9-1-1981

Trial Transcript, Vol. 98, Morning Session

Frontier Reporting Service

4456
Box 13

case # 4993

File # 205

4456

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

10/30 1981

Margaret W. Hampton

CLERK

VOLUME 98

BE IT REMEMBERED that on this 1st day of September, 1981, at Room 302, State Capitol Building, Cheyenne, Laramie County, Wyoming, the above-entitled matter resumed for trial before the Honorable Teno Roncalio, Special Master Presiding, whereupon the following proceedings were had, to wit:

P R O C E E D I N G S :

ORIGINAL

APPEARANCES

FOR THE STATE OF WYOMING:	NOSSAMAN, KRUEGER & MARSH 1536 Welton, 4th Floor Denver, CO 80202 BY: MR. SCOTTY P. KROB and MR. JAMES MERRILL
FOR THE UNITED STATES OF AMERICA:	MR. JAMES CLEAR & MR. JOSEPH MEMBRINO Attorney at Law Land and Natural Resources Division Department of Justice P.O. Box 7415 Benjamin Franklin Station Washington, DC 20044 and MR. THOMAS ECHOHAWK Attorney at Law Land and Natural Resources Division Department of Justice 1961 Stout Street Denver, CO 80294
FOR THE ARAPAHOE TRIBE:	WILKINSON, CRAGUN & BARKER 1735 New York Avenue, N.W. Washington, DC 20006 BY: MR. R. ANTHONY ROGERS
FOR THE SHOSHONE TRIBE:	SONOSKY, CHAMBERS & SACHSE 2030 M. Street, N.W. Washington, DC 20006 BY: MR. HARRY SACHSE
FOR THE PRIVATE WATER HOLDERS:	MR. GEORGE RADOSEVICH Attorney at Law 910 15th Street Denver, CO 80202

CLERK TO THE SPECIAL MASTER:	MR. LEO SALAZAR Attorney at Law 701 Rocky Mountain Plaza Cheyenne, WY 82001
ALSO PRESENT:	MR. DAVID DORNBUSCH MR. RON CUMMINS MR. DAVID VOGEL MR. GARY WATTS

THE SPECIAL MASTER: All right, we will come to order, please.

I apologize for a little bit of this confusion this morning. I thought we were to get under way at nine, and I was told by counsel on both sides that the Reporters read the transcript when they prepare them, and the last one said that we'll reconvene at 9:30 and that's my fault and I apologize.

Are you ready to proceed with the Tribes case, Mr. Sachse?

MR. SACHSE: Yes, we are, Your Honor.

THE SPECIAL MASTER: Before we begin, do you wish to make a statement for the record, Mr. Merrill? Would you mind, Mr. Sachse?

MR. MERRILL: Thank you, Your Honor. Your Honor, as we have informally informed you and other counsel in this case, the State of Wyoming's special counsel, effective today, is no longer associated with the firm of Hall & Evans in Denver, Colorado. We have opened the Denver Regional Office of Nossaman, Krueger & Marsh.

THE SPECIAL MASTER: Would you spell those, please.

MR. MERRILL: N-o-s-s-a-m-a-n; Krueger, K-r-u-e-g-e-r and Marsh, M-a-r-s-h. And I am serving on the Court and all the counsel present today, as well as the Court Reporter, a copy of notice of substitution of counsel with

our new address and telephone number. I would also inform the Court that copies of this document will be mailed to all counsel and pro se parties of record who have entered an appearance in this case within the next several days.

THE SPECIAL MASTER: And this contains your new phone number and address?

MR. MERRILL: Yes, Your Honor, it does.

THE SPECIAL MASTER: Very well.

MR. MERRILL: Your Honor, I believe Mr. Krob also has a motion to make with respect to some notices of depositions that were recently filed by the United States.

THE SPECIAL MASTER: Mr. Krob.

MR. KROB: Yes, Your Honor. As indicated to Counsel for the United States and formally last week, at this time the State of Wyoming would move the matter for a protective order with regard to the notices of deposition for the State's economists. The grounds for that order are that as the Master will recall July 15th of this year the United States and the State entered into an agreement whereby the experts for the State would be made available or certain of the experts of the State would be made available on certain dates to have their depositions taken. That deposition agreement was presented to the Court and it was the one under which the State had been operating.

On August 19th -- Well, under the deposition agreement the State's economists, Watts and Jacobs were scheduled to be deposed from the 24th through the 28th of August. On the 19th of August, the United States sent to the State a notice to vacate those depositions and notices rescheduling those depositions at a later date. Then on August 27th the United States sent another notice to the State indicating a second rescheduling of Mr. Watts' and Mr. Jacob's depositons and also purporting to notice up the depositions of Mr. Brookshire, Streeper and Mr. Carver, other economists retained by the State. The problem, Your Honor, is that the date that the United States has noticed these depositions for are dates that under the agreement other experts for the State are to be deposed.

Now, one of the primary basis for the State entering into the deposition agreement on July 15th and a basis which was made known to the United States at that time was to avoid precisely this problem, this problem of double setting depositions where you have two attorneys tied up full-time. There are only three attorneys working on the case for the State, in preparing its case, and the United States is attempting to tie up full-time two of these attorneys by depositons. Now, as I say, the purpose of the July 15th agreement was to avoid precisely this kind of agreement. In reliance on that agreement, the

attorneys for the State went ahead and set up their schedules for preparing their case in chief, made their commitments as to when they'd do what parts of that case in chief, and in fact, during the period of time for which the United States has scheduled or attempted to schedule the depositons of economists, two of the attorneys for the State will not be available and part of that time in fact they will be out of town.

That leaves only one attorney to do the two depositons.

It's a problem, and it's a problem that could have been entirely alleviated had the United States abided by the initial agreement. It's an agreement they voluntarily entered into, it's an agreement that the State relied on and justifiably so. Therefore, the State would ask a matter for a protective order in one of two formats, either a protective order completely precluding the deposition of Mr. Watts and Jacobs, in that the deposition agreement provided that they would be deposed between July -- August 24th and August 28th and that period of time has already passed --

THE SPECIAL MASTER: Is there no possibility that you Counsel for the United States and you could agree on what these two gentlemen would say if they were to testify and accept that without having to keep in limbo when they're

going to be deposed? Haven't we come to that posture in the case when you can simply come up with a statement of what they germaine -- what the gravamen of the testimony will be and accept the statement on both sides?

MR. KROB: I'm sure we could submit that.

THE SPECIAL MASTER: Have you attempted that?

MR. ECHOHAWK: We attempted that through the interrogatories and we received no response from the State of Wyoming.

THE SPECIAL MASTER: I'd like you to attempt it again, but go ahead with what you figure the other relief may be that you seek in your alternative.

MR, KROB: If the United States is to be allowed to depose these economists out of time according to the deposition agreement and in violation of the letter of that agreement, they're not to be bound by the letter of the agreement, we would at least ask that they be bound by the spirit of the agreement, and the spirit of that agreement was to allow the State to prepare its case without the problems of double setting depositions. So the other option is that the Master would order that perhaps they're not going to be completely precluded from deposing these experts, but they only be allowed to do so at a time that is not already set aside for deposing other experts under the agreement.

THE SPECIAL MASTER: If I conclude that I'd like to do that for you it's going to be difficult to find such a time because you are practically -- Well, I guess there would be some time in the middle of October.

MR. KROB: The time is short.

THE SPECIAL MASTER: And ten days in September and that would be about all, otherwise you're in trial.

MR. KROB: The State understands that the time is short, but the problem is one that has been created by the United States' violation of the deposition agreement. We'd set aside time for an attorney to be present during the 24th and 28th and to attend those depositions, and of their own volition they vacated that time that they previously agreed to on July 15th, so it is an inconvenience, but it's one they created for themselves, Your Honor. And it doesn't hardly seem equitable to impose upon the State the burden of being double timed right in the midst of preparing its case in chief through no fault of its own.

* * * * *

MR. ECHOHAWK: Your Honor, you will recall that at the Hearing we had in your office on August 17 on the motion to compel answers to interrogatories, time and time again Mr. Merrill, Counsel for the State of Wyoming, told you that his experts were not prepared.

His experts could not agree. They didn't know what they were going to do. They had nothing prepared. They couldn't give us any answers at that point in those interrogatories.

That is the very reason that the United States vacated the depositions. We knew that we wanted to talk to the State of Wyoming's experts, but it would serve no purpose to take them in on the days we had set aside previously and ask them questions when they couldn't provide us any answers to the interrogatories.

Therefore, we moved the dates back several weeks, hoping that in the meantime the State of Wyoming would at least get something prepared so we could have a meaningful deposition. That is the sole purpose that we moved them back. Furthermore, just yesterday we conducted depositions, double depositions. I deposed one of the State's soils experts. Mr. Membrino deposed the fish expert.

It didn't seem to cause that big of an upset in the State of Wyoming's preparation.

Mr. Merrill was in my deposition. Mr. Krob was in Mr. Membrino's deposition.

The State of Wyoming's Notice for the Substitution of Counsel lists four attorneys, including Mr. Jankowski, which Mr. Krob failed to recognize.

We also note that Wyoming also has several other attorneys either in the Attorney General's office or in the firm of Nossaman, Krueger and Marsh that would certainly be able to sit in on the depositions.

THE SPECIAL MASTER: If you want to file it, file it.

MR. MERRILL: Your Honor, I would like to respond to a couple of points Mr. Echohawk made.

It's true that we did allow double setting of depositions for yesterday. I informally agreed with Mr. Echohawk that we would allow one double setting of a deposition because the United States had given us the same courtesy back last winter when we were taking depositions of their experts.

