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case # 4993

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

IN RE:)
)
THE GENERAL ADJUDICA-)
TION OF ALL RIGHTS TO)
USE WATER IN THE BIG)
HORN RIVER SYSTEM AND)
ALL OTHER SOURCES,)
STATE OF WYOMING.)

Civil No. 4993

FILED _____
8/3 1981
Margaret V. Hampton CLERK
DEPUTY

VOLUME 93

Morning Session

Tuesday, July 28, 1981

ORIGINAL

APPEARANCES

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1 THE SPECIAL MASTER: May we please come to
2 order. Is there a new appearance, Mr. Merrill?

3 MR. MERRILL: Yes, Your Honor. I'd like
4 to introduce to the Court Mr. Mark Brennan,
5 who is a third year student next year at
6 Stanford University Law School, who is working
7 with us this summer.

8 THE SPECIAL MASTER: Welcome to the case,
9 Mr. Brennan.

10 MR. BRENNAN: Thank you very much.

11 THE SPECIAL MASTER: All right.

12 MR. SACHSE: I just wanted to correct what
13 may have been a misimpression as a part of Mr.
14 Higginson's testimony. We tried to correct it
15 on redirect examination. Mr. Higginson's
16 testimony completes our testimony on the re-
17 acquired -- excuse me, on the fee lands owned
18 by members of the Tribe and their direct --

19 THE SPECIAL MASTER: Decendants.

20 MR. SACHSE: -- decendants. We do not
21 intend to present further testimony on that issue.

22 The testimony that will come now will be
23 on the programs for future development.

24 THE SPECIAL MASTER: Programs for future
25 development of lands owned in fee by Indians and

1 decendants -- their direct decendants?

2 MR. SACHSE: No. We now turn to trust lands,
3 to lands owned in trust by the Tribe and by
4 allottees.

5 THE SPECIAL MASTER: So this has to be added
6 to the futures to which Dr. Mesghinna and others
7 have testified about in their reports?

8 MR. SACHSE: That is correct.

9 One other announcement, if you can call it
10 that, that I want to make. We will be referring
11 in Dr. Willardson's testimony, which I assume
12 will begin tomorrow or the next day, to the
13 drainage maps prepared by Dr. Mesghinna. So in
14 order to avoid having to make a lot of additional
15 copies, if you'd bring Dr. Mesghinna's report
16 with you tomorrow it would be useful.

17 THE SPECIAL MASTER: And the exhibits are
18 here in the building, we have to haul them in,
19 they're down the hall.

20 All right, Mr. Merrill.

21 MR. MERRILL: Your Honor, while we are
22 speaking of preliminary matters, I want to
23 point out and put on the record that I anticipate
24 that our cross-examination of Mr. Bliesner, Mr.
25 Willardson and Mr. Keller, the next three Tribal

1 witnesses will be rather short, and I want to
2 put the Tribes on notice that depending on the
3 length of their direct examination I expect we
4 could arrive at Mr. Cummings' testimony by
5 Thursday, and I just thought we ought to have
6 it on the record that he ought to be available
7 by then because we are going to make a pretty
8 good pace.

9 THE SPECIAL MASTER: All right. If I
10 compress tomorrow's hearing from nine in the
11 morning until about one and then adjourn, I hope
12 that doesn't discombobulate you because I have
13 to do that tomorrow.

14 MR. SACHSE: I should state on the record
15 too that this comes as something of a surprise
16 to us, given the length of cross-examination
17 we've had previously. We are not prepared to
18 present Dr. Cummings this week. We are prepared
19 to go forward with Dr. -- with Mr. Bliesner,
20 Dr. Willardson and Dr. Keller. We have another
21 week of trial set for the first week in September,
22 we will only have two witnesses to present then,
23 Dr. Cummings and Dr. Ohmar Stewart. And if we
24 finish with what we have lined up for this week
25 this week, I think if we can go home Thursday we

1 should go home and we'll finish up on Monday
2 and Tuesday, probably that first week -- No,
3 we start on Tuesday and Wednesday of that first
4 week in September.

5 MR. MERRILL: Your Honor, I would strenuously
6 object to that. As the Court is well aware,
7 you have set forth a schedule for the remainder
8 of the year and instructed all the parties that
9 the case will be submitted to you by December.

10 THE SPECIAL MASTER: That is right.

11 MR. MERRILL: We've got hearings scheduled
12 for all of this week. I don't think that the
13 length of our cross-examination of, for example,
14 Mr. Higginson, has been indicitive, necessarily
15 that we would not get to Mr. Cummings this week.
16 I think its been known for a long time how the
17 Tribes case would go together. I think that what's
18 going to happen is we'll take up some time that week
19 in September, and each time we get the schedule
20 pushed back a little bit further or quit a week
21 a little bit short it ends up being the State of
22 Wyoming's case or the private parties' cases
23 who are going to suffer when we get up against
24 the wire in November and December of this year.
25 And I would move the Court for an order today

1 telling them to either put on Mr. Cummings
2 when we're done with Mr. Keller or Mr. Willardson,
3 whoever is the previous witness, or conclude
4 their case in chief.

5 THE SPECIAL MASTER: I'm not ready to rule
6 that harshly on them, but if you could find
7 Mr. Cummings you would be well advised to get
8 him here for the Friday hearing or Thursday,
9 if you think you can. If we're ready for him
10 Thursday by noon you would be well advised to
11 do so.

12 All right. Where is the witness?

13 MR. CLEAR: Your Honor, I have one matter.

14 THE SPECIAL MASTER: All right, Mr. Clear.

15 MR. CLEAR: The last session, Mrs. Echman,
16 the title plant lady from the Bureau of Indian
17 Affairs, from the Billings office in Montana,
18 she testified, I believe it was four boxes of
19 land title indices which apparently were not
20 entirely up-to-date and she has now sent to us
21 the supplement to those. They're all certified
22 copies.

23 THE SPECIAL MASTER: If you give those to
24 Mr. Salazar I suppose we'll put them with the
25 four boxes. We're not going to interpolate them.

1 MR. CLEAR: No, Your Honor. Each page has
2 the section and township, and I've marked them
3 U.S. Exhibit WRIR C-317-1 and WRIR C-317-2.

4 THE SPECIAL MASTER: All right. They'll
5 be admitted. The documents to which they are --
6 The exhibits to which they are a part of have
7 already been admitted so these will be admitted
8 along with them.

9 (Whereupon, U.S. WRIR
10 (C-317-1 and C-317-2 were
11 (hereby admitted into
12 (evidence.

12 MR. SACHSE: Your Honor, one other thing
13 on the Cummings question. I assume that if we
14 do get to Dr. Cummings this week that the State
15 will then waive the five-day rule on the
16 exhibits that he will present because we
17 certainly -- We made informal arrangements
18 with the State that they would take his deposition
19 over the August period. We intended to present
20 his exhibits to the State over the August
21 period and to have him as our last witness in
22 the beginning of the September session. We
23 certainly will make every effort to get him
24 here if necessary for this week, though I think
25 this is --

1 THE SPECIAL MASTER: Well --

2 MR. SACHSE: -- pushing it a little bit.

3 THE SPECIAL MASTER: It would be pointless
4 to get him here this week and have you raising
5 objections to anything he says on the five-
6 day rule, so you're -- the ball's in your Court,
7 you can chip it or top-spin it or --

8 MR. MERRILL: I'll hit it straight back
9 Your Honor. We'll waive the five-day rule.

10 THE SPECIAL MASTER: There you are, all
11 right, thank you very much.

12 MR. MERRILL: We'll also waive our right
13 to redepose Mr. Cummings which we had under
14 the little go-around which we had a couple of
15 weeks ago about second depositions. We were not
16 able to do that second round of depositions of
17 Mr. Cummings because none of the three Tribal
18 attorneys were to be available last week.

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1 THE SPECIAL MASTER: All right, Mr. Bliesner,
2 will you stand up, please, and take the oath?
3 Raise your right hand.

4 RONALD D. BLIESNER

5 was called as a witness by the Tribes, and, having
6 been first duly sworn, was examined and testified as
7 follows, to wit:

8 DIRECT EXAMINATION

9 BY MR. ROGERS:

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

11 A Ronald D. Bliesner.

12 Q Spell your last name, please.

13 A B-l-i-e-s-n-e-r.

14 Q Would you give us your address, please, Mr.
15 Bliesner?

16 A Route 1, Box 72K, Logan, Utah.

17 Q What is your business -- is that your home
18 address?

19 A Yes, it is.

20 Q What is your business address?

21 A It's the same.

22 Q What is your -- excuse me, strike that.

23 Mr. Bliesner, what is your educational
24 background?

25 bliesner-direct-rogers

1 A I received a B.S. in Agricultural and Irrigation
2 Engineering from Utah State University in 1971
3 and an M.S. in Agricultural and Irrigation
4 Engineering at Utah State University in 1975.

5 Q Before we proceed any further, Mr. Bliesner,
6 I will show you a copy of a document that's
7 been marked as Tribes' Exhibit No. 12 and ask
8 you to identify that.

9 A That's a copy of my resume.

10 MR. ROGERS: If the Court please, I will
11 pass out copies of his resume to Counsel. Is
12 this the original, Your Honor? Are we keeping
13 that over here?

14 THE SPECIAL MASTER: Yes, for our files.

15 Q (By Mr. Rogers) Mr. Bliesner, did you grow up
16 in a rural setting?

17 A Yes, I was raised on an irrigated farm in
18 southern Idaho.

19 Q Have you had any other experience living and
20 working on an irrigated farm?

21 A I operated my father's farm from the time I was
22 a senior in high school through the completion
23 of my Bachelor's Degree.

24 Q I would like to review, if I could, from your
25 bliesner-direct-rogers

1 earliest point forward your professional experience
2 other than educational experience. What was your
3 first professional job out of college?

4 A My first job after completing my B.S. degree
5 was with Ames Irrigation Service in Twin Falls,
6 Idaho, as a sales and design engineer.

7 Q What sort of work did you do for Ames?

8 A I designed, supervised installation and sold
9 irrigation systems in southern Idaho, northern
10 Utah and northern Nevada. That included design
11 of pipeline networks, farm systems, pumping
12 plants and supervision of the construction.

13 Q Did that involve becoming familiar with how
14 costs of these various pieces of engineering
15 equipment are determined?

16 A Yes.

17 Q What did you do after your experience with Ames?

18 A I returned to Utah State University as a
19 research engineer part-time while working on
20 my Master's Degree, and I was a research
21 engineer for Utah State University then for
22 two years.

23 Q Did you -- what exactly did you do in connection
24 with your work on the research farm?

25 bliesner-direct-rogers

1 A I operated a drainage research farm in Vernal,
2 Utah, conducting research on the effects of
3 irrigation management on the quality of
4 irrigation return flow.

5 Q Following that, what did you move to?

6 A Upon completion of my Master's Degree, I went
7 to work for Superior Farming Company first as
8 an irrigation engineer and later as manager of
9 irrigation services, and their farming company
10 operating approximately 36,000 acres in the
11 central valley of California near Bakersfield.

12 Q Your resume mentioned initiation of a computerized
13 irrigation scheduling program. Could you explain
14 that a little more?

15 A The company had a fairly large acreage of
16 permanent crops, fruit crops, nut crops, grapes,
17 that type of thing. We started a computerized
18 irrigation scheduling program to better manage
19 the irrigation on those units, trying to reduce
20 operating costs of the systems and improve yields
21 through more sophisticated techniques in irrigation
22 management. That program was later expanded to
23 include row crops and surface irrigated tree
24 crops, as well.

25 bliesner-direct-rogers

1 Q I believe your resume also mentioned you were
2 manager of irrigation services for Superior
3 Farming, and was there other computerized
4 irrigation management that you were involved in
5 other than what you just mentioned?

6 A Well, that was the main irrigation scheduling
7 program. We also developed during that time
8 a computerized model for optimizing the cotton
9 production, reducing input costs, gaining better
10 utility in farm equipment, determining the
11 impact of various inputs on yield and trying to
12 make yield projection at early stages in the
13 production cycle.

14 Q Are you still with Superior Farming?

15 A No, I'm not.

16 Q What are you doing now?

17 A I'm a private consulting engineer.

18 Q Has that been up to the present ever since you
19 left Superior?

20 A Yes, from 1978 until the present.

21 Q Could you describe to us to some extent what you
22 have done as a private consulting engineer?

23 A I have conducted optimized irrigation system
24 designs on approximately 30,000 acres of land,

25 bliesner-direct-rogers

1 conducted feasibility studies to determine the
2 practicality of irrigation on some 60,000
3 acres. I was involved in writing a pumping
4 plant design manual for diesel powered pumping
5 plants, I've done design research in optimizing
6 system design, have done hydraulic transient
7 analyses and have developed both hand-operated
8 and computer-operated irrigation scheduling
9 programs for individual farmers and large corporate
10 farms.

