geological  
24 Survey information, correct?

25 page-voir dire-parish

1 A That's correct.

2 Q Okay. And just look through at the sources  
3 listed at the bottom of table 1. Most of  
4 those sources there seem to have been generated  
5 either in the '60's or the late '50's, the  
6 papers have dates on them to that effect.

7 A That's correct.

8 Q Okay. Do you know, and I frankly don't, I  
9 haven't read them, were those studies and all  
10 of the information that they came up with  
11 based upon, let's say, a 20-year study of the  
12 region or was it a study for just 1969, say,  
13 for 1576-I?

14 A Well, the information, it's abstract in here  
15 from which they generated what was pulled on  
16 this. It is not essentially a time-orientated  
17 situation. The geology has been there, it will  
18 be there. The distribution of the materials,  
19 the well fields will not change. In the  
20 situation of the Wind River Indian Reservation,  
21 the groundwater supplies then and now are still  
22 in a state of virgin conditions, if you want to  
23 use that term. They have not been drawn upon  
24 heavily, so if you are referring that these  
25 page-voir dire-parish



1 water levels have yields higher than they  
2 are now, the answer would be without specifically  
3 looking at a well, particularly on the alluvium  
4 where you would have this affect, the answer  
5 would be no. You might have a drop in potential  
6 metric services, but from one information, up-  
7 dated information, that doesn't -- in at least  
8 the last several years, does not seem to be a  
9 problem.

10 Q I understand what you are saying, that it's  
11 very -- any change would be slight or negligible,  
12 but you just mentioned -- I thought you did --  
13 there could be a drop in potential metric  
14 services, or whatever, and I thought we had  
15 established that could have an affect.

16 THE SPECIAL MASTER: Let's avoid the  
17 repetition if we can for the sake of the  
18 throat, and I think the answer is yes; I think  
19 you have said that already, is that right?

20 THE WITNESS: I'm just saying that there  
21 could be some type of changes, a few changes  
22 since that date to the present, but I don't  
23 think it reflects what is shown -- would affect  
24 what is shown on table 1 because the alluvium

25 page-voir dire-parish

1 where you could have the affect of the well .  
2 yields, you know, you're dewatering something  
3 on a permanent basis. That has not occurred.  
4 If it gets dewatered in a pumping scene, and  
5 then it is recharged during the runoff season,  
6 the only difference is nowadays there would be  
7 more available data, well data, than they had  
8 then.

9 Q Okay. I won't press my point any further, but  
10 there could be some slight variation between  
11 today and the figures they generated back then,  
12 however slight.

13 A There could be.

14 MR. PARISH: Thank you, Your Honor. I  
15 won't present any additional grounds for  
16 objection, I just join in Mr. White's.

17 THE SPECIAL MASTER: You join in the  
18 motion previously made?

19 MR. PARISH: Yes.

20 THE SPECIAL MASTER: I'm ready to rule  
21 on them.

22 On U.S. WRIR C-31-A, table 1, 2, 3, 4; and  
23 C-32 and C-33 with its overlays -- they are not  
24 numbered separately, are they?

25 page-voir dire-parish

1 MR. MEMBRINO: Yes, they are, Your Honor.

2 MR. WHITE: Yes.

3 MR. MEMBRINO: They are designated C-33-A  
4 and 33-B.

5 THE SPECIAL MASTER: All right. And 33-A  
6 and B. I want to respond as best my notes and  
7 memory will let me to each of the objections,  
8 because I did give them serious consideration.

9 As to these exhibits being totally truthful,  
10 I believe they touch such a subject matter on  
11 which there is no such things as total truth-  
12 fulness known to man. I think the geology is  
13 not that an exact science, it is a relatively  
14 new science. It's thrust on us in the last 150  
15 years, and since Cheswick (phoenetic) himself  
16 and the first authors of geology and Darwin  
17 himself, there has been a vast field of what is  
18 known and unknown and what is the probably and  
19 what is tentative, and from that comes truth  
20 man can recognize and live with. Therefore,  
21 I think that 32 in particular meets the test of  
22 representation for purposes of this lawsuit,  
23 and I recognize that the State may very well  
24 find some unique distinctions other than mis-  
25 spellings that are in 32.

1                   31-A and B, the same token based upon  
 2                   USGS materials and upon the evidence of the  
 3                   witness, and while its figures may vary on the  
 4                   potential yield, I don't know how we are going  
 5                   to get to something much closer unless we want  
 6                   to take the next 40, 30 years to go into well  
 7                   fields with measurements on them, week to week,  
 8                   month to month, year to year, measure the re-  
 9                   charge capacities and go into such detail.

10                   We could challenge them for that reason.

11                   The objection that the claims were lower  
 12                   on soil is a very serious objection, and one  
 13                   that I should like to rule upon except for the  
 14                   fact there are two sets of claims in the case.  
 15                   The United States' claim was lower, but the  
 16                   Indian claim was not, and this conflict between  
 17                   the Indian claim and United States' claim is  
 18                   quite a matter before me because I wonder why  
 19                   there could be such a disparity between the  
 20                   trustee and guardian, and this is one of those  
 21                   cases, but I don't think it is sufficient to  
 22                   say I have to throw out 31-A, but I recognize  
 23                   it.

24                   \* \* \* \* \*

25



1 MR. WHITE: I was under the impression,  
2 Your Honor, this was the United States' and  
3 not the tribes' case in chief.

4 THE SPECIAL MASTER: Well, that's true,  
5 but the pleadings -- your objection is based  
6 upon the difference between the pleadings and --

7 MR. WHITE: That's correct.

8 THE SPECIAL MASTER: And the pleadings  
9 include the tribes --

10 MR. WHITE: Not for this case, Your Honor.

11 THE SPECIAL MASTER: They certainly do.  
12 Am I supposed to ignore the mountains of pleadings  
13 I have in my office that all of you have filed?

14 MR. WHITE: I won't argue with you.

15 THE SPECIAL MASTER: I know you would like for  
16 me to ignore it, but I can't. It's a claim of  
17 tribes in this case, so that being the case,  
18 I think that these exhibits will be -- these  
19 exhibits are ordered admitted. How much ultimate  
20 reliance I place upon them compared to other  
21 exhibits depends on my own weighing of these  
22 exhibits and my determination of the facts and  
23 evidence before me, so they are in evidence.

24 THE SPECIAL MASTER: Mr. Membrino?

25 MR. WHITE: Could I just get a clarification

1 They are in evidence for the truth of their  
2 contents or for illustrative purposes?

3 THE SPECIAL MASTER: Some are for illustrative  
4 purposes, but most are for the truth of their  
5 contents, and I recognize that some have no capacity  
6 for factual truth, you know.

7 I would like to comment on the geologic  
8 differences between the boundaries of those areas.  
9 There's no way of accepting something much more  
10 careful than this as far as the geologic description  
11 of that area in my opinion.

12 MR. MEMBRINO: I just have a couple more  
13 questions on direct.

14 Q. (By Mr. Membrino) Mr. Page, I refer you to  
15 Table 4. Earlier there was some discussion about  
16 the use of water for reinjection purposes, and  
17 I would like you to tell the Court how that water  
18 is retrieved and how it's used. I'm speaking  
19 specifically on Table 4 of the enhanced recovery,  
20 the existing enhanced recovery.

21 A. Well, the source of --

22 THE SPECIAL MASTER: Maybe I can save the  
23 throat a little bit more.

24 I believe your testimony was that most --

25 page - direct - membrino

1 some of this water in large amounts is recycled  
2 and used over?

3 THE WITNESS: It is all recycled.

4 THE SPECIAL MASTER: And in the process  
5 of bringing the oil up, some water is brought up  
6 and it's recycled, and the net loss -- the testimony  
7 left me in the air on this question as to how can  
8 there be annual use of 6,000 feet without there  
9 being a discharge somewhere, and that has not been --  
10 or regeneration into some structure where oil has  
11 been taken from, and that has not been answered to  
12 my satisfaction.

13 MR. MEMBRINO: That's precisely the question  
14 he wants to answer.

15 THE WITNESS: It is my understanding now in  
16 the case of particularly Steamboat Butte all the  
17 water that is pumped is utilized. There is no  
18 discharge. It would be --

19 THE SPECIAL MASTER: Reinjecting?

20 THE WITNESS: Reinjecting. In the case of  
21 Winkleman Dome, some of their produced water is  
22 released -- is discharged to the ground, and it's  
23 my further understanding that some of that water  
24 is used for irrigation of 112 acres.

25 THE SPECIAL MASTER: It's obviously picked up

1 by downstream users?

2 THE WITNESS: Yes, apparently it's discharged.

3 Q (By Mr. Membrino) I would like to get clear your  
4 professional opinion on three issues. The first  
5 one is would you give us your opinion about groundwater,  
6 potential groundwater maintenance on the Reservation?

7 A. I mentioned before the groundwater on the Reservation  
8 has hardly been developed. It is essentially in its  
9 virgin condition and, as a result, it's my  
10 professional opinion that we cannot determine an  
11 accurate pereniel yield or safe yield to any  
12 specific.

13 Now, with regards to its future depletions,  
14 its future things, the only way we can do this  
15 is to monitor the groundwater supplies, and a  
16 monitoring program can be set up such that when  
17 development occurs an indication can be determined  
18 that you are starting to get some of these adverse  
19 effects and then you can make a groundwater management  
20 decision at that time regarding the status of the  
21 groundwater sources.

22 Q To a layman, if you were describing groundwater  
23 conditions as being in virgin condition, would you  
24 describe that as a good condition or a bad condition?

25 page - direct - memebrino



1 A. A what?

2 Q. A good condition --

3 A. Did you preface that as a layman?

4 Q. -- as a virgin supply or a virgin condition?

5 In explaining that to a layman, would you tell  
6 him that that is a good supply, that is a plentiful  
7 supply of water?

8 A. Well, it's plentiful where you are at, yes. I  
9 mean, you could have virgin conditions in the  
10 Mohave Desert and it's pretty hard to convince  
11 somebody --

12 THE SPECIAL MASTER: That's true.

13 MR. MEMBRINO: You have me there.

14 THE WITNESS: I didn't mean to get you.

15 MR. MEMBRINO: I'm touched. Let me proceed.

16 A. (By the Witness) No, in the case of the  
17 Reservation, you would have virgin conditions,  
18 yes, that would be -- it would be nice. I mean,  
19 it would be -- you'd have abundant water particularly  
20 in your --

21 THE SPECIAL MASTER: May I ask a question?  
22 Would you indeed with such virgin conditions of  
23 great aquifer and groundwater be so good that you would  
24 have no need to ever tap surface water for

25 page - direct - membrino

1 construction of power plants? Isn't that a fact?