The problem that we have here is that we have a very heavy trial schedule throughout the fall, as the Court is well aware, and it seems rather ungainly to have in the middle of Wyoming's presentation of its case in chief for two of the three main counsel who are devoted to the case to be tied up for an entire week before we begin a three-week bout of hearings here

sitting in depositions.

The other problem is that both Mr. White and myself have made plans to be out of town quite a bit during the weeks of September 7 and also September 14 in reliance on the agreement that we made before.

Now, it's not my fault that the United States vacated the depositions that they had scheduled last week.

We've had the same problems deposing their folks; that is, that they haven't finished all of their work and we haven't been able to obtain final opinions and conclusions.

It seems to me that the appropriate relief for the Court to enter is simply a protective order saying that the Federal Government having had its one chance at double setting depositions, which was yesterday and which did, in fact, impose a hardship on the State -- that no more double setting we be allowed and that the State is free to pick and choose the times when we do not have trials to depose those witnesses in whatever order the United States sees fit, including the week that I believe we have vacant in October.

It seems to me that it's unfair to the State to have the United States have an agreement and then violate that agreement of their own volition for no real reason

and thereby upset all the plans that everyone else has made in reliance on this agreement while we are in midstream relying on it.

MR. ECHOHAWK: May I speak to that one point? It seems that counsel for the State of Wyoming are at odds. Mr. Krob says that Wyoming needs that time to prepare their case in chief, and then they turn around and Mr. White and Mr. Merrill are going to be out of town doing other business, I suspect with their new law firm. It doesn't appear that they are going to be working with their experts.

MR. MERRILL: I don't know where Mr. Echohawk got that idea.

THE SPECIAL MASTER: Let me say this, gentlemen: Get your motion ready and we'll hear maybe a little more on this, but I doubt very much if -- I would sign an order granting some kind of relief, but I doubt very much it could go so far as to prohibit any more simultaneous depositions.

We have both used them, and they are apparently a good device to depose and at least learn enough to not go to Court without being totally surprised even though the witnesses may not have the total in mind or the conclusion of their expertise testimony based on their work.

At least it will serve the purpose of keeping it from being totally surprised, so let's get it ready and we'll hear it.

MR. ECHOHAWK: On that one additional point, just Friday afternoon the United States received from the State of Wyoming a supplemental witness list. I believe the first time around Wyoming had listed approximately 38 witnesses that they may call.

On Friday they listed approximately 10 more. There are not that many vacant days left in the fall.

THE SPECIAL MASTER: Well, maybe they are going to run them through pretty fast.

MR. ECHOHAWK: What we would like is to have time open to depose those people, and if we fill the period in October up with the economists, that leaves no time to depose the bank president or anyone else.

THE SPECIAL MASTER: Mr. Echohawk, that's up to you, and I think you can work that out the best you can.

Did you get your map on the order I signed sometime in August?

MR. ECHOHAWK: Yes, Your Honor, I did.

THE SPECIAL MASTER: There are no other motions, are there, Mr. Salazar?

MR. SALAZAR: No.

MR. ECHOHAWK: One additional matter, Your Honor.

You remember that during the hearing in your office during August 17 the question came up as to whether Wyoming would be able to put on a testimony regarding impact of the Federal claims, and I believe you gave a very strong indication that you would not allow that.

It appears that Wyoming is intending to go ahead and attempt to put that evidence on.

THE SPECIAL MASTER: Let's cross that bridge when we get to it.

MR. ECHOHAWK: What we need to do is -- perhaps we could have a strong indication right now.

THE SPECIAL MASTER: Let's move ahead and the indications will come and they won't be ambiguous when they come.

MR. ECHOHAWK: Your Honor, the point is we have one of our witnesses here that deals with the fisheries, and as I understand it, if Wyoming doesn't put on their impact evidence, they may go through their fisheries and esthetics claims.

What we would like to know is whether to keep Mr. Vogel here or send him back to California.

THE SPECIAL MASTER: Let's proceed. We have only one day, Mr. Sachse, the Tribes' case--

MR. SACHSE: Well, I would assume we would probably finish tomorrow. We have two witnesses.

We may finish today. I can't say.

THE SPECIAL MASTER: Well, whatever I said on the 17th stands. I think that takes care of that situation.

MR. ROGERS: I would just like to note for the record that in the Court's order, I believe of the last day's hearing in July, the Court asked for briefs from the parties on the question of the engineer being able to testify in the case when not licensed for the State of Wyoming, and the Tribes' filed, by mail on Friday, I believe -- Thursday or Friday last week -- said brief which I hope you have now received.

THE SPECIAL MASTER: We'll look forward to it.

All right, Mr. Sachse.

MR. SACHSE: We would like to call Dr. Ronald G. Cummings as our next witness.

THE SPECIAL MASTER: Mr. Cummings, would you take a seat here, please? First, will you raise your right hand to be sworn?

RONALD G. CUMMINGS

having been first duly sworn, was examined and testified as follows, to wit:

DIRECT EXAMINATION

MR. SACHSE: Your Honor, before I begin Dr. Cummings' examination, I want to point out that I have distributed

to the Court and to opposing counsel a copy of Dr. Cummings' report which we have marked as Tribes' Exhibit 22. You have a copy and Mr. Salazar has a copy.

At the conclusion of his testimony and the pattern has been used throughout the trial, we intend to introduce the report in evidence.

BY MR. SACHSE:

Q. Dr. Cummings, would you give the Court your full name and current address?

A. Yes, it's Ronald G. Cummings, C-u-m-m-i-n-g-s, 1405 Solano, S-o-l-a-n-o, Albuquerque, New Mexico.

Q. Would you state your present occupation?

A. I'm a professor of economics, University of New Mexico.

MR. CLEAR: Your Honor, could we ask Mr. Cummings to speak up a little bit? We are having a hard time hearing.

THE SPECIAL MASTER: Yes. There's water in that cup, and if you need more, there's some here.

THE WITNESS: Thank you.

MR. SACHSE: Would it help if the court reporter moved a little bit? I think he's shouting in her ear.

Thank you.

Q. (By Mr. Sachse) You said you are presently a professor of economics at the University of New Mexico?

A. Yes.

Q. How long have you been in that position??

A. Six years.

Q. Now, would you give us briefly a history of your professional activities since the time that you obtained your doctorate?

A. Well, after receiving my Master's degree at the University of Missouri, I was Assistant Professor of Economics at Park College in Kansas City for two years, attended the University of Kansas and received my Ph.D. after which I was an economist with the Kansas Water Resources Board.

I went to the Department of Agricultural Economics and Economics at Montana State University in 1969, was Assistant Professor of Economics.

In 1969 I went with Resources for the Future as a director for their program in resource economics in Mexico, Mexico City.

Q. Would you tell us what Resources for the Future is?

A. Resources for the Future is an organization primarily concerned with research in issues related to natural resources, formed and funded primarily by the Ford Foundation until about three or four years ago. Now I'm not sure of its source of funds.

But in Mexico City I was working with the National Agricultural College at Capingo, Mexico, also working with the Mexican Water Resources Ministry on evaluating irrigation projects in northern Mexico. In 1972 I took the position as chairman of the Department of Resource Economics in the College of Agriculture at the University of Rhode Island, was there until 1975.

In 1975 I took the position of professor of economics at the University of New Mexico.

Q. And you have been there ever since?

A. Yes.

* * * * * *

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Q (By Mr. Sachse) Could you tell us what courses you teach at the University of New Mexico.

A Well, primarily graduate seminars and evaluation of projects dealing with natural resource systems and emphasizing primarily water resource projects and energy systems.

Q Just out of interest, have you ever taught at the University of Wyoming?

A Yes. I was a visiting professor of economics, University of Wyoming. I think it was the visiting John Bougus Professor, based on monies, a grant, I think to the University by Mr. John Bougus. I think I was a visiting professor of economics during the summer of 1973, I believe.

Q Have you published in the field of economics of water use?

A Yes.

Q Would you run down some of your publications for us.

I could phrase that better. Will you list some of your publications for us.

A Well, I have three books that deal with water resource management for irrigation primarily in Latin America. I've numerous, numerous general articles that deal with that topic, probably ten or fifteen professional articles, a number of reports that deal with irrigation.

Q Have you done any consulting in your years of teaching?

A Yes, I've done quite a bit. I have -- I have served as a consultant or advisor with the Inter-American Development Bank concerning irrigation projects in Honduras, with the International Institute for Applied Systems Analysis in Vienna concerning the developement of water sources and research programs, Department of Agriculture in the Republic of Chili concerning the irrigation and water resources management. I have done research for the Department of Interior, Bureau of Indian Affairs, U.S. Attorney's office in Albuquerque; California Water Resources for the Future, again in an extended Latin America program; for the U.S. Senate, Committee on Energy and Natural Resources; Los Alamos Scientific Laboratory; U.S. Department of Energy; U.S. Department of Geological Survey, National Science Foundation.

Q That's enough.

THE SPECIAL MASTER: I think there is sufficient to more than warrant the admission of the Witness as a water resources management and an expert in that regard. I will withhold ruling until the voir dire if it warrants a question, Mr. Merrill.

MR. SACHSE: I'd like to do two other things just as housekeeping matters.

Q (By Mr. Sachse) Have you reviewed the curriculum vitae that's reproduced on Pages D.1 through D. 10 of what we have marked as Tribes' Exhibit 24?

A Yes, I have.

Q Is that accurate, does that accurately give a summary of your professional activities?

A Yes, with the exception of one error. From time to time, you know, I have a publication or anything like this, my secretary takes a file and will update my veta on occasion. And I received a letter from the Association of Environmental Resource Economists informing me that I had been nominated as president elect. While there is only one person on the ballot, the voting has not been counted and I am listed here as president elect of the Association of Environmental Resource Economists, and that is not accurate. I have been nominated for that position.

