BEFORE THE

ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

IN THE MATTER OF THE NAVIGABILITY OF THE VERDE RIVER FROM ITS HEADWATERS AT SULLIVAN LAKE TO THE CONFLUENCE WITH THE SALT RIVER, YAVAPAI, GILA AND MARICOPA COUNTIES, ARIZONA.	) NO. 04-009-NAV) ADMINISTRATIVE) HEARING

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BE IT REMEMBERED that the above-entitled and numbered matter came on regularly to be heard before the Arizona Navigable Stream Adjudication Commission, at Squire Patton Boggs (US), LLP, 1 east Washington Street, Suite 2700, Phoenix, Arizona, commencing at 9:10 a.m. on the 31st day of March, 2015.

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JIM HENNESS, Vice Chairman
JIM HORTON, Commissioner
BILL ALLEN, Commissioner

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CHAIRMAN NOBLE: Let's open this session of the Arizona Navigable Streams Adjudication Commission hearing on the Verde River.

Good to see everyone this morning. Thank you for being here.

George, would you call the roll?

DIRECTOR MEHNERT: Commissioner Allen.

Over there somewhere.

COMMISSIONER ALLEN: Here.

DIRECTOR MEHNERT: Commissioner Henness.

COMMISSIONER HENNESS: Present.

DIRECTOR MEHNERT: I see him too.

Commissioner Horton.

COMMISSIONER HORTON: Here.

DIRECTOR MEHNERT: And Chairman Noble, who is wide awake.

CHAIRMAN NOBLE: I am here.

DIRECTOR MEHNERT: And that's a quorum, and we can go ahead.

CHAIRMAN NOBLE: Mr. Slade, I believe the first thing this morning is you are opening cross-examination of Mr. Burtell.

Please proceed.

MR. SLADE: Correct. Good morning, Commissioners.

CROSS-EXAMINATION

BY MR. SLADE:

Q. Good morning, Mr. Burtell.

A. Good morning, Mr. Slade. How are you?

Q. Good. How are you doing?

A. I'm hanging in there.

Q. Okay. I wanted to start off this morning talking about the GLO surveys. You brought that up on cross yesterday. I think it's an important issue, so let's start right in on that.

My understanding of the importance of that issue is that we can use those as a measure of the susceptibility of the river, potentially, if we think those are accurate numbers; is that correct?

A. As I understand what Mr. Hjalmarson used those maps for was to try to get an estimate of irrigated acreage in the headwaters.

Q. Okay. I think I wasn't that clear.

When we're talking about the survey depths in the townships that we talked about yesterday, the township 3 north, 7 east, township 4 north, 7 east, and then up the road there to the upper Verde, when we talk about those depths, those are important to consider as an understanding of the river in its past for a susceptibility determination; would you agree with

that?

A. I think it's a line of evidence that should be looked at, sure.

Q. Okay. So we want to see if we can look at it if it's reliable or not?

A. I think that's fair, sure.

Q. And the reliability issue with those is whether it's representing baseflow or snowmelt; is that right?

A. I think you're lumping the two together. As you know, there is a series of townships to the south that Mr. Hjalmarson used that I think are affected by flood flows; and then there was a couple of townships north in the upper Verde that he also used, and those I don't believe there was, in my mind at least, a snowmelt issue for those.

Q. Okay. So for the township 3 north, 7 east, township 4 north, range 7 east, even township 2 north, range 7 east, those are the snowmelt versus baseflow townships?

A. As I understand, those are the townships that are in the Fort McDowell area that Mr. Hjalmarson said, as I recall his testimony and his report, that those were baseflow, yeah.

Q. Okay. And your understanding is that they

are not baseflow?

A. Based on newspaper articles, which we introduced into the record, which I didn't even discuss yesterday, although we could, in addition to the information which I presented yesterday, I feel confident that those were not baseflow; that those were certainly affected by flood flows.

Q. And you didn't discuss the newspaper articles yesterday in reference to, did you say, flood flows or snowmelt just now?

A. I should say snowmelt. Those were high flow months when those surveys were done.

Q. There's a difference between snowmelt and flood flow; would you agree with that?

A. Not necessarily. You could certainly get rain on snow events, which likely happened at that time, where you would be getting a combination of snowmelt and rain runoff on top of it, so it would be both.

Q. Okay. If you didn't have a rain on snow event and you just had warmer temperatures up in Prescott or Flagstaff, that would not be flood; that would just be snowmelt?

A. As you just described it, that would be snowmelt, sure.

Q. Okay.

A. With one caveat; depending on how long it was since the last rain event. I mean it's a big watershed. So if you have a rain event the day before, it could take as long as a day or more before that flood wave eventually works its way all the way down to the bottom of the Verde.

Q. So your contention is that it takes about a day or two days for the water to move down through the watershed; is that what I heard you just say?

A. Well, I was trying to give you an example of a rain event that could occur that there could be a lag time between when that rain event occurred and when you actually saw something downstream.

Q. Sure. But how long do you think that lag time is?

A. It would depend on the extent of the storm.

Q. Okay. So you have a storm on Monday, a big storm. How long does it take for that storm to make its way down, if it's at the top of the watershed, to the bottom of the watershed?

A. What's a big storm?

Q. You tell me. What do you think?

A. Well, you're asking me the question, so I --

Q. Sure. Sure.

A. You need to tell me what type of a storm is it.

Q. Well, on the range of storms -- you're the hydrologist.

A. I am.

Q. Okay. If it's a big storm on the range of storms, how long does it take to go down to the end of the river?

A. Again, I don't -- I mean when you say the word big to a hydrologist, that's not very descriptive.

Q. Okay. Let me provide a little more description. It's not a two-year flood. It's a winter rain event.

A. A winter rain event.

Well, again, it would depend on where in the watershed that rain event occurred. So are you suggesting that it's occurring in the Paulden area, or are you suggesting it's occurring in the Camp Verde area. Or where exactly in the watershed are you suggesting it's occurring?

Q. Sure. Let's say it's occurring in the Paulden area.

A. In the Paulden area, okay.

Q. How long would it take for a decent snow, a decent winter rain, to make its way down from the

Paulden area down to, say, Segment 5, the Fort McDowell area?

A. There is another factor which you would have to provide me information on, and that is has it been a really wet winter? Because certainly if it's been a very dry time and you all of a sudden get a rain, usually what happens under those circumstances is you're going to get less immediate runoff; rather than had it been a really wet year and you get another rain, you know, generally the watershed is more saturated, you're going to get quicker runoff, et cetera.

So under your hypothetical here, what -- are we talking about -- certainly if the watershed had been getting a lot of rain, which, as I understand, the months of January and February and March were very wet when you look at the rain events that occurred, so the watershed was pretty primed, if you will, so if you get another rain event, it could be a very short duration from when that rain event occurs to when you're going to see higher flows at the bottom.

Q. Okay. So let's call a -- just like you said, let's pick 1911, January and February and March 1911.

A. Okay.

Q. And you just said there was a lot of water during that time?

A. If you look at the U.S. Geological Survey flow records for January, February and March, I've got them in my files. The average flows for those months I think were over 2,000 cfs for each month. So that's pretty good evidence, to me, that there's a fair amount of water coming down that watershed. There's a lot of water in the watershed. It's pretty wet. So you get a rain event on top of that, runoff's going to be quick.

Q. Okay. How quick?

A. -- I think, under that.

I haven't done the modeling, Mr. Slade. So my intuition would be it could be within a day under those circumstances.

Q. Okay.

MR. SLADE: And how are we doing on the projector situation?

MS. DEBI LOPEZ: Okay.

MR. SLADE: We've got it working?

MS. DEBI LOPEZ: Uh-huh.

MR. SLADE: Okay, great.

BY MR. SLADE:

Q. Can we pull up Hjalmarson Addendum 2, Page 29, please?

A. And if it would help, I think we're talking about the same document.

Q. Okay. Yes.
A. Yes, second addendum, October 4th?
Q. Yeah.
A. Yeah, sure. So in case you're having any trouble, I can -- oh, there we go.
Q. There we go.
A. Yeah, and I think I looked at that yesterday.
Q. Yes, you did talk about that yesterday.
A. I did talk about this yesterday. Okay.
Q. And this is the document that Mr. Hjalmarson submitted, which shows the townships that he came up with depths for, and then in the blue, with the red arrows, what he believes are baseflow depths; is that correct?
A. I think I lost you on the colors with baseflow depths. In blue, I see the blue box up top; but I think that's kind of a salmon-colored.
Q. See, blue here, blue here, blue here.
A. Oh, that's blue?
Q. Yeah.
A. Okay.
Q. It's kind of a little shading.
A. Okay.
Q. Let's just go with the red arrows.
A. Yes.