11 Q Have you ever testified as an expert witness in
12 litigation before?

13 A I have.

14 Q What was that?

15 A It was in the Aamodt case in New Mexico in
16 January and February of this year.

17 Q Could you spell that?

18 A A-a-m-o-d-t, I believe.

19 Q What was the nature of that litigation?

20 A It was to determine and quantify reserved water
21 rights for Fort Pueblos in northern New Mexico.

22 Q Who were you retained by as an expert witness?

23 A By the United States.

24 Q What was the scope of your assignment?

25 bliesner-direct-rogers

1 A I was to design irrigation systems, and that
2 included wells, canals, on-farm systems for
3 roughly 12,000 acres of arable land on the
4 Fort Pueblos and determine costs associated
5 with those irrigation systems.

6 Q Step back one moment, Mr. Bliesner. What was
7 the general subject of the thesis you prepared
8 for your Master's Degree?

9 A It was the affect of irrigation management on the
10 quality of irrigation return flow.

11 MR. ROGERS: Your Honor, I would respectfully
12 ask the Court that Mr. Bliesner be recognized
13 as an expert in the field of irrigation engineering.
14 I would also move the admission of Tribes'
15 Exhibit No. 12 in evidence.

16 THE SPECIAL MASTER: Does the other Tribe's
17 or United States' Counsel wish to voir dire?

18 MR. CLEAR: No, Your Honor.

19 THE SPECIAL MASTER: Does the State of
20 Wyoming wish to voir dire or Counsel for the
21 defendants?

22 MR. MERRILL: I have just a few questions,
23 Your Honor.

24

25 bliesner-direct-rogers

VOIR DIRE EXAMINATION

1

2

BY MR. MERRILL:

3

Q Mr. Bliesner, at any point in your career have you received any training in benefit cost analysis?

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5

6

A Only briefly in engineering economics classes.

7

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Q Have you received any specialized instruction or had experience in the costing techniques appropriate for use in benefit cost analysis?

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A If you are referring to the costing techniques of determining the cost of irrigation systems, yes.

13

14

Q I notice from your resume that you have conducted a fair number of irrigation feasibility studies.

15

A Yes.

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Q Have any of the feasibility studies that you have performed ever included consideration of the economic feasibility of the installation of an irrigation system?

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A Not that I conducted. That portion that I -- that I did was to determine the costs and that information was then provided to economists to determine economic feasibility.

24

25

Q Of all of the feasibility studies that you have
bliesner-voir dire-merrill

1 undertaken, how many of these projects have
2 actually been constructed?

3 A I'm trying to recall. I'm aware of construction,
4 have been involved with the construction of
5 about 5,000 acres of those studies that were
6 conducted.

7 Q Is that one project, 5,000 acres?

8 A Yes.

9 Q Isn't there --

10 A There are other small projects, several hundred
11 acres for individual farms that have been
12 constructed, but the total is roughly 5,000.

13 There may have been three or four of the total
14 projects that were analyzed that have to date
15 been constructed. Others are scheduled for
16 construction.

17 Q Of the projects which you have done feasibility
18 work on and which have actually been constructed,
19 what is the largest project in terms of irrigated
20 acreage?

21 A It's roughly 5,000 acres.

22 Q Is that project located in Georgia?

23 A Yes, it is.

24 THE SPECIAL MASTER: Where, Mr. Merrill?

25 bliesner-voir dire-merrill

1 MR. MERRILL: Georgia, Your Honor.

2 Q (By Mr. Merrill) Mr. Bliesner, have you ever
3 conducted an irrigation feasibility study prior
4 to this work for lands located in the State of
5 Wyoming?

6 A No, I haven't.

7 Q Isn't it true that most of your professional
8 experience in the design and installation and
9 management of irrigation systems involves
10 systems located in the State of California?

11 A No, it's not.

12 Q What other areas are these systems located in?

13 A I have designed and had some systems constructed
14 in Idaho, Utah, Nevada, Texas, Georgia, Arkansas
15 and have evaluated irrigation systems in all of
16 those areas, as well as Libya.

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bliesner-voir dire-merrill

Q. (By Mr. Merrill). Okay.

A. And I've designed irrigation management programs for California and Georgia. Excuse me, some of those systems designs were in New Mexico as well and Colorado.

Q. Have you ever designed an irrigation management program for a system in the State of Wyoming?

A. No.

MR. MERRILL: Your Honor, I have no further questions, do not object to the qualification of the witness as tendered or to the admission of Tribes' Exhibit 12.

THE SPECIAL MASTER: All right. Mr. Bliesner is recognized as an expert witness in this case for the purposes stated, irrigation engineering.

MR. ROGERS: Thank you, Your Honor, and Tribes' Exhibit 12 is admitted?

THE SPECIAL MASTER: And Tribes' Exhibit 12 is admitted into evidence.

DIRECT EXAMINATION (RESUMED)

BY MR. ROGERS:

Q. Mr. Bliesner, what -- Have you been retained by the Shoshone and Arapahoe Tribes in this case?

A. I have.

Q. In connection with that retention, were you

bliesner - voir dire - merrill
bliesner - direct - rogers

1 retained in association with any other individuals?

2 A. Yes, the retention came through Southwest Research
3 & Development.

4 Q. What is the -- What is the assignment you were
5 given or the directions you were given by the
6 attorneys for the Shoshone and Arapahoe Tribes in
7 this case?

8 A. It was to examine the engineering work, the irriga-
9 tion system design and cost estimates prepared by
10 Stetson Engineers for the future trust lands in the
11 Wind River Indian Reservation; to identify areas of
12 -- or arable lands that had not been included in
13 the irrigation system design.

14 Q. Excuse me, Mr. Bliesner, are those -- Could you
15 identify by name for the Court the five future
16 land project areas you referred to?

17 A. Yes. Those areas we reviewed were North Crowheart,
18 South Crowheart, Riverton East, Arapahoe and Big
19 Horn Flats Units.

20 Q. Is it your understanding that these were lands
21 that were presently not under irrigation and had
22 not been developed for that purpose?

23 A. That's correct.

24 Q. Excuse me for interrupting.

25 bliesner - direct - rogers

1 A. Okay. The second phase after identifying those
2 areas that had been excluded from the original
3 design was to --

4 THE SPECIAL MASTER: Pardon me. From what
5 original design?

6 THE WITNESS: From the design conducted by
7 Stetson Engineers. There were arable lands that
8 were not included in their design. We identified --
9 We were asked to identify the areas that it would
10 be possible to design irrigation systems for, and
11 then we were also instructed to examine the designs
12 conducted by Stetson for appropriateness of costs
13 and designs.

14 Q. (By Mr. Rogers) Let me clarify one thing on the
15 business of additional lands. You reviewed work
16 of HKM only identifying arable land that HKM had
17 done for this case for the United States?

18 A. That's correct.

19 Q. And found arable lands they had identified that
20 Stetson Engineers had not designed irrigation
21 systems for?

22 A. That's true.

23 Q. And then you were instructed to see if there were
24 any additional undesigned lands that might be

25 bliesner - direct - rogers

1 designed for us; is that correct?

2 A. Correct.

3 Q. Were those -- Which project lands were those located
4 in?

5 A. The two major areas that were identified were Big
6 Horn Flats and Stagner Ridge. There are other small
7 parcels scattered throughout the project, but they
8 were not analyzed.

9 Q. So you focused on the Big Horn Flats additional
10 lands and Stagner Ridge?

11 A. Yes.

12 Q. You also said you reviewed Mr. Stetson's design
13 work for appropriateness of design and appropriate-
14 ness of cost.

15 A. Yes.

16 Q. Could you elaborate just a bit on that?

17 A. Our original instruction was to see if there was a
18 possibility of reducing costs on the system designs
19 that were completed by Stetson. Apparently the
20 final costs that had come in were higher than
21 accepted by the Tribes.

22 THE SPECIAL MASTER: I have a question I
23 think should be asked now. The word "appropriate-
24 ness" of designs is interesting in my experience

25 bliesner - direct - rogers

1 in engineering and construction and design work.
2 Appropriateness of design, does that regard ap-
3 propriateness as to propriety or is it engineer-
4 ing correctness or is it economic feasibility or
5 is it aesthetic values? Just what do you include
6 in that interesting adjective?

7 THE WITNESS: Basically, what we were doing
8 in that analysis was to determine if the design
9 that they had designed was a workable design --

10 THE SPECIAL MASTER: Workable.

11 THE WITNESS: -- as an engineering matter.

12 THE SPECIAL MASTER: All right, thank you.

13 Q. (By Mr. Rogers) And then you were also to examine
14 their costs to determine whether they were too high
15 or too low --

16 A. That's correct.

17 Q. -- or exactly right?

18 That would be the second phase then of your
19 assignment?

20 A. Yes.

21 Q. Incidentally, Mr. Bliesner, what were you asked by
22 the Tribes to do with the information you developed
23 or what precise information were you to develop and
24 then what were you to do with it?

25 bliesner - direct - rogers

1 A. My requirement was to develop irrigation system
2 designs for the additional areas that we identified
3 with the associated costs; to analyze the costs and
4 designs of Stetson and, if appropriate, recalculate
5 costs on the basis of the assumptions that we felt
6 were most appropriate for the situation and then
7 to supply that information to Ron Cummings, the
8 economist retained by the Tribes so that he may
9 perform an economic analysis on the cost.

10 Q. Did you understand part of your instruction to do
11 an economic feasibility study on any of this work?

12 A. No, I did not.

13 Q. Thank you. And one last point of clarification.
14 The comparative work on the Stetson system design
15 and cost, was that to be on just the Big Horn Flats
16 area and the Stagner Ridge area?

17 A. No, that was in all areas.

18 Q. All five of the project areas?

19 A. All five of the project areas.

20 Q. Thank you. Those are two areas then, the additional
21 lands for Big Horn Flats and Stagner Ridge and the
22 analysis for system design and costs. Was there
23 any other work that you were asked to do by the
24 Tribes?

25 bliesner - direct - rogers

1 A. Yes. Then upon completion of this work, we were
2 asked to determine the effect of the irrigation of
3 these additional lands on the stream flows in the
4 system, to determine availability of water supply.
5 That was done in two levels, both the impact follow-
6 ing the trust lands as included in HKM's operations
7 study and then also with the addition of the
8 Indian-owned fee lands testified to by Mr. Higgin-
9 son.

10 Q. So, in fact, we will learn later through your
11 testimony, you did, in fact, identify some addi-
12 tional lands in Big Horn Flats and Stagner Ridge?

13 A. Yes.

14 Q. And it was those additional lands, the irrigation
15 for which you were asked to determine their effect
16 on Mr. Billstein's testimony --

17 A. Yes.

18 Q. -- about the operations studies and water avail-
19 ability.

20 Was that restricted to a particular drainage?

21 A. Yes. We restricted ourselves to the Big Wind
22 system since that is the only area we had impact
23 on stream flow, was the only area that we had
24 diversions from, from streams at least.

25 bliesner - direct - rogers

1 Q. And you also then, as an additional step, reviewed the fee
2 lands owned by Indians that Mr. Higginson identified --

3 A. That's true.

4 Q. -- to determine their effect on these flows as well as your
5 additional lands?

6 A. Yes. That was necessary to sort of sum up everything that
7 was going to be diverted from the stream.

8 Q. Again, on the Big Wind system?

9 A. Just on the Big Wind system.

10 Q. Thank you. Were you doing all of this work alone?

11 A. No. We had a team of people that were working on this
12 project. The principal investigators were myself, Dr.
13 Jack Keller and Dr. Lyman Willardson.

14 Q. Could you explain for a moment the roles of these other
15 two gentlemen?

16 A. Yes. Dr. Willardson was charged with the responsibility
17 of the drainage review of the Stetson design. And --

18 Q. As well as drainage costs?

19 A. As well as drainage costs. And Dr. Keller works as a
20 coordinator and strategist in overall planning for the
21 approach that we would use in the designs and analyses.

22 Q. Thank you. All right. If we can move then to the first
23 area that you worked on, that is the examination of the
24 arable lands identified by HKM and the system design of

25 bliesner - direct - rogers



1 Mr. Stetson and Dr. Mesghinna. Could you tell us in a
2 general way what your approach was to determining whether
3 there were any additional lands in the future project
4 areas?