THE SPECIAL MASTER: If that's your worst problem in the world of being elected, you're a very fortunate person.

MR. SACHSE: We submit that Dr. Cummings is an expert in the field of agricultural and water resource economics and may be recognized as such.

THE SPECIAL MASTER: Mr. Merrill, do you wish to voir dire or anyone at counsel table for the State?

MR. MERRILL: No, Your Honor.

THE COURT: All right. This Witness is admitted for the purposes that Mr. Sachse just stated.

MR. SACHSE: Thank you.

Q (By Mr. Sachse) Now, Dr. Cummings, when did you begin your work for the Shoshoni and Arapahoe Tribes in this case?

A In October, 1980.

Q Would you describe first, in general terms, the work that you have done for the Tribes, work that you undertook.

A My work was essentially focused on two major sets of questions, the first question deals with the question of appropriate economic measures which might be used to demonstrate practicably irrigable acreage, what might, if such measures exist, what might they be. And secondly, to apply the results of that analysis to -- to an analysis of the seven projects that have been proposed for Wind River.

Q Now, let's turn first to the first task, the analysis of the appropriate economic measures for determining practicably irrigable acreage. What did you do in the way of trying to arrive at that, the answer to that question?

A Well, in general terms I attempted to -- What I did was to attempt to draw from -- from the Winters, my reading of the Winters' Case in Arizona versus California, some

criteria that relates to sort of what the Court was after in establishing the PIA rule and then assessing various economic measures against those criteria. And as a part of that work I also looked at, at the measures of feasibility for projects that have been built by the Bureau of Reclamation in Wyoming and in the Big Sloane area since 1939.

Q Have you reached any conclusions about the appropriateness of using economic criteria at all to determine practicably irrigable acreage?

A Well, I don't know if you can call it a conclusion. I must confess that -- that I am, I'm very uneasy with the economists role in this notion of practicably irrigable acreage. The use of, in particular, benefit cost analysis in speaking for his efforts to demonstrate practicably irrigable acreage regard as a very questionable exercise. Benefit cost analysis, its been my experience that we push, we push the use of benefit cost analysis well beyond its intended use in a number of instances. And underlying everything that I will say to you today is, I keep emphasizing --

THE SPECIAL MASTER: Is what?

THE WITNESS: I will keep emphasizing that if you're going to use an economic measure to demonstrate practicably

irrigable acreage, here's sort of the best that you can do. But I do want to emphasize that I have serious questions as to the appropriateness of the economic measures in this regard.

To my knowledge, an economist was, the testimony of an economist or an economist input into the PIA Rule, there was no economist that could testify, to my knowledge, in Winters nor in Arizona versus California, and a method -- Well, what's really at issue is a method that was designed to evaluate a public investment, a project of a limited life at one particular point in time. The use of that method to speak to, to speak to issues that involve the use, the use of resources and the livelihood of multiple generations is simply -- I just don't think it's appropriate. We have become very concerned in the economics profession about the appropriateness of benefit cost analysis, and particularly though, I'll discuss a little bit later, discounting practices.

In projects that involve multiple generations, this is a -- this is a very hot issue, if you will, particularly in the area of environmental -- You know, when we're talking about environmental problems, when we're talking, we're more familiar with storage of nuclear waste, it's just not clear that we have a tool for evaluating these

multiple generation sorts of problems.

We go ahead, unfortunately, in my view -- unfortunately we go ahead and use these tools primarily because we don't have a better alternative.

Q Now, I think we'll come back to this, but I think it would be useful for everyone if I ask you at this point to describe the ways that the Bureau of Reclamation and Congress over the years has evaluated water processes so we'll have something a little more concrete before us before our continued discussion.

THE SPECIAL MASTER: Evaluated processes, are you referring to the establishment of unity or benefit cost ratios to justify appropriations and authorizations of the projects?

MR. SACHSE: The different techniques that have been used over the years to evaluate water projects.

THE WITNESS: I've been involved in studies of U.S. Reclamation policy, this general area for the last couple of years and am still involved outside of this case.

Really you can if you look at U.S. Reclamation policy over the last, since about 1890s, you can usually break it down into three sorts of periods, the pre -- the period prior to the 1939 Reclamation Act, the period 1939 to 1973 and '73 to the present period, of course prior to 1939

benefit cost analysis was not used as a means for demonstrating project feasibility, if you will. And the criteria -- You have to be very careful because prior to 1939, if we begin from, say the Desert Land Act in the 1890s to 1936, 1939, you add a principle used in justifying the building of a project and then there was a practice and there was substantial, there was substantial diversion between principle and practice during this period.

In principle a project was feasible if all users of the water project could repay the project cost. It was always the idea that all users would repay project costs. And there were, you know, problems with front-end money were recognized, but through the sale of public lands and later Congressional appropriations, front-end money was provided, but the idea was that you would repay the project cost.

* * * * *

A. (Continuing) Now, it turned out in practice, however, that the repayment of project costs was a rarity, and virtually year after year after year Congress through omnibus acts and other acts would either forgive or defer payments by agriculture, and this disparity between practice and principle, if you will, really gave rise to several presidential commissions, you know, attempting to figure out what was going on here, and they kind of took care of this, you know, sins, if you will, in 1939 with the Reclamation Act, wherein really separated questions of feasibility from questions of repayment.

In other words, in 1939, in using the language of the 1936 Flood Control Act wherein Congress mandated that when you are looking at these projects, you are concerned with benefits to whomsoever they may accrue, okay, a comparison of those things with costs in speaking to feasibility and then repayment after you have shown feasibility.

Then you speak to the issue of repayment, and in terms of the agricultural sector, agricultural repayment was simply based on an ability to repay.

In other words, no longer do we assume that it would be done the way it was in the past. Repayment would

simply be based on ability to repay.

So then in 1939 -- from 1939 to '73, project evaluation was based on, in terms of the issue of feasibility, is this a good way to spend the public's money today.

Analysis was based on comparing a broad range of benefits, again benefits to whomsoever they may accrue, and it's useful, I think, to think of these benefits as falling into two categories.

One are sort of direct benefits, okay, that are analogous in a way to what we call National Economic Development, or NED benefits, but direct benefits and secondary benefits, okay, so during the '39- 73 period when we looked to Congress for appropriations for water reclamation projects, what we would do is, we would look at benefit cost ratios now and what we would expect is that benefits again broadly defined direct and secondary benefits, that benefits would exceed project costs, which is to say a benefit cost ratio greater than one would obtain.

Q. Could you explain what is meant by secondary benefits and give some examples? Make that as concrete as you can.

A. Well, secondary benefits in very broad terms are related to something you sort of call a multiplier effect, a

multiplier principle.

This principle underlies, you know, our use of monetary and fiscal policy even when we talk about tax cuts.

If we cut taxes by $5.00, your direct benefits are -- these are dollars in the hands of the first recipients of project benefits, farm income, if you will, but we know that, you know, particularly if you take an area and you introduce irrigated agricultural income in an area, as income rises, those farmers are going to spend some part of that income, and that first round of expenditure becomes income, additional income, to the butcher, the baker, the candlestick maker, the man who sells tractors, and fertilizers, and et cetera.

The manufacturer of fertilizer or the seller of tractors, then he spends more money for haircuts, he goes out with the wife, et cetera, and it's these secondary and tertiary rounds of increased income that attends that income attributable to the water project that are referred to as secondary benefits.

Q. Now, am I correct then in understanding that the period between 1939 and 1973 in working up the benefit-cost ratio that the Bureau of Reclamation would include not only the direct benefits, the income produced from the

sale of the crops, but a multiplier that reflects the indirect benefits?

MR. MERRILL: Your Honor, I object. I think Mr. Cummings has just given a fairly lucid explanation and it does very well on its own without Mr. Sachse's recharacterization by a leading question.

THE SPECIAL MASTER: Objection is overruled. It's a very, very general philosophic discussion.

MR. SACHSE: I was just trying to complete this before moving on to the next thing.

A. Well, by all means, secondary benefits were used in virtually -- you know, played a major role in virtually every Bureau of Reclamation project -- virtually every Bureau of Reclamation project in that period.

Q. (By Mr. Sachse) Now, you talked about changes that occurred in 1973. Would you describe those changes?

A. Well, really two sorts of things sort of happened in '73.

First of all, by 1973 -- excuse me just a second.

During the 1939- 73 period it was very clear that water development in the West was a national goal. It was tied to national development goals, and this was a mechanism by which development goals of the United States could be realized.

cummings-direct-sachse

We read in the Congressional testimony statements like, you know, these projects are going to give rise to development of an irrigation empire in the West.

By the end of -- you know, by the end of the 1960s, early 1970's, the cumulative development of water projects in the West, you know, was just about -- in any terms you want to describe -- were fairly massive, and there was what one can perceive really as an end of an era, an end of the construction era, an end of the sort of federal interest in water reclamation as a means for developing water development goals.

We had developed the West in a very real way.

At the same time, you had then the Water Resources Council Guidelines published in 1973, and really the major difference -- okay, and in the 1973 Water Resources Guidelines what you had was a very serious sort of requirement.

In the 1973 guidelines the WRC requires that all studies of reclamation projects be conducted under the assumption that the economy is fully employed.

In other words, you must assume a full employed economy.

Of course, when you assume a fully employed economy, then the source of secondary benefits is eliminated.

In other words, after 1973 you did not include secondary benefits in the benefit-cost ratio, and the reasons for this, stated by the WRC, is, one, you have got data problems, and, secondly, you must assume full employment.