Q. Okay.

A. And, actually, Mr. Slade, it was yesterday that I was trying to figure out if it was 4 or 5 feet that he said for township 2 north and 7 east; and, yeah, there's the 5 feet.

Q. Sure. And we'll get to that 5 feet.

So my understanding, looking at this, is the bottom township, township 2 north, range 7 east, where it says "Channel about 5 feet," that doesn't have any blue, and it doesn't have a red arrow. And I think yesterday you said Mr. Hjalmarson mentioned that that was baseflow. According to this, it doesn't look like it's baseflow.

A. Then I misspoke. Yeah, when I saw that -- and that would explain why I couldn't find in the survey notes where it said 5 feet deep of water.

Q. Okay.

A. Yeah, I read that too quickly, and I was thinking since he boxed it. But you're right, the arrow doesn't go down to the 2 north, 7 east. So we're on the same page there.

Q. Perfect.

And I did a little work, tried to come up with that 5 feet, and I think we got that. So I just want to show you that.

MR. SLADE: This is not an exhibit yet, George. I'm passing it out right now.

DIRECTOR MEHNERT: You've got a copy?

MR. SLADE: We've got copies for you, original and seven.

DIRECTOR MEHNERT: Eddie, it's X081.

BY MR. SLADE:

Q. All right, so this is X081, and it's a little difficult to discern the township exactly here, but you've also looked at township 2 north, range 7 east, Mr. Burtell?

A. Yesterday I -- in fact, that was an exhibit we entered into evidence, Mr. Slade, where, again, I was thinking that Mr. Hjalmarson was putting this up because he was suggesting it was a 5 feet deep river there, and so I couldn't find the 5 feet deep, but I was able to find the width of the channel that was surveyed at that time, and I believe it was 4 chains. It was 4 chains wide, so...

Q. Okay. Yeah, I realize these are difficult to read. There's a system that they go through, obviously, and once you learn that system, it becomes easier to understand what they're doing.

I will give it to you that you're a better expert in reading these than I am; but if we turn to

Page 112, which is the second page, and if we go to the bottom there, do we have "Channel, about 5 feet deep"?

A. I see it there.

Q. Okay. And as I said, it's difficult to discern exactly that this is 2 north, 7 east; but do you have any evidence to dispute that this is not 2 north, 7 east?

A. You know, unfortunately, Mr. Slade, you haven't provided me the page that comes before 112 that would tell us what township we're in. Because when I look at the text that precedes the bottom there, where someone wrote the 5 feet, it's not clear to me, when you go up above, which township he was in.

If you look at the first page of the field notes, you can see these field notes covered the boundaries of multiple townships.

Q. Sure.

A. So it's a little unclear to me. I'm not going to say that it's not; but for me to admit that it definitely is, I would need to see the pages that precede 112, just to be fair.

Q. Okay.

A. So I could see that. Because what they do is at the beginning of each of their given township survey, they very clearly state "We are now surveying"

this or that of this township, and they have that as a header, and then they'll launch into describing.

Q. Sure.

A. So, unfortunately, in this case we don't have that to tell us.

Q. Okay. So if we get that information, we can circle back to this.

A. That would be fair, sure.

Q. Okay. So let's do that.

A. Okay.

Q. Let's move up the river to township 3 north, range 7 east, and you submitted some survey information, a good chart.

I'm on X054, Freeport 38, Debi, if you could pull that up.

A. I'm assuming we're going to talk about 39 too.

Q. Yes.

A. Okay. So I have mine out here as well, but you'll have it up on the screen. Okay.

Q. And this is a chart of the GLO survey that was conducted for township 3 north, range 7 east; is that correct?

A. Yeah. And I'm looking at it, so if you want to keep going, that's fine.

Q. Okay. Perfect. I'll keep going, and hopefully we'll get it up here.

A. Okay.

Q. It was conducted in February of 1911; is that right?

A. That's right.

Q. And Mr. Hjalmarson, if we look on here, before we switch it over there, Debi, if you haven't already, Mr. Hjalmarson has baseflow depths for that township of 3 feet, 3 feet, 2 and a half feet, 2 and a half feet, 3 feet, 2 and a half feet, 3 feet, 4 feet, 3 feet, 3 feet, 2 and a half, 2 and a half, 3, and 2 and a half feet.

Did I read that correctly?

A. That's what he has in his addendum, that's correct.

Q. Okay. And you've gone back, checked the survey, and you've done a great job of putting it in a format that we can really look at, which has the survey date, the section, the page number, the width, the depth, and it's all on this chart; is that right?

A. That's what I've attempted to do, sure.

Q. Okay. And your contention yesterday was that the widths are so big that when you look at the flow that was happening, according to the width, the flow

was too big to be baseflow; is that your contention?

A. If you were to go back to the previous slide -- well, Mr. Hjalmarson's slide that we just had up --

Q. Okay.

A. -- noted that he said average depths were what those depths were.

Q. Okay.

A. So he's assuming that the surveyors are saying those are average depths. So as I testified yesterday, you've got two pieces of the puzzle. If you wanted to estimate the equivalent discharge, you've got the surveyor saying what the width of the channel is, the main channel. You have Mr. Hjalmarson's opinion, an estimate for the surveyors of the average depth. So now you've got the average depth, you've got the width. So you have the area. And the thing that you're missing is, of course, the velocity.

Q. Sure.

A. And Mr. Hjalmarson -- in fact, I've got it here somewhere. -- he had an extra slide that he added to his PowerPoint that I have some somewhere.

Q. You're talking about the Hyra slide?

A. Yes.

Q. Okay. We can point that out now or later.

A. The thing about that Hyra slide is that that Hyra slide relates depth and velocity to boating conditions, and he put a box around typical Verde flow conditions; and that then gives an insight as to what Mr. Hjalmarson thinks the velocities are across the Verde River.

So then it's a matter of doing the math. You've got the width, you've got an average area, and you've got a velocity; and you multiply those out and you come up with flows that are a lot more than what he suggests is baseflow.

Q. Have you done any work on velocities on the Verde River?

A. What I've done for velocities on the Verde River is -- and I actually have some deep in my files. -- is there were some direct flow measurements made along the Verde River in the Fort McDowell area way back. Unfortunately, it wasn't this same month, but they were direct streamflow measurements.

And when the GS goes out and collects these direct streamflow measurements, they also measure velocity. And so what I did is I looked at those and looked at the width of the channel, and what I found was I didn't find any velocities less than a foot per second. In fact, for widths that were less than these,

I was finding a foot and a half per second, which is, again, consistent with Mr. Hjalmarson's belief that most of the Verde is probably a foot or a foot and a half per second or greater.

The other streamflow gages there's a lot more data, and so I did that same exercise. I was able to not have to try to estimate or guess what the velocity is, but USGS was actually out there at their gage sites measuring velocity, and it's pretty unusual to see anything less than a foot per second, and I haven't seen anything less than a foot per second down in this area.

Q. There's been a lot of talk about where these USGS gages are. I think we're on the same page with that. Those gages are in a place where there's significant velocity so that they can be read adequately; is that a fair statement?

A. I wouldn't characterize it as significant velocity. You certainly don't want to put a streamflow gage in a stagnant pool.

Q. Sure.

A. That wouldn't make any sense. So you want the streamflow gage in a location where certainly the stream is freely flowing. Whether that's a significant velocity or not, I wouldn't characterize it that way.

Q. So the velocities that the USGS is measuring are not the velocities of pools; would you agree with that?

A. Not velocity of pools.

They are -- depending on the depth of the pool, they could be located near the edge of the pool.

Q. Are they the velocities of the pools?

A. There's not one velocity in a pool.

Q. Okay.

A. So when you say what's the velocity in a pool, well, there's not one velocity.

Q. Are they more similar to a velocity of a constricted area or more similar to a velocity of a broader area, like a pool?

