7-31-1981

Trial Transcript, Vol. 97, Afternoon Session

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File 204
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Case # 4993

File # 204

4455

IN THE DISTRICT COURT FOR THE FIFTH JUDICIAL DISTRICT

WASHAKIE COUNTY, STATE OF WYOMING

IN RE:	)	
	)	
THE GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN THE BIG HORN RIVER SYSTEM AND ALL OTHER SOURCES, STATE OF WYOMING.	)	Civil No. 4993

FILED

Aug 3, 1981

Margaret V. Hampton CLERK

DEPUTY

VOLUME 97

Afternoon Session

Thursday, July 31, 1981

ORIGINAL

THE SPECIAL MASTER: All right, ladies and gentlemen, let's come to order, please.

The next witness, Mr. Keller, has not been sworn, has he?

JACK KELLER

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

DIRECT EXAMINATION

BY MR. SACHSE:

Q. Mr. Keller, would you give the Court your full name and address?

A. My name is Jack Keller. My address is 35 River Park Drive, Logan, Utah.

Q. Dr. Keller, where are you currently employed?

A. Currently I'm employed at Utah State University as the Department Head of Agricultural and Irrigation Engineering, and in addition to that, I have a consulting engineering practice which goes under the name of Keller Engineering.

Q. I assume that some of your duties as head of the Department of Agricultural and Irrigation Engineering are administrative; is that correct?

A. Yes, sir.

Q. Now, would you describe your duties as department head

and as a professor at Utah State, other than your administrative duties?

A. Well, besides the obvious administrative duties of being department head, I also teach in the field -- I have courses in the field of sprinkler irrigation, engineer design, ri kle irrigation at the upper engineering division levels, and then I teach a course in the graduate level in sprinkler irrigation system and project design.

Q. I assume that sprinkler engineering includes side roll and center pivot --

A. Oh, yes, sprinkler irrigation is the 1 of all the types of ramifications where we squirt the water out of a nozzle and it more or less rains on the ground, so it can be done with center pivot, side rolls, little sprinklers -- in fact, it's sprinkler irrigation when you hold a hose and sprinkle your garden.

Q. Do you have other roles as head of the department besides your teaching and administrative duties?

A. Yes, besides teaching and administration, I also am a project leader on a project known as the Water Management Synthesis Project, and that's a rather comprehensive project that's funded by U. S. AID, and the purpose of that project is to review irrigation

technology, transfer and applications around the world, particularly -- with particular emphasis on the activities that our government has been involved in through its U. S. AID Program.

Q. U. S. AID is the United States Agency for International Development?

A. Yes, Agency for International Development, and what we have done is first, we've -- that project is rather interesting in the fact that we have looked through the paper documents of all the projects that dealt with soil and water development that AID has been involved in over its history.

Then we visited certain of these projects over a worldwide basis, and he visited those projects to give a critique and analysis and then to come back to AID to suggest how best to approach irrigation development on a worldwide basis.

So you might say the final objective of that piece of the study is to give AID directive orders -- or directive insights as to how best to progress for the next decade in our various programs worldwide, and in this study, we have visited -- Last year, we visited projects -- actually did sector analysis in India, Pakistan, Thailand, Bangledesh, and Nepal, and that

particular region of the world probably represents -- it doesn't probably, it does represent -- close to maybe two hundred million acres of irrigated land, and that's really about, oh, three or four times as much irrigated land as we have in the entire United States, so that's a very definitely densely irrigated area, you might say, and I am the project director of that.

Part of the project is operated in conjunction with Colorado State University, and I'm one co-director and Mr. Wayne Clyma, Colorado State, is the co-director there.

THE SPECIAL MASTER: Does the University of Wyoming participate?

THE WITNESS: The University of Wyoming is not involved in this particular project.

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Q. (By Mr. Sachse) As part of your duties with the Water Management Synthesis Project and your teaching duties and indeed your consulting work too, do you keep up with both costs involved in irrigating land and the technologies available for irrigating land?

A. Yes. I really feel that the -- that keeping a handle on both costs and technological development is absolutely essential to my performance, both as an administrator at the university, to direct where we might be doing our next research. Certainly it's important in terms of the work on such projects as the Water Management Synthesis Project, which I just explained, and is absolutely essential in my consulting business because as a consultant, I'm involved with, from time to time, with the actual design of systems and advice to clients who are planning on irrigating a piece of land, and so if they want advice and if they wanted actual designs made, it's essential that we be on top of both the costs and also on -- in gear with what's available, what's really not only managably available, but what's really proven availability, what works well, how it works and so on.

Q How long have you been involved in this Water Management

Synthesis Program?

A. The Water Management Synthesis Program has been going in actual full flow state where the funds were moving through the system right at two years now, it's going into its third year, and it has, the remainder of this year and approximately another, it will be over in about eighteen months.

Q. And how long have you been head of the Department of --

A. I've also been head of the department for two years. This is, I'm into my third year at this point.

Q. How long have you taught at Utah State University, School of Agricultural Engineering?

A. I've taught at Utah State since 1960, which would be what, twenty, twenty-one years, and in this teaching experience, I've taught several courses, but predominately I've developed and taught the courses I referred to because heretofore they hadn't been taught in universities throughout the country. In fact, Utah State happens to be the only school that has such an extensive program in teaching actual practical design operations of irrigation systems.

Q Is the question of infiltration water and measurement of infiltration of water part of the subject matter of your courses and research?

A. Oh, yes. And it's -- I've done my earlier research, before I was doing this more or less general analysis of systems with water management, for a number of years had a project that dealt with more laboratory and more field oriented technical research of infiltration, flow of water in soils effect. If you looked in my publication list, effective water application rate on the soils, stability, the soiltilth and such items as that. So I've been involved quite heavily in a scientific sense as well as a practical sense.

Q. Before you came to Utah State, what had you done in the field of irrigation engineering?

A. Just prior to Utah State, I was -- worked for W. R. Ames Company, who was -- who was and still is in existence, but they've been bought and sold several times since, but they were one of the, I believe, most important or I felt at the time, most important irrigation equipment manufacturers in the country. And I was with W. R. Ames Company for four years, working in their Denver office for two of the years and then two years in the California office, and at that time, the time I left the company, I was the person responsible for the use of the equipment in the field. In other words, productive application and feedback in to redesign a product

to make new products fit well. And also one of the things that a company like Ames provided to their dealers was, or potential client, they provided a design service, so during those days I was totally involved in product application or, or the design of systems that, many of which, are in existence still today.

Q. I don't think I've asked you your educational background. Would you give us the degrees that you've received and universities that they're from.

A. I have a Bachelor of Science Degree from, in Civil Engineering, from the University of Colorado and a Master of Science Degree in Irrigation Engineering from Colorado State University, and a PhD. in Irrigation and -- Agricultural Engineering is really what it's listed under, from Utah State University.

Q. Thank you. Now, would you tell me about your consulting activities, starting with the beginning of your career as a consultant.

Q. Well, my consulting activities, starting from the beginning, I -- I've kind of been going backwards, but going -- starting from --

Q. If you'd prefer, you can start at the end and work back to the beginning.

A. I think it goes well either way. In a consulting sense, my whole life, in terms of what I've done, has been a mixture of consulting and teaching and industrial experience, and so the processes have been rather well dovetailed together. I mean that's one pleasant thing that's happened.

Consulting-wise, when I left, when I quit work at W. R. Ames Company, they asked me, they asked me if I would go, stay and work with them on a retainer when I went to the university, and so you might say immediately upon leaving, that was my first real consulting activity, and upon leaving W. R. Ames Company, then I worked as a consultant for them for approximately ten years after I came to the university, and in the meantime, they were bought and sold by some conglomerates and perhaps you know how smaller companies fare when all of this happens.

But anyhow, from there on, my consulting activities expanded and I've worked as a consultant on a retainer type basis for companies like Rain Bird Manufacturing Company, Toro Sprinkler Manufacturing Company.

I do advisory type consulting, and I've worked on a project in Algeria for Bechtel Corporation, and I

suggested what systems to set up. It's a hundred and twenty, thirty thousand acre project.

I've worked as a consultant for Harza Engineering and suggested, in the designs that they're using in the field, are based on, you might say the perameters that, you know, I suggested and developed. And also, besides that, I helped train some of their people that did the design technician work for the Jordan Valley Project, not the West Bank that we hear so much about, but the Jordan side, the East Bank, where there's a project of some sixty thousand acres. Before that, I did consulting on a project called the INCORA Project in Columbia, South America, hundred and twenty-five thousand acre project put in by Resource Development Corporation. Perhaps you recall the people that run -- own that corporation started by Lillianthal from Tennessee Valley, and that was his corporation.

A recent project of interest I was consulted for was the on-farm development aspects of a Navajo project, Navajo Indian project, which is a hundred and ten thousand acre sprinkler project in the four corners, actually, in New Mexico.

Other than that, we've done various types of, I personally or as a team, Keller Engineering works in

team affairs, we've done software development for irrigation scheduling, irrigation management, pipe line design, programming in general. That's one thing we particularly like to do, some high technological things in fields of irrigation as an advisory service to other engineering clients in the business. So this is just a thumbnail sketch of some consulting activities.

Q. Which of the western states have you done work in?

A. I think -- I, you know, I might have missed one, but I'm almost certain I've worked in every state.

Q. Including Wyoming?

A. Including Wyoming. I worked in Wyoming. My work was with Marlon Kurtz, a gentleman from Cody, Wyoming, a Pawnee supplier, irrigation supply company, and maybe some people here know Marlon. He's passed away since. His son's in the company now, Don Kurtz. And when I was with W. R. Ames Company, this is the type of thing I did. I travelled with Marlon and we helped Marlon in design of systems throughout the state. Wyoming State Sprinkler Systems, a sprinkler irrigation supply house in Cody, so that was my work.

Probably spent several months of my life in Wyoming in those days.

Q Have you published in the field of sprinkler irrigation?

A. Yes. I've -- My -- I have a large number of what we call journal publications, both refereed and popular type publications, and in addition to that, I've written the, I was the co-author of the Ames Irrigation Handbook, which Dr. Mesghinna actually used in part of this design process here, I noted.

I was the editor on revision of that in 1967, and then since then I was contacted by the Soil Conservation Service and asked to revise the, the handbook, the engineering handbook that the Soil Conservation Service uses for sprinkler irrigation, and so I've completed that process. And that would be, that's in the line of textbooks. It's a three hundred or so paged transcript, and I've also written a document or a handbook for the Soil Conservation Service dealing with trickle irrigation, which is a new form of irrigation under contract with Soil Conservation. And preliminarily, I'm under contract with AVI, a publishing company out of Connecticut to produce a textbook combining the textbooks I've written in sprinkle: and trickle irrigation into a college series standard text for use in teaching.