After 1973 this sort of third period that I was describing, it's sort of difficult to characterize it because, first of all, if the whole federal interest in water reclamation as a means for achieving development goals is, in a very real sense, no longer there; and, secondly, the rules of the game are those wherein you must use a curious assumption of full employment.

Q. Now, you say "curious assumption." What do you mean by "curious assumption of full employment"?

A. Well, very simply put, unemployment rates during the 13-year period prior to 1973 were when you weren't full employment assumption were about thirty percent less than average unemployment rates after 1973.

Another way of putting this, unemployment rates during the period where you must assume full employment, you had higher unemployment rates, about thirty percent higher, than you did in the period where you were not closer to full employment.

Q. Have you considered the validity of this assumption in cummings-direct-sachse

connection with a project on an Indian reservation?

A. Well, no more than simply on its face when you are concerned -- you are looking at Indian projects wherein unemployment is a major concern and one -- but I think more than that, unemployment is a major national concern that during these years, as they have been for the last several years, and it does seem-- the rationale for imposing a working assumption where you must assume what you know on its face is false is just -- seems counterproductive.

Q. Now, does it matter -- well, let me go back.

If I understand what you have been saying, the full employment assumption of the 1973 guidelines cuts out, if you apply those guidelines, the use of secondary benefits in judging projects.

Does that matter in terms of whether a project is practical or not?

A. In that regard I wonder if it's -- I wonder if it's clear why the full employment question knocks out secondary benefits?

Q. Go ahead and make that clear if you wish.

A. You see, a second ago we were talking about, you know, when I earn additional income and I buy another tractor and I buy more fertilizer or whatever, this increases

income for those people.

When you assume that the economy is fully employed, you see, the only way I can get another tractor is if someone else doesn't get another tractor because they can't produce any more tractors. The only way I can get a haircut is if someone else doesn't get a haircut because we can't produce any more haircuts.

So when you assume that the economy is fully employed, all these secondary and tertiary rounds, you simply can't -- they can't take effect.

Okay. In response --

Q. Go ahead. I don't mean to cut you off.

A. No. Your question was I believe --

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Q (By Mr. Sachse) The question asked is in terms of how a benefit cost analysis comes out, does it matter whether you use secondary benefits?

A Well, by all means. The -- based on a number of historical studies that I've done of Bureau of Rec projects, the benefit cost ratio based on total benefits including secondary benefits will be anywhere from 50 to 100 percent higher than a benefit cost ratio based on what's now referred to as NED benefits.

Q All right.

THE SPECIAL MASTER: NED?

THE WITNESS: NED, National Economic Development benefits excluding secondary benefits.

Q (By Mr. Sachse) All right.

A To avoid confusion --

THE SPECIAL MASTER: May I interject this observation and ask you if it's correct: So what you're saying these last five minutes or so, adds a fact to the questionableness of the validity of the entire process of taking economic evidence into consideration for what is a practicably irrigable acreage. Is that a fair statement?

THE WITNESS: Certainly -- What's certainly relevant is, and what I hope to describe to you shortly, is they're -- When you talk about doing a benefit cost study there is no

one way to do it, there are a number of ways. And the bulk of my attention has been focused on looking at these various ways and asking what way might you do this, in such a way to try to speak to this issue, this practicably irrigable acreage issue, and yes, you do get elements of what you described.

Q (By Mr. Sachse) Now, let's get to that issue now. With all of this bearing in mind, the varieties of analysis that you described have been used over the years, what did you do to determine the most appropriate economic measures in the context of practicably irrigable acreage?

A Okay. Well, to begin with, certainly suggested by my earlier remarks, practicably irrigable acreage is certainly not a term in -- of art in economics. I don't have a clue what it might mean other than within the context, you know, the way it's spoken, in which case what I had to do is to begin by, by developing some sort of criteria against which I could assess various economic measures. Okay.

And what I really did was I set up three criteria that I would use in assessing these various economic measures. And these criteria are drawn from my, my trying to take what the Court is saying in Winters and Arizona versus California in such a way that it makes sense to me. The three criteria that I set up are the following: First

I don't want a measure that would penalize -- We're talking about a reserved right. I don't want a measure that would penalize Indians for not having exercised this reserved right in earlier periods. Okay.

Secondly --

THE SPECIAL MASTER: May I interrupt? Keep second in mind.

Under first you're not going to penalize the Tribes for the failure of not having exercised their rights through the decades but how do you then justify in your mind the fact that over these decades, with the most liberal federal government in the history of this Nation from 1932 to 1960, granting funds willy nilly for irrigation projects in virtually every western state, how do you account for the fact that BIA nor any other agency of the Interior proceeded with some development of these practicably irrigable acres, if they were indeed just that? There were Federal Irrigation Projects developed in that time, many thousands of acres of them on the Reservation.

At what point did they become the end of the practicably irrigable acres and at what point was it impractical under those very liberal years of New Deal funding of these projects and generalizing and rationalizing BC's to justify projects, at what point was it no longer a

fact that Big Horn Flats should have been created and should have been developed?

THE WITNESS: Or more generally, any of the Tribal lands have thought about that. Obviously I don't know if one believes, if one believes that the Indians felt secure in the reserved rights, I don't -- I see no evidence -- I see no evidence -- I see no evidence of the Indians requesting these projects and being turned down, okay. There were -- There are a number of projects in that period where Indian projects were, some Indian uses were a part of the projects, there are some examples of that. But I really -- I don't know how to respond to that question other than in looking at this sort of dependence of time. The question that has occurred to me and this relates to my discomforts with economic measures, if someone had gone to the Tribes in the 1930s and 1940s and said look, this reserved right of yours, you're going to have an economist running at you in the 1970s waving a benefit cost ratio, and if you can get an economist waving a benefit cost ratio now, it's going to be a very different cost benefit ratio he's going to wave at you in the 1970s, I've got to believe that a rational individual would say we better start rationalizing -- we better get our projects in.

THE SPECIAL MASTER: Okay. Thank you for that answer. Now, will you go ahead with number 2.

MR. SACHSE: Yes. By the way, I point out for everyone's convenience, that these three criteria that Dr. Cummings is talking about are spelled out on Page 3 of the review of the --

THE SPECIAL MASTER: Thank you, Mr. Sachse.

MR. SACHSE: Of the report.

Q (By Mr. Sachse) Would you go --

A My imagination of playing lawyer is in Appendix A.

The second criteria on and something of a correlary to the first is simply that when it's appropriate that in considering economic measures you want to bear in mind the, the priority of the Indian rights relative to other users.

The third and the particularly difficult issue that I'll -- that will come up a little bit later, it seems to me in my reading of, you know, this practicably irrigable acreage rule, that practicably irrigable acreage was the Court's means, the means by which they were attempting to get at this problem of satisfying the future needs of Indians, therefore I require, I tried to require that an economic -- that whatever economic measure is used for PIA, that it not discriminate against the assertion of the

Indians, future Indian needs.

Q When you say discriminate, in what context do you mean that?

A Well, that it -- I don't -- We don't want to -- We don't want to measure that, that -- that -- that fails to measure the impact of satisfying future needs, that discriminates between the satisfaction of present and future needs, okay. This seemed to be central to the PIA Rule. Now, set those up, those three criteria up as a means for, for assessing economic measures.

Q Now, did you then go back and actually try to assess the various possible economic measures against these criteria?

A Yes. I looked at -- I looked at the -- at the benefit cost test based on the 1973 WRC guidelines as finalized in 1979 and 1980, was referred as the NED benefit cost ratio, National Economic Development benefit cost ratio. I also looked at the total benefit cost ratio, in other words, the benefit cost ratio that excludes secondary benefits or where you simply don't assume for employment, and then I look at some cost measures.

Q What do you mean by cost measure ?

A Well, I look at cost, cost per acre as potential indicators of feasibility.

Q Now, let's go back to your evaluation of the NED approach, the no secondary benefits cost approach taken by the WRC

guidelines. Would you explain how you come out to that.

A Well, my -- In considering -- In considering the NED cost benefit ratio, I would -- I conclude that it's simply, it's totally inappropriate as a measure of PIA, primarily for two reasons. And here I'm -- I'm speaking in general about, you know -- We're talking about relevance for practicably irrigable acreage, I'm not here concerned with the Wind River Reservation per se yet.

Okay. The first one is, the first reason for which I would judge the NED BC ratio as inappropriate, it's obvious from my earlier statements, what you use -- When you use this, when you assume full employment as you're required to do as of 1973, you eliminate secondary benefits. On its face you penalize the Indians for not -- for not exercising their reserved right prior to 1973. Again, it relates to the statement I made just a second ago. If the Indians had known in the 1930s and '40s and '50s and '60s that, you know, in 1973 an economist was going to come to them with this NED benefit cost ratio they would surely exercise that right or considered exercising that right earlier.

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A. (Continuing) To use the NED benefit-cost ratio whereby on the average -- on the average you would expect a priori for the NED benefit-cost ratio could be less than one, the average .75 in historical projects, it clearly penalizes the Indians for not having earlier exercised that right.

The second reason for rejecting the NED benefit-cost ratio is the fact that the -- let's forget about secondary benefits for a second and just focus on NED benefits, okay?

The scope of NED benefits will diminish through time as projects take place along the river.

In other words, the first project on a stretch of water will be able to claim a wide range of NED benefits -- flood control, recreation, fish and wildlife enhancement and all these sorts of things.

The second project comes along --

THE SPECIAL MASTER: You consider all of those primaries?

THE WITNESS: Yes, those are all legitimate NED benefits. We are not talking about secondary.

THE SPECIAL MASTER: All right.