A. I'm sorry, like a pool?

Q. Like a pool.

A. Again, it's a bit site-specific, but gages are put in for a lot of different reasons and in different areas. When you do streamflow gaging, you certainly want to streamflow gage in an area where there's enough velocity that you get an accurate reading; but you don't want the velocity to be so high that the water is turbulent, because then you're going to have a hard time getting an accurate reading of velocity.

So it's a bit of a Goldilocks thing. You don't want it too turbulent and too quick, but you don't want it so slow that it's hard for your meter to pick up the velocity. So it's something more in the intermediate sense.

Q. Okay.

A. And I'll just say again, I think Mr. Hjalmarson's Hyra plots were an attempt to characterize the flow along the -- I mean that's what his plots say. -- along the entire Verde River, and he puts a box around it. And I didn't see him getting less than a foot per second. In fact, in the lower Verde he had over a foot per second. It's about a foot and a half, as I recall.

Q. So if Mr. Hjalmarson didn't accurately portray the velocities, then you don't have any additional data that you can present to talk about velocities?

A. Oh, I disagree. In fact, I just mentioned to you that there were some direct streamflow measurements in this area where the USGS gage -- the gage below Bartlett moved. Originally it was down near the confluence, I believe, within a half a mile or so upstream of the confluence, closer to where these surveys were done. And then it was moved upstream

about 20 miles.

But I do have some measurements down in this area where they were greater than a foot per second. There's not a lot of them, unfortunately. I wish I had more.

Q. So would it be fair -- I think yesterday you talk about a foot per second velocity?

A. As the lower limit. And, again, for the lower Verde Mr. Hjalmarson has a separate plot that I believe had a foot and a half per second was the lowest that he thought that it would go.

Q. Okay. And when we are -- if you take a foot or a foot and a half per second, you would multiply that by the area, which is the depth and the width you get from here?

A. Again, Mr. Hjalmarson was saying that those depths are average depth across the channel. That's his interpretation. So I'm saying if that's what the surveyors were actually out there doing and they're saying in their survey notes what the width is, then you can run an estimate and come up with a number. It seems pretty big to me.

Q. Sure. Did anything peculiar stand out when you looked at those widths?

A. Their estimates, yeah. In fact, when you

look at the 4 north, 7 east, you'll see that they're more precise. So when you look at the surveyor notes, and that's why I provided the page numbers, you'll see that, you know, they were estimating what those widths were.

Q. So their job wasn't to accurately depict the width of the river; that wasn't what their job was?

A. That's correct. And yet I don't think their job was either to figure out the depth of the river.

Q. Sure. So the depths are estimates and the widths are estimates?

A. That's right. Mr. Hjalmarson seems to be making a lot of hay out of a lot of estimates, by people that really weren't trying to do something that is related to hydrology. They were surveyors.

Q. Sure. And, in fact, we know they're estimates, because if you look at the chains on the widths, they're all in whole numbers?

A. Yeah. I think that's what I just said. If you go to my other table, 4 north, 7 east, you'll see it's all to a decimal.

Q. Right. So we have 4's and 4's and 6's, and, generally, when these guys are using chain widths in their surveys, they're, like you said, extremely precise, to decimals?

A. Yeah. In fact, I'm trying to think if they're to two decimals. They're actually to two decimals.

Q. To the hundredths.

A. Yeah, to the hundredths, and so they're quite precise.

Q. Sure. And as these surveyors are doing their job, is it correct to say that they're either going north/south or east/west?

A. In almost all circumstances, unless they're perhaps surveying an Indian Reservation boundary or a Military Reservation boundary.

These were township surveys, so, yes, by their very nature of a township, as you describe, they are north/south, east/west lines.

Q. Okay. So those widths are the widths as they're going from either east to west or north to south?

A. See, this is where you and I are going to disagree, I think, Mr. Slade; is I think in the case where they don't have a decimal place, I think they were looking across the widths and were perpendicular to the river, because they didn't actually survey it.

Q. Sure.

A. So I think they got to that point and just

looked perpendicular across the river and said, "Hey, we're not surveying yet. It's approximately 3 chains wide. That's what we're going to write down in our field notes."

So because they didn't actually run a line across the river, the issue about, well, was the line perpendicular to the river, which I'm sure you're going to talk to me about on the next slide, I don't think that applies to these ones, because, again, they weren't surveying them. So I think they were looking across the river. They say in their notes this is how wide the river is. I'm going to take them for their word, as Mr. Hjalmarson is taking them for their word on the depths.

Q. Okay. But their whole life is about east/west and north/south, isn't it; a surveyor's job is going east/west and north/south? You would agree with that? You just did.

A. I did.

Q. Okay. So when they turn around to look back across the river, where they came from, where their partner is across the river, do you think then they turn up and they go and find the most perpendicular point in the river, or do they say, "For the purpose of that survey, at this point the river is this wide, as I

look across to my partner"?

A. You know, since they didn't meander these stretches, it's really hard to know what they were doing out there.

Q. So we don't know if these widths are greater than the actual width of the river?

A. Well, I looked at that, and the Verde River in this township generally runs north/south. So there's certainly going to be some areas where the township lines perhaps are not perfectly perpendicular to the river; but this isn't a river that is running, you know, northwest/southeast or anything like that. It's generally a north/south flowing river.

So I don't think there's going to be substantial error in these in terms of those widths. And as you say, they're not even to a decimal point in a chain.

Q. Sure. So they're rough. We don't know if there's substantial error. You said you don't think there's substantial error?

A. I guess I know about as much about that as Mr. Hjalmarson knows about the depths.

Q. Okay. What do you think's easier to estimate as you're walking across the river, where the water comes up to you or, as you get across, where the exact

perpendicular spot is and where your partner is and the width at that point?

A. Well, if you've ever done a cross-section in a river, Mr. Slade, outside of Mr. Hjalmarson's parabolas, most cross-sections are pretty uneven. So if I was a surveyor and I was walking across a stream, I would really be a bit challenged, unless I'm out there with a wading rod taking measurements, you know, every 10 or 20 feet, depending on how wide the river is, what the average depth is.

I mean I really find it surprising that the surveyors would say, "Well, the average depth is 4 feet." Well, what's that based on? Again, cross-sections are pretty irregular. And so I guess I would cast as much doubt about the depths as I would the widths, under these circumstances.

Q. Okay. And I think Mr. Hjalmarson would disagree with you about the width angle, and, in fact, he talked about it in his report.

A. His report, okay.

Q. So let's pull that up.

A. Okay. I've got that.

Q. I'm in Hjalmarson Page 55, the original.

A. Okay, so I've got his appendices.

Q. We've got it up here, Mr. Burtell, so

whatever's easiest for you.

A. Oh, okay. Sure, sure. A little hard to read, but...

Q. Okay. So you might want to pull it up for yourself.

A. Okay. So this is his October 4th report?

Q. Yes, and let me call out some exhibits here.

A. And then he had a series of appendices with those.

Q. Exactly.

A. Sure. Okay, and I've got those.

Q. And we will look at one of those appendices.

A. Okay, good, so I'll leave these out.

But for right now we're in his main report.

Q. Yes.

A. Okay, so let me know what page.

Q. Page 55.

A. Oh, 55. Excuse me. Okay.

All right, I'm finally there.

Q. In the red box he's got a note about the width of the river, and I'm going to read that.

A. Sure.

Q. "The width of the river (W) is equal to or less than surveyed width (Ws). Adjustment was made where angle appeared larger on the Plats. Thus, some

widths used for this analysis may be larger than W due to uncertainty of method."

Then he's got a little diagram explaining what he means.

A. Sure. Yeah, I see it.

Q. Okay. And that's what we talked about, right, where the river, if it's coming at an angle to an east/west section line, the width at that section line will be greater than the actual width of the river?

A. He's up in 18 north, range 1 east. So we're not in the McDowell area, are we?

Q. No, we're not.

A. Okay. So I'm not aware that he did such an analysis down in the area of what we're talking about. The river looks like it's pretty east/westy, north/south in this area.

Q. Sure. This is the general concept. Do you agree with that general concept?

A. As a general concept, yes.

Q. Okay. So if a river is east/west meandering down south, the same concept would apply?

A. Yes.

Q. And we're in his part of the report which is the upper Verde, and that's where he explains his

concept?

A. Right.

Q. He doesn't explain it later on?

A. Unless I missed it, I don't recall him applying this concept to those sections we're talking about now to the south.

Q. But the same concepts of surveying would apply everywhere on the river, as long as the river is in that type of situation?