Q. Have you done any writing concerning this procedure for optimizing costs such as the pipe line optimization program that was used in this case?

A. Yes. Really, what struck me when I became involved in sprinkler irrigation was perhaps sometimes the designs really weren't done as optimally as they might be, and I've been interested -- I think the first time I published an optimization was in '56, and I did some work in pipe line optimization, and then in this INCORA job, the one in Columbia, South America, I had -- I was given the task or it appeared that that's what we were going to do, of actually designing the farm systems individually for a hundred and twenty-five thousand acres, as I said, something like that.

And that was rather overwhelming.

Now, I was working as a consultant's consultant for Development Resources Corporation, and I sat down and looked at a hundred and twenty-five thousand acres to design, and I said, "There must be a better process to do this", and at that time, you might say I had this innovation, I think I took the first month staring at the project to figure out how to do it easier so that, so that I wouldn't have to grind through every little thing in the more difficult ways. And so then I developed a process and published that process just -- It was -- It's in the public domain. I taught the process to students

and so on, and when computers came on the market later on in the sixties, decided that that would be a wonderful way to design, is to get into computer designs. So I moved on from there into computer designs and so on.

* * * * *

MR. SACHSE: Thank you. We submit that Dr. Keller is qualified to testify as an expert witness in agricultural and irrigation engineering.

MR. WHITE: May I voir dire, please?

THE SPECIAL MASTER: You may.

VOIR DIRE EXAMINATION

BY MR. WHITE:

Q Dr. Keller, you've testified as an expert previously in water cases, have you not?

A Yes.

Q What cases were those?

A I testified in the Aamodt case, which is the -- some Pueblos down near Santa Fe, and I have testified in the Alpine Land Company case, which was held in Reno and has to do with Newland's Project and the general water rights, and actually it eventually gets and involves water into Pyramid Lake, but our part was on the water in the region.

Q On whose behalf did you appear as an expert in those cases?

A In those two cases I appeared as an expert in behalf of the Justice Department.

Q Have you ever appeared as an expert on behalf of -- with the exception of this case -- any other parties besides

the United States?

A No, sir.

THE SPECIAL MASTER: Were you involved in Central Utah?

THE WITNESS: No, sir.

Q (By Mr. White) Do you consider that agricultural and irrigation engineering constitute a traditional branch of professional engineering or is it professional engineering?

A Yes.

Q And has your work in this case been or constitutes a practice of agricultural or irrigation engineering?

A Constitutes the practice of agricultural --

Q Yes.

A Did my work constitute the practice --

Q In this case.

A Yes.

Q Are you registered as a professional engineer in Wyoming?

A Not in Wyoming.

MR. WHITE: Your Honor, we would ask the Court not to allow this witness to testify in spite of his qualifications since, pursuant to Wyoming Statute 33-29-105, it would be unlawful.

In fact, it would be a criminal act, and I would

suggest that the Witness have an opportunity to review the statute with his counsel before a continuance if you overrule my motion, but at this time I would move that the Witness not be allowed to testify since by his own testimony his work falls squarely within the terms of the statute which prohibits this sort of activity, the practice of engineering by a person not qualified -- not registered as an engineer in the State of Wyoming, and I would be glad to share that statute with the Court and with Counsel.

THE SPECIAL MASTER: You scare me because I would like to avoid a criminal act or condoning one, so I am going to have some authority -- my thought was doing this work at the request of the Tribes on a Reservation in Central Wyoming could quite legally and I think factually be argued to be not practicing law in the jurisdiction of the State of Wyoming.

The State of Wyoming doesn't have jurisdiction over the United States --

MR. WHITE: I have the Witness' own testimony, Your Honor.

THE SPECIAL MASTER: And we failed to ask that question on about the last seven or eight, so, Dr. Keller, you got hit.

MR. SACHSE: Your Honor, may I respond to this?

MR. WHITE: I haven't finished yet.

THE SPECIAL MASTER: One at a time.

MR. WHITE: We may have to challenge the testimony of other engineers. I have got to say that there is an exception in the statute.

The exception applies to engineers working for the United States. As a result, it's not at all clear whether or not the registration requirements would apply to those experts appearing on behalf of the United States.

At this time we're taking a very close look at that particular question, and it's been only recently that the problem has been brought to our attention and, in fact, Dr. Keller has the distinct honor of being the first person qualified since the issue was raised with the Attorney General's office, and I raise the issue now and make a record.

THE SPECIAL MASTER: And he's not working for the United States, is that the reason --

MR. ROGERS: He is the third, and this is the first time the State has brought it to our attention.

MR. WHITE: It makes no difference.

THE WITNESS: Your Honor, I would like to --

THE SPECIAL MASTER: Just a minute, Mr. Keller.

MR. WHITE: I present the statute to the Court and

advise the Court that if the position of the State of Wyoming that the actions sought -- or the testimony sought to be elicited from the Witness as well as perhaps his preliminary work constitutes a violation of Wyoming State Law, and there are criminal sanctions as well as civil sanctions attached to that violation.

It is the State's position that an unlawful act ought not to be allowed by the Court, even if it constitutes the testimony by an expert witness.

We would suggest that a small recess be taken so that Counsel for the Tribes could read the statute and discuss it with their witness.

THE SPECIAL MASTER: Let me ask you a few questions before we recess, Mr. White.

If the only work that Mr. Keller did in this case was on the Wind River Indian Reservation and his only client in this case were the Tribes, or the United States of America or one of the federal agencies like BIA paying the fees for the Tribes and he's paid with federal money, in some way, let's assume, will you listen to my argument that he is exempt from the Wyoming Statutes as not having jurisdiction to extend that far?

MR. WHITE: I have always listened to your argument, Your Honor. On this one I can't agree.

And I think there are two activities that are

involved, the preliminary work which was on the Reservation apparently, at least in part, which, if your argument were correct, would fall within -- or without the jurisdiction of the State, but there is the separate question of whether or not his activity or his testimony as an expert witness qualified in irrigation and agricultural engineering also constitutes the practice of professional engineering within the state.

There is a problem that's been addressed by the Mined Land Reclamation Board recently, and it's a hot issue right now.

I don't want either Counsel for the Tribes or the Witness for the Tribes to think that it's a red herring because it isn't. It's a very hot issue in the State.

THE SPECIAL MASTER: If I were to say to you that your objection comes too late, two witnesses too late, what would you say to that?

MR. WHITE: I would say that I don't have to make an objection -- I'm the captain of my own objections. There is law in virtually every jurisdiction that by not making an objection you don't waive the right to make the objection later.

In fact, Your Honor, if it turns out that the experts called on behalf of the United States do not fall within the exception because they are consultants rather than

employees, we will probably move to strike their testimony.

We'll also, I'm sure, move to strike the testimony of other experts for the United States -- for the Tribes at such time -- before the close of their case.

THE SPECIAL MASTER: That being the case, we will take a five- or ten-minute recess.

MR. SACHSE: We don't need a recess, Your Honor. We are prepared --

THE SPECIAL MASTER: All right. We don't need a recess. I will listen to your argument.

The motion is before the Court that this Witness be denied admission as an expert and that this Court cannot hear his testimony.

MR. WHITE: That's right.

THE SPECIAL MASTER: That's the motion that's before us now?

MR. WHITE: Yes, sir.

THE SPECIAL MASTER: Let's hear what you have to say.

MR. SACHSE: To start off with, I think this is all too cute for Mr. White to come up not at the first, not at the second, not at the third, but at the fourth witness.

We've had Mr. Higginson, former State Engineer;

we've had Mr. Bliesner; we've had Dr. Willardson -- all registered engineers.

And now we put on our fourth registered engineer, and Mr. White for the first time raises this objection.

Secondly, I think if the Court were to rule in favor of Mr. White on this, that it would cast a very serious question on the jurisdiction of this Court to handle this water rights case because, to start off with, it's a rather touchy question as to whether a state court can handle a water rights case in which the interests of the United States and of the Indian Tribes would be determined.

THE SPECIAL MASTER: That will be determined when this case is reviewed by the Supreme Court, I guess.

MR. SACHSE: The State has argued throughout this case that it has an adequate Court system to do this and there would be no prejudice to the Tribe or to the United States in having this case done in state court.

Generally, a state is without jurisdiction inside an Indian Reservation, and the only importance of Dr. Keller's testimony here and of his work here is to prepare testimony to be used in Court in determining what is the practicably irrigable acres in a water rights lawsuit where an Indian Tribe's rights are at issue.

Nobody is saying that Dr. Keller is going around the

State of Wyoming and holding himself out as a professional engineer to design projects that are to be built in the State of Wyoming without anything further going on.

In other words, he is here as an expert witness in a case where the rights of an Indian Tribe are involved.

Now, it seems to me a virtual certainty that the legislature of the State of Wyoming in making an exception for persons working for the United States, though it may never have brought to mind an Indian Tribe, could not have intended to preclude someone working for an Indian Tribe working for them without having a state license.

The law is very well established that any kind of work can be done for a Tribe, both within and without the Reservation, if it's principally concerned with the Reservation, without having to get state licenses. The Tribe is free to hire somebody to come in to build the project without having a Wyoming State License.

But the other thing is this: There have been decisions after decisions that afford to the Indian Tribes the same protections afforded to the United States. For instance, Indian Tribes' immunity from suit is generally parallel to the immunity from suit of the United States. The Indian Tribes' immunity from state statutes of limitations parallel to the immunity of the United States

from statutes of limitations.

I think there would be serious constitutional questions if the State of Wyoming attempted to apply the statute to a witness for an Indian Tribe appearing in a state court to testify on behalf of the Tribe, particularly if it has already made an exception for witnesses on behalf of the United States, but I give all these arguments -- and it makes it sound more serious than it is -- the real thing here and the place I think Mr. White is being much too cute is without bringing this statute to the witness' attention and without putting it in any frame of reference, the question that he's asking -- he asks, "Are you operating as a professional engineer in doing this work for the Tribe?"

The Witness hesitates. How do you answer this question? You know, what I'm really doing is preparing testimony for a case in court, but he answers yes.

Then after he answers yes Mr. White pulls out his statute and says, "This is in violation of the statute."