2 THE WITNESS: Well, it depends -- there are  
3 other aspects.

4 THE SPECIAL MASTER: We've got one there,  
5 haven't we?

6 MR. MEMBRINO: There is an important  
7 issue here, Your Honor.

8 THE WITNESS: There are economic aspects  
9 that would probably be the bottom line.

10 THE SPECIAL MASTER: Of course. Considerations  
11 for all other human beings all enter into this.

12 Q. (By Mr. Membrino) Once again, my second point is  
13 I want to get clear for the record your professional  
14 opinion about the water in storage in the alluvium  
15 on the Wind River Reservation.

16 A. Yes.

17 Q. Would you tell the Court what your professional  
18 opinion is as to that amount of water in storage?

19 A. The quantities in storage?

20 Q. Yes.

21 A. The total -- the number is about 360,000 acre-feet  
22 are in storage under full or essentially present  
23 conditions.

24 Q. Thank you.

25 page - direct - membrino

1 A. Do you want a more specific breakdown?

2 Q. No, that is fine. Finally, turning your  
3 attention to the Exhibit WRIR C-33 and its  
4 overlay, 33B --

5 A. What overlay is that?

6 Q. That is the mineral and resource development.

7 A. Okay.

8 Q. Is it your professional opinion that there is  
9 sufficient water available, groundwater available,  
10 for the development of the resources described  
11 and the requirements for development of those  
12 resources described in that Exhibit?

13 A. Yes.

14 MR. MEMBRINO: Thank you.

15 THE SPECIAL MASTER: Let me ask two or three  
16 questions, and I hope you can answer them in just  
17 a few words.

18 Please define for me the distinction between  
19 permeability and transmissivity. Is one horizontal  
20 and one vertical?

21 THE WITNESS: No, permeability is -- I'll try  
22 to -- is for a unit, a square foot, let's say, and  
23 transmissivity is the sum of those.

24 Say you have an aquifer that is 20 feet thick.

25 page - direct - membrino

1 Permeability is the characteristic of the aquifer  
2 property, not all aquifer, of the sands and gravel,  
3 the open spaces, and so it is the number of a foot  
4 of it, a square foot. It's a quantity of water  
5 that can be transmitted through a cross-section.

6 THE SPECIAL MASTER: And does that depend  
7 upon the porosity of the material in that square  
8 foot?

9 THE WITNESS: There is a relationship,  
10 but it is not fully dependent on porosity.

11 THE SPECIAL MASTER: Okay. Now, then,  
12 transmissivity.

13 THE WITNESS: Okay. Transmissivity is just  
14 the sum. You have defined sort of the flow  
15 characteristic of the aquifer. Now you have --  
16 if you have 20 feet of aquifer, you have 20 of  
17 those little squares. You have 30 feet, so that  
18 product is your transmissivity.

19 THE SPECIAL MASTER: All right.

20 Q. (By Mr. Membrino) With your indulgence, Mr. Page,  
21 I want to make one thing clear. You gave your  
22 opinion that there were 360,000 acre-feet of  
23 storage of water stored in the Wind River alluvium.

24 A. No, that's the total alluvium, of the ones we  
25 page - direct - membrino



1 evaluated.

2 Q. Now, would you tell the Court what the principal  
3 source of that water in the alluvium is?

4 A. Well, the principal source are the surface  
5 streams that traverse that alluvium.

6 Q. What will happen if substantial amounts of that  
7 water in storage in the alluvium is withdrawn?  
8 What effect does that have on the surface?

9 A. That's a function of the time of pumping and  
10 the amount of pumping, but with a significant  
11 withdrawal, you will be getting -- inducing  
12 more surface water or diminishing the surface  
13 water supply in that particular area of pumping.

14 MR. MEMBRINO: Thank you. Your Honor, I  
15 think that's all the questions I have at this  
16 time.

17 THE SPECIAL MASTER: Very well.

18 MR. ROGERS: Your Honor, I have a couple  
19 of sets of questions.

20 CROSS-EXAMINATION

21 BY MR. ROGERS:

22 Q. The colloquy you just engaged in about the use  
23 or the interrelationship between the surface  
24 water and the alluvium, do you understand the

25 page - cross - rogers

1 claim of the United States for use of surface  
 2 water to include pumping from the alluvium?

3 MR. WHITE: Objection Your Honor. It calls  
 4 for a legal conclusion.

5 MR. ROGERS: I just asked him if he  
 6 understood the claim of the United States to  
 7 include the use of surface water --

8 THE SPECIAL MASTER: He can answer yes or  
 9 no, but that's about all right now.

10 THE WITNESS: Are you asking me then is  
 11 the claim for both under surface flow and --

12 THE SPECIAL MASTER: Repeat the question  
 13 again, would you, please?

14 (Thereupon the last  
 15 question was read as  
 16 follows: "Q. The colloquy  
 17 (you just engaged in about  
 18 the use or the inter-  
 19 relationship between the  
 20 (surface water and the alluvium,  
 21 (do you understand the claim  
 22 (of the United States for use  
 23 (of surface water to include  
 24 (pumping from the alluvium?)

25 \* \* \* \* \*

1 THE SPECIAL MASTER: Do you understand  
2 it?

3 I'm going to let you answer. I think  
4 it's not a legal conclusion, and his expertise.  
5 Go ahead.

6 THE WITNESS: They are definitely  
7 connected and by pumping from the alluvium,  
8 it would be taking surface water. From a legal  
9 standpoint, I'm not going to comment on the  
10 legal basis.

11 Q (By Mr. Rogers) My question was not seeking any  
12 sort of legal conclusion, I was trying to obtain  
13 your understanding of the facts of the claim of  
14 the United States as to whether or not you knew  
15 whether any of the uses they claim from surface  
16 sources whether they intended those to be in  
17 any way pumped from the alluvium.

18 A No, they did not.

19 Q Thank you.

20 MR. WHITE: I'd move the question be  
21 stricken or the answer be stricken, and I  
22 object to the question because when I tried  
23 to get the witness on voir dire to examine the  
24 Statement of Claims I was not allowed to do so,

25 page-cross-rogers

1 and as part of the cross examination the witness  
2 is asked to interpret the Statement of Claim,  
3 and if Mr. Rogers' question and answer hold  
4 up, then I'd ask that I be given the same  
5 indulgence in my cross examination.

6 MR. ROGERS: Your Honor.

7 THE SPECIAL MASTER: Just a minute.

8 If the question just asked -- and I was too  
9 busy writing to hear it -- dealt with the  
10 Statement of Claims and something in it, it  
11 is hereby stricken. The answer that I heard  
12 and will permit on the record was as follows:  
13 "By pumping from the alluvium you would be taking  
14 surface water." That will stay in the record.

15 MR. WHITE: I got no objection to that,  
16 and withdraw my motion to that.

17 MR. ROGERS: Your Honor, maybe I  
18 should clarify the reason why I'm standing up  
19 here. I understood I was up here in cross  
20 examination not here voir diring the exhibits.  
21 I understood that I was in cross examination  
22 and therefore I should be able to inquire into  
23 Statement of Claim.

24 MR. WHITE: Well, Your Honor --

25 page-cross-rogers



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MR. ROGERS: Mr. White earlier was in  
voir dire and he will have his opportunity for  
cross examination.

MR. WHITE: Your Honor --

THE SPECIAL MASTER: I thought you  
were bringing some information from your witness  
on direct not on cross, Mr. Rogers, but you  
have not yet examined him or interrogated him.  
Now, if you wish to say you're cross examining  
your own witness, I --

MR. ROGERS: Well, Your Honor, this is  
not my witness. I am standing here representing  
the Tribes.

THE SPECIAL MASTER: The line gets  
pretty fine between who is and who isn't with  
the United States and with the Tribes.

MR. WHITE: That's right, Your Honor.

THE SPECIAL MASTER: But I ruled on  
this, let's move ahead.

MR. ROGERS: I would like to clarify  
what I am permitted to do then because I  
understood from the previous rulings of the  
Court when the Tribes have -- what I have done  
is cross examine the two previous witnesses

page-cross-rogers

1 and that Your Honor was considering it a form  
2 of cross examination.

3 THE SPECIAL MASTER: Continue with  
4 your examination, cross or otherwise.

5 MR. ROGERS: Well, I'm happy with what  
6 I've gotten. I got what I wanted out of the  
7 question, and do I understand that you did not  
8 strike it?

9 THE SPECIAL MASTER: I struck one  
10 question I didn't even hear, and if you want  
11 to repeat it -- I'm just as human as the rest  
12 of them.

13 MR. WHITE: Maybe I could help clear  
14 something up. If counsel for the United States  
15 will stipulate that I can inquire into the  
16 Statement of Claim, I'll withdraw my motion  
17 to strike, and his answer will stand as was  
18 given rather than repeated by the Master.

19 MR. MEMBRINO: I don't believe Mr.  
20 Page should be questioned about the legal aspects  
21 of the United States' claim. He was hired to do  
22 technical research and that's what the examination  
23 ought to be confined to.

24 THE SPECIAL MASTER: I don't think he

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1 should be questioned on the legal contents of  
2 it either, but I think the material, the  
3 mathematical figures on it, what we have  
4 gained, would be -- can come in.

5 MR. ROGERS: I think there are two  
6 of us talking in two different directions.  
7 I think Mr. White and I are beginning to be on  
8 the same wave length. And it's my understanding  
9 that he will be entitled on his cross examination  
10 to inquire of Mr. Page about the Statement of  
11 Claim.

12 THE SPECIAL MASTER: Yes, and you have  
13 no objection to do that and nor do I.

14 MR. ROGERS: I have no objection to  
15 that.

16 MR. WHITE: I just want to make sure  
17 that's the case and the United States joins in  
18 with that agreement and I will withdraw my motion  
19 to strike.

20 THE SPECIAL MASTER: Very good. Then  
21 it stays in the record. Proceed.

22 CROSS-EXAMINATION CONTINUED

23 BY MR. ROGERS:

24 Q Let me restate the question, Mr. Page. Are you  
25 page-cross-rogers

1 aware of the United States' Statement of Claim  
2 with respect to diversions of surface water for  
3 various purposes?

4 A Yes.

5 Q Is it your factual understanding of those  
6 surface water claims that they would be purely  
7 surface diversions or will some of those involve  
8 pumping from the alluvium?

9 A To my knowledge they're purely surface water  
10 diversions.

11 Q Thank you. Earlier in the direct examination I  
12 believe the Master made inquiry about the effects  
13 beyond the reservation boundaries of withdrawals  
14 from groundwater within the reservation. How  
15 many of the aquifers that are displaced on  
16 Exhibit C-33 extend beyond the reservation  
17 boundaries?

18 A Speaking of the aquifers in blue, there are --

19 THE SPECIAL MASTER: I have to ask  
20 that the question be clarified because C-33  
21 is not an exhibit of aquifers, it's an exhibit  
22 of formations. Now, Mr. Rogers, if you substitute  
23 the word formations for aquifers --

24 MR. ROGERS: Formations is the word I

25 page-cross-rogers



1 meant to use.