A. Right. If it's not running more north/south and they're on an east/west transect.

Q. Sure.

A. Sure. Yeah, I got you.

Q. And, in fact, he thinks it's such an issue that on 56 he mentions it again.

A. Okay.

Q. Okay.

A. And what's interesting here is, where he's applying it, the river -- I'm assuming this was an east/west transect and the river is going up and down like this.

Q. Sure.

A. So certainly in an area like this, there could be some differences, sure.

Q. In any area where the river crosses at an

angle, there would be a difference?

A. And that difference would increase depending on the degree of the angle.

Q. Sure. And that's the general concept that can be applied to all sections that are surveyed?

A. Sure.

Q. So let's take a look at a section down south. Let's look at township 3 north, range 7 east.

A. Okay.

Q. And we're going to have to -- unless you have a better -- did you submit anything on township -- did you submit a map on township 3 north, 7 east, that you recall?

A. No.

Q. Okay. So we'll go to the one that is in Hjalmarson's second addendum.

A. Second addendum, okay.

Q. X059, Page 39.

A. Okay.

Q. Yeah, let's blow up that map, if we can.

A. You know, I've got a magnifying glass and my hard copy, so I can do my best with mine.

MR. BREEDLOVE: Did you bring magnifying glasses for everybody?

MR. SLADE: This is as good a magnifying

glass as we can provide for you, Mr. Breedlove.

COMMISSIONER HORTON: That's how you get a Master's degree.

BY MR. SLADE:

Q. So we're going to have to pair this with your width chart to really understand what's going on here.

A. Okay.

Q. So while we're looking at this, if you could also look at X054, Part 38, which is your width chart that we were talking about.

A. Yes. I've got that right next to me.

Q. All right. And that's the widths for township 3 north, range 7 east from the February 1911 GLO survey.

A. Okay.

Q. Okay. And let's start, actually, with what you said about survey Sections 5 and 6.

On your chart, from what I recall yesterday, you said that -- let me read what the surveyor noted. He said "Impractical to [survey] up the channel on account of high water."

And I believe yesterday you said that that meant high water because of the snowmelt; is that correct?

A. What I did is Mr. Hjalmarson explained to the

Commission that all of these surveys' data, I believe from this township, were unaffected by either snowmelt or precip. He said they were baseflow.

And he made the argument, as I recall, by going back and looking at the precipitation records. And he was saying, "Look, they were out there on these days and there was no rain in the days preceding."

My point was is, well, when you look at those same precipitation records and look at the day of February 22nd and I think three or four days preceding that, there was no rain in the watershed. And yet the surveyors are saying "on account of high water."

So that suggests to me that you can't just assume that rain is the only reason why the river was high.

Q. Could have been snowmelt?

A. I believe it was probably snowmelt, sure. It's at the right season, it's the right season. It's February.

Q. Sure. Could it have been anything else?

A. Well, if it's not rain and it's not snowmelt, I'm sure you're going to tell me what I'm not thinking.

Q. Okay. Well, let's take a look, and let's see how steady we are here with the hand. This is 5 and this is 6; is that right?

A. Yes, that is 5 and 6.
Q. And between 5 and 6 is this line right here; is that right?
A. Yes.
Q. Okay. So the surveyor, if he were to make that section line, which he did not, would have had to go through the middle of the river?
A. Let's see, between 5 and 6.
Okay.
Q. Yeah, can we make that bigger, actually, Debi?
Here's 6 and 5.
A. Okay.
Q. Let me ask you that question again.
If the surveyor were to make this section line, he would have had to go through the middle of the river?
A. Okay. Yeah, that's fair.
Q. Okay. Do you think that's what he meant by "Impractical to survey up the channel on account of high water"?
A. I take him for what his words are. I mean the water was high.
Q. Well, it might be high in the middle of the river, if you've got to go through the middle of the

river to make your section, all the way; I mean the whole section line would be in the middle of the river.

A. Well, if take a look at the 24th, he talks about when the high water had come, as a temporal thing, "the high water had come."

Q. Sure. That's not on the 22nd. That's on the 24th.

A. Sure. But I'm not sure if you're familiar with hydrographs, but the river just isn't merrily at this level and then one minute later or one day later it's this high. I mean typically in a snowmelt circumstance, it rises more gradually.

Q. Okay.

A. So I mean the surveyors are talking about the high water had come by the 24th. That certainly seems consistent with the river was running high on the 22nd. Not so much a question of they're marching right up the channel, but the water level was high.

Q. Did he make any other surveys on the 22nd?

A. No, because he said it was impractical to survey on the 22nd. In fact --

Q. In other sections, did he make any other surveys?

A. Did he make any other surveys on the 22nd.

Yes, in Sections 6 and 7 and 7, sure.

Q. Okay, so he made two other surveys on the -- in fact, he crossed the river one, two, three, four other times on the 22nd?

A. Absolutely. Sure.

Q. Okay. And we're talking about the 22nd, between 5 and 6.

A. Okay. And -- okay.

Q. Okay. And in that one spot between 5 and 6, he said he didn't survey, but he made four other surveys on the 22nd across the river and didn't mention high water; is that right?

A. Well, and he mentions and he provides those depths, sure.

Q. Okay. So based on what you know now, Mr. Burtell, is it more probable that he didn't survey between 5 and 6 based on high water from snowmelt or precipitation or because he's going through the middle of the river for a full mile?

A. Well, Mr. Slade, no disrespect, but he's not going -- when you take a look at this -- I apologize for my shaky hand. But if you go straight north, you're not in the middle of the river right here.

Q. Where are you?

A. Well, the river, at least based on this, goes -- this is the east bank, and this is the right

bank. So if you draw this line straight up, he's not hitting the middle of the river right there. He's hitting the bank of the river. I mean his survey lines are north/south, and so follow your way up here, and you come up north, you're going to hit west bank right there.

Q. Well, what happens when you keep going north?

A. Well, you go through more west bank and then you come over here.

And so by the time he gets up to the top, he's now close to the east bank. So you're suggesting that he's walking right up the river the whole time. That's not consistent with the map.

Q. I'm suggesting that you misread high water.

A. And I'm suggesting Mr. Hjalmarson misread. I think he's ignoring snowmelt. I think he's ignoring the fact that January and February had, I believe, average discharges of over 2,000 cfs each month, and he's suggesting that's baseflow, which is ludicrous to me.

Q. And we'll talk about snowmelt, and I'm happy to have that discussion. We're talking right now about what that means.

A. Okay.

Q. And we'll let the Commissioners decide for

themselves if that looks like the middle of the river or not.

A. Okay. I think that's fair.

Q. Okay. And we'll also make sure the record notes that he crossed the river four other times and didn't mention anything about high water; is that right?

A. What he did is they surveyed at those spots, yeah. Whether or not the water was higher, but not too high for them to survey, is not stated. So you're making the assumption just because they're out there surveying, that it can only be baseflow, that it's impossible for these guys to survey in anything other than baseflow; and I don't agree with that either.

Q. And I'm not making that assumption.

A. Okay.

Q. I'm just trying to interpret correctly what was written down. That's all.

A. Okay.

Q. And let's turn to -- on your chart you've got on February 20th, Survey Sections 18 and 19.

Let's keep that map up, actually, Debi.

A. Okay. Let me see if I can find 18 and 19.

Q. And now we'll talk about the width issue.

A. Okay.

Q. The last issue really wasn't a width issue. It was a reading issue.

So if we look at 18 and 19. Okay. And can we blow -- let me blow up -- let's see here.

18, 19.

Okay. Is that the biggest we can get it? Right here, this spot right here. Yes, right up here. Okay. That's fine.

So this is Section -- Mr. Burtell, this is Section 19, right?

A. Yes.

Q. And it's cut off, but the above section is 18?

A. Yes.

Q. Okay. And the river is -- well, actually, we've got a denotation here. It looks like almost that that's the main channel of the river right there, the dotted lines; and then this is -- the bigger channel is what we call the flood channel?

A. The floodplain, I would probably say.

Q. Floodplain?

A. Sure.

Q. Okay. So you're in agreement that the dotted line is the main channel?

A. I would probably want to go back to the

survey notes to verify that, but that's a reasonable conclusion based on the map.