Well, I just think there is nothing to this and that if we are going to try this water rights case, we have to have the right to bring in the witnesses of our choosing to testify in this case and not have the State of Wyoming control who can be our witnesses in a case against the State of Wyoming in this Court, and I think I've said enough.

end 14

MR. ROGERS: I'd like to add one point, Your Honor, that even -- I fully agree with Mr. Sachse on everything he said, including the fact that this is a serious question, whether this is even practicing engineering in the State of Wyoming by testifying at trial, when most of the work was done even out of state, some visits to the reservation, which I think we correctly contend is outside the jurisdiction of --

THE SPECIAL MASTER: I think Mr. White's meaning the appearance of the witness in this case is what constitutes, if indeed there has been a breach of the statute, it was in doing the engineering work in the state, not in coming to this trial.

MR. ROGERS: But furthermore, Your Honor, even if everything else said here were true and obviously Mr. Keller would want to consider that if it were true, which I think it's fairly true that it isn't; even if it were true, I don't think there's any remedy in the statute that involves striking the witness' testimony as a remedy.

MR. SACHSE: That's a good point. I have one other thing I want to say while we're up, and that's this, I think the Court should realize that if you were to hold with Mr. White here, which would then mean striking

the testimony for witnesses of the United States on an issue never before raised in this case, there would have to be a continuance of this case while we sought review of that ruling, and if the State prevailed on that ruling, we would then have to be afforded the opportunity to have all of this work done again, which would be a question of a continuance of months to have it done again, and anything short of that would be a denial of due process of law.

MR. WHITE: Well, I'd like to respond --

THE SPECIAL MASTER: In view of all of that, I think you'll want to withdraw that, Mr. White, and hear what this man's got to say.

MR. SACHSE: Go ahead and get to the case.

THE SPECIAL MASTER: Let's take a ten-minute recess --

MR. WHITE: May I make one statement, Your Honor?

THE SPECIAL MASTER: Yes.

MR. WHITE: In response to Mr. Sachse's argument, very energetic argument, I'm beginning to think there's even more to this than meets the eye. But first I'd like to ask whether or not the Tribes will stipulate that their previous witnesses were not registered in the State of Wyoming since that question was not asked?

MR. SACHSE: I frankly don't know.

MR. WHITE: Second point, Your Honor, if the Tribes have brought forth witnesses which, would under State law, cannot lawfully testify, then --

THE SPECIAL MASTER: Does the statute say they cannot lawfully testify?

MR. WHITE: They may not practice.

THE SPECIAL MASTER: Doesn't say anything about testifying in a Court of law, refers to the professional practice.

MR. WHITE: But if this is a violation of the statute, then there is no right to come in and try it again. You get one shot. And Mr. Sachse's waving about his famous red herring when he says all sorts of outrageous things will happen because it will have to take place all over again. I think there are two important things to be done today, first, to make the record with respect to this particular issue, however the Master rules, and second, to afford the witness an opportunity to review the statute, obtain the advice of counsel and determine whether or not he wishes to continue. And I think the ten-minute break you suggested is appropriate.

THE SPECIAL MASTER: I was hoping that these kind of delayed action bombs, what we used to call these in World War II, torpedoes, bangalore torpedoes, wouldn't hit us in the middle of our operation.

MR. CLEAR: Your Honor, as you recall, Mr. White's list of witnesses, he has all the engineers that the United States called listed as witnesses for the State. Now, when he calls them back, is he going to throw them in jail?

MR. WHITE: We'll just have to wait and see.

THE SPECIAL MASTER: These are exemptions, he does not list these four witnesses, including -- he does not list them as his witnesses here, I don't believe.

MR. WHITE: We're not going to ask them to bring a toothbrush, Your Honor.

THE SPECIAL MASTER: I might just check the list to make sure of that, though I don't think he does. Toedter, Keene, most of the HKM people, down through -- Well, I'm ready to rule on this, but I ought to read the statute before I do. Let's take a five-minute recess, please. I'll go sit someplace else and read it.

(Thereupon, a five-minute recess
(was taken.

* * * * *

THE SPECIAL MASTER: Okay. All right. I thank Counsel for your legal arguments in this matter, and I'm going to rule against the motion, Mr. White, for the following reasons, but I'm going to ask for briefs from the Tribal Counsel, short briefs, for research to sustain me on appeal. This may very well take next.

I believe that the law, Wyoming Statute 33-29-105, 106, does indeed, as Mr. White set forth, provide some rather stringent prosecution and penalties for those who violate its requirements for professional engineers as it does with doctors and lawyers and others that enjoy the same statutory benefit, but I believe that in this case the United States of America as parties defendent find themselves aligned with the Tribes of the Shoshone -- and of the Wind River Indian Reservation also as defendants and merged as defendants in this case, the United States of America and the Tribes find a common position vis-a-vis the State of Wyoming, and I believe that the guardian ward traditional -- federal statutory guardian/ward relationship of the United States of America and the Tribes makes even further and closer the affinity of the Tribes and the United States, even though at this particular posture in this lawsuit the evidence is head knocking, but I believe that identity in interest is sufficient -- of interest as defendants

is sufficient in this particular general adjudication to permit that the Tribes' professional engineers can enjoy the same statutory exemptions as is enjoyed by the United States' professional engineers, and I so rule.

MR. SACHSE: Thank you, Your Honor.

MR. ROGERS: Mr. Master --

THE SPECIAL MASTER: And I do want briefs.

MR. ROGERS: We will prepare them to the extent there is much state law.

I would like to point out, Your Honor, something that I just noticed in the annotation to the statute which I think supports what I regard as still our principal argument here, that the witness is not really practicing professional engineering in the state when he merely testifies at a trial.

THE SPECIAL MASTER: But the record has also shown that he and his firm have actually not only testified. They have been on the Reservation.

MR. ROGERS: But for preparing the papers to testify at trial, but I would like to point Your Honor to the case -- it's cited in the annotation under this statute, Section 33-29-105, United States versus Buttner, Wyoming --

THE SPECIAL MASTER: City Engineer --

MR. ROGERS: That says that a land surveyor accepting the office of City Engineer is guilty of no crime unless

he practices or offers to practice professional engineering.

Here is a man who reviews papers in the role of engineering, and he's exempt.

THE SPECIAL MASTER: I do welcome Shepardizing of any state cases --

MR. WHITE: I would just caution the Court and Counsel that the annotation is not the whole case, and when the whole case is read, perhaps a different light might be shed on the holding.

THE SPECIAL MASTER: Well, I just hope that my ruling will be sustained.

So that being the case, we can proceed with your testimony, Mr. Keller, legally or otherwise.

MR. SACHSE: I assume then, Mr. White is finished with his voir dire of the qualifications of the Witness?

MR. WHITE: I am, Your Honor.

THE SPECIAL MASTER: All right. Any further questions on voir dire?

MR. CLEAR: No, Your Honor.

MR. RADOSEVICH: No, Your Honor, I have none.

THE SPECIAL MASTER: All right. The Witness is admitted for the purposes requested as an expert witness.

DIRECT EXAMINATION (RESUMED)

BY MR. SACHSE:

Q Mr. Keller, can you identify the document that I'm giving you designated as Tribes' Exhibit No. 23?

A Yes, that's my professional bio-data or resume.

MR. SACHSE: At this time I offer Tribes' Exhibit No. 23, the Witness' resume.

THE SPECIAL MASTER: Copies have been distributed?

MR. SACHSE: And the other parties have also received a copy.

MR. WHITE: Could I ask the purpose of the offer? Illustrative, the proof of its contents or what?

MR. SACHSE: Illustrative of the --

MR. WHITE: No objection, Your Honor.

MR. SACHSE: I'm informed by my co-counsel that we will offer this for the truth of its contents inasmuch as all the other bio-data have been offered for that --

MR. WHITE: Then I would like to voir dire, Your Honor.

THE SPECIAL MASTER: All right. Mr. White, you may voir dire.

VOIR DIRE EXAMINATION

BY MR. WHITE:

Q On Page 4 of the exhibit, Dr. Keller, Exhibit 23, you

list a project beginning in '78 and continuing to the present at Antonito, Colorado. Would you please describe that project?

A The project at Antonito, Colorado?

Q Yes.

A It's a farming operation that I'm involved in, and it's a

a project with -- we have 10 center pivots irrigating small grains.

Q And from what source do those center pivots obtain the water?

A Those center pivots obtain their water from a combined source. During spring runoff they get some surface waters, and after the spring runoff our water rights are not very, you know, high priority, and so we run out of water early, and so we pump.

Q And as a practical matter, the reliable source of water is an aquifer in the San Luis Valley, isn't it?

A You know, I really don't -- I'm not very knowledgable about the aquifer system in there, but it is part of the aquifers of the San Luis Valley because Antonito is in the San Luis Valley.

Q Are they deep wells or shallow wells?

A The pumping lifts are a couple hundred feet. The wells are probably 250 feet, so they would be considered deep

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wells.

THE SPECIAL MASTER: They would be considered what, sir?

THE WITNESS: Deep wells.

Q (By Mr. White) Did you in your work in this tract near Antonito find it to be economically feasible to irrigate deep wells through sprinklers?

A We found from a commercial standpoint that we have been, like farming operations typically, borderline.

Q You made the economic or financial decision to go to deep groundwater?

A The farm was there before I came. The farm asked me to come in as an advisory service. The farm has existed many years before I had anything to do with it. All of the wells and the systems were in place before I arrived on the scene.

MR. WHITE: I have no further questions. We would object for the lack of foundation, Your Honor, to many items which are listed in here, only a few of which are supported by testimony, and again if it's offered for illustrative purposes, I have no objection.

If it's offered for the truth of its contents, I would object on lack of foundation.

THE SPECIAL MASTER: I will overrule the objection

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and admit the exhibit for whatever value it may have.

Go ahead, Mr. Sachse.

DIRECT EXAMINATION (RESUMED)

BY MR. SACHSE:

Q Now, Dr. Keller, would you describe the team put together for the work that Keller Engineers did for the Shoshone and Arapahoe Tribes and the role of each person including yourself in that team?

A The group I put together, as we unfolded the objectives, what we were trying to do, was to -- I asked Ron Bliesner to act as a team leader because I felt he had both the competence to do this and the time to devote to doing the work in the time frame which we were operating, so he functioned as the team leader, and you have heard from him.

There was obviously a drainage component in the system to be looked at, and I conferred with Mr. Bliesner and we concluded that we would use or at my suggestion we used or asked Dr. Willardson to join with us to serve as the drainage expert to review the drainage thing because my personal opinion of Dr. Willardson is that he would be considered in my mind probably the world's outstanding applied drainage engineer, so we were very fortunate to have him.