2 THE SPECIAL MASTER: All right.

3 MR. WHITE: Your Honor, the witness  
4 was looking at Exhibit 32, I think when he's  
5 answering. You mean 32 or 33?

6 THE SPECIAL MASTER: I meant 32 and  
7 so did Mr. --

8 MR. ROGERS: I meant 32 as well, Your  
9 Honor.

10 THE WITNESS: I'm looking at 32.

11 THE SPECIAL MASTER: I'll make the  
12 numbers bigger, I've been wanting this done for  
13 two days.

14 (Off-the-record discussion.)

15 THE WITNESS: Essentially all of the  
16 deeper formations, all the formations with  
17 the exception of some of the local surface  
18 deposits extend off the reservation.

19 Now, I believe that would apply to the  
20 Wiggins Formation, Tepee Trail and Unnamed Tuff,  
21 and Aycross Formation. They have small out-  
22 croppings. Some of the are up in that northeast  
23 corner.

24 I would believe they would go off the  
25 page-cross-rogers

1 reservation, but the major, from there down are  
2 off the reservation including the Wind River  
3 Formation and the exception would be the surface  
4 deposits and I think the Popo Agie, some of  
5 those surface deposits would be off the reservation.

6 Q (By Mr. Rogers) As I understand your answer,  
7 then the deeper formations would extend even  
8 further away than just a short distance off the  
9 reservation?

10 A Oh, very definitely.

11 Q Do -- Can you tell us whether those formations  
12 that go great distances beyond the reservation  
13 boundaries, do they extend in a westerly direction  
14 beyond the Continental Divide, or is there a  
15 single easy answer for all of the formations?

16 A I am familiar with them extending eastward and  
17 northward; westward, I can't answer that question.  
18 A lot of them you can see where starting on the  
19 west part of the reservation. There you get in  
20 the granitic rocks, they're just being trimmed  
21 off, but I can't say for sure their extent, but  
22 I do know they go to the north of the Big Horn  
23 Basin to the west and -- I guess I mean to the  
24 east and northeast, Powder River Basin and beyond

25 page-cross-rogers

1 in some cases.

2 Q Based upon what you know as a professional or  
3 what you have studied for this case, do you  
4 have any sort of opinion as to the general  
5 effect of the withdrawal from those extensive  
6 deeper formations to points very distant from  
7 the reservation in the north and easterly direction?

8 A Well, it's my opinion you won't have an affect  
9 at very great distances from the withdrawals in  
10 this area.

11 Q In other words, if there were a level of development  
12 that might occur, as contemplated in the United  
13 States' Statement of Claims for the Tribes, are  
14 you stating that in, at some hundreds of miles  
15 distance from the reservation, as the Master  
16 inquired, that that would not have a significant  
17 affect on the formations that far away?

18 A I've not studied the regional geology in that  
19 way, but it would be hard for me to believe it  
20 would have an affect hundreds of miles away.  
21 The level of development, that is really relatively  
22 small from these aquifers because of their depth,  
23 deep occurrence throughout most of the reservation,  
24 that development probably remains restricted.

25 page-cross-rogers

1 Q Is it -- Do you know whether or not there is  
 2 a great degree of recharge of those same  
 3 formations contributed from the general area  
 4 of the reservation that would perhaps restore  
 5 or recharge?

6 A Undoubtedly they're getting some recharge where  
 7 they outcrop on the flank of the Wind River  
 8 Mountains and in the Owl Creek Mountains, streams  
 9 pass over the outcrop areas. That's just one  
 10 of the recharge areas that you look at, and,  
 11 of course, where they extend a hundred miles away  
 12 they have many rechargers at other places.

\* \* \* \* \*

25

page-cross-rogers



1 Q (By Mr. Rogers) Would significant withdrawals  
2 of groundwater for large scale purposes, say,  
3 in the Powder River Basin of the state, are  
4 even more eastward or northward, have an effect  
5 on the levels of groundwater in those formations  
6 on the Reservation?

7 MR. WHITE: Objection, Your Honor. No  
8 foundation.

9 THE SPECIAL MASTER: Objection overruled.

10 THE WITNESS: I don't believe that's the  
11 case. That would be a situation that would  
12 occur.

13 Q (By Mr. Rogers) So that there would not be --  
14 the effect of withdrawal eastward and northward  
15 would not have an effect, a great significance,  
16 if any, on the Reservation, is that it?

17 A Yes, that's my belief.

18 MR. ROGERS: Thank you. I don't have any  
19 further questions.

20 THE SPECIAL MASTER: Off-the-record.

21 (Off-the-record discussion.)

22 MR. WHITE: Your Honor, what is the  
23 pleasure of the group? I have probably five  
24 or six hours of cross-examination.

25 page-cross-rogers

1 THE SEPCIAL MASTER: Why don't we go another  
2 hour tonight, if you can stand it, and that cuts  
3 off an hour from tomorrow and we will get done  
4 tomorrow morning, unless you can think you can get  
5 it done tomorrow from nine o'clock to twelve, that's  
6 three hours. But we are going to break up at twelve  
7 o'clock tomorrow. I have to go to a funeral.

8 MR. WHITE: I understand.

9 THE SPECIAL MASTER: I guess we can come  
10 back later in the afternoon, but I already told some-  
11 body we would not meet Friday afternoon.

12 MR. WHITE: My point was, I probably will  
13 not finish cross-examination before we break on  
14 Friday, and if we want to break now and save the  
15 witness' voice, we should, if we are going to get  
16 three quality hours in tomorrow. I don't care.

17 THE SPECIAL MASTER: I am willing to go  
18 an hour more if everybody else is.

19 MR. MEMBRINO: Mr. Page, is that all right  
20 with you?

21 THE WITNESS: That's okay.

22 THE SPECIAL MASTER: As long as you are not  
23 in pain.

24 THE WITNESS: No.

25 MR. ROGERS: Your Honor, may I also suggest

1 that in order for the continuity of the trial, would  
2 it be -- would all be amenable to possibly going  
3 another hour now and beginning at eight o'clock in  
4 the morning so as to have four hours in the morning  
5 under our belts?

6 THE SPECIAL MASTER: That's agreeable with  
7 me. Does everybody want to be here at eight o'clock  
8 in the morning?

9 MR. WHITE: That's fine with me.

10 THE SPECIAL MASTER: All right, fine.  
11 We will go now until five o'clock or 5:30 and we  
12 will convene at eight o'clock in the morning.

13 Mr. White?

14 MR. WHITE: Can I have just a minute? I  
15 have some notes misplaced.

16 THE SPECIAL MASTER: Do you want to take  
17 a minute or two?

18 MR. WHITE: Could we, please, Your Honor?

19 THE SPECIAL MASTER: All right. We are  
20 off-the-record for a couple minutes.

21 (Whereupon, a short recess  
22 was taken.)

23 MR. WHITE: Your Honor, I'm reminded I  
24 stepped in out of order. Private counsel has first  
25 crack on cross after the Tribes, and I apologize to

1 the Court and private counsel.

2 THE SPECIAL MASTER: Either way is fine.

3 Private counsel may begin on cross.

4 MR. PARISH: Thank you.

5 THE SPECIAL MASTER: You bet. We are in  
6 session.

7 CROSS-EXAMINATION

8 BY MR. PARISH:

9 Q Mr. Page, first of all, as to your opinion  
10 that there are approximately 360,000 acre-feet  
11 of storage in the alluviums that you studied  
12 at least on the Reservation, I guess I didn't  
13 quite understand how that was computed. How  
14 did you total all that up?

15 A Just a moment, please.

16 (Brief pause.)

17 What we did, we took all the available cross  
18 sections, some of which are published --  
19 all published at various sources, USGS had  
20 them for their studies, various studies for  
21 dam sites had them, we took those cross sections,  
22 we -- and although the existing well infor-  
23 mation we had, and from that --

24 THE SPECIAL MASTER: Please stop. Please

25 page-cross-parish



1 read to me what he said so far.

2 (Whereupon, the Reporter read  
3 back, "A Just a moment, please.  
4 What we did, we took all the  
5 available cross sections, some  
6 of which are published -- all  
7 published at various sources,  
8 USGS had them for their studies,  
9 various studies for dam sites  
10 had them, we took those cross  
11 sections, we -- and although  
12 the existing well information  
13 we had, and from that --.")

14 THE SPECIAL MASTER: Will you proceed,  
15 please, and from that --

16 THE WITNESS: From that we determined the  
17 saturated thickness of the various alluvial  
18 bodies under essential full conditions -- okay,  
19 so we have the saturated thickness. From the  
20 cross sections we also used the cross sections  
21 to -- I will backtrack. You look at your out-  
22 cropping area where the alluvial outcrops.  
23 That's a surface expression. Besides that  
24 channel are not vertical, so they're sloping  
25 to various degrees. In the wider parts of the  
channel by Riverton it's pretty vertical. You  
get further upstream and it becomes more v-  
shaped, so we had to account for that because it's  
not like taking a whole slice, we had to reduce

25 page-cross-parish

1 our area. You can apply the reduction factor  
2 to the area or volume, reduce what we call  
3 sort of the average saturated area. We did  
4 that from the cross-sections where we had them.  
5 That resulted, as I recall, in reductions  
6 anywhere from maybe 75 to 95 percent. Then  
7 we analyzed the drillers logs that describe  
8 what was penetrated below the water level by  
9 the wells, and utilizing another U.S. Geological  
10 Survey publication, and I cannot right offhand  
11 give you the number, but they have specific  
12 yield, and that is the quantity of water that  
13 can be yielded from the formation to the well.  
14 It's less than the porosity. You can have some  
15 porosity, but the water cannot escape or drain  
16 from gravity from that, so the specific yield  
17 is a lower number, anywhere from three percent  
18 for clay, I believe, and it can get up above  
19 30 percent or above, in the 20's, for some clean  
20 gravels or sands.

21 So from that we looked at those logs and  
22 determined average or composite specific yield  
23 for any of the creeks we had there. The USGS  
24 in Water Supply Paper 1576-I discussed -- I'm

25 page-cross-parish

1 not sure what they might have used, but they.  
2 are talking about ten percent and applying  
3 it overall in their water supply paper, and  
4 Owl Creek they were saying if it was 20 percent  
5 you would have this much. Our values ranged  
6 from 13, I believe, to 18 percent.

7 Because the distribution of the well infor-  
8 mation we had was not uniform, I made the  
9 decision to use 15 percent. In other words,

10 I used the log information to kind of confirm  
11 and overall -- I applied an overall value as  
12 did the USGS --

13 Q And you picked sort of the middle of what  
14 changes they --

15 A We found what they said, what I have used in  
16 other work and from that you take the saturated --  
17 well, from the saturated thickness in your  
18 area you get a volume, and from that volume you  
19 apply that percentage, the 15 percent. I mean,  
20 that is the total quantity in storage.