5 A. Well, the first thing that was done shortly after we
6 were first contacted about participating in this case
7 was to review the reports that had been prepared by
8 Stetson and by HKM concerning arability and then irri-
9 gation system designs.

10 It was fairly obvious that the two major areas that
11 we've been discussing, the Big Horn Flats additional area
12 and Stagner Ridge, had significant quantities of arable
13 lands that had not been included in the designs, so that
14 was sort of the first key. Then in mid-May I took a
15 field trip to visit the Reservation. The visit was very
16 short, was to get an impression of the overall area, both
17 of the additional lands that were were looking at to
18 design and the lands that had been included in the
19 Stetson design. I spent a day in the field with Richard
20 Harbour from the BIA.

21 Then visited HKM in Billings to obtain additional
22 information from them on arable lands and any work they
23 had done in investigation for drainage.

24 Then met with Stetson Engineers, principally Dr.
25 bliesner - direct - rogers



1 Mesghinna, in San Francisco to further review the work
2 that he's done and gain additional information that I
3 needed to do the analysis.
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4-1 mn-sm

1 THE SPECIAL MASTER: May I ask a question? Did
2 you and Dr. Mesghinna have careers that crossed prior
3 to this time or were you acquaintances on the campus at
4 Logan or just friends?

5 THE WITNESS: No. Dr. Mesghinna was in school at
6 Utah State after I was. We both attended Utah State
7 and know many of the same people, but prior to this
8 had not formally met. We may have met in passing, but
9 had no professional relationship.

10 THE SPECIAL MASTER: Had no professional relationship?

11 THE WITNESS: No.

12 Q (By Mr. Rogers) After you met with Dr. Mesghinna in
13 San Francisco, what did you do after that?

14 A. Okay, then I returned to Logan, and Dr. Keller and I
15 examined the information we had collected and developed
16 the general strategy, the general approach for the
17 analyses that would be done. We then set up, made ar-
18 rangements for an additional field trip to further in-
19 vestigate the areas that we were concerned with, and
20 the first week in June I spent the entire week in the
21 field examining both the additional lands that we would
22 be designing for and the previously designed lands
23 looking for information that would guide us in the
24 types of irrigation systems we would use, where the

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1 diversion points would be for the additional lands, and
2 then we also with Dr. Willardson spent two and a half
3 days roughly in the field examining the lands from a
4 drainage standpoint so he could physically see the lands
5 and aid in the determination of the natural drainage
6 capability.

7 Following the field trip -- additionally in the
8 field trip we conducted some intake rate tests on Big
9 Horn Flats. Since we were anticipating using center
10 pivot sprinklers, intake rate is a critical issue. We
11 conducted in-place intake rate tests at that time. We
12 then returned to Logan and began the work on the analysis,
13 the systems design and the analysis of the existing sys-
14 tems, working the remainder of June and up to the present
15 on completion of those studies and preparation of the
16 reports.

17 Q. You were asked to prepare a report, then?

18 A. Yes, we actually prepared two reports.

19 Q. What was the first report? Could you describe that?

20 A. The first report is an "Irrigation System Design and
21 Engineering Review of the Conceptual Irrigation De-
22 velopment Plan for the Wind River Indian Reservation".

23 Q. As long as we have done that, Mr. Bliesner, let me show
24 you that and ask you to identify what I have marked for

25 bliesner - direct - rogers



1 identification as -- or have you just identified what I
2 have marked for identification as Tribes' Exhibit Number
3 13?

4 A. Yes.

5 MR. ROGERS: I would like to point out that Tribes'
6 Exhibit Number 13 also contains in the back in the pocket
7 part some ten maps, which I will mark shortly as separate
8 exhibits keyed on number 13. It will be 13-1 through
9 13-10. For the moment we are just identifying the
10 initial report and its textual matters, figures and
11 tables.

12 Q. (By Mr. Rogers) So you have read into the record then
13 the title of Tribes' Exhibit Number 13. Was that report
14 prepared under your supervision?

15 A. Yes, it was.

16 Q. What input did you receive from anyone else working with
17 you, particularly Drs. Willardson and Keller?

18 A. Dr. Willardson principally prepared the narrative on
19 the drainage review analysis of the Stetson plan, and
20 Dr. Keller generally reviewed and made editorial com-
21 ments on the total report.

22 Q. But you were in charge of the final preparation of the
23 report and the integration of all this material?

24 A. Yes.

25 bliesner - direct - rogers



1 Q. In addition, you prepared yourself -- or who prepared
2 the remainder of it that Dr. Willardson did not prepare?

3 A. I prepared the remainder of the report.

4 Q. In connection with the work on the additional lands
5 also, did you identify various system costs associated
6 with the irrigation design of these additional lands in
7 Big Horn Flats and Stagner Ridge?

8 A. Yes, I did.

9 Q. Are they contained in Tribes' Exhibit Number 13?

10 A. Yes, they are.

11 Q. Could you identify just generally where that is located?

12 A. That will be in the first two sections.

13 Q. Well, are there places where costs are listed in tabular
14 form in the report?

15 A. Yes, at several locations.

16 Q. Well, let's strike that and we will come back to that
17 later.

18 A. Okay.

19 Q. Now, as a general overview of all of your assignments,
20 you have basically described what you did to identify
21 the additional lands. Was this roughly the same approach
22 you also took in making the comparative review of Mr. --
23 of the Stetson firm's work in appropriateness of design
24 and cost?

25 bliesner - direct - rogers



1 A. Yes. The field trip and discovery of information was
2 done simultaneously for those two tasks.

3 Q. Is the result of that work also contained in Tribes'
4 Exhibit Number 13?

5 A. Yes, it is.

6 Q. Now, with respect to the work you indicated you have
7 done on the review of Mr. Billstein's operation studies
8 of the water availability, what was your general approach
9 to that?

10 A. We obtained copies of Mr. Billstein's computer runs
11 of the operation study, and also the assumptions that
12 he used in development of that study, descriptions of
13 the control points that were identified in the study,
14 and then applied our diversions and the diversions of
15 the fee lands to that study to determine the effect of
16 the additional diversions and return flows from those
17 diversions.

18 MR. MERRILL: Your Honor, at this time I'm going
19 to object to any more testimony concerning any water
20 supply studies that this witness may have conducted.
21 He was offered and accepted as an expert in the field of
22 irrigation engineering, not in the field of water resource
23 engineering or hydrology or depletion studies or any of
24 those other fields in which we have seen other experts

25 bliesner - direct - rogers



1 come forth and testify as to these matters. I think it's
2 beyond the scope of this witness's competence and ex-
3 pertise to start talking about hydraulic studies he may
4 have performed during the course of his work.

5 MR. ROGERS: Well, Your Honor, I think --

6 THE SPECIAL MASTER: I will rule without having you
7 respond. I believe there is an inevitable overlapping
8 in the science of agricultural engineering, be it irri-
9 gation, hydrology, or the various component parts of the
10 overall field that one spills over into the other some-
11 what. I don't expect this gentleman to give us great
12 testimony on nonconsumption, percentage of return flow
13 and what goes to deep aquifers and what returns to the
14 river system and whatnot, but I think it's sufficient --
15 a few more questions on this line I think will be proper,
16 so I will overrule for the time being your objection.

17 MR. ROGERS: Thank you, Your Honor.

18 Q. (By Mr. Rogers) Mr. Bliesner, I believe you testified
19 that you did prepare a report of this review.

20 A. Yes, I did.

21 Q. I show you what I have marked for identification as
22 Tribes' Exhibit Number 14 and ask you to identify it
23 for the record.

24 A. That's a report prepared by Keller Engineering entitled
25 bliesner - direct - rogers



1 "Estimates of the Effect on Stream Flow from Irrigation
2 of Additional Trust Lands on Big Horn Flats and Stagner
3 Ridge, Wind River Indian Reservation, Wyoming".

4 Q I would like to move now, Mr. Bliesner, into some detail
5 on the actual work you did on identifying additional
6 irrigable lands in the Big Horn Flats' Stagner Ridge
7 area. I believe you testified that you did identify
8 some additional acreage in this area.

9 A I did. There was approximately 17,000 some odd acres
10 of additional arable lands that were identified by
11 HKM that were not included in the systems designed by
12 Stetson Engineers.

13 Q Did you, in fact, design an irrigation system for
14 these additional acres?

15 A For a major, more a major portion of them, yes.

16 THE SPECIAL MASTER: Before you did that, did you
17 find out why Stetson did not include the lands and re-
18 spond professionally to their reason?

19 THE WITNESS: The information that I received from
20 Dr. Mesghinna was that he was instructed from the pre-
21 liminary work that they had done on Big Horn Flats that
22 it would be not an economic project and they did not
23 complete it. There was no engineering reason for not
24 completing the design on Big Horn Flats.

25 bliesner - direct - rogers



1 THE SPECIAL MASTER: Based purely on
2 economics?

3 THE WITNESS: Yes.

4 THE SPECIAL MASTER: That is they excluded
5 arable lands?

6 THE WITNESS: Excluded it, yes.

7 Q (By Mr. Rogers) When we say "purely economics",
8 Mr. Bliesner, what exactly do you mean by that?
9 Do you mean that he felt costs were too high
10 or exactly what?

11 A I understand he received instruction from the
12 economist that he was working with that for the
13 analysis that he conducted, that the costs would
14 be higher than benefits.

15 MR. MERRILL: Your Honor, I object and move
16 to strike the answer.

17 THE SPECIAL MASTER: It comes late. I'll
18 sustain it, but Dr. Mesghinna's in the courtroom,
19 we'll ask him tomorrow or later, undoubtedly.

20 MR. CLEAR: Your Honor, I believe there was --
21 Dr. Mesghinna has already testified to that
22 effect so it's not hearsay.

23 THE SPECIAL MASTER: It's not hearsay. Well,
24 it's close.

25 bliesner-direct-rogers

1 MR. MERRILL: If that's the case, Your
2 Honor, it's already in the record and the
3 testimony is duplicative.

4 THE SPECIAL MASTER: Duplicative, one or
5 the other. But go ahead, Mr. Rogers.

6 MR. ROGERS: Yes, Your Honor.

7 Q (By Mr. Rogers) I ask you, Mr. Bliesner, if
8 you will open up towards the back of Tribes'
9 Exhibit No. 13 and pull out the first two maps
10 that --

11 THE SPECIAL MASTER: First few maps?

12 MR. ROGERS: First two, there are two
13 pockets there, Your Honor, and there are three
14 maps in the first pocket.

15 THE WITNESS: That's the wrong pocket.

16 THE SPECIAL MASTER: Next will be the wrong
17 map.

18 THE WITNESS: That's the wrong map too.

19 THE SPECIAL MASTER: I know, let me get
20 them all out.

21 Q (By Mr. Rogers) I ask you if you would identify
22 what I have marked as Tribes' Exhibit No. 13-1
23 and 13-2.

24 A Those are the two sheets of the maps and they're
25 bliesner-direct-rogers

1 entitled Proposed Irrigation Project, Big Horn
2 Flats Unit, Conceptual Irrigation Development
3 Plan.

4 Q Does these two maps constitute what you designed
5 as the irrigation system for Big Horn Flats?

6 A Yes.

7 Q I would also like to refer you to the --

8 (Inaudible.)

9 MR. ROGERS: I'm sorry, who said what?

10 MR. CLEAR: I said slow up a minute.

11 Q (By Mr. Rogers) Mr. Bliesner, I would also
12 like to direct your attention to the poster
13 board, to what I have marked as Tribes' Exhibit
14 No. 15, and ask you if you would identify that.

15 A That's a composite map of those two sheets that
16 we just previously identified.

17 Q Are there any differences between the two sheets,
18 between Tribes' Exhibit 15 and the maps on
19 Tribes' Exhibit 13-1 and 13-2?

20 A No. The information presented is the same.
21 The only difference is one of them is trimmed
22 so they fit together at the match line.

23 Q And I ask you to do that for convenience of
24 presenting your testimony here today?

25 bliesner-direct-rogers

1 A That's correct.

2 Q Thank you. With reference to Tribes' Exhibit,
3 what has been identified as Tribes' Exhibit 15,
4 however it's convenient for you to do so, would
5 you please identify for us the general features
6 of the design for Big Horn Flats for the
7 additional lands.

8 A Yes, I will. The irrigation system design for
9 Big Horn Flats, first of all there were two
10 alternatives explored for water supply for the
11 project. One was from the Little Wind System
12 with the canal diverting from the North Fork of
13 the Little Wind, and the other was a pumping
14 station from Bull Lake Creek just downstream of
15 Bull Lake Dam.