My personal role in the operation was to coordinate the activities to help assemble the team, to discuss with Mr. Bliesner from time to time the approach, the strategy of attacking the problem within our particular activity level, and to review the site to see -- to present -- or make sure we were moving according to my opinion as to what would be sensible design procedures as another expert in issue to look over what Stetson had done, to see my impression in terms of applicability of those practices like the side roll practices and the design in general, so I was doing that type of an over-view statement to the project in a coordinating role, and then the technical assistance team that was involved -- I was involved in the selection of those teams, and they are qualified beginning junior engineers who have had a certain amount of practical and field experience, and they are in the developmental stage, but the people that helped were graduate engineers who had been out working and who had returned to school and were working on their PhD. programs at the time.

* * * * *

Q (By Mr. Sachse) Would you describe your own involvement in the work in more detail, please?

A Well, my own involvement in better detail is after we assembled ourselves as a group to go, Mr. Bliesner and I visited the project site, he had been there earlier and issued around the site and shown his way around so he could physically move around the site and knew the site.

We spent three days, two to three days, actually two and a part of a day reviewing these sites, looking, going out on the land, particularly the North Crowheart Unit, looking at the soils in an impression state as well as looking at cuts and seeing how the soil generally looked to us; seeing if, in fact, we liked center pivot, you know, we liked the idea of side roll systems, etcetera; seeing what kind of crops and irrigation practices were being used in the area.

We, after a field or ground survey, we did rent an airplane and flew over the project to get that bird's eye type of a view of it, to get that type of an impression, to give a general feeling, again, of the feasibility of the project.

In more particular, I spent somewhat more time in looking at what I might refer to as the Big, we could

call it the Big Horn Flats Mesa, if you want to so say mesa to imply that we are talking about this particular table and piece. And we did spend quite a bit of time, or extra time on that particular element of the project, looking, first of all, at the reconnaissance studies and reconnaissance level activities that Stetson had provided, then checking that out and deciding that we also did not like the way things looked for the reconnaissance, by that approach to designs. So we moved around and looked for other approaches to reaching, getting water to the area.

Q Dr. Keller, would you explain what you mean by the reconnaissance level study that Stetson had done to the Big Horn Flats Mesa.

A The reconnaissance level is where you sort of go preliminary to the preliminary design level, where you look at a possible way to approach a design problem and then you do a very rough calculation as to how you like that approach and then you decide to either go further or not. And he discontinued the design based on his rough approach to it.

So then we looked, we moved around and looked for other approaches to the design and we discovered what we ended up using as an approach to the design, which was

taking water from the Bull Lake Creek side and then Lily Pond and we located a suitable pipe routing up the hill by looking at the hill, the topography and actually driving out on the scene. And then carried the project up on the hill, and then after we decided it looked very interesting to, to go ahead with a more full design, preliminary design level or design level for the feasibility level design.

Then we strategized as to how we'd get into that piece of project, what we'd do. We decided to use center pivot and we said, how will we lay these out. That led to the fact that we wanted to do some field studies to check on infiltration to see how we designed the center pivots center.

Q Now, the State, in cross-examination, has raised some questions about the infiltration tests that were done to design the length of the arms of the center pivots on Big Horn Flats Mesa.

Would you describe why you picked that technique and what information you got from the technique of infiltration tests that you used.

A Well, we decided the soils were relatively thinner up there and we liked center pivots, so they allow us more frequent irrigation and optimizing crop production.

The way to select center pivots, the sort of traditional way is to go to -- Perhaps you're familiar with a soil triangle and you look at a soil triangle and you say I think these soils are more clay, we can't do this; these soils are sandy, it might work in. In fact, in one of the publications in the SCS publication, I'd gone so far to take a soil triangle and draw some contours that suggested, based just on soil texture, where center pivots would work and where they wouldn't. But that's just a general thing, well, you will or you won't have problems with center pivots. For a long time, in a design mode, I've been trying to figure out a way to determine a rational approach to center pivot design short of just looking at it and saying I think we'll put a center pivot here, and getting one there and then saying, well, if it doesn't work we'll change it, that kind of approach. And that's really been the design approach.

Some people have been trying to say, well, we'll put in some ring infiltraumeters on?

THE SPECIAL MASTER: What?

THE WITNESS: Ring infiltraumeters. They take a steel band and they bang it into the ground and typically they put another band around the outside of it, and so

they have two bands. And they put water in the space inside the inner band and some more water in the outer band as a buffer, and they measure against time the rate at which water seeps into the soil. But a problem with ring infiltraumeter tests is that there is flooding irrigation and then they're trying to predict, from flooding, what's going to happen when you sprinkle. Well, this just doesn't look like, and it hasn't been proven to be very good. So we, from time to time, have tried and we have made simulation models and stuff to predict what would happen under sprinkle irrigation, and what we used on this particular thing was an infiltraumeter, and I -- Perhaps it's already been described. Do you want a description of that?

Q (By Mr. Sachse) It really hasn't been described in much detail. It might be well that you describe it.

A This particular apparatus was the second generation of an apparatus developed by some research students at Utah State. The first one was Al Colamood, and I might not be able to spell that. And he made a try, and he did make an infiltraumeter. And Robert Baggs, B-a-g-g-s, was a graduate student who had his undergraduate degree in mechanical engineering. He was really quite a good mechanical genius as well as he became in our department

a very good irrigation engineer. And he innovated, as his Master thesis, this spray, this simulator for sprinkle irrigation. Now, other people have made sprinkler irrigation, Royce Tovey, who since passed away, who lived in Nevada, made a sprinkler infiltration machine; Claud Pear used one up in Kimberly, Idaho, so we didn't invent the whole world, by any means. But we did come up with a portable thing that you could take out to the field and not have a semi, you know, a big truck and everything to go out there, and this apparatus was very workable and it's a published thesis, and it's in the public domain for anybody who would like to use it. And this particular appartus is not, is nothing more than a sprinkler device that sprays water on the soil, on a piece of soil about a yard in circumference. It has some excess water around the soil to act as a buffer zone does in the double ring infiltraumeter test.

And we observe using different application rates, which we use rates that are, would occur along a center pivot. We observe at one point the surface begins to show that first sign, it's slicking, getting shiny, that water would begin to perhaps pond.

And then we developed, which had -- We developed the curves that are actually presented in here, that's

the average curve of the data we particularly collected.

And we took that, ran with a, what we call a model in engineering, to simulate the center pivot happening against this piece of field data like all the engineering models to design other things, using in that model some techinque and stuff that were -- actually part of the technique was developed by some people in Texas, I think Hiller, I may be wrong on that, just off. Using pretty conventional practices and techniques and stuff that have been substantiated quite well in making our new model, using this particular piece of apparatus, and feel very definitely confident that we have evolved a process and used a process that has good backing and it is much better than this, go to the triangle and guess it's okay here approach.

So that's really what we did, and I think it was a, I personally felt very good about what we did to, to that process because I think we've done more than I've ever seen other people do, and I think we did it very well.

Q In contribution to the planning of the Big Horn Flats Mesa, what you talked about so far that I recall is the siting of the pipeline going up, general consultations about it, the work with the infiltration device. Did you

any other work in the design or completion of the figures for Big Horn Flats Mesa?

A I think the, the only thing I did -- Actually Mr. Bliesner basically did the work and was on top of details. We discussed the approach using an optimization program to make the selection of the pipe sizes. We did this together, and a general layout discussion and so on.

Q Did you --

A But I did not do the design.

Q Did you visit Stagner Ridge?

A I really did not go up on Stagner Ridge. We drove around it and I conferred with Mr. Bliesner and he said conditions were similar, and I know he was up on Stagner Ridge and I did not.

Q All right. Now, I want to move away from the Big Horn Flats Mesa and Stagner Ridge and get into your role in the review of the work that the Stetson firm had done for engineering design for the five future projects.

One concept that's been talked about a lot this week is your pipeline optimization program, and I'd like you to explain your role in the invention and development of this program. And I think we can start with that.

MR. WHITE: I would object to the question, Your

Honor, because the program was one of those that we've not been allowed to see, and I think if the Witness is going to testify about the program we ought to have a program listing so that we can effectively cross-examine.

* * * * *

MR. SACHSE: Your Honor, the Court has already ruled on that. The program has beendescribed in detail and you have ruled that the computer program itself did not have to be produced, but I think the testimony may go even further in giving Mr. White access to similar computers.

Q. (By Mr. Sachse) Would you explain the optimization program, and in your explanation, the extent to which that is available in the public domain

A. As you recall, I mentioned developing the theory of the process in conjunction with the INCORA Project in Colombia, and let's just start from there because the actual -- if you can write a computer program, you also have to be able to do it by hand, and the computer program doesn't do anything that you can't do. It just does what you can do easier and faster in the sense of this particular program.

When computers came into the engineering domain, one of our -- you might say one of our tools or one of our playthings--somebody might accuse us of--we decided--or I decided that I would computerize this and W. R. Ames Company -- I had left W. R. Ames Company by this time, as you recall.

W. R. Ames Company contracted with me to design a

computer program which we -- "we" being Gary Watters and I designed the under contract for W. R. Ames Company with the stipulation in our contract that we could do what we wanted with our knowledge.

We then took the program and made another version or an enhanced version of it, and we sold a design service using this program, and probably I think in an approximate sense we have designed some 20,000 acres of high density sprinkler systems which, if you think in terms of the extended density of the center pivot system, it would be like over a couple million acres perhaps, and we've designed in California, in Spain, in Russia -- and these are places where systems with this design are in place -- engineers and others have gone out and checked to make sure that, in fact, the pressures, the system had worked well.

We have taken the program and competed with someone else designing the program and the contract, and we competed with that program and won in kind of like a chess game.

We have then -- Well, we took the design and at one point the Department of Energy was wanting to enhance and prove the efficiency of irrigation, the reduction in energy use in irrigation systems, and Keller Engineering

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had a contract with the Department of Emergy to make this program public, and so the essence of our program was to make the program public. And we completed that contract with the Department of Emergy, and at this time the Department of Energy has the program. Actually, we can send somebody a copy of this program that is part of the public domain with a user's manual in great detail to explain how to use it.

We had three seminar work courses in which time we taught various consulting engineers and such to use the program. I believe four different consulting engineering firms have -- three -- four -- I think four -- four people have the program, and for all -- whether they are using it or what they are doing, I don't know, but they have it.

In the meantime, Bob Hill and I developed a program which we -- a smaller version of the program which has been used by Patterson Engineering in Denver, John Patterson. He bought that program.

Ron Bliesner is an expert computer person himself. He has the strategies that were used in the large program.