The maps and the survey notes track each other. But that's certainly fair, without looking any further.

Q. Okay. Perfect.

And we have an idea of that because each one of these little squares is about a mile wide in the section. In fact, it's exactly a mile wide, each one of these squares, as we go across a section?

A. No, each of those is 40 acres.

Q. Oh, yes, you're right.

A. Each section is a mile.

Q. Each one is a quarter mile. Each one of these little --

A. Yes, each is a quarter mile, yeah.

Q. Okay. And we know a quarter mile is about 1,700 feet, something like that?

A. I have a calculator.

Q. Okay. And we know the -- so we're in agreement that we think the main channel is this dotted line, but if we need to do some different calculations, we could confirm that.

A. Okay.

Q. So as we look here, as the river crosses, is

it crossing at an angle?

A. It sure is.

Q. Okay. And as it crosses, if the surveyor is coming across and he's taking the width at the angle and not perpendicular, is that a larger width than it would be if he was taking a perpendicular width?

A. It is. Can I provide you an example?

Q. Sure, after this one.

A. Sure. Okay.

Q. And if he is writing down a width on here that is the angle width and not the perpendicular width, the width on here would be greater than the actual width of the river; is that right?

A. At that point, sure.

Q. But we don't know if he did that or not?

A. You know, and based on these widths, you're presuming that they're looking across the river on that section line and making an estimate of the width and not correcting it for the angle.

We don't know that for sure. With these widths being rounded up to the nearest chain, we don't know, but my guess would be is the plus or minus effect by that angle is probably within the rounding error of these chain widths, since they didn't provide us to the hundredth. It's only to a single width.

Q. Sure. And a chain is 66 feet?
A. 66 feet, yeah.
Q. Okay. So plus or minus what?
A. I would have to do an analysis similar to what Mr. Hjalmarson did. I guess I'm a little surprised he didn't do that analysis down here. He did it up north, but he didn't for these townships. I guess he just presumed that down here everything was baseflow, so...
Q. Right, and he presumed that because he used different data to talk about baseflow, and we'll get to that; is that right?
A. No, I disagree. He justified that by his precipitation data.
Q. Right, which is different than width data, which is how you're justifying that it's not baseflow?
A. No, I'm using his precipitation data to further support my conclusion that it's not baseflow.
Q. Okay. So we'll look at your precipitation data.
A. It's his precipitation data.
Q. We'll look at his precipitation data.
But you've also incorporated width data?
A. I did. Is this an opportunity for me to show you my example?

Q. Go ahead.

A. Okay. And let's see. If you could -- you're at 19. If you could move up to the line between Section 7 and Section 18. Yeah, I think that will capture it. Okay.

Now, if you look at my table, Mr. Slade, on February 21st, 1911, the surveyor has indicated it was 5 chains wide between Sections 7 and 18.

And when you come up and look here, and if you're right, here's the river, and the line between Section 7 and Section 18, the river is perpendicular to the section line. And so at least at that point we got a width of the surveyors where if they're looking across the river, as you suggest, they're looking straight across and they're saying it's 5 chains wide. That's 330 feet. They indicate a depth of 3 feet. So my math's a little rusty, but that's almost 1,000 feet, right? 1,000, and then you multiply it by the 1 or the 1 and a half.

So that's certainly a period of time where I don't believe there was any rain events going on that Mr. Hjalmarson was talking about. We're perpendicular to the channel, if you believe their map, and we're getting over 1,000 cfs, probably in the order of 1,500 cfs.

I'll again ask the Commission and Mr. Hjalmarson to wonder whether that's baseflow.

Q. So that's a relatively wide part, 5 chains?

A. It is.

Q. Pools are pretty wide, aren't they?

A. I don't -- I mean based on his map here, Mr. Slade, it doesn't look any wider in terms of what you're suggesting is the low flow channel than it does anywhere else, if you believe this map.

Q. Well, we just pointed out that it was a wide part, based on the width, so we know it's wide?

A. The channel there is wide, yeah.

Q. Right.

A. But what's important is the flow.

Q. Sure.

A. I mean regardless of whether the flow is going through a pool or a riffle, my contention is it's not baseflow. So it doesn't really matter whether it's in a wide spot or a narrow spot from a perspective of calculating discharge. If the discharge is high there, it's going to be high anywhere up and along the river.

Q. Well, we talked about this earlier. What happens to velocity in a pool?

A. It's going to be lower.

Q. Okay.
A. But you don't have any indication that that's a pool.
Q. And you don't have any indication that it's not?
A. That's right.
And so we're trying to do a lot based on survey notes that I think are of suspect value in trying to determine what Mr. Hjalmarson -- he seems to think they're much more useful than I do.
Q. We do know that this is a relatively wider section where you pointed out, 330, 5 chains, versus some of the other ones, we've got 5, 4. We've got some higher, too, 7 and 6. But it's not 3 and it's not 4.
A. You know, you could view this a little different way. A lot of this is conjecture on my part, and I'm the first to admit. But take a look at those widths. They seem, you could argue, to start getting a bit wider as you work your way down the date calendar. So you could argue maybe you're getting a rising hydrograph. The reason it's wider is not that it's a pool. It's that the river is flowing more.
Q. And the precipitation records will help us discern that?
A. No, I haven't said that. In fact, my whole

point has been the precipitation records, I disagree with how Mr. Hjalmarson used them. He used them to try to suggest it's baseflow because there was no rain. It doesn't say anything about snowmelt. And snowmelt, anyone who's lived in mountainous terrain, it's very unusual during snowmelt season. Sometimes the river will be higher or lower on days, and sometimes it almost defies explanation. But it happens.

Q. Sure. So temperature in places where there's snow is an important factor to look at?

A. You know, Mr. Hjalmarson throws temperature data out, but I don't think he uses it in such a way that you could definitively say whether or not it was warm or not warm and whether that was driving snowmelt. He just throws temperature data out there and seems to suggest we're to accept that to indicate that it's not snowmelt.

I'll just go back to saying that in February and January, there's an average of over 2,000 cfs in those months. Where's all that water coming from if it's not rain events?

Q. I agree with you that there's a lot of water during those months; but I think you'll agree with me that water is variable during those months as well, will you not?

A. Unfortunately, we wouldn't be having this discussion if we had flow records from that month. So we're all doing a lot of conjecture about what's happening during those months, including his depth measurements, because the depth measurements are affected by the flows.

Q. Sure. Let's take a look at one more, briefly.

A. Okay.

Q. Let me ask you this question.

A. Okay.

Q. Would you agree that the Verde River is a pool and riffle system?

A. The pools and riffles seem more prominent in the upper and the middle, but there are pools and riffles in the lower portion as well. Certainly they're more common in the northern part.

Q. And you've heard Mr. Fuller and Mr. Hjalmarson testify that they think about 95 percent of the river is pools and 5 percent is riffles or rapids?

A. And, you know, I hear them say that, but I've never seen anything where they back that up with, where they actually -- did they go out and measure the number of riffles and pools. I've heard those statements, but

I'm not sure what they're based on. I mean maybe they made those measurements; but if so, I haven't seen those entered into evidence.

Q. So if Mr. Fuller actually GPSed the measurements of the pools relative to the measurements of the riffles, that would be something you would be interested in seeing, or that's the data that you think would support a contention that it's 95 percent pools and 5 percent riffles?

A. I think to make a statement like that, you would have to do that type of survey, correct.

Q. And you don't know if Mr. Fuller actually did that?

A. Yeah. I haven't seen it entered into evidence. Maybe it will be. I haven't seen it up to this point.

Q. So do you have a percentage or a thought about how much of the river is pools versus riffles?

A. See, I wouldn't -- I think it's a bit of a misnomer to worry about the percentages of riffles. To me, it's more the occurrence of riffles. Even if they're not terribly wide, it's how frequently you keep hitting them. And I believe I testified yesterday, Mr. Slade, that the Williams book at least provides one glimpse of how frequent riffles occur.

He was careful to include river miles from the headwaters all the way down, and he shows on those topographic maps not just rapids, but also the occurrence of riffles. So when I saw that, it certainly was as detailed a survey as I've seen of at least the occurrence of a riffle. But it certainly doesn't lend itself that, without going out and surveying, to make some 95 versus 5 percentage, because that's based on length versus just the occurrence.