16 Preliminary analyses of the two approaches
17 indicated first of all that the more reliable
18 water supply was from Bull Lake Creek, and
19 secondly, the cost for diversion was cheaper
20 from Bull Lake Creek. So that option was chosen.

21 The major features included Diversion Dam
22 on Bull Lake Creek, a short canal diverting into
23 Lilly Pond, then a main pumping station pumping
24 water from Lilly Pond through a steel pipeline

25 bliesner-direct-rogers

1 up onto Big Horn Flats. It then enters a lined
2 canal that traverses Big Horn Flats to a point
3 near the highway in the center of the project.

4 Off of the main pipeline and the main canal
5 are individual pumping plants or gravity
6 turnouts supplying water through pipeline
7 distribution systems to individual center pivot
8 sprinklers, for the most part. However, there
9 are three fields of wheel-line sprinkler included
10 to sort of fill in some holes in these three
11 locations (indicating).

12 A total of 9,264 acres had irrigation system
13 designs completed for them on Big Horn Flats;
14 that's the irrigated acreage.

15 THE SPECIAL MASTER: By Stetson or by you?

16 THE WITNESS: By me. And of this you'll
17 notice there is one parcel here of arable fee
18 land. The irrigation system irrigates those.
19 However, for determination of additional acreage
20 and diversion requirement only, the trust lands
21 are included. So there is 9,073 acres of trust
22 land and 191 acres of fee land that are irrigated
23 by the project.

24 Q (By Mr. Rogers) What was the reason that you
25 bliesne-direct-rogers

1 withdrew the acreage from the fee land from your
2 total?

3 A They were included in Higginson's report.

4 Q Does that complete your description of the --

5 A That's the general description project features.

6 THE SPECAIL MASTER: I'd like to see where
7 the additional acreage is compared to where the
8 existing Stetson acreage was for Big Horn Flats.
9 Your map includes all of Big Horn Flats, does
10 it not?

11 THE WITNESS: No, it doesn't.

12 THE SPECIAL MASTER: A combination of the
13 two.

14 THE WITNESS: This just shows the arable
15 lands of the addition. There are parcels off the
16 map in this direction on the Big Horn Flats Unit
17 of the Stetson (indicating).

18 There are parcels in this area, I believe,
19 and then there are some over on the other side
20 of Big Horn Flats that don't show on this map
21 either (indicating). So this is sort of the
22 center, the parcels that were included by Stetson
23 are on either side of this piece.

24 Q (By Mr. Rogers) All right, Mr. Bliesner, let's
25 bliesner-direct-rogers

1 run through exactly how you designed this system
2 then. What was your -- What was your first step
3 in designing this system for the Big Horn Flats
4 additional lands?

5 A The first step is to determine the irrigation
6 water requirements for the development, and for
7 this the irrigation consumptive use used by
8 Stetson in their design was used. The highlands
9 crop mix identified by Stetson in their report
10 was the crop mix used since the elevation for
11 the most part is above 5,900 feet here.

12 Q Did you use the same climatic zone?

13 A The climatic zone used here was the Burris
14 Station since it was closest in elevation and
15 location to the project and felt to be most
16 representative of the consumptive irrigation
17 requirements or the demands that would be
18 calculated for this area.

19 And the irrigation consumptive use require-
20 ments by month appear in Table 1 of our report
21 and are essentially the same as those from
22 Stetson for that crop mix, averaging 20.0 inches
23 per year consumptive irrigation requirement.

24 Then the next step was to determine the
25 bliesner-direct-rogers

1 farm delivery requirement. To that we applied
2 the irrigation efficiency for the individual
3 systems. The side roll sprinkler systems we
4 used the same efficiency as Stetson did, 67
5 percent for the seasonal efficiency.

6 Q Refers to three special tracts in your system
7 design?

8 A Yes. Then on the additional lands for the
9 center pivot lands, since the bulk of the area
10 is in center pivot design, we determined
11 additionally the efficiency for center pivot,
12 and center pivots operate more efficiently than
13 wheel lines do or side roll laterals in which
14 the uniformity of water in center pivot is much
15 better, it's more uniform.

16 The irrigation efficiency used for center
17 pivots for seasonal efficiency is 75 percent in
18 this project. That gives us farm delivery
19 requirement for center pivots of 26.7 inches
20 per acre. For side roll laterals, 29.9 inches.

21 Now, having to go on and determine the
22 diversion requirements there are two other
23 elements that are included in the efficiency.

24 One is the distribution efficiency, the other is
25 bliesner-direct-rogers

1 conveyance efficiency. Here our definition of
2 distribution efficiency differs somewhat from
3 the Stetson concept. The distribution system
4 is taken as everything downstream for the main
5 pumping plant. The reason that is so is because
6 we had to apply energy to all of that water, so
7 this becomes the distribution system from that
8 main pumping plant to the main pipeline, the lined
9 canals and pipeline distribution systems. Since
10 this is a lined canal and seepage losses for
11 all practical purposes are eliminated, the
12 irrigation efficiency for that is taken to be
13 95 percent since the rest of the system is all
14 closed. Now, the conveyance efficiency is
15 applied to that to determine the diversion
16 requirement and the conveyance efficiency is the
17 efficiency of this unit here, whatever leakage
18 we would have out of this earth lined canal and
19 the Lilly Pond, which is the forebearer here,
20 since this is a very short canal, we use 95 percent
21 efficiency for the conveyance efficiency.
22 The diversion requirement then, by applying these
23 numbers, is approximately 20.6 inches per acre,
24 and there is a typographical error in the report.

25 bliesner-direct-rogers

- 1 Q. (By Mr. Rogers) Could you identify where that is?
- 2 A. It's on Page 5, top of the page. The report indicates
- 3 29.2 inches. That is a typographical error and it should
- 4 read 29.6 inches.
- 5 Q. Is it on the second line on Page 5?
- 6 A. Yes. And that gave us the diversion requirement then for
- 7 designing the systems.
- 8 Q. In reviewing the system then, would it now be appropriate
- 9 to move to each of the system components, or design
- 10 features?
- 11 A. I think that's probably the easiest way to describe it.
- 12 Q. Can you then do so and tell us how you went about design-
- 13 ing these various features?
- 14 A. Okay. If I may, I would like to do that and then also
- 15 give the costs of each of the units as we go through so
- 16 we don't have to go through it again, if that's satis-
- 17 factory.
- 18 Q. I would like you to do that and as we go through, also
- 19 where capacities do apply to the various features, if
- 20 you could identify the capacities as well as their costs.
- 21 A. Okay. Beginning here at the diversion, there is a 1350-
- 22 foot long canal designed for 147-foot capacity, delivering
- 23 water to Lily Pond. That canal and the diversion dam on
- 24 Bull Lake Creek are both estimated to cost \$730,000.
- 25 bliesner - direct - rogers



1 MR. MERRILL: Your Honor, due to the narrative
2 nature of what I understand his answer is going to be,
3 I will interpose an objection now to the witness testi-
4 fying to the costs of each of the significant features
5 of the irrigation and delivery system since there is no
6 foundation as to what components are involved, what the
7 unit costs of those components are and how the costs
8 were determined.

9 THE SPECIAL MASTER: I'm inclined to sustain that.
10 I don't like to go through all the -- I'm not sure,
11 first, that -- Is this the only witness that is going
12 to testify as to costs?

13 MR. ROGERS: Well, Your Honor, he's going to testi-
14 fy as to costs of the system. He is not performing the
15 economic analysis, however. It is our intention as we
16 go through these, when we reach that point of discuss-
17 ing the first item of cost, to discuss at that point
18 how he arrived at it. If that is appropriate, I will
19 go ahead and will show now --

20 THE SPECIAL MASTER: All right, we will overrule
21 the objection for the time being, but I'm beginning to
22 believe that testimony on costs of new irrigation
23 systems is going to be so uncertain and so fraught
24 with the inevitable questions as to financing, feasibi-
25 lity of financing, costs -- what dollar costs are we



1 talking about, 1981 dollars or what that will be at the
2 time of construction? It's a fuzzy field.

3 MR. ROGERS: The witness is prepared to tell us that.
4 Maybe it would be appropriate if we --

5 THE SPECIAL MASTER: Go ahead.

6 THE WITNESS: Okay. The unit costs used in the system
7 are all 1979 costs, from the same basis as the Stetson
8 design as far as the year the costs were taken. The unit
9 costs that are included in the major components appear in
10 the appendix of this report. Some of the unit costs, how-
11 ever, are not included for lump sum items, such as diver-
12 sion dams, some of the major canals and that kind of
13 thing. If necessary, we can take the time to go through
14 and generate the individual unit's costs and the volumes
15 involved to develop those costs.

16 MR. MERRILL: Your Honor, at this point I'm going to
17 interpose another objection to any further discussion of
18 costs since it now appears the costs are going to come out
19 in 1979 dollars. As an evidentiary matter, the basis of
20 my objection is the costs of 1979 dollars don't have any
21 probative value with respect to a system that isn't built
22 in 1981, and if it's ever built, would be built sometime
23 afterwards, and the costs are going to be obviously much
24 higher than 1979 costs.

25 As the Court has pointed out, we have enough problems



1 dealing with the accuracy of the costing of the components
2 of the systems and the whole setup of vagaries that you
3 apply to economic analyses, but it aggravates the problem
4 to go back a couple of years in time when costs were much,
5 much lower, since we have had the last two years a very
6 high rate of inflation in this country, particularly with
7 respect to costs of things used to design systems like
8 this, and I think that it's not probative of anything to
9 come in and talk about 1979 costs. Why don't we talk
10 about 1930 costs or 1968 costs? I think that the costs
11 that we are talking about to evaluate these systems ought
12 to bear a little more realism to some time that these pro-
13 jects are projected to be developed. Maybe 1981 costs
14 would be all right, maybe 1985 costs would be even more
15 realistic.

16 THE SPECIAL MASTER: I see that we are going down
17 that same road again because if we do that, we have to
18 go into the benefits and what is hay going to sell for
19 in 1986, and we are back through the same stuff we have
20 been through.

21 I want to hear the other side of this.

22 MR. SACHSE: Yes, I want to speak to this because
23 I was here during -- as you know, we have divided to
24 some extent which lawyer has covered which witness and
25 so forth, and I was here during the entire testimony of



1 Dr. Mesghinna. I don't know whether Mr. Merrill was or
2 not, but I think he was. If he was, then his objections
3 at this point are particularly surprising because all
4 this was gone through in the testimony of Dr. Mesghinna.
5 What we have asked Mr. Bliesner to do is essentially the
6 same thing that Dr. Mesghinna had been asked to do.
7 Where he is presenting plans for areas left out of the
8 Stetson report, he's gone through the exact same proce-
9 dures that Dr. Mesghinna went through in planning his
10 part, but these are plans for pumping and center pivot,
11 and he's explaining that.

12 But if we had come in with figures from a year other
13 than 1979, there would have been no way to compare them
14 with the testimony already admitted for Dr. Mesghinna's
15 work and for Mr. Dornbusch's work.

16 So it's not in any way to seek any advantage, but
17 simply to have comparable figures to the figures already
18 fully admitted in evidence that Mr. Bliesner was asked
19 to do 1979 figures. That also means, of course, the
20 returns, which will be discussed by Dr. Cummings, have to
21 be in 1979 figures, too.

22 So the point I'm trying to make is there's nothing
23 new in what Dr. Bliesner -- Mr. Bliesner is testifying
24 to. He's following the same procedures in testimony,
25 presenting the same kind of evidence that already has



1 been admitted into evidence for all of the Stetson testi-
2 mony, including the costing figures. It's the engineer
3 who figures out how much this would cost, how much that
4 would cost, how much the other thing would cost. The
5 engineer then supplies those figures to the economist.
6 We have not differed at all from that procedure.

7 THE SPECIAL MASTER: I appreciate that. If there's
8 one thing in life that's worse than making one error, is
9 making two errors, and I don't want to do that if I ruled
10 improper the first time. But I do believe we are at the
11 crux of the business of additional lands now, and that's
12 going to be the costs and that's the reason they were ex-
13 cluded in the first place was the costs, so maybe the
14 proof of this is going to require some particularly larger
15 effort or a higher test, a higher degree of test of
16 acceptability since it's already been rejected once.