He developed and tailor-made a program for doing what we were doing here, so in a sense, while Mr. Bliesner's program is not a part of the public domain and not

available for giving to people, the general program which contains the same logic system, the same strategy, in fact, is available, and this larger program which is the one available has some 12,000 -- I think 12,000 cards -- it's a big program. It takes a big box of cards and this is what we can make available, and it's available if someone wants to pay -- send their computer tapes to us. We will print their tape and they can have a copy of the user's manual, and the only fee is just the fee for the service of sending this out.

Q. Did you work with Mr. Bliesner in determining how to use the optimization program that was usedin reviewing Stetson's pipeline costs?

A. To the point that we discussed using an optimization program to check out the pipelines, on a selected basis on some of the systems, and so we did discuss how -- we had already accepted -- we thought the systems were fine. I mean, the amount of water, the efficiencies, the side-roll systems, so we are really only talking about getting two contractors are going to build the same buiding, and one contractor has a different way to do something, and it's just a matter of how he's optimizing. So we are only talking about optimization, not changing the whole system designs.

And we discussed within our time frame taking a certain selected set of systems that Stetson had, and then it was approximately 10 percent, as I recall of the systems, and then trying to have a representative set, checking those out in detail, and then saying, "Okay, the world is sort of like this," and we had the assistance of Stetson in selecting the 10 percent that we selected.

In other words, they said -- Dr. Mesghinna said, "Okay," and he said on these fields and these fields and these fields --

MR. CLEAR: Excuse me, Your Honor, He's saying what Dr. Mesghinna is saying.

MR. WHITE: I will join in the objection, Your Honor, on hearsay.

THE SPECIAL MASTER: Just don't go into what he said.

A. It was my understanding -- I know that we stopped to get what were representative fields and we then used those to test -- to run out and analyze using the optimization program that I have described and figuring out the cost analysis of the pipe distribution networks based on that thing.

It did not change the amount of water that we were developing. It did not change the kind of systems. It

didn't change the efficiencies. These things were not in question.

We were merely saying, "Should the price be smaller or bigger?"

It would be the same kind of idea as if you were going to put a bigger furnace in the house and less insulation or a smaller furnace with more insulation. It's that kind of an optimization.

THE SPECIAL MASTER: What facts govern the decisions either made by you or your associates to change the drainage patterns in given fields when you changed them and pulled the plan for certain pipe or cut in half the amount of pipe, what physical facts?

THE WITNESS: What I'm speaking of here is the sprinkler distribution networks, not the drainage networks.

THE SPECIAL MASTER: I see. You are speaking only of sprinklers so far.

THE WITNESS: And it really didn't eliminate any pipes. It just changed the sizes of the pipes.

THE SPECIAL MASTER: So you are still talking about sprinkler?

THE WITNESS: Yes, sir.

THE SPECIAL MASTER: Did it even change some of the

sprinklers?

THE WITNESS: It doesn't do anything to the aluminum pipe and to the sprinklers.

THE SPECIAL MASTER: But you see the Stetson plan had absolutely no sprinklers on the mesa.

THE WITNESS: Oh, on themesa there were no sprinklers, so what we did, we actually physically designed the whole thing. We were not comparing anything with anybody else's. We did our own.

THE SPECIAL MASTER: Did your own design?

THE WITNESS: I'm only speaking of the comparative studies like on the North Crowheart and so on.

THE SPECIAL MASTER: Go ahead.

Q. (By Mr. Sachse) Were you involved in Mr. Bliesner's redesign of the pumping stations in the Stetson future project areas? For instance, the decision not to build pump houses over the stations?

A. Yes, I discussed this with Mr. Bliesner in some detail, and really the thing that goes on in the current practice, the U.S. Bureau of Reclamation's current practice for electric pumping plants of this nature is actually no shade at all even.

The pumping plants on the Navajo Project going in have no shade. There are literally millions -- and I

mean millions -- of pumps throughout all of the irrigated acreage you see in the region that are electric pumps with no shade at all. Building houses actually adds the cost in two ways, and so we would not recommend building a house over such a pumping station.

One problem you have is that the pump doesn't need a house and so you have the additional first cost of the house, but in addition to that, you've actually, since the pump doesn't need the house, it doesn't reduce the maintenance on the pump to have the house, so you have the house to maintain instead of something that really was a little thing that maybe needed painting once in a while, you have a big thing to worry about. So that actually houses on pumping plants of this nature are really not required, nor are they an item which we would suggest putting in. So that from that standpoint -- which changes the price of the pumping plant immensely by striking this structural element in the plans. I was involved in discussing this with Mr. Bliesner.

Q. Have you seen pumps of the general size and sort to be used here used in the western states with climates similar to this?

MR. CLEAR: I think this pumping plant thing is cumulative of Mr. Bliesner's. We went through this once

on his direct and once on his redirect.

THE SPECIAL MASTER: But this is direct, so maybe not too much repetition.

MR. SACHSE: I won't go much further, but since the question was raised of Mr.Bliesner --

MR. CLEAR: I think Mr. Bliesner should be the one to testify.

THE SPECIAL MASTER: You may answer.

A. The answer is yes, if we want to keep it short.

In fact, many, many -- and, in fact, the pumping plants along the Columbia River and stuff, they usually have some shelters. It's not unusual to see shelters over them, but no houses, and the smaller pumping plants around on canals and such would not have any shelter.

THE SPECIAL MASTER: I feel like a Shakespearean character in that I protest too much. Where did Dr. Mesghinna learn to put houses on these? Who were his professors? Where were we with the criticism when all the this came into the record the first time that we can sit here and beat the man's work so badly? It doesn't require all that much repetition.

MR. WHITE: He probably learned it driving from here to Denver, Your Honor. You see them all along the highway.

THE SPECIAL MASTER: So much for that. Go ahead.

Q. (By Mr. Sachse) Did you review and contribute to the report that has been admitted into evidence as Tribes' Exhibit 13 in this case?

A. Yes.

Q. Would you describe your role in that?

A. My role in that aspect was in the element of review, editing some re-changes, questioning, reviewing in the process of in-depth review in looking into making certain that we had covered the bases, so to speak, and had, in fact, a satisfactory report.

Q. Do you agree with the conclusions in the report?

A. Yes.

Q. I want to askyou, because the Master has been asking about -- I want to ask you to give your opinion of the work that the Stetson firm did in general in designing.

MR. CLEAR: Objection, Your Honor.

THE SPECIAL MASTER: Objection sustained. I really don't believe -- well, maybe you can lay a foundation for it.

* * * * *

MR. SACHSE: Well, Your Honor, I think we have laid the foundation. We've had Dr. Keller describe in detail his really complete experience in this area, his review of such projects.

THE SPECIAL MASTER: But not with the Stetson report. Dr. Willardson hadn't even seen the Stetson report.

MR. SACHSE: Let me ask a few more questions, Your Honor.

Q (By Mr. Sachse) As part of your work on this project, Dr. Keller, did you review the Stetson report and the Stetson designs?

A I reviewed the Stetson report of April, the April report.

Q Did you go out in the field to look at the, the fields as to which there were designs in the Stetson report?

A Yes. As I said earlier I did a field reconnaissance review.

Q Did you participate in the review of the pipeline designs and pumping designs?

THE SPECIAL MASTER: For irrigating or for drainage?

MR. SACHSE: For irrigating the future projects set forth in the Stetson report.

THE WITNESS: My participation was to the extent I've already explained.

Q (By Mr. Sachse) That you've described.

Now, can you state your, your general conclusions as to the adequacy of the work that Stetson did?

MR. WHITE: Objection.

THE SPECIAL MASTER: I'll permit that.

MR. WHITE: I'd like to object on the basis of foundation, Your Honor. If he reviewed the material which is not in the record of this case and which we've not been entitled to look at ourselves, then I think there's an inadequate foundation established and we ought to know that.

THE SPECIAL MASTER: What I was about to say, the report of last April of Stetson, I presume he meant C-245 and if you'll wave that, we can get an affirmative --

THE WITNESS: This is the final report. I have not reviewed all of the backup materials.

THE SPECIAL MASTER: When he said he saw the other document, I presume he may have seen the same document that Dr. Willardson worked with, which was in fact the document of Wind River Drainage Analysis Depth to Barrier and Average Weight, Hydraulic Conductivity. Was that document available and did you work with that?

THE WITNESS: I did not work with that.

THE SPECIAL MASTER: One of them anyway.

MR. WHITE: Your Honor, I would renew the objection on foundation, even though the Witness has indicated that

he reviewed nothing other than that report, for the reason that unless the Witness is able to state that he's able to reach a conclusion by only reviewing the final report and not the preliminary and more detailed documents, I don't think he should be allowed to state that conclusion.

MR. SACHSE: Let me --

THE SPECIAL MASTER: I'll overrule the objection. He may answer.

Q (By Mr. Sachse) Please give your impression.

A I thought that Dr. Mesghinna did a very good job of the report. I though he did well in selecting systems, the processes he selected. The total system conceptually was very workable, it was standard practice, he used good judgment in, in the element of -- I think side roll systems were very appropriate for what he did, his efficiencies, his sprinkler spacings, his sprinkler analysis in general. So in a summary statement, I think that it was a good report.

Q So your disagreements are only in the particular areas where you and Dr. Mesghinna and Dr. Willardson have testified?

A We're speaking of the disagreements, not in the edifice, we're speaking of some techinques. It would be like

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getting two contractors to judge building a site or something. It's really the possibilities for some optimization, some streamlining here and there and so on, but not in the conceptual statement to say we found error in the report in that sense. I mean the system is very workable, it's not an unworkable thing by any means.

THE SPECIAL MASTER: But wasn't there a conclusion or removal of the 30 percent of his drainage, applied drainage facilities?

THE WITNESS: Well, Your Honor --

THE SPECIAL MASTER: Overall?

THE WITNESS: The changes were looking with a different set of judgments.

THE SPECIAL MASTER: I can appreciate that.

THE WITNESS: And not professional criticism in that sense. Dr. Mesghinna's drainage system would work too, and it was said this morning, the drainage is the judgmental area of the drainage is to look, to suggest what may be needed in the future, and you don't put it in until you get nearer to the problem because you don't know where the leaks are going to show up or what the problems were going to be, as already stated. And then you're working on the judgment as based on what scientific

information you have, the soils tests and all of these things that we described, as to what is the proper level of that particular element. And that's merely what was done.

THE SPECIAL MASTER: All right, very good.

Q (By Mr. Sachse) Thank you. Now, I want you to bear in mind the designs for future projects on the Reservation. By that I mean the five areas designed by Stetson Engineers, the two additions that have been put in by Keller Associates, and then looking at the Stetson projects, and for the question I'm about to ask, I want you to consider it both the way Stetson designed it without any modifications and the way it is with the optimizations and so forth that you've contributed. And I want to ask you now some questions about the future projects planned for the Reservation.