Q. Sure.

A. It's kind of like saying you're on a really, really long road, but only 1 percent of the road or a tenth of a percent doesn't have a bridge. Oh, boy, when you hit that tenth of a percent, that's a really bad thing.

So it just doesn't seem like playing the game of, well, 95 percent is pools and that means life is good, I don't think that's the point, in my mind.

Q. And you're speaking about riffles and rapids as impediments?

A. Obstacles, impediments, sure.

Q. Okay. And I'm talking about riffles and rapids relative to pools when it comes to velocities. And so understanding what percentage of the river is a pool versus a riffle can give us a little insight into

what velocities might be on the river when we're looking at these depths and you're trying to calculate your flows?

A. Yeah. And what I find interesting about this is Mr. Hjalmarson's Hyra criteria, where he puts the box on the Hyra chart, he seems to suggest that what's most important is boating in the pools. And yet in that area he's got a foot or a foot and a half per second velocities, and those velocities would go up in the riffle areas and the rapids.

So I think Mr. Hjalmarson is even suggesting with his own data that the velocities in the pool are a foot per second or greater, unless he's mistaken and he didn't -- you know, he would change his plot.

Q. So if he did a rough Hyra plot and he wasn't thinking about the particulars of velocities, then that rough plot might not be as valuable to us as something with a little more definitive information like the velocity from a pool versus a velocity from a riffle?

A. I think it's almost a hypothetical question. You're suggesting that his plot is not -- was rough. Did he -- I don't know if he ever said that. I never heard him say that it's a rough plot. In fact, he presented it, I thought, with great vigor. So, again, if he's retracting it now or wants to correct it,

that's a different situation; but I never heard him say that.

Q. Did you hear Mr. Hjalmarson talk about velocities when he testified?

A. I don't recall him talking too much about it.

Q. So he didn't make too much of a big deal about it?

A. Whether in his mind he made -- the last place I want to go is Mr. Hjalmarson's mind, as to what he was thinking or not thinking at any time, so...

Q. Did he make a big deal about depths?

A. Certainly for the purpose of navigability he did, sure.

Q. And depths are shown on the Hyra plot?

A. Depths and velocities, both are shown.

Q. But he didn't ever present any data specific to velocities in his testimony or anything you've reviewed in his report?

A. I would not want to agree with that without going back and reviewing the 7 or 800 pages that he submitted in this proceeding.

Q. You can't recall anything right now?

A. No.

Well, let me take that back, Mr. Slade. He could not have calculated -- when he reconstructed the

flow depths, like at the Paulden gage and the Clarkdale gage and all of those other cross-sections where he estimated what the maximum depth was, he couldn't have done that without having velocities.

So perhaps you could ask him what velocities he used to calculate those discharges, or I should say those maximum depths, because he applied the Manning's equation, so...

Q. So if we presented evidence that velocities in pools are less than 1, and, in fact, sometimes they can go all the way down to .1, and then you took those velocities and you multiplied them times the width and times the depth and you could calculate a flow, you get a lower flow than what you calculated; is that correct?

A. And under that hypothetical, sure.

MR. SLADE: Joy, how are we doing on time?

MS. HERNBRODE: I think it would be more appropriate to ask Mr. Chairman how he's feeling about how we're doing on time?

CHAIRMAN NOBLE: Well, it really has a lot to do with how long the video is.

MS. HERNBRODE: It's about an hour and 20 minutes.

CHAIRMAN NOBLE: And then, Mr. Slade, do

you expect to do some additional cross-examination of Mr. Burtell after we finish with Mr. Dimock?

MR. SLADE: If we have time, certainly; and tomorrow, if it goes until tomorrow, Mr. Chairman.

CHAIRMAN NOBLE: Let's take a break for 15 minutes, about 10:20. Let's come back at 10:35.

(A recess was taken from 10:20 a.m. to 10:41 a.m.)

CHAIRMAN NOBLE: We're online.

BRAD DIMOCK,

called as a witness on behalf of the State Land Department, was examined and testified via video as follows:

DIRECT EXAMINATION VIA VIDEO

BY MS. HERNBRODE:

Q. Can you tell the Commission your name?

A. I'm Brad Dimock.

Q. And what do you do for a living, Brad?

A. In the summer I'm a river-runner, and in the winter I'm a boat builder.

Q. And are you also a historian?

A. Yeah. I've worked as a historian, written biographies of river characters and river history.

Q. Well, let's talk about the river guide portion first. How many years have you been a river guide?

A. Forty -- this would be 45 this year.

Q. And about how many trips a year?

A. It varies. Anywhere from about zero to nothing for a couple years to 13 or 14 in Grand Canyon.

Q. In what kind of boats?

A. Every kind of boat they've got, from the big motorized pontoon boats, rowing rafts, wooden dories, paddle rafts where you scream and holler; and also run it in various historic craft, from the Powell boat to sweep scow, old-style Galloway boats, modified Galloway boats, Nevills boats. So I've got a pretty good feel for all the major types of boats that have been run down there.

Q. And along the Colorado?

A. On the Colorado.

Q. Okay. Have you run other western rivers?

A. Yeah. Probably once a year up in the upper stretches of the Colorado drainage, the San Juan, the Yampa, the Green River, the upper Colorado.

Q. Have you ever run the Verde?

A. I've run the Verde a lot back in the 1970s in kayaks and rafts.

Q. How come you haven't run it since the '70s?
A. My attention has just been elsewhere. I've been working commercially for most of my river-running, and that's up north and in Grand Canyon.
Q. And you love the Canyon?
A. I do. I love the canyon country and it's my home.
Q. The trips you went on the Verde, did you portage on any of those trips?
A. I believe we portaged around Verde Falls once or twice when we had something we thought was inappropriate, like a big canoe or something.
Q. Okay. Have you ever run it, run The Falls?
A. Yeah, mostly we ran The Falls.
Q. Do you remember how long that portage was?
A. I don't remember it as being much of a project at all. I think you just get out on the right bank and walk around the main drop and get back in.
Q. And when you talk about a boat being inappropriate for running The Falls, what were you -- do you remember why you were worried about it?
A. The one time I know I portaged it was my girlfriend and I were just learning to paddle a two-man decked canoe, and flat water was scary. So Verde Falls was just like we're not going to do that, and we

carried around it; but then the next month we took it down the Grand Canyon, so...

Q. Okay. And you did all the other rapids with no problems?

A. Yeah.

Q. Have you ever run a dory on the Verde?

A. I haven't. By the time I got into dories, again, my eyes were pointed northward. You know, you might want to line or portage at Verde Falls, but I never looked at it with a doryman's eye, so I would have to reassess it.

Q. Okay. Do you use a life jacket when you run rivers?

A. I do. It's the law, and in a bouncy river it's only common sense. We used to not wear them, unless there was an actual obvious threat ahead.

Q. How about a helmet?

A. In a kayak I wear a helmet. That's the only thing I've ever -- and in a decked canoe, where you're likely to be upside down and still in a boat.

Q. Do you check the USGS gage records before you run a river?

A. Sometimes we did. It was a lot harder in the '70s to get that information. They didn't have a worldwide web. So we would usually just go and look

and say, "Hmm, there's no water. Let's go do something else."

I went to run the east Verde one time and that happened, so we went over and ran the Camp Verde down stretch instead.

Q. Did you bring a GPS?

A. GPSs had not been invented.

Q. How about a map?

A. Sometimes we would have a map, a primitive map, usually kind of a bad xerox of a USGS topo map wrapped up in clear contact paper, which would usually get wet and it would dissolve, so...

Mostly, you know, you go until you get to the car, which is at the other end, so...

Q. Okay. Were any of those things around, available in 1912?

A. Which things?

Q. The life jacket, helmet, USGS gage records, GPS, that.

A. No, there are pictures of an expedition up in Colorado in 1916 where they're wearing football helmets going down the Gunnison River, which is insane, but...

Q. Insane to go down the Gunnison --

A. Yeah.

Q. -- or insane to wear helmets?

A. No, sane to wear a helmet on the Gunnison. But life jackets, yeah, were available. They used them on ships, and so they were made of strips of cork and usually some kind of canvas sewing together. Been trying to find one on eBay for years, but I think they're all rotted away.

Q. Even in the 1970s, when you were running rivers, were any of those things sort of commonly used by people, or did most people just go out with a boat?