17 I think I'm going to reserve ruling on this and go
18 ahead and hear some of this.

19 MR. MERRILL: Your Honor, I would like to point out --

20 THE SPECIAL MASTER: To see how thoroughly these costs
21 were gone into as to the -- and then, of course, you have
22 your chance to try your lawsuit as far as if you believe
23 them or not.

24 MR. MERRILL: We will, Your Honor. I would simply
25 like to state for the record that I was here during the



1 beginning of Dr. Mesghinna, but I did not conduct the
2 cross, so I don't know if Mr. White made an objection on
3 those grounds. I did make an objection on Mr. Dornbush's
4 testimony based on the use of 1979 figures.

5 MR. CLEAR: Your Honor, I'm getting a little confused
6 now. Now, he's saying we have to go to a future date. Now,
7 when I recall Mr. Billstein was testifying, the objection
8 was he was using current stream flow information and not
9 1868 stream flow information. Now, the State started this
10 lawsuit, and if they didn't want to get involved in this,
11 they didn't have to do it. What we are talking about here
12 is practicably irrigable acres. The State shows the date
13 they started this fight, and I think we are entitled to
14 put on evidence on that date.

15 THE SPECIAL MASTER: Well, on those harmonious notes,
16 let's take a ten-minute break.

17 (Whereupon a short recess was
18 taken.)

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1 THE SPECIAL MASTER: Okay. Shall we resume, please.

2 I've reserved the ruling so go ahead with the testimony.

3 Q (By Mr. Rogers) Mr. Bliesner, before we proceed in
4 the manner I asked you, I wonder if you could tell us
5 why you chose, as a general proposition, since we've --
6 it's the first we've heard in this case, why you chose
7 center pivot sprinkler irrigation for this additional
8 land?

9 A With this approach, with the diversion out of Bull Lake
10 Creek, there is a significant amount of energy involved
11 in lifting the water up to the plateau. How efficiently
12 you use that water once it gets there has a great bearing
13 on the cost because the more inefficient you use it
14 as it gets to the top the more water you're going to
15 have to pump up there and the more it's going to cost
16 you.

17 So what we did, we looked for an irrigation system
18 that was a low energy requirement system, that would
19 operate at low pressures, that operated very uniformly
20 so we would keep our efficiencies high and that was a
21 reasonable approach for the lay of the land. And center
22 pivots are sort of a natural for that big flat. They
23 have all of those components, they are the highest
24 efficiency method of sprinkler irrigation available.

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1 They operate at the lowest pressures of this sprinkler
2 system available and they're ideally suited to the
3 way the lands lay.

4 Q Let's go back to the river, the initial diversion and
5 I'll ask you, instead of what I asked initially, if
6 we could review the design features of this system,
7 just exploring their capacities and why you chose what
8 you did, not get into cost at the moment.

9 A Okay. If I remember right, we were -- we had just
10 talked about the canal and the Diversion Dam. We have
11 designed a pumping plant here to operate off of Lily
12 Pond, and it is designed as a wet sump type pumping
13 plant with automated trash racks (Indicating).
14 It will employ line shaft turbine pumps and included
15 in the design, it's an open type pumping plant with
16 just a shade structure, it's not an enclosed pumping
17 plant design; very typical of river pumping stations
18 all up and down the Snake and the Columbia River.

19 Included in the design is surge control equipment
20 for supplying water through this main pipeline. What
21 happens when you have a major pipeline that increases
22 in elevation very rapidly, and actually crosses a
23 couple of summits in here, then drops back down and comes
24 back up again on the flat, if something happens to

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1 these pumps and they shut down suddenly to you, you
2 have a large volume of water, 140 second feet moving
3 up the hill at five feet per second. If you don't have
4 some protection for that, that moves up the hill and
5 it stops at some point and turns around and comes
6 back down, and without surge protection you end up with
7 a pumping plant in Lily Pond instead of at the side of
8 Lily Pond.

9 So we went through a very rigorous analysis in
10 determining the surge requirements for this design,
11 and what we ended up with is five air chambers. There
12 will be nine pumps, 1,000 horsepower pumps. They will
13 pump into the main line through a manifolding
14 assembly and there will be five air chambers there.
15 And an air chamber operates like a captive air tank
16 on a private water system. If you have a well at
17 your house or have been associated with those where
18 you have a pressure system and there is a pressure
19 tank, the pump comes on, pumps into the tank and the
20 air pressure will deliver water out of the tank. Well,
21 the air tank works the same way. When the pumps
22 shut off the water is going. What happens is the
23 water then displaces out of the tank into the line
24 and gradually slows the flow of water as it goes up.

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1 Then when the flow reverses, the tanks are now full
2 of air, they act like a giant shock absorber, when
3 the flow is reversed, they absorb the shock on the
4 river's flow. That would do it if we just had a
5 straight uphill line that discharged at the top, but
6 this line comes over two summits, one right here, then
7 it drops down a few feet, then summits out again here
8 near this pumping plant A as indicated on Tribes'
9 Exhibit No. 15 (indicating). Then drops again down
10 Winchester Draw and exits at elevation 6,220 here
11 (indicating).

12 THE SPECIAL MASTER: A and B also have pumps?

13 THE WITNESS: Yes. Those pump out of the main
14 line; they're booster pumps to supply the additional
15 pressure to get water to those locations shown.

16 Now, the additional surge control features that
17 are included, we have at each of those points an open-
18 ended surge tank with an altitude valve for filling.
19 It's like a float valve on the thing, so you got giant
20 tanks up there full of water, so when the system
21 shuts down what it tries to do is separate the water
22 column at that point and water drops both ways. Well,
23 you don't want that to happen because you get large
24 negative pressures in the pipeline and then those

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1 will reverse and become positive pressures and a
2 tremendous surge develops. So what happens when
3 the pressure there drops down to atmospheric pressure,
4 in other words, zero gauge pressure, the water flows
5 from that tank into the system, filling it up until
6 equilibrium is reached so you don't have column
7 separation at those points.

8 And the cost to install these surge tanks and
9 the air chambers here are included in the pumping
10 unit costs and are designed for the pumping plant.

11 Now, this canal, this main pipeline then with the
12 routing shown on Exhibit No. 15 is designed to be a
13 steel pipeline coal tar enamel coated and buried, 72
14 inches in diameter, half-inch wall thickness applied.

15 Discharges here into the canal at elevation 6,220.

16 The canal is designed as a dead level canal.
17 There is no gradient on the canal. The flow is
18 generated by gradient of the water surface. The
19 reason for that is there is no place to waste water
20 out of the downstream end of the canal, no convenient
21 place. If there is an operational accident, the most
22 logical place to waste is back into Winchester Draw.
23 The other reason to design it at dead level is because
24 it can be automated to operate very efficiently. It

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1 acts like a large reservoir then. So with very simple
2 liquid level controls at this point in the canal,
3 controlling points at this point, you can regulate
4 the number of points that are operating and maintain
5 a constant water level in the canal, thereby there are
6 no spillage losses in the canal.

7 The pumps operate to keep this thing between
8 set levels and that's one of the reasons we can keep
9 such high efficiency on the canal. Again, once you get
10 it up there you don't want to spill it back on the
11 bottom. The wasteway is included here, again a 72-inch
12 steel line.

13 Q When you identify, when you say "here" on the record,
14 where is it on the map you're pointing?

15 A Okay. It's located in Section 33 and is indicated as
16 labeled on the Exhibit No. 15. This is an emergency
17 wasteway only, in case all of the pumps fail on the
18 individual pumping plants, the main pumping plant
19 continues to operate and the liquid level control
20 levels fail, the water will waste back into Winchester
21 Draw.

22 THE SPECIAL MASTER: And stay there?

23 THE WITNESS: Well, you'll actually have whatever
24 flow rate you're pumping at the present time move down

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1 Winchester Draw and move into Big Wind, but that design
2 would be akin to an emergency spillway on a dam which
3 generally is not protected from erosion because it's
4 emergency in nature.

5 Other than just an apron of riprap at the outlet
6 of the wasteway, there is no protection features designed
7 for Winchester Draw. It's supposed to be a very un-
8 likely event. It's better to waste in there rather than
9 down through the middle of the arable lands.

10 Okay. Then each of these pumping plants were
11 separately designed and if you'll look in the report
12 at figures -- excuse me, Figure 1 --

13 Q (By Mr. Rogers) Page 8?

14 A Page 8 in the report, you'll see some typical layouts
15 for pumping plants. Now, these individual pumping
16 plants will, in all probability, not look exactly like
17 this. Each one will be configured slightly different
18 but the same components will be included in the same
19 one.

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* * * * *

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1 THE WITNESS: We begin at the canal with the
2 headgate supplying water through a 24-inch concrete
3 pipeline to an automatic trash rack, which then spills
4 water into a small settling basin, and in the settling
5 basin is a submerged screen. That is then connected
6 to the main pump stand in the case of the upper unit,
7 which is a turbine pump installation, then the pump
8 is set in that reinforced concrete pipe pump stand.
9 There is a shade structure over the pump. Then included
10 on the discharge side of the pump there is a flow
11 meter, a pressure regulating valve. There's a butterfly
12 valve shown there, and a continuous acting air vent.

13 Also included, but not shown on the drawing is the
14 pressure relief equipment in case something should
15 happen and shut off all the irrigation systems downstream
16 and the pump continues to operate, then there's a
17 pressure release valve in, in some cases at the pivot
18 locations and some cases at the pump location, depending
19 on where the highest pressure is.

20 Now there are two types of pumps shown here in
21 the drawing. Depending on where you are at on the
22 canal, you will use a different kind of pump. The
23 upper pump in this drawing shows a turbine pump, and
24 that particular installation is somewhat more expensive

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1 than a centrifugal pump shown in the lower installation.
2 So where you can, it's advantageous to use the
3 centrifugal pump. However, centrifugal pumps are not
4 self-priming unless their water supply is above the
5 case of the pump, the Volute case, so therefore, any
6 location we have where we are on the downhill side of
7 the canal, we have used centrifugal pumps with what is
8 termed flooded section or the water surface elevation
9 above the Volute case of the pump. Again, this is a
10 measure to reduce cost.

11 Then anyplace we're on the uphill side, since it's
12 a little difficult to excavate out and provide drainage
13 for the pump and whatnot, we use the lined shaft turbines
14 as shown in the upper portion of Figure 1. Then in
15 addition, we have some booster pumps indicated on
16 Exhibit No. 15 as pump numbers A, B, then there are two
17 other booster pumps, K-1 and K-2. Those are in line
18 centrifugal boosters where the pipeline is supplying the
19 system directly upstream, and then a pipeline coming
20 out of the downstream end. So what you do in Figure 1
21 there is eliminate the settling basin and that structure
22 assembly and connect it directly into the main line.

23 Q Mr. Bliesner, before we move to another area, have you
24 included in your report, Tribes' Exhibit 13, specifications
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1 for certain of these features that we have already
2 gone through, such as I don't believe you mentioned
3 capacity lists in tabular form for the main pumping
4 plant.

5 A Yes, excuse me. Back when we were talking of the main
6 pumping plant, the design specifications of that
7 pumping plant appear in Table 2 on Page 6 of the report
8 listing discharge capacity, total dynamic head, total
9 horsepower, pump efficiency, the number of pumps, the
10 size of pumps, the types of pumps that will be used.

11 Q This is the main pump that actually carries the water
12 from roughly the water level at Bull Lake Creek up
13 the hill?

14 A That's true, it's the main pumping plant at Lily Pond.

15 Okay, then the individual specifications for these
16 pumps we have just been discussing appear in Table 3
17 on Page 7 listing the type of each of those, whether
18 it's a booster pump, whether it's a centrifugal canal
19 pump or turbine canal pump, showing the design capacity
20 and head requirement in nominal horsepower or motor
21 horsepower of each of those units.

22 Now, from the pumping plants we go into the pipe-
23 line network. The design of the pipeline network was
24 done utilizing a computerized optimization pipeline
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1 network design program. If I may, I have a reproduction
2 of I believe it's Figure 2 in the report.

3 MR. ROGERS: On Page 10, Your Honor.

4 THE WITNESS: The figures demonstrate the rationale
5 behind the optimization program, and we use a term
6 called life cycle costing here.

7 Q (By Mr. Rogers) Excuse me. For purposes of identification,
8 you have prepared a blowup or a larger drawing of
9 Figure 2 from Tribes' Exhibit 13, and is that what I
10 have identified as Tribes' Exhibit No. 16?