21 Q It would just seem logical to me, I'm probably  
22 wrong, that somewhere along the way I would  
23 have to know the total volumes of the alluvium,  
24 would you not?

25 page-cross-parish

1 A The saturated alluviums. That's what we did:  
2 We essentially had the area and we had the  
3 average saturated thickness adjusting the thick-  
4 ness. That product is your volume -- right,  
5 area times the volume, that's it.

6 Q Okay. Now, in getting that saturated thickness,  
7 you mentioned at some points the size of some  
8 streams are more vertical than others, and that  
9 makes a difference on the volume.

10 A Correct.

11 Q Because you don't get a full slice. Did you  
12 actually go out and measure the angles on a  
13 lot of these streams?

14 A No, we used the existing cross-sections that  
15 were available to us. I believe all of them  
16 were published in various sources.

17 Q Like USGS --

18 A Well, I know -- it's an approximation in 1576-I,  
19 yes, several on the rivers. We picked some up --  
20 dam sites, when they drill for dam sites they  
21 define the channel. We had that information.

22 Q Okay. Now, again, it would seem to me only  
23 logical that the size are certainly something  
24 the angles of them are certainly something that

25 page-cross-parish



1 could change with time; you have a flood  
2 go down there and it is going to carve out a  
3 bigger channel at a different angle, right, so  
4 the angles in the '69 USGS thing are not  
5 accurate, it would seem.

6 A What we did, the saturated portion is essentially  
7 below the scouring line. I mean, we are looking  
8 at subsurface, it doesn't mean the river  
9 couldn't scour into that. All right, we had  
10 that contact there. What we did, I had my  
11 people get the USGS topographic maps, seven and  
12 a half quadrangles, I believe, and I said we  
13 want to look at the configuration based on the  
14 topography. Usually you see the bank and it  
15 drops down, and we used that to guide us in  
16 the validity of those banks, and sure, I don't  
17 know the dates on those topographic maps, they  
18 probably varied, but --

19 Q I was just going to ask you that.

20 A But that's one factor. That's why we say we  
21 estimated the groundwater in storage.

22 Q That's fine. I understand this, as the Master  
23 has said, it's not an exact science, but I'm  
24 just trying to find out from where you got your

25 page-cross-parish

1 information. Fine. Thank you.

2 I would like to move now to the terrace  
3 deposits, if I could. If my notes are correct,  
4 I got the idea that the way you estimated those  
5 was that there is sort of a standard storage  
6 in terrace deposits for a set volume of sat-  
7 urated feet, is that correct?

8 A No, no. We applied the same -- we did sort of  
9 the same situation, but we had fewer wells than  
10 those. So I can't tell you whether we had  
11 three water level measurements, ten water level  
12 measurements, I cannot tell you that, but I did  
13 not feel we could say full saturated thickness  
14 under full terraces. We looked at some terraces  
15 with the general information, I forget the  
16 specific values, but maybe the USGS 1576-I  
17 terraces range in thicknesses -- well, it might  
18 be on this (indicating) no, apparently they  
19 didn't.

20 But I picked -- okay, where drained, so  
21 maybe with the drained you might still have five  
22 saturated feet. Full, you might have 20.

23 Essentially the terraces were not important  
24 after I got to know them, so to speak. Anything

25 page-cross-parish

1 that's just dependent on man's recharge of it,  
 2 irrigation, it had to depend on development  
 3 above it, it did not -- I didn't consider a  
 4 major -- or a significant source of groundwater,  
 5 and I just essentially said, fine, we have looked  
 6 at them, that's it.

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- 1 Q (By Mr. Parish) You have mentioned that those  
2 terrace deposits get recharged, I think, from  
3 return flow and precipitation?
- 4 A Precipitation would be pretty small, the quantity  
5 of it.
- 6 Q Return flow from other activities then?
- 7 A That's right. That's why you would have irriga-  
8 tion above it.
- 9 Q Did you ever do any actual -- I don't know -- tests  
10 to determine what that return flow was in those  
11 areas?
- 12 A No, I didn't.
- 13 Q So how did you sort of estimate what it might  
14 be?
- 15 A I didn't. I just assumed that it would -- that  
16 with the return you would get twenty feet  
17 of saturated thickness.
- 18 Q What is that assumption based on?
- 19 A The assumption is based on some information  
20 I had on the thickness of the terrace deposits,  
21 looking at topo maps. I do not recall, but  
22 I believe we would have had a least a few  
23 logs for showing the thickness of the terrace  
24 deposits.

25 page-cross-parish



1 In other words, you could say maybe  
2 twenty feet would be the maximum capacity, and  
3 then draining -- it could drain down to one  
4 foot, you see. Your edges of the terrace  
5 deposit, depending on the direction of drainage,  
6 would probably be drained down to almost nothing.

7 You would anticipate your drainage occurring  
8 where these terraces are staying in contact with  
9 something like the Wind River Formation, some  
10 barrier type situation, a less pervious material,  
11 but essentially doing that, we had that capacity,  
12 and that's where we left it.

13 I mean, it was just general assumptions and  
14 definitely I can't say this terrace is that  
15 (indicating).

16 Q I'm not sure I understand, but maybe Mr. White  
17 will have questions about it.

18 A Pardon me. That 360,000 acre-feet did not  
19 include the terraced deposits.

20 Q That was just the alluvium?

21 A That was just the alluvium.

22 Q Right. I believe my next question has to do  
23 with Table 4 of C-31A, which has now been  
24 admitted, if you would turn to that, please.

25 page-cross-parish

1                   And I just -- perhaps this is more  
2                   appropriate in voir dire, but the peak annual  
3                   use figures, that column, where did you obtain  
4                   those figures?

5           A       From Dornbusch and Associates.

6           Q       They told you that that is what this type of  
7                   activity would use at its peak?

8           A       They told me that was the water requirement,  
9                   yes, to do that type.

10          Q       And you didn't do any independent calculations  
11                   of your own to confirm that?

12          A       No.

13          Q       You just accepted whatever they told you?

14          A       That's correct.

15          Q       If they had told you, for instance, in the  
16                   first thing for oil, they told you 10,000, you  
17                   would have used that?

18          A       Yes, I consider them professionally competent  
19                   so I accepted their figures.

20          Q       Someplace in your testimony you mentioned something  
21                   about an infiltration gallery. Can you tell me  
22                   where that was located, please?

23          A       The communities of Fort Washakie, Ethete, Boulder  
24                   Flats -- I believe that covered them -- uses

25                   page-cross-parish

1 infiltration galleries to develop their  
2 community supplies.

3 Q And can you just briefly explain what an  
4 infiltration gallery is, please?

5 A Pardon me?

6 Q Can you briefly explain what an infiltration  
7 gallery is and how it works?

8 A It's a horizontal piece of perforated pipe or  
9 casing that is placed in the alluvium below the  
10 water-- groundwater -- the water table, and,  
11 ideally, if you can place it a couple feet above  
12 the base of the alluvium, that's ideal, allows  
13 you to capture the maximum quantity of water  
14 that you could get.

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page-cross-parish

1 Then it is connected to a vertical sump or  
2 another vertical piece of pipe, a culvert,  
3 something like this in which a pump is mounted.

4 It's like a horizontal well, is what you are  
5 doing, so as you draw down, you pump, you are  
6 causing, instead of a cone of depression around  
7 a central well sort of, kind of a trough depression.

8 I think that's a professional term, but  
9 that's essentially what you are doing (indicating).

10 This water flows from the perforated pipe to  
11 the sump and is withdrawn by a pump.

12 Q. And undoubtedly the drawing of water into that  
13 infiltration gallery, of course, depletes the  
14 surface flow of the stream, correct?

15 A. I wouldn't say that as a general statement. It  
16 depends on the quantity of pumping and duration  
17 of pumping, yes, but you could assume that.

18 Q. Over a sustained period of time?

19 A. Right. Quite often these galleries are used  
20 to divert surface water because you get natural  
21 filtration, and it eliminates a lot of the solids  
22 that might be in the surface water, so if you  
23 have sufficient natural sands and gravels, you  
24 can filtrate your water that way.

25 page - cross -parish



1 Q. Now, concerning the projects listed on Table 4  
2 of Exhibit C-31A, did you do any calculations  
3 concerning the expected rate of return flow  
4 for any -- we talked about them some, but the  
5 expected rate of return flow from any of those  
6 projects? I think we talked about the oil, was  
7 it?

8 A. No, I didn't, because I'm not familiar with these  
9 particular projects, and so I have no return flows  
10 were looked into on my part.

11 Q. The column concerning peak uses presumably -- in  
12 other words, that amount of water would not have to  
13 be new water each year? Some of it would be  
14 recovered?

15 A. I can't comment on that. I don't know.

16 Q. The present pumping of wells and whatever sources  
17 would take place from the Reservation, is that  
18 having any effect at all upon the groundwater  
19 table there? You have mentioned it is still  
20 pretty much in a virgin state, but --

21 A. Probably the only area where there has been some  
22 effect would be the Riverton area, but the hydrographs  
23 we have had available which were monitored by the  
24 USGS did not indicate any significant declines

25 page - cross - parish

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at least for the last several years. I'm not commenting from their start up date back in the fifties, or whenever that was, but for maybe the last -- I don't have it in front of me to look at the hydrographs, but our hydrographs were not necessarily the middle of the center of pumping, so I'm -- from what we saw, things are pretty stable now at least.

\* \* \* \* \*

1 Q (By Mr. Parish) (Continued) Okay. From what you  
2 saw, there was not much effect, but certainly your  
3 test did not cover a very large area looking for  
4 that?

5 A On the Riverton -- We have hydrographs as well  
6 where -- and I -- my professional opinion would be  
7 elsewhere on the reservation, they're not in that  
8 state where you have effect. The only other center  
9 of pumping would be the well field there of Gulf  
10 by Pilot Butte for Steamboat Butte there. They're  
11 pumping in the order of 1,000 to maybe 1600 acre-  
12 feet a year.