A. Well, I started at Prescott College, which, to be nonnegligent, made us wear helmets and life jackets for all of our kayaking. And so it was available. Kayaking was just starting to pick up in the early '70s. They invented the plastic kayak, which was more durable than the fiberglass ones and the skin ones before that, and that's sort of when I got into the kayaking.

Q. So your career as a historian, you have written some books?

A. Yeah, I've written biographies of some of the lesser-known mythic characters of the Colorado River. The Hyde couple, who vanished down there in 1920s. Buzz Holmstrom was the first person to solo it in a wood boat. I've got a replica of his boat down here. And a fellow named Bert Loper, who spent almost all his

life on the river and died at 80 years old. I've written those and then researched a lot of the other characters.

Q. So your focus has really been Grand Canyon boating?

A. It has.

Q. Do you use newspapers in your research?

A. All the time.

Q. As a historian, would you be surprised to learn that not every boating account on a particular river was documented?

A. Not at all. One of the stories I have worked on is a character who went through Grand Canyon in 1903, who does not show up in any newspaper accounts anywhere, but one of the fellows who accompanied him showed up in 1951, when a river historian was speaking, and told him a story and produced his diary. And the diary checks out. There's no way he could have written it without being there. And so -- and the fellow he went with is -- went by the name of Hum Woolley, Elias Benjamin Woolley; said that he had been there before.

So there could have been one, two, or more trips that Woolley had done without telling the press, and there were no press sitting by the river when he put in or took out. So it was never recorded.

Q. And he did pass by some towns that had newspapers?

A. Yeah, he went all the way down to the gulf. So he went through, you know, Needles, Blythe, Ehrenberg, Yuma. But there were trappers down there, so it wouldn't surprise him to see a person in a boat at Needles, but, you know, they didn't get out and say, "Oh, oh, we just ran the river."

And there are other little accounts that you come across that you can't verify of people who said they went down the river. I think I'm trying to remember one out of Williams that mentioned a fellow who had just gone down the Colorado and who the hell is that, and that's the only account, so you don't know. I mean there's no witness. There's no journal. There's no interview. So...

Q. And the Colorado is fairly well-researched; there are a lot of people in Grand Canyon who are interested in that little history?

A. Correct. But, you know, in the early 1900s and the 1800s, there were no people near the river at the remote points, and so no one to witness it and write a story about it.

Q. Have you looked at some of the materials from the 1931 case where the navigability of the Colorado,

Green, and San Juan Rivers in Utah was decided?

A. I've looked at a lot of it, primarily when doing my river history writing, because each of the significant boaters or residents along the river was subpoenaed for that, and so if you wanted to know the history of any of those early boaters, you could go to that riverbed case and they'll get them to tell their whole life story as part of that. So I've used it a lot. It's a great resource.

Q. And you've run these rivers?

A. Yeah.

Q. Does it surprise you that the Special Master in that case found that you needed 3 feet of water for navigability?

A. It does, because there isn't a boat that's been run on any of those upper rivers that would need 3 feet. There were a couple little steamboat adventures near Moab to Green River and a little bit up in Green River, Wyoming, and maybe a steamboat. But even those were only drawing a foot or two, and they didn't prove practical. But all the river expeditions, they're drawing 6, 8, 10 inches, maybe a little more.

Q. You run commercial dories through the Grand Canyon?

A. I do.

Q. How much draw does a fully loaded commercial dory take?

A. A fully loaded dory is a very heavy boat for its size, and it can draw, with the heaviest load we run, 10, 11 inches, and that's tough to row.

Q. How many pounds of gear and passengers is that, about?

A. That's four passengers. The passengers are getting bigger. And we probably put in maybe a ton of gear in the boat. That's just a wild guess. And myself.

Q. Okay. So I would like to move on to the boat builder, and at some point we'll go down and look at your boats, but we'll stay in the warmth for a little while longer.

You're located in Flagstaff?

A. I am in Flagstaff.

Q. What's your boat building education?

A. My boat building education sort of began self-taught as we would break dories, crashing dories and having to fix them on river and then fix them better when we got back to the warehouse, taking them apart, rebuilding them.

I broke one in two in 1988 and had to do a full rebuild in the winter, and eventually started

building complete boats, and all sorts of different techniques, old lapstrake and plywood boats, and working with some pretty good boat builders along the way, reading a lot of books. And the last four years I've been training at WoodenBoat School in Maine under some of the best boat builders in the country, and continuing with the self-taught process as well.

Q. And the boat you broke in half, that was on the Colorado?

A. That was a dory on the Colorado River in the Grand Canyon. Sad day.

Q. How many boats have you built?

A. Oh, a few dozen.

Q. Okay, let's talk a little bit about one that you've built.

Are you familiar with the boat the Kolb brothers used for their -- or the boats the Kolb brothers used for their Grand Canyon trip?

A. I am intimately familiar with the Kolb boats and replicated one.

Q. Okay. The one that we still have in existence is the Edith?

A. They're both in existence. The Defiance is on display in Utah. The Edith is up at South Rim.

Q. Okay. And you're familiar with it because

you've worked with it at Grand Canyon?

A. Yeah. I've been around the original boat a lot. I built the display carts on which they sit, and I've been in, out of it, all around it, measuring it, documenting it, and gone through the blueprints that were made from it. So I could answer a lot of questions about that boat. It's an amazing boat.

Q. How big is it?

A. I would have to put a tape on it. I think it's 18 feet.

Q. And how wide?

A. About 4 feet, so very narrow compared to a modern boat.

Q. Does she have cargo compartments?

A. Yeah. It has two cargo compartments, one forward, one in the rear, which the Kolb brothers had lined with zinc boxes. I didn't do that.

Q. And they did that to try to waterproof their boxes a little bit.

A. Yeah, they knew that the wood boat would crack and leak and so forth, and they had cameras and film they wanted to keep dry. It didn't work, but...

Q. How much weight can she carry?

A. Boy, that boat would carry a lot. And, of course, the more you put in, the less manageable it

becomes, but I bet you could put a ton in that boat.

Q. What kind of cargo?

A. Oh, whatever you wanted. You know, I just put in food and beer, but anything.

Q. You could replace the beer with skins or the food with skins?

A. Yeah, you could put skins, if you're out there being a trapper. You could put a fair amount of mining supplies in it. You could fill it full of staple goods and go down the river being a merchant. You could do a lot of things with a boat like that. I think anything you want to carry you could put in there, except livestock. You could put chickens in it.

Q. There you go.

Why did the Kolb brothers have the Edith built; what were they planning on doing?

A. Well, the Kolb brothers wanted to go down the Green and Colorado down the Powell route that Powell did in 1869, but they knew there was better technology available. A fellow named Nathaniel Galloway had designed and had been using a boat that was flat on the bottom, instead of keeled, like a Powell boat is, and so it didn't hit the rocks so much and pivoted a lot better.

And Galloway had done a second Grand Canyon

trip a few years before the Kolb trip, and they wrote back and forth by mail, got the design from Galloway and his friend Stone, and then sent that design to a boat builder back in Racine, Wisconsin, and had them built professionally.

Q. In what year did they start on their trip?

A. 1911. Boats were built in the winter of 1910, 1911 and shipped out to Wyoming, and they started -- oh, I can't remember when. Mid-summer, I think.

Q. Did they make it all the way through Grand Canyon?

A. They did. They had a long layover halfway through because they lived halfway through on the rim, and when they came out, they found Emery's wife was very, very ill, so they took a month off while she got better, and then continued on through to Needles.

Q. Did they have any issues?

A. They had a lot of issues. Neither one of them knew how to row when they started, and they had been told by Galloway and Stone, you know, the theory of the technique; but learning that technique is not that easy in a heavy, old wooden boat, and so they crashed and burned. Well, they didn't burn, but they crashed, put holes in the boat, and they had to patch

them a lot, portaged them, lined them, pushed them over the rocks, and -- but they're tough American men; you know, that it doesn't matter what gets in your way, you find a way to overcome it, which is the way a lot of boating was done in those days.

Q. And I think we have a photo in the record of the Kolb brothers on their trip through the Grand Canyon where they're looking out through a hole in a boat. Is that the Edith?

A. That is the Edith.

Q. I think you have another picture of it down where the boat is, so...

A. Yeah, Emery had just watched his brother flip over in the deep water, so he pulled into the shallow sideways and, pow, T-boned the thing. And that boat in particular is not designed to be hit from the side, and the whole side collapsed.