First question is, is there any technology in these projects that is speculative or cannot be found successful in operation elsewhere?

A Dr. Mesghinna nor we used any such technologies. All technologies were very appropriate. They're used elsewhere, they're even used locally. You can see all the things we're talking about in the immediate vicinity in operation. So it's very, very common; no experimentation,

no risk taking in terms of techniques and technology involved.

Q Did you review the crop mixes that are proposed for these projects?

A Yes. The alfalfa and small grain is the basic crop mix, and it's a very, it's essentially a very conservative or very simple crop mix with minimum kinds of trouble, and those are the same crops that you see up there now being grown.

Q Do you know the elevations of the future projects?

A Yes. I'm quite certain they range between a little shy of 5,000 feet to up on the Big Horn Flat Mesa, the highest I think it touches about 6,500 feet.

Q Are these elevations in any way unusual for successful irrigated agriculture?

A No. There are many projects in the Rocky Mountain region that would fit into that elevation such as the Antinito Project I mentioned to you. Our elevation is just shy of 8,000 feet, we're 7,900, just touching on 8,000.

Q What do you grow there?

A We grow all small grains. It would grow alfalfa too. I mean it wouldn't be any trouble with alfalfa, and they can grow potatoes there, about the same growing season as up on the Wind River.

The Navajo Project is around 6,000, it's a bit less.

MR. WHITE: Your Honor, I would move to strike any reference to any project including the Navajo Project on another Indian Reservation. You may recall we had a small dispute or a series of disputes earlier in this case concerning the Crow Reservation where we sought to obtain information that the same experts, HKM essentially, had done or about the same types of work that they'd done on a different Reservation, same river system, different state. We were not allowed to have that information. You indicated that it had no probative value or would have no probative value and I think it would be appropriate for the Court to make the same ruling with respect to any reference to other Indian Reservations.

THE SPECIAL MASTER: I have to make some distinction on subject matter. I don't think you can exclude professional comparison of techniques, and methodology and that material from Reservation to Reservation or from place to place anymore than I could say I'll object to your questions on the Antonito thing, but it's not of any great moment, it's a general question and he can give a general anwser.

MR. WHITE: I want to make sure what the Court's ruling is.

THE SPECIAL MASTER: It depends on what you want to show, you know, if you've got a -- Why don't we wait until we get into some more problems.

MR. SACHSE: Your Honor --

MR. WHITE: Maybe I ought to wait and see what his testimony will be about the Navajo Reservation.

THE SPECIAL MASTER: Sure.

MR. WHITE: And then maybe we can get the same information.

MR. ROGERS: That wasn't the basis of the objection to the Crow Reservation anyway, Your Honor, it's an entirely different situation.

MR. SACHSE: I was going to explain that, that the objection --

THE SPECIAL MASTER: It's not necessary.

MR. SACHSE: It would take just a minute -- was that there was -- there is a lawsuit underway there and the information sought was part of what was developed for that lawsuit. We're not offering information that's part of some other lawsuit or in any way claimed as privileged.

THE WITNESS: Well, to add to that, there is just

lots of areas throughout the region that are that high or higher.

Q (By Mr. Sachse) Do you know the growing season on Big Horn Flats, which you've testified is the highest area in these projects?

A The growing season for alfalfa, according to the numbers that I'm familiar with, is somewhere around 125 days for alfalfa.

* * * * *

Q. (By Mr. Sachse) Is there anything unusual about irrigated agriculture with this kind of growing season?

A. Well, there's a lot of irrigated agriculture with this kind of growing season, so no.

Q. Could you give some examples?

THE SPECIAL MASTER: Oh, I think that's almost common knowledge, Mr. Sachse.

MR. SACHSE: All right. Thank you.

THE SPECIAL MASTER: In the Rocky Mountain West.

Q. (By Mr. Sachse) In reviewing the Stetson future plans and your own, the two areas, did you run into any problems with accessibility of water or water quality?

MR. WHITE: Objection, Your Honor. The question is ambiguous. First of all, what location? What projects are we talking about? And, second, what is meant by accessibility of water? Is it groundwater? Is it surface water? And what sort of water quality problems does he have in mind? Too broad.

THE SPECIAL MASTER: He meant all projects, I assume, the futures and these two --

Q. (By Mr. Sachse) In connection with the totality of the future project plans which we have been discussing in this whole series of questions, did you run into any problems with the quality of the surface water for

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irrigation?

A. I did very little on quality except I did see one report on quality, and the quality was excellent, as you would expect from a mountain stream.

I mean, it's coming out of the mountains. The Wind River has Class 1 water, or whatever classification you want to have.

Q. Now, one requisite of irrigation, I would think, is to be able to get the water from the stream to the fields that are to be irrigated, and that's what I mean by accessibility of the surface water.

Did you find any unusual problems or out of the ordinary of irrigation in the west for accessibility of water in these projects?

A. If you mean the proximity of water to the land and the difficulty, terrain you would have to reach to go into the water surface supplies, we are talking about here --

Q. That's what I mean, yes.

A. No.

Q. Would you elaborate on that?

A. I merely mean that the water is relatively close to the land, the topography between the water and the land is not severe or unusual, and the elevations involved are not -- you know, the lifts involved such as the Big Horn

Flats are not out of what's being done out of practice.

Q. Have you reviewed the quality of the soils in the future projects?

A. In a very brief way I know by the observation of cuts and such in the field. By discussion on the soil -- you know, reports -- the soils in the area range between very fine sandy loams and the clay loams with most of them in the sandy loam to loam class, which is really considered an excellent soil from the agricultural standpoint because it has good traffic ability. I mean, you can drive out on it. You don't get stuck on it when it's a little bit moist so easily. They hold water well, and they receive water well, so they are nice soils to deal with.

Q In terms of engineering and the physical characteristics that you have been mentioning of these projects, do you see anything that makes these projects not practicable for irrigation?

MR. WHITE: Objection, Your Honor. I believe that it calls for a legal conclusion because what is practicably irrigable land is a legal conclusion. It's not an engineering conclusion, as Mr. Kersich has already testified.

The United States has indicated in Exhibit -- the

Billstein cross-examination Exhibit 80 that land capable of sustaining irrigation, long-term irrigation, at a reasonable cost -- there's been no discussion of cost associated with these projects. All of the facts go together for you to make a legal conclusion as to practicably irrigable acreage, and it certainly isn't an engineering conclusion, as Mr. Kersich so eloquently stated.

THE SPECIAL MASTER: I'm going to make an assumption because if he thought there was something that wasn't practical, he wouldn't have approved it, so I would have to presume the answer has to be yes. What more can we say? I'll make my mind up whether I concur or don't concur on the basis of all the evidence.

MR. WHITE: Let me add one more grounds, and that is there is a lack of foundation with respect to the long-term nature of the irrigation involved and the reasonable cost element of the PIA definition, and until this witness is able to deal with those two aspects, an adequate foundation --

THE SPECIAL MASTER: He has to limit his answer in those fields in which he has expertise.

MR. SACHSE: I would bring to the Court's attention that I phrased the question carefully in terms of

engineering and physical characteristics. I'm not asking this witness to make the legal decision at this point. That's obviously the decision you have to make later.

THE SPECIAL MASTER: All right.

MR. WHITE: One more objection, Your Honor, and that's on competence with respect to nonengineering aspects.

This witness has been qualified by the Court as an expert in agricultural engineering. He has not been qualified as an expert in soils, for example, and if his testimony includes or his conclusion includes any conclusions concerning soils, any nonengineering aspect, then I think that it would be inappropriate, and if the question were limited to engineering, I would have no objection.

MR. SACHSE: I would differ with that, Your Honor, in that the point you made earlier that Dr. Keller has been qualified as an agricultural and irrigation engineer. All of these disciplines concern knowledge about the soil.

That was brought out very carefully in Mr. Kersich's testimony. Mr. Kersich is also an agricultural engineer, and I submit --

THE SPECIAL MASTER: Yes, it's a technical and a

theoretical thing we are discussing. Kersich was on the arability, not irrigability, as I recall, and his figures were honed down accordingly, but in your own expertise and area of knowledge, would you answer his question?

THE WITNESS: The answer to the question is yes, as you suspected, and the answer is saying that the land is irrigable by using traditional practices, by using things we know how to do. It is not out -- it's not wild. It's not out of the ordinary. It's in common practice.

There's land just like it being irrigated just like we propose to irrigate that land. It is workable. The agriclimatical conditions are such that it will grow crops.

MR. SACHSE: Could we have a five-minute break now? I think we have been on for about --

THE SPECIAL MASTER: Fine, we will take a five- or ten-minute break.

(Recess.

* * * * *

THE SPECIAL MASTER: Come to order, please. Mr. Sachse.

Q. (By Mr. Sachse) Dr. Keller, would you turn to page 35 of Tribes' Exhibit 13, that's Table 14.

(Witness complied.

Q. Would you give me the total investment figure per acre for the five future projects under the costs submitted by Keller Engineers.

MR. WHITE: Objection, Your Honor, the document's already in evidence and it speaks for itself.

THE SPECIAL MASTER: It does --

MR. SACHSE: Your Honor, the last objection was that it wasn't in evidence and I couldn't refer to it. Now that it's in evidence it certainly can be referred to.

THE SPECIAL MASTER: Covering all sides of the street.

MR. WHITE: It's also good law, Your Honor.

THE SPECIAL MASTER: I'll permit him to answer.

THE WITNESS: On that page, the number 1470 is the revised cost, average total investment.

Q. (By Mr. Sachse) That's $1,470?

A. 1,470, and coming on down the Stetson cost, using their, their numbers and then averaging across all of the subparts,

the project is $1,891.

Q. Now, would you turn to page 36.

MR. CLEAR: Your Honor, I'm a little confused.

THE SPECIAL MASTER: I lost him too. What page were you reading from?

THE WITNESS: I'm on page 35, Table 14, the furthest column to the --

THE SPECIAL MASTER: Right.

THE WITNESS: -- right, and it's about mid, a little past midway down. Total investment.

THE SPECIAL MASTER: Thank you.

THE WITNESS: And then again in the repeated section of that same table.

THE SPECIAL MASTER: Right.

Q. (By Mr. Sachse) So your prices are $1,470 per acre, weighted average; Stetson's prices are $1,891 per acre, weighted average. Now, would you turn to Table 15 where you've added in your two new parts of the project, the Big Horn Flats addition and the Stagner Ridge part. What is your weighted average, total investment price there for all projects?