A. The second project, for obvious reasons, you know cannot -- you cannot attribute the second and the third project

that range of flood control benefits and recreation benefits.

In other words, the scope of NED benefits depends on when in time, you know, your project comes up, okay, in which case in instances -- in instances where projects developed by people with rights junior to those of the Indians, when, you know, they put those projects in, okay, the source for an obvious penalty for the Indians for not entering this right earlier exists.

Now, as I'll say a little bit later, you can observe that problem. There's not much you can do with it because there's not much you can do with it, but that bias exists. That penalty, you know, you have just got to recognize that it does exist.

We will talk about what to do with it a little bit later.

THE SPECIAL MASTER: Why don't we take a break? It's a convenient time and we have been at it for an hour.

(Whereupon a brief recess was (taken.

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

Q (By Mr. Sachse) Did you apply your criteria to the

concept of a total benefit-cost ratio, not limited to to NED benefits?

THE SPECIAL MASTER: Is this still along the general lines which he testified earlier, not on the Wind River Indian Reservation?

MR. SACHSE: Let me try to clarify that.

Q. (By Mr. Sachse) You have just testified, as I understand it, about the problems with using the post-1973 NED-type analysis --

A. Yes.

Q. -- for determining practicably irrigable acreage. You said -- what I want to ask you now is did you also measure the use of a total benefit-cost measure against the criteria that you've set up to see how that would come out?

A. Yes, I did.

Q. And would you tell us what results you came to there?

A. Well, with the exception of two caveats that I'll mention, the use of total benefit-cost measure, which is to say considering the range of benefits and costs simply without assuming full employment would not -- would be consistent with what appears to me what the Court was seeking in PIA.

Again if you are going to use an economic measure,

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the benefit-cost measure that would be consistent with not penalizing the Indians for having not earlier exercized their rights, et cetera, would be a total benefit-cost ratio.

Now, there are two caveats, however, that total benefit-cost ratio would have to be viewed as a conservative estimate of the relationship between benefits and costs for the project for two reasons.

First of all, I mentioned a source for penalizing Indian projects associated with, you know, the range of NED benefits. Now, the only way you could try to eliminate that bias would be to try to conduct your analysis as if earlier projects hadn't taken place and just operationally there is just no way you are going to do that, in which case what you would have to do is do your best to structure a good measure of direct and secondary benefits, compare them with project costs, and recognizing the potentially conservative nature of that measure attributable to simply operational problems, use that as the conservative measure for the projects' feasibility or practicability just as we've been doing this since 1939.

A second issue, a second source of problems, relates to discounting, and I do feel that discounting practices typically used in this benefit-cost analysis has the

effect of violating the third criterion that I mentioned.

Q. Would you restate the third criterion?

A. Discriminating against satisfaction of future needs, by the Indians.

Q. Now, will you explain how discounting practices do that, and I think it would be helpful if you would give us some examples because this can get pretty abstract at times.

A. Well, it goes back to my earlier comments concerning my sort of general discomfort with the benefit-cost measures.

The major source of this discomfort has to do with discounting, and you have got to understand what you are doing when you discount, what you are trying to accomplish when you discount. What you are saying is, "Look, I have a flow of dollars, benefits or costs through time, and I want to add them," and you say, "Well, you know, I can't add a dollar in 1990 to a dollar in 1981," and so what I am going to do, in order to make them addable, okay, is I'm going to say that I'm going to receive $10.00 in the year 2000. I'm going to say that what I'm going to do is I'm going to say how much money would I have to have and put it in the bank right now, okay, and I put that much, you know, money in the bank, and at compound interest by the year 2000 I have got this $10

or this $100, and that will be something like -- depending on the discount rate you use, that will be that $100 its present value, that amount you put in the bank right now, and it will be worth $100 in the year 2000, it's probably something like $10, so you say, "Okay, that's what I'm going to do."

Now, we face this sort of -- when you are talking about what I'm going to do, you know, or we're going to invest in a project and that project has a life of 50 years, you know, or a hundred years, something like that, there's some appeal in using present values, in using discounting, and the more clearly defined the decision maker is, okay, for capitalizing kinds of problems, this is an appropriate exercise, but when you are considering questions that involve multiple generations, this practice of discounting becomes very weak because what you're led into is something like the following:

Suppose we have two options, and the first option is you are going to get $10 today in your pocket and you get an absolute flat-out guarantee that your progeny after 200 years are going to get a thousand dollars. That's one option.

The second option you get $10.50 today,

you get 50 cents more today, and your progeny, after 200 years, they only get $50. They get $950 less.

When you use discounting, you'll always choose the second option, okay? In other words, you'll take that 50 -- you'll trade off that $950 loss to your heirs, to your progeny after 200 years, for that 50-cent gain today, and on ethical grounds, okay, in the economics profession, as well as our collegues in other professions, we are extremely uncomfortable with this kind of a notion, okay, with discounting practices that have the effect again that you are talking about projects, when you are talking about decisions where multiple generations are involved, okay, that this same -- the effect of discounting which says that the value of satisfying needs in 200 years, 300 years, three generations, four generations, down the road, really they are imperceptible when you discount them.

Okay, making decisions that way simply involves, you know, ethical questions where they give rise to many, not just water rights, but in other kinds of projects that we worry about, tremendous discomfort in the appropriateness of using discounted values.

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THE SPECIAL MASTER: In other words, it's not difficult to find a basis to reject them, you don't have to search too long to find a basis to reject them, these that are fraught with uncertainties?

THE WITNESS: Particularly for the issues at hand, sir. If what you expect is, are rising values over time, in other words, for the -- If in reservations, if, for example, you expect the population to increase, if you expect levels of education and technical expertise to increase, these are the kinds of things that you expect. And not only that, this is what you're after. In other words, you know, this is what you hope will take place and you want a value, you know, those things; greater agricultural expertise, greater interest in the future.

When you discount them you're -- it's -- it's counter to your purpose. Okay.

Now, I -- I -- In my mind, discounting practices are inconsistent with that third criteria. You cross purposes with a goal of trying to consider and value the satisfaction of future wants just as you justify the satisfaction of today's wants. I would argue that you probably wouldn't discount. Now, I have, however, considered the question, if you are going to discount, the following notwithstanding, the problems of choosing a real discount rate, I haven't

gotten beyond that, just real discount rate.

Q Now, would you tell us about that.

A Okay. If you're going to discount, you've got to get at a real discount, that's an interest rate that's inflation free. You've got to do that because all of your other prices are inflation free and, you know, your interest rate, discount rate is another price, you want that to be free of inflation.

Now, the choice of a discount -- of a real discount rate is -- You can get some experts that will tell you it's very high and you'll get some experts that will tell you it's very low. One thing -- One thing I can say about a real discount rate, first of all the Water Resources Council discount rate of seven and a quarter percent or whatever it is, that's clearly not a real discount rate. The Water Resource Council says it's not a real discount rate, the National Foundation says it's not a real discount rate. WRC says seven and a quarter percent is not a real discount rate.

THE SPECIAL MASTER: Why do they say that, because the end doesn't justify the means?

THE WITNESS: No, sir.

THE SPECIAL MASTER: Said Mr. Machovelli.

THE WITNESS: No, sir. What happened was, you see,

Congress set the discount rate to be used for the water projects and actually they did a pretty good job, you know, when they first set this up back in the, back in the '40s and '50s. What they said was they tied it -- They said when you're doing these projects use a discount rate, they tied it to the long run rate of return on government securities and that for a long time was around, oh, two percent, two and a quarter percent, two and a half percent, you know, in that range. And a lot of economists, a lot of economists, in searching for this real discount rate, will use, for a real discount rate, as a surrogate for a real discount rate, the real growth and national product, real growth in the economy. And the rate, the rules set by Congress will result in a rate that was fairly close to rates of real growth in the economy. What was not anticipated, of course, is the inflationary sorts of pressures and wildly fluctuating interest rates that we've experienced over the last decade plus.

Now, in that regard, see, like the Environmental Protection Agency in the late '70s, I think I was reading a document that's cited in here, '78; '79, Environmental Protection Agency argues for a two percent real rate of growth -- of real interest rate, and it's based primarily on considerations related to real growth in the economy.

Now, in -- since there is no -- there is no unsaleable objective ways of choosing a real discount rate, we can get a range of economists in here and some will argue high and some will argue low. I would use basically the same criteria that I used earlier in looking for an appropriate real rate of discount, and in that regard, one, I would -- I would look to the real rate used in -- for those projects that were in the bulk of where the western water was developed, and that would be something on the order of two and a half to three percent. Alternatively, if you, if you choose -- if you sort of look at -- If you sort of look at the relationship between that Congressional mandated rate and the rate of growth on the economy, okay, which again, as I say, many times is used as a measure, as a way at estimating a real discount rate, but what you'd wind up with is something in the range of two and a half to four percent, okay, you would see something probably on the EPA rate, the rate of the Environmental Protection Agency uses, which is two and a half percent. And a high range, very conservative range I'd use something maybe like four percent for my analysis. I did use the higher four percent rate although I could have as equally well, and I think I would have been justified in using two percent or two and a half percent. So in summary, I think you've

got to recognize that when you -- when you discount you're saying something about the relationship between the satisfaction of future needs and present needs, but if you're going to discount, then I think an appropriate range for a real discount would be two to four percent.

Q What other economic measures have you looked at as a way of getting towards practicably irrigable acreage?