13 Now, during the summer they may have effects,  
14 they would have some local effects that would be  
15 recovered in the period of high runoff. And speci-  
16 fically, their manager there indicated that when  
17 the river's flowing high, wells performed better.  
18 Of course, they're flowing up the bank. These  
19 wells are located on the bank. So they've raised  
20 the static water level just in that. I was pump  
21 testing, I can't say it was low flow, but it was  
22 fairly low flow, and it was like 9 feet to water,  
23 and we were about on a 9-foot bank, something like  
24 this, and they apparently had some trouble with

25 page - cross - parish

- 1           them then.
- 2           Q    I just realized that I must be good for you,
- 3           your voice sounds better.
- 4           A    It is better when I talk.  It's these breaks
- 5           when the attorneys are arguing with each other
- 6           that do it.
- 7           Q    I think I just have one more question.  When I
- 8           asked you did you do any calculations on the re-
- 9           turn flows before, I take it from your response
- 10          from that that you did not do any return flows on
- 11          irrigation or pivot sprinkler or anything like
- 12          that?
- 13          A    That's correct.
- 14                   MR. PARISH:  Fine.  I have no further ques-
- 15          tions.
- 16                   THE SPECIAL MASTER:  Mr. White or Mr. Merrill,
- 17          either one?
- 18                   MR. MERRILL:  While Mr. White's preparing
- 19          for cross-examination, I wonder if I might be
- 20          excused from the courtroom.  Some of our experts
- 21          are leaving town and I need to meet with them be-
- 22          fore they go.
- 23                   THE SPECIAL MASTER:  All right, we'll proceed
- 24          in the morning at 8:00.
- 25          page - cross - parish



1 MR. MERRILL: Thank you, Your Honor.

2 THE WITNESS: Your Honor, can I get a cup of  
3 coffee?

4 (Off-the-record discussion.)

5 CROSS-EXAMINATION

6 BY MR. WHITE:

7 Q Mr. Page, with respect to your well yield predic-  
8 tions or estimates, Table 2 of Exhibit 31-A, did  
9 you -- Well, let me ask you this: What assumptions  
10 did you use in calculating those estimated yields?

11 A. The main assumption would be on those creeks in --  
12 that I gave you permeability of 1,000.

13 Q Okay.

14 A. Okay. That was based just on professional opinion.  
15 I lowered it from the test data we had on the other  
16 creeks because, just given to be on the conservative  
17 side. I felt it was a reasonable -- a reasonable  
18 value, but we did not have any specific values.  
19 The assumption of the K value in that --

20 Q Fifteen hundred?

21 A. Fifteen hundred. Again, that, as I indicated, the  
22 test I performed, we were looking more to around a  
23 little over 2,000. And that's a figure that's been  
24 thrown around, used a lot by people in my profession

25 page - cross - white

1 when they have no test data and they have to make  
2 some estimates or some calculations.

3 Some place we had to assume a saturated thick-  
4 ness or interpolate. And even on the permeability  
5 values we did determine from the Wind River, there's  
6 interpolation between them.

7 As far as I recall, it's probably the main  
8 assumption. There may be others.

9 Q You must have made some assumptions as to the most  
10 efficient percentage of draw data?

11 A All right, yes.

12 Q What was that?

13 A I made the assumption that the aquifer was essen-  
14 tially homogeneous or at least there was not a  
15 restricting clay layer in there, and what we did  
16 is we assumed that the well was drilled to base-  
17 ment -- not to basement, to the consolidated rock,  
18 actually, into it 5 or 10 feet just as a junk col-  
19 lector, perforated the lower third of the saturated  
20 thickness and it did not allow drawdown with the  
21 interference allowance that I had spoke of, to  
22 drop below the top of the formation.

23 This screening of the bottom third is a  
24 standard assumption in my profession for this type

25 page - cross - white

1 of situation. It's not always attainable in the  
2 field. So drawdown, essentially total drawdown  
3 in the well was restricted to two thirds of  
4 saturated thickness.

5 Q I must have misunderstood you. You perforate the  
6 upper two thirds?

7 A No, lower one third.

8 Q Lower one third.

9 A It's ideal if you can avoid it to avoid cascading  
10 water.

11 Q Well, I'm not sure I understand now how you applied  
12 your one-foot interference factor with perforation  
13 only in the lower third of your case. Could you  
14 explain how you did that?

15 A Based on the permeability value, using that K  
16 factor, we determined a specific capacity, okay.  
17 Then what you take with that specific capacity,  
18 you say, okay, you want to know Q -- pardon me,  
19 specific capacity is the discharge that, the yield  
20 per foot of drawdown. So we said we have two  
21 thirds of the saturated thickness for the total  
22 allowable drawdown. I subtracted an amount for  
23 the interference, I believe it's one foot, some-  
24 thing like that, it was an arbitrary selection,

25 page - cross - white

1 and that left me two thirds minus one foot. Then  
2 you can apply that to the specific capacity value,  
3 you get a discharge for the well.

4 Q So if you had a 30-foot well, you're talking about  
5 a 19-foot drawdown, is that what you're saying?

6 A That would be correct.

7 MR. WHITE: I have to fix this.

8 THE SPECIAL MASTER: May I ask a question  
9 while you fix it?

10 MR. WHITE: You bet.

11 THE SPECIAL MASTER: There's been so much  
12 attention given to the drawdown and so much atten-  
13 tion to the comparable well, what guarantee is  
14 there of subsidence problems from the drawing of  
15 water from these structures?

16 THE WITNESS: You would not expect subsidence  
17 in the type of deposits you have along the alluvial  
18 channel.

19 THE SPECIAL MASTER: Why?

20 THE WITNESS: Because of their nature, the  
21 sands and gravels, plus you're not -- they're not  
22 under artesian wells, you get subsidence when you  
23 lower the pressure in the formation, and you have,  
24 like a clay compress, and then even though you may

25 page - cross - white



1 recharge them, they cannot expand.

2 THE SPECIAL MASTER: I see; I think I see.

3 THE WITNESS: We're in water table conditions  
4 in the shallow alluvial aquifers.

5 Q (By Mr. White) Does that mean in the alluvial  
6 condition, the material is essentially in contact  
7 and you're just draining water out of the pores?

8 A You're draining ideally by gravity, yes.

9 Q Did you make any adjustment in your well yields  
10 for declining saturated thickness with increasing  
11 drawdown?

12 A Yes.

13 Q And what was that adjustment?

14 A I do not have a specific factor, but I used the  
15 typical graph in the Johnson's book.

16 Q Page 107?

17 A I can't quote the page, but I'm sure you're  
18 familiar with it.

19 (Mr. White approached the  
20 witness.)

21 A That's it. I knew there was something missing  
22 from all this. I'm glad you brought it all up.

23 Q Well, I asked you before to give you a little  
24 tip on it, but I didn't get a rise out of you.

25 page - cross - white

- 1 A. What was that?
- 2 Q. About Johnson.
- 3 A. You did?
- 4 Q. Yeah.
- 5 A. I'm sorry, I missed that.
- 6 Q. I was really curious where you were going to come  
7 up that answer to that Page 107.
- 8 A. That's it, 73, that's correct.
- 9 Q. To use the figure 73, don't you have to assume, and  
10 have you assumed first that the water-bearing mater-  
11 ials are of uniform permeability?
- 12 A. Yes, I assumed that.
- 13 Q. And that the alluvial aquifer is not stratified?
- 14 A. That's correct.
- 15 Q. And that the saturated thickness is constant before  
16 the pumping starts?
- 17 A. Within your area?
- 18 Q. Yes.
- 19 A. Yes. You mean uniform?
- 20 Q. Yes.
- 21 A. Okay.
- 22 Q. Don't you have to assume, to use that graph, the  
23 well's 100 percent efficient?
- 24 A. I made an adjustment for efficiencies, I used --  
25 page - cross - white

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assumed it was a new well, I believe I used 90 percent. This is one you're not getting a value of 1200 like the USGS.

\* \* \* \* \*

- 1 Q (By Mr. White) Are you saying that they didn't  
2 use 90 percent to get 1200?
- 3 A My feeling is they didn't make these adjustments  
4 from efficiency, they used the Johnson Curve,  
5 but I don't believe they made any adjustment for  
6 efficiency.
- 7 Q Don't you have to assume the water table is hori-  
8 zontal to use that curve?
- 9 A You do, but it's not necessarily that significant.
- 10 Q Well, is the water table generally horizontal?
- 11 A No, it isn't.
- 12 Q Isn't this example that you have drawn here  
13 (referring to chalkboard drawing) an illustration  
14 of where the water table would not be horizontal?
- 15 A That's correct. It's not horizontal laterally  
16 either.
- 17 Q How about the nature of the flow through the  
18 aquifer, you have to assume it's a lateral flow?
- 19 A I'm not sure with that particular equation you  
20 have to make that assumption. I know that that  
21 assumption is made on some groundwater equations.
- 22 Q Don't you have to assume that the well penetrates  
23 to the bottom of the saturated thickness?
- 24 A Oh, I did, yes.
- 25 page - cross - white



1 Q How about -- Did you assume that the cone of  
2 depression is reached equilibrium?

3 A Yes.

4 Q That means the radius of the influence will not  
5 change during extended pumping?

6 A That's correct.

7 Q Have you assumed anything with respect to the  
8 continued flow of the surface streams for which  
9 you estimated yields in the alluvium? Have you  
10 assumed those surface flows, the discharge of  
11 those streams remains constant?

12 A I assumed that the surface -- the stream remained  
13 a live stream, and that was not -- the river did  
14 not become intermittent.

15 Q What would happen if 500,000 acre-feet of water  
16 were diverted out of the Wind River?

17 A I'm not familiar with the surface water resources.

18 THE SPECIAL MASTER: At what, you would have  
19 to make your question, because he is answering he  
20 is not familiar, so I suppose that's the answer.

21 Q (By Mr. White) Had you about 500,000 acre-feet  
22 taken out of the Wind River above the Kinnear  
23 Valley?

24 THE SPECIAL MASTER: At what rate of removal?

25 page - cross - white

1 That much in one year?

2 MR. WHITE: Per annum with a constant rate  
3 of diversion.

4 Q (By Mr. White) Would that have any effect on the  
5 yields of your wells?

6 THE SPECIAL MASTER: Well, south of that point  
7 of taking?

8 MR. WHITE: North of the point, Your Honor.

9 THE SPECIAL MASTER: North of the point of  
10 taking?

11 MR. WHITE: Yeah.

12 THE WITNESS: It doesn't matter where it's  
13 taken, but if you tell me what is taken and what  
14 the flows are there, I could give you a general  
15 answer back.

16 Q (By Mr. White) Until you know the remaining flow  
17 after diversions are made from the area of any of  
18 your wells on Table 2, you wouldn't be able to  
19 say whether or not that yield would remain con-  
20 stant, would increase the surface diversions,  
21 would you?

22 A Significant surface diversions where it would re-  
23 duce the wetted area of the channel, it would af-  
24 fect your yields if you were pumping on a prolonged

25 page - cross - white

1 basis. In other words, you would be losing re-  
2 charge, but essentially, if you have some water  
3 there that's available to be induced by these  
4 wells, you will be providing your recharge.

5 Q Let me ask you to assume that in the Kinnear  
6 Valley the Wind River was dry because of diver-  
7 sions for agricultural projects. What would hap-  
8 pen to your estimated well yields of the alluvium  
9 of the Wind River?

10 A They would eventually with time decline somewhat.  
11 You would have to design your pumping rates to  
12 account for that.