A. That's slightly moved our average up to 1,517, that's the number just above the upper dotted line on page 36, in the furthest right hand column.

Q. Now, would you identify the highest total investment cost that you find under any of these projects for a particular future project.

A. If you'll give me a moment, I'll see. That should be easy.

You mean regardless of which person, Stetson or Keller?

Q. Yes.

A. Looks like the highest numbers come on Table 14, don't they?

Highest number in there is $2,067 for the small, lower parts of Big Horn Flats.

Q. So the range of these costs is from $2,067 per acre down to, averages of around $1470 -- Well, just using the Stetson figures, $2,067 an acre down to $1837 an acre seems to me.

A. Correct.

MR. WHITE: Objection, Your Honor; leading, duplicative and the document speaks for itself.

THE SPECIAL MASTER: It does, but it's late in the afternoon.

MR. SACHSE: This is just laying a basis for the questions --

THE SPECIAL MASTER: Go ahead.

MR. SACHSE: -- that comes next.

Q. (By Mr. Sachse) Now, you've already testified that as part of your work, both under contract for the Agency for International Development and your teaching and consulting, that you keep up with the prices of irrigation generally worldwide.

Are these prices outlined with irrigation per acre, for land being irrigated today in the, in the west?

A. For new developments?

Q. Yes, new developments.

A. Current developments, not at all. They would be for projects, they would be considered in the very comfortable side, good side.

Q. Are you -- Do you know the per acre costs of the portions of the Navajo Project being built at the current time?

THE SPECIAL MASTER: That I will sustain an objection to.

MR. WHITE: Thank you, Your Honor.

THE SPECIAL MASTER: That doesn't give me any probative value whatsoever without a very thorough understanding of soils conductivity, plateau, mesas, topography, everything else of the two units, and then a comparative figure that would give me something to compare it to, Mr. Sachse, so I'm going to sustain.

MR. SACHSE: Well, I'd like to go into the basis a bit so we can have a comparison because I think there are figures that will be useful to you and I think you should know.

THE SPECIAL MASTER: The witness has said that this, by comparison to other programs similarly in the West, is a very, very comfortable figure.

MR. SACHSE: That's right.

THE SPECIAL MASTER: And that makes the point, I think.

Q. (By Mr. Sachse) You have consulted on the Navajo, you've been a consultant on the Navajo Project; is that correct?

A. Yes.

Q. Do you know the division of costs in the Navajo Project in terms of on-farm costs, delivery costs and dam costs and so forth?

A. Yes, I have some knowledge of the numbers.

Q. Do you know the -- I'm not asking you to give it to me now, I'm asking do you know the cost per acre for the delivery and on-farm application at Navajo for the most recent costs being put into operation?

THE SPECIAL MASTER: Costs per acre?

MR. SACHSE: Costs per acre, yes.

THE WITNESS: Yes.

Q. (By Mr. Sachse) You do know that.

Are you familiar -- You've already testified that the altitude at Navajo is 6-- approximately 6,000 feet. Are you familiar with the kind of terrain that the water has to cross at Navajo as compared to the present project?

MR. WHITE: Your Honor, so I don't have to jump up time and time again, I'd like a continuing objection --

THE SPECIAL MASTER: Continuing objection.

MR. WHITE: -- with respect to any comparison with another Indian project when the Master has already disallowed our attempt to get a comparison with Crow Reservation work, which is probably the most similar reservation to the Wind River Reservation.

It's simply inappropriate to deny us access in one case and to allow the Tribes to come on and put on evidence in the other. In other words, there appears that there's something being hidden concerning the Crow and that's been successfully hidden, there's something to be gathered from the Navajo and that's being gathered.

MR. ROGERS: Your Honor, may I say I am the attorney of record for that case and there is something to be hidden, it's a privileged document. There has been no discovery in the Crow case, The State of Montana, which is the principal opposition in that case, has not sought any of the data on which we have relied. So, in fact, it is to be hidden and is inappropriate.

THE SPECIAL MASTER: Gentlemen, we can avoid this patch and thistle if we'll just keep in mind what Mr. Sachse wants to do is get a professional statement comparing the costs of this with the project of the Navajos and is it favorable in comparison. I think that's what he's leading up to. He doesn't want the figures, he wants to know the professional opinion and its favorable comparability, and that's approriate, he may go on that way.

MR. SACHSE: I would like to get a figure because I would like you to see, I think I can say this to you --

THE SPECIAL MASTER: The figures would have virtually

no probative value because we've got a range now with wide disparity from 1937 for North Crow under one set of engineering to down to 1430 on another one, up as high -- And this is the thing, this is the ballpark I'm interested in, not so much somebody else's --

MR. SACHSE: Your Honor, I'll make one more question and then I'll read into the record an offer of proof.

THE SPECIAL MASTER: All right.

Q. (By Mr. Sachse) My question is: Are the costs per acre for the Navajo Project undertaken in, being done now, considerably higher than the costs for any of these future projects?

A. Yes.

* * * * *

MR. SACHSE: Now, I'm making my offer of proof now.

If the witness were allowed to testify as to the cost per acre on the Navajo Project, the witness would testify that the cost of the most recent part would be approximately $4,000 per acre, and that is exclusive of any costs in connection with the storage of water.

THE SPECIAL MASTER: It's probably just as well we are getting as much as we can of the cost figures in the record because they are going to be more important in negotiations for you gentlemen in the case after I'm gone than they are in determining what quantity of water is going to be granted on the Reservation, I think.

Q. (By Mr. Sachse) Now, Dr. Keller, I want you to turn to the energy costs shown in the Stetson tables and in the Keller tables as part of Table XIV, Page 35.

MR. WHITE: Your Honor, could I also have a continuing objection on the grounds that the document speaks for itself?

THE SPECIAL MASTER: You may.

MR. WHITE: And that the questions are duplicative of the material already in evidence?

MR. SACHSE: Then I'll rephrase the question to:

Q. (By Mr. Sachse) I refer you to the document already in evidence which shows the annual energy costs weighted

average under Keller figures as $13.42 per acre and under Stetson figures as $14.92 per acre, and I ask you if these costs are well within the range of energy costs actually being expected in the West today for the delivery of water.

MR. WHITE: Objection. Foundation, Your Honor. How does this witness know that? What costs is he comparing them with?

MR. SACHSE: The witness has already testified that part of his professional background has been in the program for Agency for International Development that reviews irrigation programs and that in his teaching duties he keeps up with costs as well as technology in irrigation. That's the foundation.

THE SPECIAL MASTER: Well, the only difference I find is that in quoting one set of figures on annual energy costs of a comparison between Stetson and Keller is appropriate. When you go to the total, you have a little problem because the totals for all the units adding the two lumps to these into electric power dollars per year, and I don't read that the same as the total of the energy costs,and the demand costs.

MR. SACHSE: I think perhaps I should ask a different question and get to the point the Master has raised.

Q. (By Mr. Sachse) Would you review Table XIV and see what the highest and lowest energy costs are that you see in your program or the Stetson program?

A. Well, the highest energy cost shows up on Stetson's, Big Horn Flats, the smaller part, with $37.80 for energy and an annual demand cost $7.50, which is the cost of having energy available to you.

Q. Will you review Table XV also, which shows the two new Keller --

A. And going to Table XV I find -- XV, the power cost in XV is of the single item, underlined, highest one is $57.77, and that is what's given in XV.

Q. How did these costs compare with energy costs actually being paid for irrigated agriculture today?

A. These energy prices are -- of course, there are people that have no energy, but they are not high for pumping energy costs.

For instance, in Antonito our energy bill is probably -- is not probably, it is -- over $50 a year.

Q. Over -- $50 an acre?

A. $50 an acre per year for electric power. Average in the West -- it would be hard for me to give the average, but the amount of lift in the West averages a couple hundred feet, which would give you comparable energy costs to

these averages for the whole entire western 17 states with some places obviously much higher than others.

Like on the Columbia Basin, the Snake and stuff where lifts are seven or eight hundred feet high, if you can go out to Israel and stuff, you will find thousand-foot lifts.

Q. You have done some work on costs in Israel?

A. I haven't done any work, but, you know, I have studied the systems and all the water in Israel is lifted over 600 feet, and then it's boosted from there up to 1,000 feet higher than the thing that we call the Sea of Galilee. That's where their water comes from. It's lots of high lifts and very expensive lifts.

Prices get up -- some of the newest developments that they claim they have prices that approach $1,000 per acre for water for energy per year.

Q. How do they justify those figures?

MR. WHITE: Objection, Your Honor. Calls for speculation and hearsay.

THE SPECIAL MASTER: He may answer if he knows.

A. The way they undoubtedly justify it is because that's their homeland and that's their water and they are going to use it, and then they try to raise very valuable things with it to make it pay the best they can, and they go

ahead and do some not too valuable things with it just to secure their land and their water.

MR. SACHSE: I have no further questions.

THE SPECIAL MASTER: Okay. Questions by the United States?

MR. CLEAR: No, Your Honor.

THE SPECIAL MASTER: Questions by the other defendants counsel?

MR. RADOSEVICH: Excuse me, Your Honor. Do you mind if I don't have a jacket on?

THE SPECIAL MASTER: That's quite all right.

MR. RADOSEVICH: Your Honor, I just have a few questions.

CROSS-EXAMINATION

BY MR. RADOSEVICH:

Q. Mr. Keller, how much time did you actually spend in the field on the Big Horn and Stagner Ridge Projects?

A. Well, I told you the Stagner Ridge I didn't go up. We drove around it and I don't know how much time it might have taken to look at it, but the Big Horn, twelve hours or so, something in that neighborhood.

Q. Approximately how much time did you spend reviewing the reports prepared by either Dr. Mesghinna or HKM?

A. 20-30 hours.

Q. Did you have any discussions with Dr. Mesghinna after you prepared -- after you had a chance to review the reports that he prepared?

A. I had an opportunity to discuss with Dr. Mesghinna and, you know, about our report and his report after that time.

Q. You discussed that -- or you stated today that you have become very much aware of costing figures. Did you provide Dr. Mesghinna with any figures on costs of materials or installation?

A. You mean during discussions?

Q. Yes, during discussions with him.

A. Actually, my discussions with Dr. Mesghinna were after, you know, our report was done and our report was done, and we just discussed about the report, so there was no specific elements.

Q. Regarding the cost figures that are reflected on Table XIV, Page 35 of your report, what year are those cost figures provided?