A Well, as I mentioned the measures that I looked at was the NED BC ratio, and what we've called total benefit cost ratio, and in that total benefit cost ratio we don't assume total employment. We do the same thing, I did benefit cost analysis just like you 'd do it today if you were with the World Bank or AID or whatever. The other -- the only other sort of ballgames in town that you might look at are some cost measures. I looked at cost per acre foot; let's compare, you know, we got an Indian project, let's look at cost projects, cost per acre foot and compare it with past projects that were feasible that were constructed and look at cost per acre and make those comparisons.

Now, I got to point out that you have to be careful when you're making cost comparisons for objective reasons. High costs in and of themselves don't mean anything if you've got high benefits, ultimately higher benefits, okay. Low costs, the fact that you got low costs wouldn't

mean a lot, you know, if benefits were correspondingly low, you can use a cost measure, I think, usefully along -- as a way of sort of circumscribing practicably irrigable acreage. You're using comparative measures, you can take -- just as you'd use, you say what if you're sort of -- You got -- You got, what I would argue to be a relatively conservative measure of a benefit cost ratio, you look at that and then you sort of look at, you might wish to have sort of looked at, in terms of projects that have been practical, that involves practicably irrigable acreage in the past, how does our project compare. And we got soils scientists that look at our projects and irrigation engineers, and they say kind of either it does or it does not sort of meet what these projects, past projects have looked like. And in that -- in that frame, you could look at construction cost per acre, cost per acre-foot, you could look at a NED cost measure if you'd like, you know, for comparative purposes.

You got to bear in mind when you look at these, the thing you've got to be most careful with when you look at these cost measures is that for more modern projects you'll expect a little higher cost per acre-foot and cost per acre corresponding with lower water diversion require-ments. If you use pipes and things like this, you're going

to -- You're going to see a higher cost per acre-foot or higher cost per acre, but you have to look behind it, it's more efficient because you might be using only 30 percent of 50 or 60 percent of the water per acre, you're using less water, you're substituting capital for water in a very real way.

You've got to be alert to that.

Q All right. NOw, could you summarize for us your conclusions -- I want to state this carefully -- you crossed the barrier of saying you are going to use economic measures to get PIA, then the economic measures that you have said would be most appropriate to use in this context.

A Well, in terms of -- of appropriateness and appropriate in terms of what the Courts seem to be after in establishing a PIA Rule, I would use, I would use a total benefit cost measure. If I discount, I'm going to use a discount rate somewhere in the range of two to four percent, a real discount, inflation free, two to four percent.

I will likely call on comparative sorts of measures in an effort, really, sort of as supportive to that total benefit cost measure because that total benefit cost measure, looking for consistency through time, is going to have to be conservative. I can't do anything about the fact that earlier developments have taken place, just can't

do anything about it. Okay.

Q Right.

A It's going to be conservative in that regard.

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Q. (By Mr. Sachse) Now, have you -- go ahead.

A. Well, I would then also, as supporting evidence of practicability or, if I may use that term, I'd look at some comparative measures from those provided by the soils scientists and the drainage engineer and the irrigation engineer, and I would look at costs per acre and costs per acre-foot that the economists could provide and compare it with past projects.

I would look at -- I'd use really every characteristic I could get my hands on in an effort to sort of circumscribe the notion of what's practical. Within that context, probably use an NED benefit-cost measure which is a super, super, super conservative, but I would use that, as a comparative measure, compare it with past projects.

Q. Now, have you applied these standards to the five projects designed by Stetson Engineers and the two additions designed by Keller Engineers on the Wind River Reservation?

A. Yes, I did.

Q. Now, I would like you to describe in some detail the analysis you undertook, particularly making clear to the Court where you relied upon work already done by experts in the case and where you've done additional work of your own.

MR. SACHSE: And for the Court's benefit, I point out that there is a summary description of this on pages nine and ten of the report.

A. Well, I did not -- certainly did not start from scratch. I have relied primarily on data provided by Dornbusch and data provided by Stetson Engineers and Keller Engineers.

What I did was I took Dornbusch's estimates for net farm returns on the five projects that he has, and for the Big Horn -- what I call Big Horn Flats Extension to make -- there is a project proposed by Stetson on Big Horn Flats. There is an expanded project on Big Horn Flats proposed by Stetson --

Q. By Keller, you mean?

A. By Keller. I refer to Stetson's project on Big Horn Flats as Big Horn Flats, and the latter, the one proposed by Keller as Big Horn Flats Extension, okay, so we can make sure we distinguish between the two.

And so for Big Horn Flats Extension and Stagner Ridge, what I did was to use Dornbusch's estimates for net farm returns which were applicable to what the category says is highlands. Okay, they broke this out by highlands and lowlands.

Net farm benefits I calculated by subtracting the on-farm irrigation system costs from Dornbusch's net

farm returns, okay?

Q. Now, how did you get that breakout?

A. Now, Stetson Engineers' cost estimates are on-farm costs and project costs combined. Following common practices in economics and particularly Bureau of Reclamation policies, I needed to have those project costs or on-farm costs separated out so you can identify net farm -- you know, net farm returns and gross returns less all on-farm costs. Okay?

So I had Keller Engineers separate out Stetson's project costs into those that were appropriately considered on-farm and those that were appropriately, you know, considered project, okay?

So then my estimate of net farm benefits is based on Dornbusch's calculations of net farm returns, less on-farm system costs, okay?

I estimated the secondary benefits via regional multipliers which are provided by the Water Resources Council. The Water Resources Council provides estimates for regional multipliers.

I did this primarily because I could not find --

THE SPECIAL MASTER: I thought your earlier testimony was to the effect that you would probably exclude secondary benefits and use net benefit-costs according

to the NED concept, and now you say you did use this secondary benefit in considering the extension, the Keller Engineering?

THE WITNESS: No sir, my testimony was that I would use the benefit-cost ratio wherein secondary benefits were included.

THE SPECIAL MASTER: I see.

THE WITNESS: I could not find a reliable input-output study for the State of Wyoming, in which case I had little recourse but to use the regional multiplier provided by the Water Resources Council.

These result in what I think has to be regarded as conservative estimates of secondary benefits.

THE SPECIAL MASTER: What are some secondary benefits from the Keller Extension?

THE WITNESS: I beg your pardon, sir?

THE SPECIAL MASTER: What are some secondary benefits from the Keller Extensions, the Stagner Ridge and the Big Horn Flats Extension?

THE WITNESS: It would be secondary benefits associated with the projects that would be of the kind that I described earlier.

It would be increases in income to processors, sellers of products, simply the rippling of income

effect throughout the economy.

THE SPECIAL MASTER: And is that one of the material reasons, one of the heavier reasons that warranted your conclusions that Big Horn Flats Extension and Stagner Ridge do have NED BC measures putting them into a unity or better?

THE WITNESS: Sir, the secondary benefits would be included in the total benefit-cost measure, not in the NED benefit-cost measure, okay? The NED benefit --

THE SPECIAL MASTER: Where in the exhibit do you show your total benefit-cost measures? I know on Table 2, Page 12, you have a column in which you give us the NED BC measure, not the total BC measure.

THE WITNESS: Okay, sir.

THE SPECIAL MASTER: You are confusing me on which is which to justify the project.

THE WITNESS: May I clarify that?

THE SPECIAL MASTER: Surely.

THE WITNESS: If you refer to Table 2 in the first column, I have argued the benefit-cost measure appropriate -- as appropriate as you are going to get for PIA -- would be the total benefit-cost measure, and that is the one given in column one, okay, benefit-cost measure for PIA.

In the next three columns --

Q. (By Mr. Sachse) Let me stop you here so we don't get any confusion about this.

Would you go down the different projects -- I don't want there to be any confusion as to where you are using a different system for the two divisions than from the projects --

THE SPECIAL MASTER: There's no question about that.

MR. SACHSE: It's the same approach for all of them. I just wanted to make sure we all understood that.

Q. (By Mr. Sachse) Go back to the Master's question.

THE WITNESS: So, sir, in the first column is the total benefit cost measure, okay? For North Crowheart using Stetson's costs, it's 2.52. Using Keller's costs -- I'm sorry. It says Bliesner, who is a part of Keller -- it says 3.29.

Now, up at the top you'll see the title "Comparative Economic Measures".

I spoke earlier about using, in addition to the benefit-cost measure, one might wish to use -- to look at comparative measures. We will talk about these historical averages shortly, but what you see there is for this project I have given you costs for project acre,

costs per acre-foot, and then an NED benefit-cost measure.

That is a benefit-cost measure that excludes secondary benefits.

I'm sorry if my titles aren't descriptive.

Q. (By Mr. Sachse) Just so we have this clear, the benefit-cost measure that you are testifying is the appropriate measure for these projects is the measure shown in the first column?

A. Yes, that is --

Q. And that measure includes secondary benefits?

A. Yes, it does.

Q. As well as the direct benefits to the farmer?

A. That's correct.

Q. And to compute those secondary benefits you used a regional multiplier obtained through WRC?

A. Yes, by a WRC publication, yes. Again I say -- I used that simply because I couldn't find -- there apparently has not been a good input-output study done for the State of Wyoming, in which case my only recourse was to use the WRC multiplier for the region that includes Wyoming.

Q. Thank you.

A. Okay. Relative to past projects, I would like to point out

that secondary benefits that are derived via these multipliers are about a third of total benefits compared with roughly fifty percent in past projects.

Q. Yes. Now --

A. Okay?

Q. I want to get a few other questions in.

MR. SACHSE: And, Your Honor, we'll come back to this table. I am laying a bit more foundation.

THE SPECIAL MASTER: Very well.

Q. (By Mr. Sachse) I think it would be useful if you would describe the major differences between your analysis that produced the cost ratios shown on column one of Table 2 and the analysis that the Dornbusch firm did.

You have already stated, as I understand it, that you relied upon the Dornbusch figures for benefits.