11 A It is.

12 Q You were saying about life cycle cost.

13 A Until pipeline designs are in, any system design, life
14 cycle costing applies to any system, any engineering
15 system that has both capital input and operation
16 maintenance inputs, specifically energy inputs in this
17 case. What you do then in life cycle costing is you
18 are looking for the minimum annualized cost of that
19 system-- well, in a pipe system that is related to
20 the pipe size that you are using for a given flow rate.
21 So in the program it operates like this: As the pipe
22 size increases for a given flow rate, the fixed cost
23 goes up, obviously. You are buying bigger pipe, it's
24 more expensive. But as the pipe size increases, the

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1 power cost goes down because it takes less energy
2 to overcome the friction in the pipeline to push water
3 through a big pipe than it does in a small pipe.

4 What happens then is you are looking then for
5 the annualized fixed cost plus the annual power cost,
6 and you are looking for a point that gives you the
7 minimum sum of those two. Okay, our computer program
8 essentially applies that technique to design what is
9 termed as the critical leg in a pump -- or excuse me,
10 a pipeline network. For example, if we take this
11 pipeline network here (indicating), which supplies
12 from Pumping Plant G, it supplies Field Numbers G-1,
13 G-3, G-2 as indicated on Exhibit No. 15. What the
14 program will do, based on the flow rates in the individual
15 pipelines, it will determine the most economic pipe
16 size to use in each of those cases. It will then
17 calculate the pressure requirements at each point and
18 it will identify the legs or the pipeline segments
19 that are in the critical path, where the most energy
20 is required. Then it will find out what the excess
21 pressure is in one of these other legs, and in this
22 case the leg to G-1 would be the highest pressure leg
23 since it is discharging at a higher elevation.

24 Then the program will come in and look at all of
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1 the other segments and determine how much excess
2 pressure there is available in those. Now, that's
3 excess pressure that you have had to generate and had
4 to supply at this point (indicating) to end up with
5 enough pressure out at the distal end. So the excess
6 available energy you have here you can't do anything
7 with. So the logical thing is to put a smaller pipe
8 in there and burn it up since you don't need it down
9 here. (indicating) to operate this pivot. If you put
10 a smaller pipe in, then it's less expensive. So the
11 program goes in and squeezes down these pipe sizes
12 in the areas it can within a velocity limitation of
13 six feet per second. So what we end up with at the
14 end result is the least cost pipe network for those
15 particular conditions, and you have to include what
16 the pumping requirements are, how many hours a year
17 the pump operates, what the energy cost is, and we
18 include the interest rate and the life of the pipe
19 systems to arrive at the annualized cost. All of that
20 goes into the program, and each of these pipeline
21 networks that you see shown on Exhibit No. 15 were
22 designed utilizing that computer program.

23 Okay. Now, the next step, we go on down to the
24 individual field requirements, the on-farm irrigation
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1 systems. We applied some fairly specialized design
2 techniques to determine the optimum center pivot
3 for the particular conditions that we have here. As
4 I mentioned earlier, when we were in the field we
5 conducted some in-place infiltration tests. A graduate
6 student at Utah State University has developed a
7 piece of equipment that simulates sprinkler irrigation
8 in a small contained unit, so we can determine what the
9 intake rate of those soils are under sprinkler
10 conditions. We took that piece of equipment to the
11 field and set up in six locations and ran three tests
12 to determine intake rate. What happens is this unit
13 has a small spray nozzle and it has a micro-processor
14 that operates it to obtain a given application rate
15 by pulsing the sprinkler on and off, and you set this
16 thing up and you operate it at a given rate, and it's
17 generally at a fairly high rate since we are simulating
18 center pivot operations, and they apply water at a
19 high rate.

20 We operate that at whatever rate we have set until
21 we start to get ponding on the surface, then we note
22 the time to ponding. We run that for three individual
23 rates, and when we get done we end up with a relationship
24 that looks like that one shown in Figure 3 on Page 13

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1 indicating the time to ponding for those application
2 rates of the various sales. This Figure 3 happens
3 to be the average of all of those tests that we ran.

4 THE SPECIAL MASTER: But none of those tests were
5 run on this specific soil?

6 THE WITNESS: Yes.

7 THE SPECIAL MASTER: They were?

8 THE WITNESS: They were run at locations indicated
9 by the triangles on Exhibit No. 15. You will see we
10 were in Sections 35, 34, Section 4 and Section 11 of
11 Township -- well, excuse me, there are two different
12 townships.

13 MR. ROGERS: There are two different townships
14 there.

15 THE SPECIAL MASTER: K-5 is sprinkler?

16 THE WITNESS: We are in Township 2 North, Range 2
17 West, Section 11 and Section 4. We are in Township 3
18 North, 2 West in Section 35 and 34, and we are in
19 Range 2 North -- excuse me -- Township 2 North, Range 1
20 West with Test No. 6, which is in Section 11, and we
21 are in Township 3 North, Range 1 West with Test No. 5,
22 and that's in Section No. 34. Those are the six
23 locations where we actually ran tests in the field
24 with this equipment on that specific soil in place.

End 25

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1 Q (By Mr. Rogers) Just for clarity, again, Mr. Bliesner,
2 the sites of intake rate tests are where the triangle
3 appears?

4 A. That's correct. It's indicated in the legend.

5 Q Not the squares that had the letters in them. Those
6 refer to the pumping?

7 A. That's correct, and circles with the numbers in them
8 refer to the field numbers.

9 Okay. We took that information, then generated this
10 relationship that is shown in Figure 3 and we then applied
11 that to another computer model to simulate the operation
12 of a center pivot on that type of soil. And if I may,
13 we have, for demonstration purposes, developed a graph
14 that's labeled Tribal Exhibit Number 17, entitled "Center
15 Pivot Operation Simulation".

16 Q Mr. Bliesner, does that graph appear in the report?

17 A. No, it does not.

18 Q Thank you.

19 A. Now, that intake rate function that you see on Figure 3
20 appears on that figure as a straight line, that is a log
21 log plot. It's a power function, so on linear scales it
22 appears as a curvilinear line and in a general sense
23 this is the shape or the form of that intake function.

24 What happens now in our computer simulation is we
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1 then operate a center pivot across that point. The maxi-
2 mum point of application rate on a center pivot is right
3 out at the end because that piece of system is covering
4 more ground than any other piece.

5 So that is the point that we're simulating. Okay.

6 What happens then is we start out at time zero and
7 as this center pivot passes the application rate at the
8 leading edge of the sprinkler pattern it's fairly low,
9 the water is just starting to hit the ground out there
10 in the front where the water is reaching. As you come
11 closer and closer to that point you're getting closer
12 and closer to the sprinkler and the rate is increasing.

13 Well, for -- for simulation purposes this pattern
14 is most closely represented by an ellipse. So that
15 shape is indicated as an ellipse in the model.

16 What happens, we start out in time zero and appli-
17 cation rate is considerably lower than the intake rate,
18 but as we put more water on, the intake rate decreases
19 very rapidly and we get over here at some point in time
20 where the application rate may actually exceed the in-
21 take rate. And then as the pivot passes on past, then
22 the application rate drops off again at the tailing edge
23 of the sprinkler pattern.

24 Okay. Where those two curves overlap right there
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1 is the required surface storage.

2 Now, if you've watched center pivots operate closely
3 at all, if you stand out right behind the system as it
4 passes, you'll notice water standing around on the field
5 in nearly every case. And that's a very common technique
6 to see, it's not very long before that water disappears,
7 but there are some limits on how much water you can store
8 in that surface microtopography, the little dents and
9 dips and holes in the ground.

10 Several studies have been conducted. One study
11 that is referenced in the report by Dillon indicated sur-
12 face storage could range between a tenth of an inch and
13 five-tenths of an inch, depending on how much slope
14 you have.

15 Another study that was conducted by Gale and Skaggs,
16 did a very detailed analysis of the surface storage on
17 weather bedded lands. They took corn fields in North
18 Carolina or someplace and had the nice level beds and
19 the furrows, and then they let rainfall occur on it all
20 year and then after, harvested, and all the trucks run
21 across it and everything, and the tractors, then they
22 determined that the minimum amount of storage that was
23 available on the average was .04 inches.

24 Well, on the Big Horn Flats area we have no row
25 bliesner - direct - rogers



1 crops, so it's all -- it's either grain or alfalfa crops,
2 so the microtopography is more conducive to holding water
3 there. It's not smoothed off like a bedded surface is.
4 So we have an opportunity to store more water. In the
5 study we set a maximum limit of .05 inches as the storage
6 requirement we would allow.

7 Okay. Then we operated this simulation program to
8 determine the maximum length of system we could have at
9 each of the different sprinkler configurations that we
10 used.

11 Now, I talked earlier about the pressure requirements
12 of center pivots being very low these days. Well, there
13 are several concepts in center pivot sprinkler design.
14 You have the low pressure sprinklers which are just a
15 single line of spray nozzles on the system. Okay. That's
16 a very low pressure system, but it has a very high appli-
17 cation rate because it doesn't spread the water over a
18 very wide area.

19 The next level then to go to to keep the pressure
20 low, yet get a large area, one of the techniques used
21 is to put booms across the center pivot's bands with
22 several sprinklers on them, smaller nozzles. We spread
23 the water out and apply it uniformly over the boom.

24 Okay.

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9-5

1 That was the next level that we looked at. And
2 the third and final level was intermediate pressure low
3 angle impact sprinklers, which have the widest spread
4 of all, and those were used only in the area on the east
5 end of Big Horn Flats where we had sufficient pressure
6 available from gravity to supply the pressure required
7 for the higher pressure requirement systems.

8 The reason we do that is they get a little larger
9 area coverage, we can use a little larger system and
10 they're a little cheaper since you don't have to put
11 booms on. So where we had pressure available we used
12 those.

13 Okay. We determined then for, for each of those
14 configurations what the longest length of system we
15 could have and it turns out that for the spray boom
16 concept, for one example, 1660 feet or 189 acres of
17 irrigated area was the maximum system length. So in
18 areas where we could only use spray systems, then that
19 was the maximum length used.

20 Some of -- of the center pivots are actually
21 smaller than that, but depending on what the field
22 configuration was. Obviously you want to use as long
23 a system as you can within limits because the longer
24 the system is the more acres of irrigated ground

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1 you have per unit length of system and their initial
2 cost.

3 You also hit a point of diminishing return on long
4 systems if you get too long because the head loss gets
5 too high in the system. And we analyzed this in this
6 case and we're fortunately on the economic side of the
7 low point.

8 Okay. That determined the maximum length. Then
9 we applied the same life cycle costing techniques from
10 the computer design program for pipeline network design
11 to determine the pipe sizes in the center pivots. And
12 this is something that is just starting to be done
13 now among center pivot manufacturers. We've been de-
14 signing systems this way for about five years now, since
15 center pivot manufacturers are now making center pivots
16 with different sizes of pipes, you have the same option
17 in center pivot design that you have in pipeline net-
18 work designs. You can determine the most optimum pipe
19 size for the flow rate in the system.

20 So we apply again another computer program to de-
21 termine the pipe sizing of each of these pipes.

22 Now, the results of the general systems specifica-
23 tions for the center pivots appear in Table 4, and those
24 are all of the lengths of the systems that are used.

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1 And that lists the length of eight inch pipe, the length
2 of six and five inch pipe, the type of sprinklers, the
3 pressure requirement at the pivot point. And you notice
4 there's a column there that says with regulators and
5 without regulators. If you have those very low pressure
6 center pivots where the minimum pressure at the distal
7 end is 15 psi, and you have a small change in elevation
8 of, say ten feet, it can significantly affect the dis-
9 tribution of the water under that system. It will reduce
10 the pressure and when it comes on the high point it won't
11 get enough water, so what you do if the elevation variation
12 is in excess of 20 percent of the, of the distal end
13 pressure of 15 psi, then we included pressure regulators.
14 And when you do that you have to add some extra pressure
15 because they burn up some pressure in the regulating pro-
16 cess.

17 THE SPECIAL MASTER: Are you addressing drainage on
18 this too?

19 THE WITNESS: Not at this point. I will later on.

20 THE SPECIAL MASTER: Okay.

21 THE WITNESS: Also shown there are the individual
22 unit costs.

23 Okay. Also included, as we mentioned before, are
24 three fields of side-roll lateral systems, and those are
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1 designated as field number K-4, K-15 and K-22. And it's
2 fairly obvious the reasons for not using center pivots
3 in those locations; the shape is just not conducive
4 to it. One reason more weren't used is some of the areas
5 have fairly low holding capacities, and if we had to
6 extend a mainline, say for the additional mainline plus
7 the increase size in mainline about, and space the lateral
8 lines closely enough together to adequately irrigate the
9 area, we started getting more expensive on the total
10 system.