A. The cost figures in this report are based on '79 -- I mean, trying to do it for '79 prices.

Q. Okay. Has there been an increase in costs of pipe and pump since 1979 to the present date, to your knowledge?

A. An increase since '79 to now in materials?

Q. Yes.

A. Certainly.

Q. Is it significant?

A. What do you mean by significant?

Q. Would you venture a guess as to the percentage of increase in PVC pipe or perforated pipe?

A. PVC jumps around quite a bit, sometimes goes up and sometimes, believe it or not, goes down.

It depends on how the supply and demand picture is looking at the moment as to where it would be, so it could jump up and down.

Your mechanical devices pretty well take a steady increase. Depending upon the irrigation market, we've had kind of a flat irrigation market this last year, the Russian grain embargo and things like that, so when the irrigation market is down, people sell things a little cheaper, so it looks lower, so we didn't take so much -- even though there has been general inflation, we didn't take -- I would say the changes have been in the 10-15 percent range in the last couple of years, but these are very difficult things and that guesses as to where they are going to be.

Q. Is the Navajo Project being constructed right now, the drains being installed, the sprinkler systems being installed?

A. The Navajo Project is about half through its construction in terms of land under irrigation, so, yes. but it's still moving forward.

The project -- it's my understanding now they finished putting in the sprinkler systems on what they call Block 5. The project is 110,000 acres. They are farming 40,000 -- they are roughly 10,000 a shot. Each block is 10,000 acres, so they grew that way and they put on the latest piece of land, but they didn't get -- the installation was not done in time for planting.

It's my understanding that it's not planted, so it's 40,000 acres planted, another 10,000 acres sitting there ready to go with fall crops.

Q. Do you know when that project was planned?

A. I don't recall the planning history of that. That project started as a surface irrigation project, and it's got into -- you know, it's on the Colorado system and that's a tight river system, as you are well aware, and they decided at some stage downstream to convert it to a sprinkler irrigation project, and the planning is certainly, you know, in the 10-20 year bracket, but I don't know the dates on that.

I have not done recent research back into that history.

Q (By Mr. Radosevich) Would you happen to know what the cost per figure, say in 1979 for construction of that project would be on a per acre basis?

A The latest figure that I had, the latest figure that I was ever given, and it was based on the '80 figures, and I really am not going to speculate the '79 figures, but I can tell you the '80 figures and what they would be if you'd like me to.

Q Yes.

A You want that?

Q Well, does the '80 figure differ from the offer of proof offered by Mr. Sachse?

A It's pretty close, his number is pretty close.

Q Okay.

A It's supposed to be -- Well, just say it, the price is supposed to be just short of five hundred million dollars for the 110,000 acres.

THE SPECIAL MASTER: Who is paying for that project, Dr. Keller?

THE WITNESS: U.S. Government.

THE SPECIAL MASTER: How did the Indians get that money? Was there a judgment or legislation, part of a program or some private power plants contributing to that?

THE WITNESS: No. This piece of the project was based on just, for irrigation. It does not include the dam. The dam was put on the Colorado River System by the System, so the dam is separate. This was just for the irrigation, diversion works, the canal to the project lands.

THE SPECIAL MASTER: And the on-farm.

THE WITNESS: And the distribution system. And on top of that, then there's another piece that the actual sprinkle systems on the land are in addition to this. This is just to get the water to the corner.

THE SPECIAL MASTER: It's a delivery.

THE WITNESS: Delivery system, but the sprinkler systems are, you know, they're more or less like numbers in here. If you'll notice, the on-farm systems are not that huge and item outside of over $4,000.

THE SPECIAL MASTER: Does that project depend upon annual appropriations to stay alive and be fulfilled?

THE WITNESS: I think that's a fully appropriated project that's in process because it goes on and on.

THE SPECIAL MASTER: Okay, thank you.

Q (By Mr. Radosevich) Dr. Keller, you were asked several times with respect to your experience in reviewing projects for U.S. AID, the answer will be obvious, but

are there any of those projects located in the United States?

A No, those are all international projects.

Q Is it relevant at all to compare the cost of energy and materials for the project in foreign countries to a cost per acre in the United States?

A Well, it might be relevant from the standpoint saying what's the world willing to do to develop irrigated land, and the answer would be -- I just was going over the Thailand report, and I'm sorry I can't remember all the numbers and things like that, but the average for the next two million acres of irrigated land that's going to be brought on steam in Thailand, the average for their five-year plan is roughly $1,500, $1,600 an acre, so that's what -- that's what the world bank and so on is putting into, it's to supplement the rainfall for rice irrigation, for the most part. There is some upland crops involved.

So it is somewhat appropriate to say that rather large numbers are being used for land development world-wide, Indians and so on, and these numbers are in this $1,000, $2,000 class and higher.

Q In fact, isn't it also true then whether they construct a project is probably more of a function of their

keller-cross-radosevich

alternatives for food supply than cost per acre in many cases?

A I think that -- That's right. You know, they're soverign units that have these resources and their option is to develop those resources.

MR. RADOSEVICH: Your Honor, I have no further questions.

THE SPECIAL MASTER: Okay, thank you.

Mr. White, cross-examination, if any?

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CROSS-EXAMINATION

BY MR. WHITE:

Q. Dr. Keller, could you please describe the investigation which you made or your team made in its development of these systems for the use of groundwater as a primary source of supply.

A. We did nothing, I did nothing on groundwater.

MR. WHITE: No further questions.

THE SPECIAL MASTER: Let me ask a question or two before you go on because it's opened up a whole new world of things that sooner or later we have to spend more time on.

In all of the work you've done, can you give us a lead or guide as to whether or not where groundwater is available and plentiful and surface water is scarce and short, of converting to groundwater to supply the center pivots?

THE WITNESS: That -- Unfortunately that question, not to hedge or anything, just doesn't have a simple answer.

The systems in a basin like this are interlocked, the surface and the groundwater system. You're not, until you do quite a study, and I have not done the study, so I am not even going to speculate in that system, until you've done quite a study, you have to decide if

you're taking groundwater or are you in fact taking surface water.

THE SPECIAL MASTER: Are you taking somebody's return flows.

THE WITNESS: What are you doing, so until --

THE SPECIAL MASTER: Percolation.

THE WITNESS: Until you get that analysis, you have no answer to that question.

THE SPECIAL MASTER: You know of no analysis that's been made on the Wind River Reservation?

THE WITNESS: I am not aware, I have not looked or I haven't hunted for it either.

THE SPECIAL MASTER: It's not been a part of this project or parameters of your work?

THE WITNESS: No.

MR. WHITE: Can I ask one question that was prompted by yours?

THE SPECIAL MASTER: You might spend another three weeks on this because this is where the future is, as you know.

RECROSS-EXAMINATION

BY MR. WHITE:

Q. Dr. Keller, isn't it true that the development near Antinito in the San Louis Valley that you testified,

enjoys its primary source of supply from groundwater, is located in the Rio Grande drainage where Judge Eakes recently wrote his opinion concerning the conjunctive use concerning groundwater and surface water?

A. Antinito, it's in the drainage, yes.

MR. WHITE: Yes. That's the only question I have, Your Honor.

THE SPECIAL MASTER: Okay, thank you very much.

Dr. Keller, you -- This is to remind you that you are to remain under the jurisdiction of this Court, which is the District Court of Worland, Wyoming, even though we are sitting here. And if you're asked to come again you won't -- you'll still be under the jurisdiction of this Court and still under oath.

THE WITNESS: Yes, sir.

THE SPECIAL MASTER: Thank you very, very much.

Next witness? If we have none, or can you put a man on?

MR. SACHSE: Well, perhaps I can say for everyone's benefit that we have no further witnesses for this week, and accordance with the agreement that was reached earlier, we have two further witnesses in our direct presentation of the case as a whole. We -- One is Dr. Ronald Cummings, the other is Dr. Omar Stewart. We will present those starting Tuesday, September 1st.

Depending upon the amount of cross-examination, we may well finish that within two days.

MR. WHITE: Your Honor, I think the record should reflect that because the witnesses of the Tribes were not available, not ready, we lost about three quarters of a day here. Mr. Sachse has volunteered previously, by making up that time, by starting on Monday of that week which would be August 31st. I'm feeling very much in a bind about getting my case on and off. And I would like to ask that we start on August 31st or that three quarters of a day that we are talking about is not deducted from my case but deducted from the rebuttal case of the Tribes', perhaps. I don't see why we couldn't start on Monday and it's already been suggested by the Tribes.

THE SPECIAL MASTER: Do you want to try that on August 31st?

MR. SACHSE: Well, let me be straight forward about this. If the Court orders us to start on August 31st, of course we'll do it and we have offered that --

THE SPECIAL MASTER: I won't order you to do that, but the next go round I would probably cede.

MR. SACHSE: What it really amounts to is, is more weekend time.

THE SPECIAL MASTER: I know.

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MR. SACHSE: We're only talking about three quarters of a day, and we've put in a pretty full day today.

THE SPECIAL MASTER: I will not order you to, but the next time there's a situation like this I will not yield from my position in the case. All of this must be submitted by that date in December that's in our schedule. In order to be fair about that, I cannot permit a compression of the time left for the State of Wyoming's case, and that's what I wanted to avoid, but I did compress a half a day or three quarters, but we'll try to make that up for you.

I am firmly convinced that there will be drops in evidence and open gaps that will make this up to you.

MR. WHITE: Your Honor, I should say at this time we anticipate that our case in chief will comprise of approximately 20 to 23 days. It may change, make it slightly larger, slightly smaller on direct.

I'm not sure how much cross there will be, but that's what we anticipate for our direct and I would hope that we would have that opportunity.

THE SPECIAL MASTER: All right. I will rely on your professionalism, all of you, to see that we could proceed through that, get what remaining exhibits we have and we will rely on the cross-examination people

not to unduly delay that, because we're getting so close to the definition of the issues.

I thank you all very, very much, and we'll see you at the next session, and we are in adjournment.

(Thereupon the proceedings were (recessed at 3:30 p.m.

REPORTERS' CERTIFICATE

State of Wyoming)
: SS
County of Laramie)

We, Merissa Racine, Monika S. Fleischli and Viola J. Lundberg, Registered Professional and Certified Shorthand Reporters and Notaries Public, hereby certify that the facts as stated in the caption hereof are true; that we did at the time, date and place, as set forth, report the proceedings had before the Honorable Teno Roncalio, Special Master Presiding, in stenotype; that the foregoing pages, numbered 8633-8824, inclusive, constitute a true, correct and complete transcript of our stenographic notes as reduced to typewritten form under our direction.

We further certify that we are not agents, attorneys or counsel for any of the parties hereto, nor are we interested in the outcome thereof.

Dated this 30th day of July, 1981.

Merissa Racine
MERISSA RACINE
Registered Professional
Reporter

Monika S. Fleischli
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