A. Right.

Q. And that what you are doing is a different analysis to obtain those same figures.

A. There are really only two main differences. The first is the obvious one that I include secondary benefits. I don't assume full employment, okay?

The second major difference is that in Dornbusch's formation of his benefit-cost ratios, okay, he included on-farm irrigation costs as a project cost whereas

typically on-farm costs are treated as just that, an on-farm cost just as you would include a tractor cost or anything like that in getting at net farm income.

When you include on-farm costs as a project cost, what you do is you artificially diminish the benefit-cost ratio.

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THE SPECIAL MASTER: Yes, but don't you have to consider the fact that on these projects you're not going to end up with 150 or 200 separate entities called the farms which would be put up for drawing by lotteries in the earlier days of projects or will be sold? You have a Tribe, a collective type thing, and entity, a political subdivision, in fact, owned and operating, so aren't your distinctions of on-farm irrigating systems cost as not being a part of project costs, a little bit artificial compared to reality, the real world facts of life on the Wind River Indian Reservation? Can you address that concept?

THE WITNESS: Yes, sir. I don't -- You can put whatever costs you'd like in a project cost. I, in following -- in following Bureau of Rec practices, simply common practices despite the fact, the fact that there are a number of examples wherein non-Indians they'll have tractor sharing pools and all this kind of thing, that fact notwithstanding, you typically, when you're doing your benefit cost ratio, what you're -- the question that you're trying to address, okay, is, you know, for a sort of a typical farm, if you will, what is the relationship between, you know, net gains in farm income and project costs. Now, I -- I, by no means, mean to imply -- there

is nothing wrong with including on-farm costs as project costs nor would it be wrong to include tractor costs as a part of project costs, you know, if you were going to have simply one managing entity, put everything down, you know, I suppose if you want to. I'm simply saying that typical practice and certainly the practices that you'll -- that are common to Bureau of Reclamation in agricultural economics, you'll look at -- When you talk about net farm income you mean just that, okay. And you don't stop with, you know -- You take gross crop revenue and the cost of tractors and cost of fertilizer and you don't stop, you continue with all costs that are on-farm costs.

Q (By Mr. Sachse) Let me see if I understand this and correct me.

You're saying that what you have done is to take the net farm income and to deduct more from it --

A Yes.

Q -- than Dornbusch did because you're putting more into the on-farm costs, and then you end up with a --

THE SPECIAL MASTER: Better BC ratio.

Q (By Mr. Sachse) You end up with a higher BC ratio?

THE SPECIAL MASTER: More attractive BC ratio, more justifiable one?

THE WITNESS: What you're saying is true. That's not

why you do it.

Q (By Mr. Sachse) I mean --

THE SPECIAL MASTER: We think we understand.

THE WITNESS: Okay.

Q (By Mr. Sachse) Okay. Now, you've described the process that you went through to arrive at these figures. Do you have tables in the report that show that process in more detail?

A Yes.

Q And if so, would you explain those tables in general without going through every figure and making this take forever.

A If you'll refer to Appendix B, I will just cause you to flip through one time, if you'll sort of put one finger on Table B.1 and look back to Table B.8. In Tables B.8 and B.9 you have Stetson's estimates for irrigation costs, okay. They are separated into project costs and on-farm costs. You add project costs and on-farm costs, you have the costs reported in the Stetson's report.

Table B.9 are the on-farm and project costs, the lower on-farm and project costs estimated by Keller Engineers, okay.

Now, these costs, the cost by Stetson in Table 8, the cost by Keller Engineers on Table 9 are unadjusted.

THE SPECIAL MASTER: Are what?

THE WITNESS: They are not adjusted, they have different, each of those cost items have a different project life, okay.

THE SPECIAL MASTER: So right now they're apples and oranges, so to speak.

THE WITNESS: Right. They need to be adjusted, they need to be adjusted by the factors that are given in Table B.3. I used here, for consistency, the adjustment factors used by Dornbusch. The adjustment factors are the following: A present value factor, which takes into consideration different lifetimes for the different captial items; a normalization factor that adjusts for normalized prices; a labor factor which adjusts for the uses of otherwise unemployed Indians; and IDC factor, that is Interest During Constructor -- Interest During Construction, okay.

You take the product of those factors, you get the total, which is in the last column on Page B.3. Those factors are applied to Stetson's data in Table 8, Keller Engineers data in Table 9. It then gives you adjusted costs, those that are reported on Tables B.1 and B.2.

Again, Table 1 gives you adjusted project costs by Stetson and Keller. Table B.2 gives you adjusted on-farm

costs from Stetson and Keller. That gives you your cost.

On Table B.4, first column gives you the present value of average annual farm returns taken directly from the Dornbusch report. Those farm returns are reduced by on-farm irrigation costs, those given in Table B.2 to give you then net irrigation benefits per acre given in the last column. You divide net benefits per acre given in Table B.4 by project costs given in Table B.1 to give you -- I beg your pardon, I've left one thing out. It's Column 3 is the, is farm returns less on-farm irrigation costs. To those I add secondary benefits that are given in Table B.5.

THE SPECIAL MASTER: Now, hold it right there for just a minute. What factors do you use, do you use about a 33 percent, what -- What figure did you use for those?

THE WITNESS: Secondary benefits.

THE SPECIAL MASTER: Secondary benefits?

THE WITNESS: Yes, sir, on Table B.5, okay.

THE SPECIAL MASTER: All right.

THE WITNESS: Bottom line is Column 11, sir, which gives you the secondary benefits, so the change in regional incomes, it's an estimate of the change in regional incomes.

THE SPECIAL MASTER: How did you arrive at those

figures in Coulmn 11?

THE WITNESS: Okay, sir. I calculated, for each of the project -- for each of the projects, gross returns per acre that are given in Table 9, okay. I do that because the WRC multiplier is a gross output multiplier, therefore I had to have estimates.

THE SPECIAL MASTER: What multiplier did you use?

THE WITNESS: The one given in Table 10, sir.

THE SPECIAL MASTER: 1.053 throughout?

Q (By Mr. Sachse) Table 10, Column 3 --

A Table 5, Column 10.

THE SPECIAL MASTER: 1.053.

THE WITNESS: Yes, sir, which it taken from the --

THE SPECIAL MASTER: WRC.

THE WITNESS: -- WRC, published in January, 1977.

Now, those are gross output multipliers, we can't use those because we need -- we need an estimate not of gross output which would involve double counting, but the -- What we want are the increase in earnings, so what we have to do is multiply that by the WRC's earnings gross output ratio, which is 20 percent or .201.

THE SPECIAL MASTER: Now, where did you get that 20 percent?

THE WITNESS: That's out of the WRC's regional

multipliers publication, cited in footnote 5.

THE SPECIAL MASTER: Can you hold that just a minute.

THE WITNESS: Certainly, sir.

THE SPECIAL MASTER: I have that 20 percent confused with the 33 percent figure in the top of Page 10.

THE WITNESS: Yes, sir.

THE SPECIAL MASTER: Would you distinguish those two figures for me, please.

THE WITNESS: Yes, sir. On top of Page 10 I say that secondary benefits constitute about a third of total benefits, and what that means is, for example, on Page B.4, okay, let's just take an example, Riverton East using Stetson's cost. The present value of secondary benefits is 39.45 less 25.96.

THE SPECIAL MASTER: Please go over that again. On Page B.4, Table B.4 on North Crowheart.

THE WITNESS: Yes, sir. No -- Well, let's use North Crowheart. I was using a different one.

North Crowheart, total benefits including secondary benefits are using -- using Stetson's costs are 41.70, agreed?

THE SPECIAL MASTER: All right.

THE WITNESS: Benefits excluding secondary benefits are 28.40, Column 2.

THE SPECIAL MASTER: Yet you captioned that as PV Farm Return less PV On Irrigation Cost Systems.

THE WITNESS: Yes, sir. That gives you -- Those are essentially NED benefits. It's farm returns less the on-farm system cost.

THE SPECIAL MASTER: The present value thereof?

THE WITNESS: Yes, sir. All in present value terms. Okay. That's 28.40. Okay. I have added 13.30, roughly, if my calculation is correct, of secondary benefits. What that 13.30 is is if you'll -- referring to Column 11 in B.5, is 15 --

Q (By Mr. Sachse) Wait a minute. Column 11 on B.5, all right.

A Let me go at this in the following way --

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Q. (By Mr. Sachse) I just wanted time to turn the page.

A. Sir, if you're looking at Page B.4, the difference between NED and total benefits, which includes secondary benefits, is 4170 less 2840.

I will talk about where that comes from in just a second, okay?

That's a difference of 1330, which is roughly a third of total benefits of 4170, okay?

Q. Where does the roughly 1330 come from?

A. On Table B.5, if you take in Column 11, 53.21, those are annual -- that is an estimate of annual secondary benefits. You would want a present value figure for that, okay?

The present value factor is 25. Multiply 25 times 53.21 to get the present value of secondary benefits that are added to the present value of farm returns less on-farm irrigation costs.

I'm sorry if that's confusing.

Having calculated on Table B.4 the present value of net irrigation benefits, you simply divide that by project cost given on Table B.1 for the measures given on Table B.6.

Q. Are there any tables that you have not explained in the B series? It seems to me B.7 maybe.

A. Well, on Table B.7 you have net acreage and diversion

requirements for each of the projects. You use those in conjunction with cost data on Table B.1 to derive costs per acre-foot and costs per acre.

Q. And these are all data from exhibits already filed in this case?

A. I believe so, yes.

Q. Now, we then have your benefit-cost analysis of these seven projects.

The other item that you talk about and that I want to get into now is the comparison with historical projects.