13 Q All right, your wells are essentially water out  
14 of storage, is that right?

15 A To -- Well, they could also be intercepting ground-  
16 water, the recharge, say, from the Wind River For-  
17 mation in small quantities, but essentially depend-  
18 ing on the accompanying rate you may still reach  
19 an equilibrium by intercepting underflow, but a  
20 heavy well field is quite possible.

21 Q Have you made any determination with respect  
22 to the amount of water in storage, or estimated  
23 well yields, based on hydrologic conditions  
24 in 1868?

25 page-cross-white

1 A Oh, I'm not specifically familiar with the  
2 hydrologic conditions in 1868.

3 Q That answers the question. Have you been  
4 supplied with any information from any other  
5 consultants for the United States in this  
6 case with respect to hydrologic conditions in  
7 1868?

8 A No.

9 Q Okay. I believe you told me that the yields  
10 on table 2 were designed to last essentially  
11 indefinitely under continued stream flow  
12 conditions, is that correct?

13 A That would be correct.

14 Q Let me skip around just a little bit. I got  
15 off on a tangent there. Let's talk about the  
16 alluvial storage determinations.

17 THE SPECIAL MASTER: Alluvial storage  
18 determinations?

19 MR. WHITE: Yes, sir.

20 Q (By Mr. White) Your 362,000 acre-feet.

21 A Okay.

22 Q Is that water in storage the quantity of ground-  
23 water filling the voids and alluvial deposits  
24 that could be available to wells?

25 page-cross-white



- 1 A No.
- 2 Q Okay, what is it?
- 3 A It's the total storage under full conditions,  
4 it is not a useable storage.
- 5 Q That's right. So the 360,000 acre-feet is not  
6 a useable resource, only a portion of it is,  
7 is that correct?
- 8 A That's correct.
- 9 Q What was the storage capacity that you determined  
10 for the alluvium of the Big Wind?
- 11 A I believe 147,000 acre-feet. About 168,000  
12 acre-feet.
- 13 Q 147,600, perhaps?
- 14 A Correct. The same number I gave you during  
15 the deposition.
- 16 Q How about for the Little Wind, Spring Creek?
- 17 A Eighty --
- 18 THE SPECIAL MASTER: The same number he  
19 gave you at the depositions?
- 20 MR. WHITE: Just checking, Your Honor.
- 21 THE SPECIAL MASTER: How about Spring  
22 Creek, he said?
- 23 THE WITNESS: About 80,000.
- 24 Q (By Mr. White) Explain how you combined the  
25 page-cross-white

1 storage for the Little Wind and Spring Creek.

2 I'm not quite sure why you combined those

3 storages.

4 A I believe Spring is a tributary to the Little  
5 Wind.

6 Q Okay. And is that the only tributary of the  
7 Little Wind?

8 A No, but it appeared on the geologic map to be  
9 the one that had a significant alluvial deposit.

10 Q What I meant to ask: Is that the only Little  
11 Wind tributary that you lumped in with the  
12 Little Wind?

13 A That's correct.

14 Q You didn't pick up any others?

15 A May I look at the map?

16 Q You bet.

17 THE SPECIAL MASTER: Why don't we take a  
18 five, ten minute break since we have 45 minutes  
19 to go.

20 MR. WHITE: All right.

21 (Whereupon, a short recess  
22 was taken.)

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1 THE SPECIAL MASTER: Shall we resume?

2 MR. WHITE: Off the record, Your Honor.

3 (Discussion off the record.)

4 THE SPECIAL MASTER: Okay, Mr. White.

5 Q (By Mr. White) What storage capacity did you use

6 for Little Wind and Spring Creek? 80,000, did

7 you say?

8 A I believe so, yes.

9 Q How about Crow Creek?

10 A 2300.

11 Q Mill Creek?

12 A 30,700.

13 Q Popo Agie?

14 A 9600.

15 Q Sage Creek?

16 A 2100.

17 Q Owl Creek?

18 A 2400.

19 Q Five Mile Creek?

20 A 16,800.

21 Q Muddy Creek?

22 A 4400.

23 Q Kirby Draw?

24 A 17-six.

25 white - cross - page

1 Q Beaver Creek?

2 A 6900.

3 Q What area did you use for the alluvium of those  
4 respective streams when you calculated the amount  
5 of water in storage in the alluvium?

6 A I do not have the work sheets with me, but  
7 essentially we did not go up the little narrow  
8 tributaries. I could point out some examples.  
9 And again without -- for instance, let's just  
10 start with Wind River here (indicating). If  
11 we could just lop that off, a little creek  
12 like that. What's that -- that's called Sand  
13 Draw. We ignored that, ignored all of these  
14 along here (indicating), essentially -- of  
15 course, we did Crow Creek. Essentially on the  
16 Wind we didn't go into any tributary.

17 Q Now, did you planimeter the area that's covered  
18 by Qa on Exhibit 33 to determine your starting  
19 point for the area of your alluvium?

20 A Yes, we planimetered the perimeter after referring  
21 to our topo maps for -- yes, we planimetered  
22 from this with spotchecking from the topo maps.

23 Do you want me to look at other creeks, or  
24 did you want to continue your question?

25 white - cross - page



1 Q Yes.

2 A On the Little Wind -- this is just my recall --  
3 we didn't go up and include this Qsa. We just  
4 stayed in this area arbitrarily. I would believe  
5 we didn't go any further than this on -- well,  
6 that's the Little Wind, and the same up here  
7 (indicating).

8 I cannot tell you if we included -- I would  
9 assume we excluded that just from observation.  
10 We excluded that, and then on Mill Creek we  
11 utilized -- in this area we checked some logs to  
12 see if -- you have some terrace deposits -- we  
13 looked at some of the logs, and we even indicated  
14 that we had alluvium underneath it, so we -- I  
15 believe we cut it off this way and came down like  
16 this (indicating) --

17 Q So you included some Qt or terrace areas?

18 A No, no, there's alluvium underlying it, it was  
19 our conclusion, and if the water level was not  
20 in the Qt -- if it was up above drain, it was  
21 not included then, and then we came down here to  
22 where it -- in this area right here where it's  
23 tributary to the Little Wind and then the Popo  
24 Agie and, of course, that's Beaver Creek. That  
25 white - cross - page

27-4

1 was separate and Kirby Draw, that was separate.

2 Q So you took this map and planimetered the areas  
3 for the various alluvium units that are table 2?

4 A That's correct.

5 Q And you don't know the areas which you calculated  
6 from your planimetering?

7 A You mean the actual areas?

8 Q Yes.

9 A I believe I have those.

10 Q Okay.

11 A It's my general recollection I have those numbers  
12 here with me, but not here (indicating). I  
13 could give them to you tomorrow.

14 Q Why don't we come back to that area tomorrow  
15 then?

16 Let me ask you while we are there though if  
17 you know the locations of the cross sections,  
18 channel cross sections, which you used to determine  
19 your average saturated thickness for each of  
20 those?

21 A I refer you to Water Supply Paper 1576-I. They  
22 show the locations of the cross sections we used  
23 out of there.

24 Q Is it Plate 3?

25 white - cross - page

27-5

1 A I believe so, yes.

2 Q Would you take a look at it to make sure they are  
3 all the cross sections you used?

4 A They are not all of them.

5 Q Okay. Are there more --

6 A Yes.

7 Q -- than 1576-I?

8 A I don't believe in 1576-I. We had a dam site  
9 cross section up in here (indicating).

10 Q What was the source of that cross section?

11 A Oh, I believe it was a Bureau of Reclamation  
12 project regarding some study they did up there.  
13 I don't know the name.

14 And I believe we had another dam site  
15 cross section in this reach (indicating). I  
16 believe that was it.

17 Q Now, is that for everything or just the Big  
18 Wind?

19 A No, I don't believe we had any other dam site  
20 cross sections.

21 Q How about cross sections other than dam site  
22 cross sections on which you developed your  
23 saturated thickness for that alluvium?

24 A It's in that. You have the Kirby Draw and the  
25 white - cross - page

1 Beaver Creek.

2 Q So those are the only ones you used in 1576-1?

3 A That's correct, plus one or two from the Bureau  
4 of Reclamation dam sites.

5 Q Let's come back to your groundwater storage then  
6 tomorrow and talk again about your well yield  
7 analysis.

8 You indicated that on Sage Creek you had  
9 assumed saturated thickness of 20 to 30 feet,  
10 permeability of 1,000; is that correct?

11 A That's correct.

12 Q What did you do with those two numbers to come  
13 up with the yield values on table 2 for Sage  
14 Creek?

15 A We went through the methods I described previously,  
16 using the K factor, using -- assuming an  
17 interference, using the Johnson curve, the same  
18 procedure. To my knowledge, I recall --

19 Q Straight through?

20 A As I recall, it was the same procedure.

21 Q Isn't it true that for all the units, the  
22 alluvial units, for which you calculated potential  
23 well yields on table 2 that those well yields are  
24 calculated -- calculated well yields are far

25 white - cross - page



1 in excess of any well that has yet been drilled  
2 or been produced for water in any of those units?

3 A To my knowledge, that's correct.

4 Q Why is it that in the Wind River alluvium, for  
5 example, the largest measured discharge shown for  
6 any well in Water Supply Paper 1576-I is only  
7 65 gallons per minute and yet your estimated  
8 yield is 900 gallons per minute? What's the  
9 explanation for that?

10 A That's incorrect, for one thing -- that might be  
11 what that says, but the Gulf well was discharging  
12 at a hundred gallons a minute. My calculation  
13 resulted in the area of the Gulf well where I  
14 had the pump test for a properly designed, properly  
15 efficient, and not a 30-year old well -- we should  
16 be looking at a hundred and fifty gallons a  
17 minute. Nine hundred gallons a minute is in the  
18 Crowheart area where you have your thickest  
19 saturated thickness and your highest permeability.

20 Q But it's true that there's no well in the Wind  
21 River alluvium today that even approaches the  
22 900 gallons per minute?

23 A That's correct.

24 Q If 900 gallons per minute was available from a  
25 white - cross - page

1 well or a series of wells that you've described,  
2 do you know why such a well has not yet been  
3 constructed?

4 A In the case where the Crowheart area -- let's  
5 talk about that area -- that's where the 900 gallons,  
6 not anywhere else along there -- we look at that  
7 well, and they estimated the cost of a single well  
8 at that point, and it was in the order of 20 to  
9 25 dollars an acre-foot to pump that water to the  
10 wellhead.

11 In that area, surface water -- I have been  
12 advised surface water is cheaper to use, and I  
13 think that's the reason.

14 Q Isn't it true that in the Little Wind River you've  
15 calculated a potential yield of about 200 gallons  
16 per minute, the largest measured discharge from  
17 any well shown in Water Supply Paper 1776-I is  
18 roughly one-fifth of that?