11 So the wheel lines were, for the most part, included,
12 where either there was reasonable good soil moisture
13 holding capacity or the line extension was not excessive.

14 And these are designed with a -- with similar tech-
15 niques that were used by Dr. Mesghinna. Their side-roll
16 laterals are 40 feet by 60 foot sprinkler spacing, sprink-
17 lers on the pipeline are 40 feet apart, the sprinkler
18 moves 60 feet.

19 We used two moves per day in the design and they're
20 designed for the same peak application rate as the rest
21 of them. I guess I didn't touch on that.

22 The system is designed to meet the peak consumptive
23 use requirement for alfalfa.

24 Now, that differs from the Stetson design, but there's
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1 a very good reason for that. You don't have the option
2 under one of these center pivots to raise the average
3 crop mix. It becomes a little difficult to manage
4 if you have a pie shaped piece of 17 percent grain in
5 the center pivot, so you reduce the system capacity
6 so the system capacities are designed sufficient to
7 handle alfalfa.

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1 THE SPECIAL MASTER: You can't put a crop on
2 one half of a circle and a different crop on the
3 other half?

4 THE WITNESS: You can. It's more difficult to
5 manage. If you had a large unit like this and you
6 are operating it as a single farm, you would probably
7 not do that. You would try to plant them so you had
8 one crop under one machine.

9 THE SPECIAL MASTER: Do you know of a farm that
10 size operated as one unit, outside of Russia, that
11 you have had some experience in with center sprinkler --
12 center pivot sprinklers that close together, that
13 volume and that size?

14 THE WITNESS: Well, one I have designed in Georgia
15 was approximately 5,000 acres, and it's all center
16 pivot.

17 THE SPECIAL MASTER: Is it finished or not even
18 completed?

19 THE WITNESS: There are two or three systems
20 that are not in. It's roughly 4,300 acres, or some-
21 thing in that category that's completed.

22 THE SPECIAL MASTER: What is your total acreage
23 for this one?

24 THE WITNESS: Ninety two hundred sixty four.

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1 THE SPECIAL MASTER: That's not true because you're
2 irrigated acreage totals on Table 4 comes to at least
3 1,400 acres, from what I can count quickly.

4 THE WITNESS: This is just the individual tables.
5 If you will flip over to Table 5, this summarizes all
6 of the individual fields.

7 THE SPECIAL MASTER: Well, how many acres do you
8 have under irrigation that totals up on Table 5?

9 THE WITNESS: Ninety two hundred sixty four, the
10 bottom total there. Now, that's just the acreage that
11 is actually irrigated under the machine. That does
12 not include --

13 THE SPECIAL MASTER: Do you know of any system
14 that is 9,200 acres or more and operating side by side
15 of the size of this in actual reality?

16 THE WITNESS: I can't give you the name of one
17 specifically. Whether it's operated as one unit or
18 two units when it gets to that size is sort of im-
19 material. You define the efficiencies from operation
20 of the irrigation system per se, farming it. I don't
21 know about those efficiencies, where the breaks are
22 on land size.

23 Q (By Mr. Rogers) Mr. Bliesner, in your professional
24 opinion, is there any reason this system design you
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1 have prepared would not operate as a single unit or
2 as two units?

3 A It could be operated essentially under the scheme you
4 decided. If you wanted one farmer on each center pivot,
5 that would be possible. If you wanted to farm them
6 all as one, that would be possible.

7 THE SPECIAL MASTER: If you wanted one farmer
8 on each center pivot, that would be fine?

9 THE WITNESS: I'm saying the system could operate
10 that way.

11 THE SPECIAL MASTER: That would be a little
12 monstrous, wouldn't it? That would out-deal the
13 new deal. I don't follow that.

14 THE WITNESS: I'm just talking about the flexibility
15 of the irrigation system design, not what is practicable
16 from a farming standpoint.

17 THE SPECIAL MASTER: But what is a practicably
18 irrigable acre, that's my charge in this.

19 THE WITNESS: Okay, then from that standpoint
20 that would probably not be the way it would be operated.

21 Well, that completes the systems specifications.

22 Q (By Mr. Rogers) Just a moment. Let me get my place
23 here.

24 Mr. Bliesner, let me ask you, the total on Table 5 --
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1 on Table 5 the total acreage figure you have there
2 that you are capable of irrigating with this system
3 is 9,264 acres, is that correct?

4 A Yes.

5 MR. ROGERS: I would like to inform the Court again
6 that there is a footnote in Mr. Bliesner's report that
7 notes this on Page 3.

8 THE WITNESS: Page 3.

9 MR. ROGERS: That we had extracted from the Tribes'
10 claim with respect to this additional acreage on Big
11 Horn Flats for 191 acres of the fee land, and that
12 has been made a part of Mr. Higginson's testimony
13 yesterday. While Mr. Bliesner is capable of irrigating
14 this system, we are not claiming it under his part
15 of the report, despite this total on --

16 THE SPECIAL MASTER: Is that included within the
17 ninety two sixty four?

18 THE WITNESS: It is.

19 MR. ROGERS: It is included, yes, sir.

20 THE WITNESS: The one ninety-one is included in
21 all of the cost calculations and presentation of
22 total acreage. It is only deducted in the values
23 where the diversion requirements are shown or total
24 acreage where a claim is shown.

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1 Q (By Mr. Rogers) Mr. Bliesner, I think we can now
2 appropriately step back and begin the review of the
3 features from the cost standpoint. I would like to
4 ask you if we could -- I assume the best place to
5 begin would be at the river again -- and move through
6 each of the features and tell us how you arrived at
7 the costs.

8 A Okay. We will begin back here (indicating) at the
9 Diversion Dam and the short canal into Lily Pond.
10 The unit costs used for canal excavation, access
11 road construction, fencing, placement of top soil and
12 seeding, all of those elements dealing with canal
13 construction costs were the unit costs supplied by
14 Stetson and used in their study. The Diversion Dam
15 cost at Bull Lake Creek is taken to be the same as the
16 diversion cost from the Stetson plan at South Crowheart
17 and Riverton East essentially. He lists a cost of
18 \$669,600 for those diversion dams. This one is
19 approximately the same capacity and the same size,
20 and that cost was used for this diversion dam.

21 The unit excavation costs for -- from the Stetson
22 report were used in determining the cost of this
23 earth canal coming from Bull Lake Creek to Lily Pond.

24 The cost of that canal using those unit costs is

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1 estimated at \$30,000; the Diversion Dam at \$700,000,
2 and for a total of those two together is \$730,000.

3 MR. MERRILL: Your Honor, I object to the cost
4 figures and move to strike them on the grounds that
5 there is still no foundation for the testimony based
6 on what unit costs were actually used, how many units
7 were required of each of the particular cost items.
8 What we are getting is a bottom line with no indication
9 as to how it was reached.

10 THE SPECIAL MASTER: Well, for purposes of --

11 MR. ROGERS: Your Honor, I believe Mr. Merrill
12 is free to go into that on cross-examination if he
13 wishes, and the Witness has testified that he has
14 relied on the same cost figures that were used by
15 Stetson where appropriate.

16 THE SPECIAL MASTER: Yes. I will allow them to
17 be answered.

18 THE WITNESS: The next component is the main
19 pumping plant. Included in the costs of this is the
20 concrete structure for the wet sump and pump support,
21 and the reinforced concrete prices from Stetson were
22 used in these areas. Of course, there is excavation
23 and backfilling around structures, and again, the unit
24 costs from Stetson were used for those. The cost

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1 includes road work into the site, and the Stetson
2 costs were used again. It includes a shade structure
3 at \$10 per square foot.

4 THE SPECIAL MASTER: A shade structure?

5 THE WITNESS: Shade structure over the pumps as
6 indicated in Figure 1.

7 THE SPECIAL MASTER: Thank you.

8 THE WITNESS: Also included are automatic trash
9 racks and related structures associated with those, and
10 then there are nine 1,000 horsepower pumps, and the
11 component prices were generated from information in
12 Appendix Table A-7 -- A-6 and A-7 --

13 MR. ROGERS: Those are on Pages 40 and 41 of the
14 report, Your Honor.

15 THE WITNESS: -- to determine the pumping unit costs,
16 and this includes motor controls, pumping plant panels,
17 necessary wiring and installation.

18 The manifold assemblies are also based on prices
19 from the Appendix, Table A-8 under header and control
20 valve costs. The air chambers and surge control
21 equipment were --

22 THE SPECIAL MASTER: That's header, H-e-a-d-e-r,
23 if you are looking for the spelling.

24 THE WITNESS: Yes. The costs were included
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1 individually for the five air chambers and the surge
2 tanks. Then also a lump sum of \$100,000 was included
3 for automation controls between the point at the
4 wasteway and the main pumping station.

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1 A. (Continued) The total estimate of the pumping plant,
2 including all of those features, is \$2,200,000.

3 Q. (By Mr. Rogers) What is the next feature?

4 THE SPECIAL MASTER: Is that what you would call the
5 end of your systems work and the beginning of your on-farm
6 or is there such a classification?

7 THE WITNESS: No, no. The systems work in this case
8 goes all the way to the center pivot. The pipeline net-
9 work, since these are such large fields, all of the pipe-
10 line network would be considered a project feature.

11 THE SPECIAL MASTER: Since this isn't breaking up
12 into units of 160 acres in individual ownership, so you
13 really don't have an on-farm classification, do you?

14 THE WITNESS: The on-farm, if you were going to
15 separate it and consider these as fields, then the normal
16 concept of the project features are to deliver water to
17 the field boundary, and so you would deliver it to the
18 pivot point, and that would be the responsibility of the
19 landowner to take over at that point.

20 Okay. The next feature is the main canal -- excuse
21 me, the main pipeline. And that pipeline is 72 inches in
22 diameter. It's 14,000 feet in length, steel pipeline is
23 indicated at a price of \$2,377,400, including installation.

24 Those costs, the unit costs of the pipeline appear in

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1 Table A-1, Page 38.

2 Okay. The next feature is the major canal. Again,
3 the excavation components, any reinforced concrete work,
4 such as the transition from the pipeline to the canal and
5 headwall for the wasteway were used, the unit costs from
6 Stetson were used. The lining cost came from bid prices
7 given the Bureau of Reclamation in Riverton on 12 mill
8 PCV lining in place. It's designed with that 12 mill
9 lining in place and placement of 12 inches of selectively
10 graded fill material over that for protection.

11 The cost of the canal with lining is estimated at
12 \$1,500,000, and it's 16,500 feet long.

13 Okay. The next elements of design that we need to
14 discuss are the individual pumping plants that are indi-
15 cated by the squares with the letters inside them, and
16 the specifications for those appear in Table III. I've
17 previously discussed what was included in the unit costs
18 used to generate those, the costs of those individual
19 pumping plants appear in Appendix Tables A-5 to A-8.

20 THE SPECIAL MASTER: How many of them are there,
21 individual pumping plants?

22 THE WITNESS: There are -- Let's see. I believe
23 there are twelve. Yes, there are twelve.

24 THE SPECIAL MASTER: Thank you.

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1 THE WITNESS: And the total estimated cost for that is
2 \$512,840. The pipeline system, again as designed by the
3 optimazation program, using unit costs in Appendix Table
4 A-1 were installed costs. The total costs of that pipe-
5 line network, as shown on Figure 15, as the pipe network
6 is shown on Exhibit 15, the total cost for that component
7 is an estimated \$3,526,200.

8 THE SPECIAL MASTER: How deep are these pipes put to
9 go to the center pivot, two feet?

10 THE WITNESS: Two feet of cover generally. Of course,
11 the depth of trench varies depending on how large the dia-
12 meter of the pipe.

13 Okay. Then the on-farm system costs, we discussed the
14 individual unit costs of the various systems, and that was
15 listed in Table IV by length of system. Table V then
16 summarizes the length of system by system number, so you
17 can't apply an individual unit cost to each of those and --

18 THE SPECIAL MASTER: Roughly translated, you're talk-
19 ing -- You're about to talk now of the cost of the sprinklers
20 themselves?

21 THE WITNESS: Yes, yes. This is the sprinklers them-
22 selves. The on-farm system costs; then added to that cost,
23 those unit costs that are shown in, in those tables would
24 be the cost of the wheel lines and the unit costs for those
25 appear in Appendix Table A-2.



1 Total on-farm system cost, which includes the side-
2 roll laterals and the center pivot systems is estimated
3 at \$2,678,330.