MR. SACHSE: And I'm thinking should we take just a minute to break since we are about to change to another subject?

THE SPECIAL MASTER: Well, it's 11:30. If we are going to break, let's break for lunch and get back at 1:00 or 1:15.

Do you want to do that, Mr. Merrill?

MR. MERRILL: I would be happy to keep going.

THE SPECIAL MASTER: Let's go another fifteen minutes and break for lunch if you wish.

Q. (By Mr. Sachse) Now, I want you to tell us what you did in your comparative study, and while you're telling us, it might be useful for you to go through some of the tables in the C series, Appendix C.

A. Okay.

Q. Because I think that might make it -- might illustrate what you are talking about.

A. Well --

Q. Let's start at the beginning of the study, even the work you did before you came onto this project.

A. Well, I have been involved in studies of BuRec projects for over the last three-plus years. We did a large historical analysis of BuRec projects on a contract from the U.S. Attorney's office in Albuquerque and the Bureau of Indian Affairs several years ago back, the results of which were published in the Natural Resources Journal.

The work that we have done here is sort of in some ways a continuation of that. We are continuing -- we have a continuing interest and are continuing our work in these sort of historical analyses for the purposes of a book we are putting together.

What we did here was -- see, in the bulk of our work we had focused on projects in the Colorado River Basin, and we wanted to get primarily, you know, Wyoming projects to get a large enough sample of projects so that, you know, measures would be meaningful.

What I did was to consider all of the projects in the

Pick-Sloan Planning Basin, and we took all of those plus any other Wyoming projects.

There are very few -- there are some, but any other Wyoming projects that weren't in the Pick-Sloan area, okay, so our sample of BuRec projects --

THE SPECIAL MASTER: You took the projects that were in the Pick-Sloan Missouri River Basin, or you did not take them?

THE WITNESS: Yes, we took all of the ones in Pick-Sloan plus any other Wyoming projects that were not included in the Pick-Sloan.

THE SPECIAL MASTER: All right.

Q. (By Mr. Sachse) Now, do you have a table that shows a list of the projects that you at least looked at --

A. Table C.2 on Page C.2 lists all the projects -- we started with all of them, and out of that we wound up with 20 projects for which, you know -- well, of course, the ones that were constructed prior to 1939, there are no -- you know, benefit-cost studies were not used for justifying those projects.

Q. I think it would be helpful if you would stop for a minute and explain what you did with each of these projects, and once you had chosen a project --

A. Okay.

Q. -- what were you doing and what were you trying to find.

A. Well, what we were attempting to do is for each of the projects for which data existed, we adjusted everything for 1979 dollars for comparability, okay, and then calculated the relationship between benefits and costs using, as they did, a total benefit-cost ratio.

We also calculated the benefit-cost ratio that would have been relevant if you were using the NED benefit-cost ratios.

Q. Just so this is --

THE SPECIAL MASTER: Let me ask one question right now, Dr. Cummings.

Is it fair for me to believe that if you were to have used conservative policies for justification of projects that were mandatory if you were to borrow from the private sector that you would have found that not a single solitary one of these projects listed under Wyoming beginning with Eden through Palisades would have been economically feasible?

THE WITNESS: Sir, if you would have used -- I'm not -- let me respond to that in two ways.

Based on an NED benefit-cost ratio, I think only four -- Well, to respond to your question, there's a table that does that, sir. It's C.4A.

THE SPECIAL MASTER: C.4A?

THE WITNESS: Yes, sir. Right before Page C.5, the page before C.5.

THE SPECIAL MASTER: And of those projects --

THE WITNESS: There are only four of the twenty that would have had a B/C --

THE SPECIAL MASTER: Which of those -- Give me a quick reference to their names.

THE WITNESS: Okay. They are Garrison Division, Oahe, Rapid Valley --

THE SPECIAL MASTER: Wait. I'm not on C.4A.

THE WITNESS: May I assist you?

THE SPECIAL MASTER: Well, there is C.4A.

THE WITNESS: Here, the NED benefit-cost ratio --

THE SPECIAL MASTER: Only four that would have been -- Garrison Division?

THE WITNESS: Garrison Division, 1.20.

THE SPECIAL MASTER:

THE WITNESS: Oahe, 1.31.

THE SPECIAL MASTER: Oahe, 1.31.

THE WITNESS: Rapid Valley, 1.32.

THE SPECIAL MASTER: All right.

THE WITNESS: And Glendo, 1.46.

THE SPECIAL MASTER: So you have one in the State of Wyoming. The other three are in South Dakota.

THE WITNESS: I believe that's right, sir.

THE SPECIAL MASTER: All right, so of thirteen projects authorized by Congress since 1939 to date, you have absolutely one that would have survived a true -- true, not a fictionalized -- but a true pay out on economic justification? Now, I'm raising this only to know what the facts are that I have to work with.

THE WITNESS: Sir, may I point out that of the thirteen I do not have included -- you can't make that statement relative to the thirteen Wyoming projects because of those -- of these projects that you see right here, only four are included in our data set. The other nine were not included. You will see they are marked "deleted".

THE SPECIAL MASTER: I see Helena Valley. Well, you haven't included such things as Flaming Gorge because it's not underway. That hasn't got anything underway and never will be --

THE WITNESS: That's why they are deleted. Shoshone was built in 1940.

THE SPECIAL MASTER: Seedskadee is shut down, a disaster. Is it right to say that it's a disaster?

THE WITNESS: Yes, sir.

THE SPECIAL MASTER: Eden Valley isn't far from being a disaster. Lyman is a success after a fashion but didn't

qualify?

THE WITNESS: Yes. Does the data on C.4A respond to your question, sir?

THE SPECIAL MASTER: Yes, it does. I'm searching because I'm going to have the duty to search for some rationale to justify a practicably irrigable acre on this Reservation, and I'm not going to find it in the history of the Bureau of Reclamation, I don't think.

THE WITNESS: That's right, but may I point out, sir -- I should point at that the B-C ratio -- that the NED B-C ratios that you looked at, the four of the twenty that were greater than one, does not imply that they would have met the pre-1939 criterion because, in point of fact, historically, farmers, irrigation farmers, have repaid with something like 16 to 20 percent of their allocated costs, okay, so -- Okay.

Table C.2 sets out our data set. . Our criterion was -- what we were looking for were studies that used, as best that we could ascertain to justify the project, okay?

As the Master has pointed out, some of the projects in here have since closed, but they were constructed, okay?

On Table -- So for these projects, for the projects set out in Table C.2, what we did, as shown on Table C.3 is --

Q (By Mr. Sachse) Before you get to that, could you explain -- perhaps you have, but I want to make sure. Could you explain why you would delete a project, what the various reasons were for deleting a project?

A Well, if they were -- If they were constructed prior to the Reclamation Act in 1939, in which case benefit cost tests were not used in presenting them to Congress.

THE SPECIAL MASTER: They simply wouldn't be applicable.

THE WITNESS: Wouldn't be applicable. If they are -- Since we're interested here primarily in irrigation, we excluded projects that were primarily power and recreation, okay. We excluded projects that were, wherein it was, there was either no irrigation or where it was primarily supplemental irrigation, because you get very biased numbers in comparing, you know, projects that involve primarily full irrigation with projects that involve primarily supplemental irrigation, okay.

Q (By Mr. Sachse) All right.

A And the reasons for excluding the various projects are denoted, hopefully clearly, in Table C.2.

For those projects included in our set, all values were converted to 1979 dollars by price deflators given in Table C.5. And what we did was, was to go back and

analyze those projects and say what they would have looked like, what do they look like using the total benefit cost measure, what do they look like using NED measures, and we're interested in, you know, for comparative purposes, what was the average and what was the range.

Those results are described in Table C.1, Page C.1.

Using a total benefit cost ratio, something analagous to the benefit cost ratios used to justify projects during the period 1939 to '73, the average benefit cost ratio, as you'd expect, is well above 1.32, but ranging from .74 to 2.25. Okay.

THE SPECIAL MASTER: Okay.

A You got projects that even including secondary benefits, benefit cost ratio would have been less than one and in many there were two and 2.25, the average being 1.32.

Looking to comparative measures, cost per acre for - Now, when we had data that -- We did not have data for 20 projects for this particular measure, but only for 13 projects. Cost per acre on the average was $1,875 in 1979 dollars, but ranging from a low of $600 in '75 to as high as $3,971. In terms of cost per acre-foot, here we had data for 16 of the 20 projects. The average cost per acre-foot, now, these are costs allocated to the irrigation sector, okay, divided by water diversions to

irrigation, $23.92 an acre-foot.

THE SPECIAL MASTER: Computed with the same water duty in all 16 projects?

THE WITNESS: No, sir, that is taking cost allocated for each of the projects, take the cost allocated to irrigation, okay.

THE SPECIAL MASTER: I see.

THE WITNESS: Divide it by the water diversions to the irrigated sector, $23.92, with a large range from $8.67 --

THE SPECIAL MASTER: Eight dollars to $63. I fail to find any probative value in that, but it's interesting.

THE WITNESS: Yes, sir. And if you want to look at it for individual projects that is given.

Now, if you look at the NED, that's the one we just looked at a second ago, if you look at the benefit cost ratio excluding secondary benefits, on the average that benefit cost ratio has been .75, ranging from .36 for the -- only for the 20 projects that we looked at had a BC ratio, an NED BC ratio greater than one, but ranging as high as 1.46.

THE SPECIAL MASTER: Oh, boy. Gentlemen, let's go to lunch and come back at 1:30.

MR. SACHSE: Thank you.

(Thereupon a lunch recess was
(taken at 11:45 p.m.