19 A If you are reading it from that, yes, that  
20 wouldn't surprise me.

21 Q Are you aware of any other well that is greater  
22 than 40 gallons per minute measured discharge?

23 A Not specifically, no.

24 Q Mill Creek, shown by 1576, is again 40 gallons  
25 white - cross - page

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a minute. Are you aware of any well that is greater than that or approximates the 250 gallons per minute that you have estimated?

A Not to our knowledge, none that's been drilled for that purpose.

1 Q (By Mr. White) (Continued) Are you aware of  
2 any well on Sage Creek where you estimated a  
3 yield of 190 gallons per minute that has  
4 actual measure discharge of over 30 gallons  
5 per minute?

6 A I don't -- I'm not aware of the specific  
7 discharges from these creeks, I'm aware they're  
8 very low.

9 Q Any idea why on Sage Creek instead of having  
10 30 gallons per minute and 10 gallons per minute  
11 wells there are 190 gallons per minute wells?

12 A What are their diameters and what are their pumps?

13 Q I don't know.

14 A See, you can drill a six inch domestic well and  
15 need 10 gallons a minute. Does it mean that  
16 those wells were designed and pumped at their  
17 potential?

18 Q You're saying the bigger wells could have been  
19 build but just haven't for some reason?

20 A That's what I'm saying, yes.

21 Q Mr. Page, when did you begin your work on your  
22 groundwater investigation for the Wind River  
23 Indian Reservation?

24 A The summer of '78.

25 page-cross-white



1 Q And were you given any assignment or instruction  
2 which you did not describe on direct examination  
3 with respect to what you were supposed to do?

4 A No.

5 Q No? Have you submitted a report entitled  
6 Groundwater Resources of the Wind River Indian  
7 Reservation?

8 A I have not completed that.

9 Q I see. Is that the report that you indicated  
10 previously would be coming out in September of  
11 last year?

12 A That's correct.

13 Q Have you reached any conclusions in that report  
14 which are different from the conclusions which  
15 you expressed in Court today?

16 MR. MEMBRINO: Your Honor, I believe  
17 he said the report is not completed.

18 THE SPECIAL MASTER: Yeah, but he can  
19 still answer the question.

20 THE WITNESS: The numbers I have given  
21 you way back in the first deposition, they have  
22 not been changed and to my knowledge I haven't  
23 reached any new different conclusions.

24 Q (By Mr. White) Well, let me ask you specifically,  
25 page-cross-white

1 without trying to trap you, the values for  
2 the various parts of M and I use weren't  
3 included in that report, were they?

4 A Do you mean those in this table?

5 Q Table 4?

6 A I didn't discuss that in the report. I wasn't  
7 really even planning to. I think I discussed,  
8 at best, maybe the magnitude of pumpage on the  
9 reservation because at that time that's all  
10 I had.

11 Q Is it true that you spent less than two weeks  
12 actually on the reservation studying the  
13 groundwater resources?

14 A I made four trips to the reservation including  
15 two of prolonged stay. I would say a total of  
16 around two weeks, in that order.

17 Q You mentioned that you got some material from  
18 the USGS office in Lander.

19 A No, not Lander.

20 Q I thought you said that.

21 A Thermopolis.

22 Q Thermopolis?

23 A Oil and gas conservation.

24 Q How many pump tests did you actually conduct on  
25 page-cross-white

1 the reservation?

2 A Conducted three, two of which we got results.

3 Q The other one was a fluke?

4 A The other one was a fluke.

5 Q Did you conduct any seepage runs for any of  
6 these rivers?

7 A No.

8 Q Isn't it standard professional -- standard  
9 professional approach when investigating  
10 groundwater sources, especially alluvial ground-  
11 water sources, to consider secretions and  
12 depletions from that alluvium in the form of  
13 a seepage run?

14 A In the situation where we had these virgin  
15 conditions, we had this -- it's not necessarily  
16 standard, it's a thing you can do. We did not  
17 do that.

18 Q Were there constraints placed on your work in  
19 terms of the budget that you had to stay within?

20 A I had a budget.

21 Q Would that budget allow you to do seepage runs  
22 for these major alluvial areas?

23 A Maybe at the expense of doing something else. Our  
24 fieldwork was restricted or at least it was specified

25 page-cross-white

1 to pump testing.

2 Q In your contract?

3 A Yeah, we had a contract for test pumping.

4 Q So it wasn't within your contract to do your  
5 seepage runs?

6 A Right.

7 Q Okay. Couldn't have done them if you wanted to;  
8 is that right?

9 (No response.)

10 MR. WHITE: The record should reflect that  
11 the witness nodded.

12 Q (By Mr. White) You indicated that your work was  
13 essentially a reconnaissance, during direct exami-  
14 nation. What does that mean in the groundwater  
15 context? Does it mean the same thing as it would,  
16 say, to somebody that works with the Bureau of  
17 Reclamation, that same sort of reconnaissance  
18 study?

19 A I don't know the Bureau of Reclamation's term.  
20 What it means within the area as large as the  
21 Wind River Reservation, covering such a diverse  
22 type of aquifers and in areas where there is no  
23 groundwater data, in some cases you quantify the  
24 groundwater resources with the information. The

25 page-cross-white.



1 next step would be, you want to go into a specific  
2 development, and then you would look at, you would  
3 take your time and effort and money to analyze  
4 every little bit of information in that area.

5 THE SPECIAL MASTER: That was a reconnaissance  
6 you just described?

7 THE WITNESS: The general study on the reser-  
8 vation and the other one is a little more specific.

9 THE SPECIAL MASTER: I see.

10 Q (By Mr. White) Is the second step that you des-  
11 cribed normally referred to in your area of exper-  
12 tise as a feasibility study?

13 A Pardon me?

14 Q Is the second step a feasibility study?

15 A It's a little above the reconnaissance, more site  
16 specific, but as far as the feasibility, I picture  
17 the feasibility of getting into costs, that would  
18 be the next step short of test drilling, unless  
19 you had, fortunately had the resources to test  
20 drill before.

21 Q So you're describing sort of a fourth step process  
22 before you actually go to construction; is that  
23 correct?

24 A In general. Sometimes your test drilling can be

25 page - cross - white

- 1 in one step or the other. You can eliminate a step.
- 2 Q Have you progressed the first step with respect to
- 3 the ground water supply for any of the facilities
- 4 shown on U.S. Exhibit WRIR C-33-B?
- 5 A On the overall.
- 6 Q Beyond Step 1 that you described?
- 7 A Step 1, I did -- Well, in the case of the with-
- 8 drawals from the Wind River, stream generating
- 9 electricity plant, that was close enough to our
- 10 pump test area in our study and that I felt in
- 11 that situation it was a step beyond.
- 12 Q Okay. So you got to Step 2 here for the coal-fired
- 13 electric generating station?
- 14 A Yes.
- 15 Q And this is the --
- 16 A In other words, yes.
- 17 Q -- the area that's got a green circle around it
- 18 and an arrow that points down to the Wind River?
- 19 A That's correct.
- 20 Q What effect did you assume, if any, on your ability
- 21 to obtain the subsurface underflow from the Wind
- 22 River for this coal-fired general -- coal-fired
- 23 electricity generating station that would be
- 24 caused by diversions and consumptions of water
- 25 page - cross - white

1 claimed in other portions of the statement of  
2 claim by the United States?

3 A. Again, I assume that we had a live stream, more  
4 than trickle, and that, you would get equilibrium  
5 conditions. You would have essentially a similar  
6 type of performance they have at Pilot Butte where  
7 the wells are spaced 150 to 200 feet apart, talk-  
8 ing of a few inches of interference.

9 Q. Okay. Have you or have you not developed the poten-  
10 tial of groundwater supplies for specific uses on  
11 the reservation?

12 A. Could you be more specific?

13 Q. Well, I worded it carefully because it was the same  
14 question I asked you in the deposition, and you  
15 said, "No, you had not." Do you want to look at  
16 the deposition?

17 A. No, that's okay.

18 Q. Okay.

19 A. You asked me -- Would you repeat it again?

20 Q. Well, let me pull it out and make sure I've got  
21 it right.

(Brief pause.)

22  
23 Q. Have you developed the potential of groundwater  
24 supplies for various uses in the reservation?

25 page - cross - white

1 A. Since then I have, since that deposition I have  
2 looked at more site specific.

3 Q. Okay. Have you done any analysis of a site speci-  
4 fic nature beyond that which you described in your  
5 direct examination?

6 A. I'm trying to recall my direct examination.

7 Q. No, I mean today, during direct.

8 A. Yeah, I know, I'm trying to recall.

9 Q. It's been a long day.

10 A. Not beyond the extent of determining that there  
11 were aquifers present capable of yielding the  
12 quantities of water required. Is that what I  
13 said earlier?

14 Q. I think that's a fair representation. So then  
15 it's true that you've made no investigation with  
16 respect to the suitability of that water from a  
17 water quality standpoint?

18 A. That's correct.

19

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1 Q (By Mr. White) So the water may be physically  
2 available, yet unfit to use for the particular  
3 purpose, is that correct?

4 A I don't know that.

5 Q You don't know one way or the other?

6 A I don't know what water quality requirements  
7 are for the specific uses.

8 Q Didn't Dornbusch give that to you?

9 A I mean, the water quality, pardon.

10 Q I'm sorry, I thought you said "Quality."

11 Didn't Dornbusch ask you to find sources of a  
12 certain water quality?

13 A No, no quality factor at all.

14 Q Wouldn't you normally make that investigation?

15 A On -- well, not necessarily -- that may not  
16 necessarily be the case. As an example, in  
17 Peabody we were looking on Black Mesa for the  
18 poorest quality we could find. The Navahos  
19 wanted us to use the junk. Now, on some  
20 particular boilers I know specifically there are  
21 water quality requirements. So it -- I can't  
22 give you -- yes or no, it would vary, that you  
23 could be expected if it was a water quality  
24 sensitive use.

25 page-cross-white

1 Q Did you provide anyone -- excuse me -- did  
2 you determine for any of the mineral and  
3 resource developments shown on Exhibit C-33-B  
4 the cost of developing the amount of water  
5 needed from the source identified by yourself  
6 on table 4?

7 A No.

8 Q No, okay. So your conclusion is that if you  
9 spent enough money, you might get some water  
10 from those sources and you don't know how much  
11 money it would be?

12 A Well, I developed the cost of single typical  
13 wells to the wellhead I mentioned to you, but  
14 I did it different for a shallow well, a 1,000  
15 foot well --

16 Q But you didn't do it for these specifics?

17 A No.

18 Q So if Mr. Merchant had included the cost of  
19 water development for these particular facilities,  
20 the values he used would not have come from  
21 you, is that correct?

22 A That's correct.

23 Q Now, let's get to the Statement of Claims.

24 A Okay.

25 page-cross-white

1 Q Turn to page 15.

2 A Okay.

3 Q You see the language "Sufficient groundwater  
4 to maintain the surface condition and the  
5 well levels of the Wind River Indian Reservation  
6 in their naturally occurring state"?