4 Q (By Mr. Rogers) For the 9,264 acres?

5 A. Yes. Now, the other element that we haven't discussed is
6 the drainage system design. We've been talking just about
7 irrigation system. If we're going to summarize the costs
8 for all of this, you need to look at the drainage require-
9 ments.

10 The drainage requirement for Big Horn Flats, the
11 drainage system design is shown on the drainage system
12 maps in the back of our report.

13 MR. ROGERS: Your Honor, these -- Let me see which
14 one. These are the --

15 THE WITNESS: Sheet 3 of 7.

16 THE SPECIAL MASTER: The back jacket?

17 THE WITNESS: The back jacket, yes, Sheet 3.

18 MR. ROGERS: Your Honor, these are the drainage maps
19 which I have marked for identification as Tribes' Exhibit
20 Nos. 13-4 through 13-10.

21 THE SPECIAL MASTER: Yes.

22 Q (By Mr. Rogers) And this is, Mr. Bliesner, this is Sheet
23 3 of 7?

24 A. Yes.

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1 Q So this would be Tribes' Exhibit No. 13-6. Is that the
2 drainage plan for the proposed irrigation project of Big
3 Horn Flats?

4 A. It is. And they are shown, if I may indicate their loca-
5 tion on Exhibit 15 since it's on the board, if you'll look,
6 there is a break in the ridge that runs diagonally through
7 Sections 33, 3, 2 and 1, all of those with the exception of
8 33 being in Township 2 North, Range 2 West. There's a
9 drain that runs diagonally through there and discharges
10 over at the head of Big Horn Draw.

11 THE SPECIAL MASTER: Point to the head of the Big
12 Horn Draw, would you, please?

13 (Witness complied.)

14 Q (By Mr. Rogers) Could you identify that on the map for
15 the record?

16 A. That is in Section --

17 THE SPECIAL MASTER: 6, I think.

18 A. -- 6 of Township 2 North, Range 1 West. The discharge
19 point for that interceptor drain, there's another inter-
20 ceptor drain in Range 1 West, Township 2 North, Section
21 1 and 2, and it discharges into Johnston Draw.

22 The drainage requirement for Big Horn Flats is, is
23 reduced by several means. One is we're using very high
24 efficiency systems, so the deep percolation losses on Big

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1 Horn Flats is reduced. Drainage coefficient, the amount
2 of water we have to remove with the drains is fairly low.
3 The other thing is the natural drainage features of the
4 Big Horn Flats is very good, it's highly elevated from
5 surrounding lands, isolated from additional irrigated
6 lands. The subsoil is composed of a fairly thick layer
7 of gravel overlying fractured sandstone.

8 MR. MERRILL: Your Honor, I'm going to object at this
9 point to any further testimony about the drainage require-
10 ments or the drainage characteristics of Big Horn Flats
11 and move to strike that testimony that's already been
12 adduced on the grounds that Mr. Bliesner himself has
13 testified that Dr. Willardson did the drainage investiga-
14 tion and analysis as well as the determining of the arti-
15 ficial drain.

16 THE SPECIAL MASTER: I'll sustain that.

17 MR. ROGERS: May I ask the witness one question on
18 that?

19 THE SPECIAL MASTER: It just overlaps.

20 Yes.

21 Q. (By Mr. Rogers) Mr. Bliesner, how much work did you do
22 with respect to the drainage studies on Big Horn Flats
23 and Stagner Ridge, the additional lands you've placed
24 there?

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1 A. I've previously testified that Dr. Willardson conducted
2 the drainage selection and analysis of Dr. Stetson's
3 plans. Dr. Willardson and I developed the drainage
4 requirement for Big Horn Flats and Stagner Ridge.

5 THE SPECIAL MASTER: All right. I'll sustain --

6 THE WITNESS: We did the field investigation together.
7 He did the placement of the drains and I wrote the discus-
8 sion.

9 Q. (By Mr. Rogers) I believe you also testified that you
10 were, you had overall supervision of the preparation of
11 the report?

12 A. That's true.

13 Q. Did Dr. Willardson prepare the drainage discussions with
14 respect to Big Horn Flats or did you?

15 A. I did under his guidance.

16 Q. Did he review it?

17 A. Yes, he did.

18 Q. Did he review any of the work with respect to the costs
19 of the drainage system?

20 A. Yes, he did.

21 MR. ROGERS: Your Honor, I believe that for two
22 reasons --

23 THE SPECIAL MASTER: It is of no great moment,
24 frankly, whether it stays in the record or stays out.

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MR. ROGERS: Well, Your Honor, we would like to get in the record the cost figures at this point just to have a complete picture, and Dr. --

THE SPECIAL MASTER: All right. The cost --

MR. ROGERS: Dr. Willardson will be on the stand and can be cross-examined on this.

* * * * *



1 THE SPECIAL MASTER: Proceed.

2 THE WITNESS: Okay. With those natural drainage
3 features available, interceptor drains were all that
4 was felt was necessary. Those were included, again,
5 using the unit costs that were used by Stetson Engineers,
6 and the cost estimated for those interceptor drains
7 was \$129,621. Since there may be other isolated
8 instances of drainage problems that crop up after the
9 system is installed, barriers that were not identified
10 in any subsoil investigation that may come close to the
11 surface, that figure was doubled to allow a contingency
12 fund to handle any of those particular problems that
13 may arise. So the total drainage cost then is estimated
14 at \$259,382 on the 92,000.

15 THE SPECIAL MASTER: Can I hear that again?

16 THE WITNESS: \$259,382.

17 MR. ROGERS: Your Honor, just for the record,
18 each of these totals he has given up here are at their
19 pertinent subject areas in the written report.

20 THE SPECIAL MASTER: All right. Is what you just
21 said in the written report regarding --

22 THE WITNESS: Yes.

23 MR. ROGERS: Yes, sir.

24 THE SPECIAL MASTER: What page?

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1 THE WITNESS: Page 17.

2 MR. ROGERS: That particular figure -- yes.

3 THE WITNESS: Page 17.

4 Q (By Mr. Rogers) Mr. Bliesner, from the Diversion Dam
5 up through the sprinklers and the drainage costs, do
6 those constitute all of the capital costs?

7 A They do, with the exceptions of the engineering and
8 contingency.

9 Q Could you explain those then, please?

10 A Okay. The total to this point is \$13,784,152. We
11 used as a contingency ten percent or -- excuse me --
12 we used for engineering contingency ten percent for
13 engineering and ten percent for contingency on the
14 full project and on-farm features. In other words,
15 we increased these total costs by 20 percent for
16 engineering and contingency for a total of --

17 THE SPECIAL MASTER: What is the basis of
18 increasing all costs 20 percent?

19 THE WITNESS: Engineering fees for projects of
20 this size we estimate from previous work that we have
21 done and data we have analyzed to be approximately ten
22 percent of the total project cost. Ten percent for
23 contingency is just sort of an average number that is
24 used to cover any unforeseen costs that we may not have

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1 included.

2 Q (By Mr. Rogers) Obviously, Mr. Bliesner, then if the
3 actual cost of the project doesn't use up that
4 contingency, it's a matter of money not spent?

5 A That's right.

6 Q But you planned them in the system in case?

7 A That's right.

8 THE SPECIAL MASTER: If you find that the two
9 main drainage structures are going to be insufficient,
10 for example, if you find that the very last field of
11 the right-hand lower corner of Exhibit 6 should not
12 be adequately drained by one drainage a mile and a half
13 to its northeast, what do you propose to do then to
14 make these free of being alkali or being --

15 THE WITNESS: What happens here is you have
16 significant elevation drops away from those fields
17 to a natural drain. In all probability, unless there
18 is an unforeseen barrier, a shale barrier that crops
19 up in the middle of the field, drainage would not be
20 a problem. It's on the border of a non-irrigated area
21 creating natural drainage away from those points. If
22 it was, that's what that contingency fund is for.

23 THE SPECIAL MASTER: Do you know if there has been
24 any augered holes or drillings to ascertain whether any
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1 barriers do exist in these areas?

2 THE WITNESS: Yes. HKM has conducted drill holes
3 in those areas, but I really think I should defer this
4 discussion to Dr. Willardson. He will be able to
5 further enlighten you on that area better than I.

6 Q (By Mr. Rogers) Then with the engineering and contingency
7 costs added to the capital cost, does that -- do those
8 conclude the totals of the capital costs?

9 A That gives you a total capital cost, including engineering
10 and contingency, of \$16,540,982.

11 Q Could you read that one more time?

12 A \$16,540,982.

13 THE SPECIAL MASTER: Translate it to acres. How
14 much an acre.

15 THE WITNESS: That is shown in Table 6, \$1,785
16 per acre.

17 Q (By Mr. Rogers) Is that in the first column of Table 6
18 on Page 19?

19 A It's in the first column of Table 6 on Page 19.

20 Q I notice also in Table 6 you have calculations based
21 on Project O & M. Could you please explain to us how
22 you drew up those costs?

23 A Yes. There are two major components -- well, three
24 actual major components of operation and maintenance.

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1 The biggest single item in this instance is energy
2 costs required to pump up to that area. The energy
3 costs are based on a 75 percent application efficiency,
4 average for the season, and 85 percent distribution
5 efficiency from the pumping plant out, assuming that
6 all of that water has to be pumped then. Then it's
7 based also on 1,890 hours of pumping per season at the
8 designed flow rates. Using that 1979 electrical hour
9 rates from Riverton Valley Electrical Association for
10 both energy charge and demand charge, we have a total
11 estimated cost for electrical power and demand of
12 \$535,206 or \$57.77 per acre per year.

13 THE SPECIAL MASTER: Does the company have capacity
14 to take care of that in the present -- or would it throw
15 it into peaking, or do you know whether that's available?

16 THE WITNESS: I'm not sure what their generating
17 capacity is. I had discussions with them concerning
18 line construction and supplying especially this main
19 pumping plant at Lily Pond, and they indicated that it
20 would not be a problem. They are a member of Tri-State
21 Co-op, which has generating capacity, and that's where
22 they buy their generating capacity, so I didn't make
23 any independent determination of their capacity there.

24 Okay, the next piece of operation and maintenance
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1 cost is the project features, and that's everything
2 up to the actual on-farm systems, and that was estimated
3 as percentage of capital costs as indicated in Table A-3
4 or in the case of pumping plant maintenance, on the
5 basis of \$2.00 per horsepower per season.

6 And the pipeline and canal maintenance is based on
7 one percent of the capital cost per season. That gives
8 you an annual O & M for project acres of \$11.88 per
9 acre, then the on-farm maintenance is estimated at
10 two percent of the on-farm capital cost or \$5.78 per
11 acre per season.

12 Q (By Mr. Rogers) Where are your total O & M costs then
13 reflected?

14 A Then the total, both O & M and capital costs, are
15 summarized in Table 6.

16 Q On Page 19?

17 A On Page 19. We have a total capital cost of \$1,785,
18 and then each of those units of operation costs are
19 also shown.

20 Also shown in that table are the annualized capital
21 costs, and these are annualized over the life of the
22 various system components as indicated in Table A-4 at
23 a four percent interest rate.

24 Q Did you do any further work with respect to any costs on

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1 Big Horn Flats?

2 A Well, that summarizes the costs that were conducted.

3 Q What did you do with the information about costs that
4 you developed?

5 A That information was provided to Ron Cummings.

6 Q Was it furnished to him in the form either contained
7 in this report or on Table 6?

8 A Principally. There was one other breakout provided to
9 him on costs, and that was a separation of all project
10 costs from all on-farm costs. The capital costs split
11 fairly easily here. He was also given a split between
12 on-farm and project costs for power.

13 THE SPECIAL MASTER: In a project of this kind,
14 what is the reason for the distinction between total
15 project cost and the on-farm costs? We are not setting
16 up a system whereby the operators or government can
17 charge an annual O & M, so why is it done?

18 THE WITNESS: You would have to ask Mr. Cummings
19 that. I just supplied the information he requested.

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MR. ROGERS: Your Honor, we have concluded the discussion on his design for Big Horn Flats. Our next area will be the discussion of the Stagner Ridge area which will move somewhat faster, although it's going to take some description and probably would put us beyond the noon hour if we started it now. We're willing to start it at Your Honor's pleasure.

THE SPECIAL MASTER: All right. Why don't we adjourn now and is 1:00 a little too fast or do you want 1:30?

MR. RADOSEVICH: 1:00.

MR. MERRILL: 1:00 would be fine, Your Honor.

THE SPECIAL MASTER: All right. Let's try to be here at 1:00. If we don't we'll start a few minutes after.

(Thereupon a lunch recess was taken at 11:40 a.m.)