7 A Yes.

8 Q Do you know what a naturally occurring well  
9 level is?

10 A My interpretation of that statement would be  
11 keeping the well levels, the conditions, not  
12 in an overdraft state, in an --

13 Q Overdraft state means you are taking out more  
14 than what is coming back in?

15 A That's correct. Over perennial yield you are  
16 going to have some well drop for utilizing  
17 your perennial yield.

18 Q So, okay, are you saying that language on the  
19 top of page 15 essentially means that from a  
20 groundwater geologist's standpoint, that you  
21 do not have mining of groundwater?

22 A That would be my interpretation.

23 THE SPECIAL MASTER: Could I inject a  
24 question at that point, Mr. White --

25 page-cross-white

1 MR. WHITE: Yes, sir.

2 THE SPECIAL MASTER: -- exactly on the  
3 charges? If I were to add after the words  
4 "Occurring state, comma, and this must be  
5 qualified to allow for the inevitable drop in  
6 tables if use exceeded recharge capacity," would  
7 that appear a fair and proper statement to  
8 your education and technology?

9 THE WITNESS: Could you read that again?

10 THE SPECIAL MASTER: I will, indeed.  
11 After the "Occurring state," comma, "Must be  
12 qualified to allow for the inevitable drop  
13 in tables if use exceeds recharge capacity."

14 THE WITNESS: That would be contradicting.  
15 wouldn't it?

16 THE SPECIAL MASTER: That would be what?

17 THE WITNESS: It would be contradicting,  
18 wouldn't it?

19 THE SPECIAL MASTER: Do you believe that  
20 would be contradicting --

21 THE WITNESS: Are you implying that --  
22 I think you are mentioning, you are talking about  
23 you would be overdrafting; in other words, you  
24 would be taking out more than your recharge

25 page-cross-white



1 or your captured discharge.

2 THE SPECIAL MASTER: Yes, but the request  
3 is the water is to maintain the level of all  
4 lakes within the Reservation in their natural  
5 state except Bull Lake, Ocean Lake, Boysen  
6 Reservoir, Ray Lake, Washakie Reservoir and  
7 Pilot Butte Reservoir, then comes the point,  
8 "Sufficient groundwater to maintain the surface  
9 condition and well levels of the Wind River  
10 Indian Reservation in their naturally occurring  
11 state."

12 How can you assure groundwater if there  
13 are to be drawdowns in excess of recharge  
14 capacity?

15 A THE WITNESS: How you can preserve --  
16 what I'm saying is you could -- if you were  
17 pumping the perennial yield, you would have  
18 drawdowns and you would get recharge and recovery.  
19 If you are mining, you would have pretty much  
20 continuous drawdowns below that level that  
21 pumping at the perennial yield would result in.  
22 That's my interpretation of it.

23 THE SPECIAL MASTER: I think that's been  
24 helpful to me. Thank you.

25 page-cross-white

1 Thank you, Sandy.

2 Q (By Mr. White) Oliver, that discussion was  
3 applicable primarily to alluvial water, wasn't  
4 it?

5 A Well, you can be talking about the piezometric  
6 surface, also you would be mining the potential  
7 metric surface or depressing it, which would  
8 affect that would be -- over well fields or  
9 someone else coming in.

10 Q So you are saying that this would preserve  
11 the artesian head in the confined formations,  
12 is that your interpretation of this, or is  
13 that too rough a statement?

14 A Your -- my interpretation would be that might  
15 be the intent, that's not separating unconfined  
16 and confined, but in the case of the artesian  
17 condition, you will have a piezometric, a  
18 drop in the piezometric surface, and I think  
19 this is just saying that let's control, let's  
20 monitor these effects. We cannot say at this  
21 time say water levels or the potential metric  
22 surface can drop 50 feet, and that's it, like  
23 that, I think it's just saying we want to not  
24 use the groundwater in excess to where you are

25 page-cross-white

1 having some adverse effects, tremendous  
2 drops of piezometric surface. I can't put  
3 a number to those, but let's monitor and  
4 avoid that. In other words, monitoring the use  
5 of groundwater is what it's stating.

6 Q But isn't it true that just about any develop-  
7 ment in a confined formation will reduce the  
8 artesian head or the piezometric levels?

9 A That's true. It's to the extent -- I mean,  
10 if you pump a well 500 gallons a minute, it's  
11 going to reduce it a lot more than at 100.  
12 That's your total extractions. Now, I don't  
13 know where you would draw your lines to say  
14 we will only tolerate this amount.

15 Q In the Wind River Formation, say, in the central  
16 and eastern portion of the Reservation, at  
17 what distance -- or over what distance would  
18 the artesian head or piezometric surface be  
19 affected by withdrawals from the 500-gallon-  
20 per-minute well?

21 A I haven't made the calculations, so I could  
22 not give you that number.

23

24

25

\* \* \* \* \*

1 Q (By Mr. White) It would extend not very far  
2 off the reservation?

3 A I am speaking of a single well.

4 Q Right.

5 A The artesian cone expands out a fair distance.  
6 I'm not -- I can't tell you without making the  
7 calculation what the aquifer assumption -- it  
8 can be done where that cone is going to be,  
9 extend to.

10 Q Have you reached any conclusions since January 9  
11 with respect to aquifer recharge or discharge  
12 areas?

13 A No. We have talked --

14 Q I'm sorry.

15 A Other than what we did talk about in general terms,  
16 the recharge areas.

17 Q You are just picking those up from USGS, aren't  
18 you?

19 A Well, in some cases. From my professional  
20 experience on the deeper aquifers where they  
21 are outcropping along the outflanks of the  
22 mountains and the streams, that is my professional  
23 conclusion. I don't believe I have specifically  
24 picked that up. They may mention it, but as far

25 white - cross - page



1 as the Wind River Formation, that is correct.

2 Q Where are the areas of discharge out of the Wind  
3 River Formation into the Wind River itself  
4 based on your professional opinion?

5 A Without that accretion study you were talking about --  
6 I might get back to that. HKM Associates were  
7 doing surface hydrology, and the initial thought  
8 was we will wait for their results and, you  
9 know, I haven't seen a final result. I was hoping  
10 from that we could get some general idea of looking  
11 at the values they generated, but I have not done  
12 that.

13 Q But isn't it true that without a seepage run it's  
14 almost impossible to say with any certainty exactly  
15 where areas of discharge --

16 A That's true because you have manmade additions and  
17 subtractions from the system.

18 Q Isn't it true that USGS has not performed any  
19 seepage runs?

20 A Not to my knowledge.

21 Q So any conclusions that the GS may have reached  
22 with respect to discharge and recharge areas are  
23 similarly without the benefit of a seepage run?

24 A I don't know.

25 white - cross - page

1 MR. WHITE: I'm at a convenient stopping point,  
2 Your Honor, before I start on the next.

3 THE SPECIAL MASTER: I think it's a good  
4 convenient stopping point.

5 MR. WHITE: Do you want to start at eight  
6 o'clock in the morning?

7 THE SPECIAL MASTER: I'm wrestling with the  
8 idea, maybe anticipating the legal burden, but  
9 a particular one of a claim for reserved water  
10 right for sufficient groundwater to maintain well  
11 levels when there cannot be, at the same time,  
12 imposed certain restrictions upon the draw of  
13 those well levels. Otherwise, you give somebody  
14 the right to dry up every drop of water not only  
15 on the ground, but on the surface too, but this  
16 is a real concern.

17 We are now at the heart of the this lawsuit,  
18 and on that little thought I will adjourn until  
19 tomorrow morning at eight o'clock.

20 MR. WHITE: We'll get back to it, Your Honor.

21 (Court in recess at 5:30 p.m.)

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1 REPORTERS' CERTIFICATE

2 State of Wyoming )  
3 : SS  
4 County of Laramie )

5 We, Merissa Racine, Mary Nelson and Viola J.  
6 Lundberg, Registered Professional Reporters and Notary  
7 Publics, hereby certify that the facts as stated in  
8 the caption hereof are true; that we did at the time,  
9 date and place, as set forth, report the proceedings  
10 had before the Honorable Teno Roncalio, Special Master,  
11 in stenotype; that the foregoing pages, numbered 732-  
12 inclusive, constitute a true, correct and complete  
13 transcript of our stenographic notes as reduced to  
14 typewritten form under our direction.

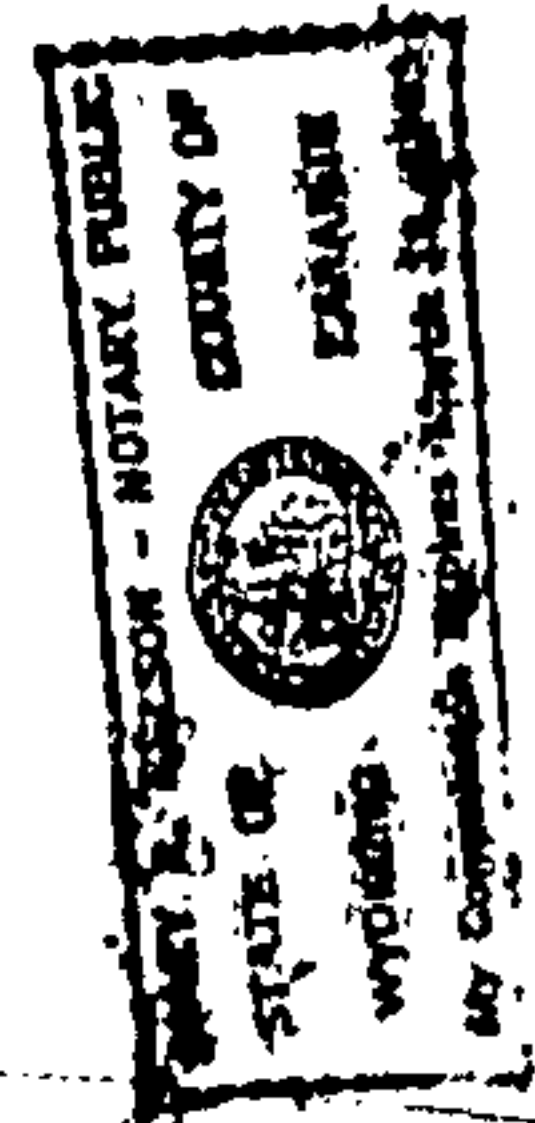
15 We further certify that we are not agents, attor-  
16 neys or counsel for any of the parties hereto, nor are  
17 we interested in the outcome thereof.

18 Dated this 29th day of January, 1981.

19 Merissa Racine  
20 MERISSA RACINE  
21 Registered Professional  
22 Reporter

23 Mary Nelson  
24 MARY NELSON  
25 Registered Professional  
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26 Viola J. Lundberg  
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28 Registered Professional  
29 Reporter



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COUNTY OF LARAMIE STATE OF WYOMING  
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