Q. But they fixed it down at the bottom of the canyon?

A. They fixed it and went on. Took a couple pictures of them waving through the hull and put up a Merry Christmas sign, because it was Christmas. It didn't bother them much.

Q. And I think you said they lined or portaged some of the rapids?

A. They did. Lining, where you're actually lowering the boat through the water without picking it up is difficult work, slippery rocks and the boat pulling against you, but it's a lot of times easier than actually unloading and carrying the boat, especially when there's just two of you. So they lined a lot and portaged some.

Q. And what did they do with the film they had taken on that trip?

A. They took it home and edited it into an absolutely dreadful little movie, which became the longest running movie in the history of the world. They ran it four times a day for 60 years.

Q. And you built a replica of the boat the Kolb brothers used to float the Colorado?

A. I did for the centennial of their trip. I built an exact replica and used the same type of wood, same type of hardware, same techniques. And the only thing I didn't do authentic was I could not bear to paint it battleship gray, which is what they did. I left it natural.

Q. And you call your replica the Edith as well?

A. I do. It's my mom's name.

Q. And you've run her through Grand Canyon?

A. I've run it through Grand Canyon and Cataract

Canyon, and they're both pretty serious whitewater. I've run it through Lodore Canyon on the upper Green, which is a very shallow, steep, rocky thing. Hit some rocks pretty darn hard in it thundering through the bottom of Hell's Half Mile. Made my GoPro jump.

Q. Did you line or portage any rapids?

A. I didn't. And, you know, a lot of these replica trips are very inauthentic because a modern boat you do not want to line or portage. You have got, you know, a hundred years of passed-down growing skills that our skill set is something that was unavailable then, and we can run just about anything pretty successfully, and so we do.

Q. Could you use the Edith on a Verde or another relatively shallow, rocky river?

A. Yes, you could.

Q. How about on a sandy river?

A. Absolutely.

Q. Would you be concerned about hitting rocks on the Verde?

A. I would be concerned, but not horribly concerned. You know, you always hate to hit rocks, but on a river like that, you would be hitting them all the time, and wood is tremendously resilient. It wouldn't be a real problem.

Q. Would you be concerned about scraping the bottom?

A. No. Bottoms are made to be scraped. You've got an inch or so of wood, and on those style boats there are runners of oak that are even beneath that, which take a lot impact.

Q. And Edith isn't the only replica boat you've built?

A. No. I've built a modified Galloway, which is sort of the next step in the evolution. Built in the 1930s originally. It's shorter, wider, more up-kick, so treading more toward the modern dory design that we have today, and that one was run all over the West. And it's built in the old plank style, unvarnished, you know, unpainted. And it's got about 4,000 miles on it on rough, shallow rivers, a lot of it. And I've built plywood replicas of the Nevills' boat, plank replica, the Glen and Bessie Hyde's sweep scow, and I've run all the way through the Grand Canyon.

Q. And you build more modern boats as well?

A. Mostly I build what we call dories, which are an Oregon drift boat design that evolved in Oregon in the 1930s. The really great designs came around the 1960s and '70s, and those are the designs that we still use today. The last 40 years nothing's evolved,

haven't seen better.

Q. Let's talk a little bit about materials. Do modern finishing methods make wooden boats more durable today than they were a hundred years ago?

A. No. They make the prettiness of them more durable, perhaps. You know, varnish is very pretty, but it doesn't make the wood stronger. I prefer to use oils because you can hit it again and again and again and just rub a little oil on it again and it looks great. But the durability has not been enhanced by the finish on it. The wood is stronger than the finish.

Q. One of the things the Commission needs to determine is if modern boats are meaningfully similar to the types of boats being used on the Verde today.

So I guess the first question is what kind of boats were available in 1912?

A. Well, from the small end, kayaks had just come on the market about two years earlier. Klepper from Germany started producing a collapsible kayak, which we can see a sample of, that their design did not change; that today they still make them. The materials are somewhat better. The skin is a Hypalon rubber, rather than a gummy rubber or a canvas, but a very tough, tough kayak. That was available.

Canoes, there were collapsible canoes with a

heavy wire steel frame with canvas that were being used in the Grand Canyon around then in the flat water and small riffles.

Big freight canoes, Peterborough freight canoe you could get, which are an incredibly tough, old beast. They used those on the first descent of Westwater Canyon, actually, a couple years later in 1916.

So you got the kayaks, canoes.

In terms of rowboats, a lot of home-built boats, and home-built boats you never know what they're going to be; a bunch of planks with a couple of sides nailed on. A lot of the early Grand Canyon boats that's what they were, and if you don't have a picture, you don't know what it was. So you got Hum Woolley's boat, the Flavell boat. You don't know what they were; something somebody whacked together.

Commercially, steel boats were very popular around then. Right around the turn of the century they started making these things. Michigan Steel Boat Company made the boats used on the 1907 trip through Grand Canyon, and they're kind of like a Powell boat. They had a bit of a keel to them. Not terribly appropriate for whitewater, but nobody knew that. They're mainly made for the Midwest, where people would

take them out on a lake for a family picnic. Well, people started taking them everywhere; you know, steel, it's unsinkable. So you could get those delivered by train out West. They're 50 bucks. They used them again in 1914, the Mullins steel boats, which was a very popular brand. And I'm not sure what else was available to buy.

There were boat builders, of course, out on the coast that would build you anything. In Arizona I would imagine they were either buying steel boats or they were building something themselves; more likely the latter.

Q. We have an account in the record, actually, of two brothers who made at least five trips from Camp Verde to Yuma in a home-built boat, trapping furs that they later sold. Do you think building a boat like they did would be impossible or unusual?

A. No. No, I think it was very common. You know, it's just our perception of what it takes to do some of these things has changed so radically. People were so handy back then. Building a boat was, "Okay, I'll build a boat."

And so, you know, you might look at a book or you might just say, "I saw a boat that looked like this," and you get someone who is a half-decent

craftsman and they can make a box that floats and they call it a boat and off they go. Some of the contraptions people were running on rivers were just comical, but people are adaptable.

Q. I think there was a guy on the Colorado who started running in a wooden horse trough?

A. Well, that's Norman Nevills, and there's a bit of urban legend of that, but it was a modified horse trough/outhouse that -- you know, and he didn't change the design very much, and that was Nevills' first trip with his bride, whose maiden name was Doris Drown.

Q. Oh, dear.

A. But they didn't. Died in a plane crash.

Q. Were any of these small boats you've been talking to used to carry cargo or passengers?

A. Yeah. Cargo meaning food supplies, yes.

Q. Trappers?

A. Trappers were carrying skins. Galloway was a trapper. That's why he designed that boat, and he would go out for many, many months at a time in these things and just heap them full of skins and ship them back.

Q. Mining equipment?

A. What's that?

Q. Mining equipment?

A. Sure, you could carry mining equipment. You could carry staple foods to sell. I know in Idaho in those days, people would load up their boat with all the staple goods, you know, the good trade items, coffee, tobacco, whiskey, sugar, flour, and end the trip six months later with pelts and maybe a few bags of high-grade ore from the miners or something. So boats have always been a great trade mechanism.

Q. Did they have some kind of dry bag equivalent that you could stick stuff in?

A. Oh, not so good. There was natural rubber that was used in making some bags that you could roll them tight and they would be watertight, but they usually would crack and leak. They dried stuff out a lot in those days. They had tin cans with screw-on lids. Some people were carrying stuff in those.

But no plastic bags, no Jack's Plastic Welding river bags at all. Even when that started in 1971, the waterproof bags were not waterproof. It was pretty primitive even then.

Q. Do you need a break, or are you doing okay?

A. I'll go on forever.

Q. Okay. Second question. Could you have used these types of boats, the canoes, kayaks, rowboats, in

a relatively shallow, rocky river like the Verde?

A. Yes, they could have used any of those boats on the Verde.

Q. How about a braided sandy river? And let me talk a little -- let me distinguish a little bit about braiding, because we have had some disagreement among the experts as to what a braided river looks like. So some experts characterize a river where there is an occasional braid, where in some places the river is two or three distinct -- taking two or three distinct paths and then comes back together as braided. Some experts have characterized the river as braided where the majority of the river is in multiple paths.

On either of those things, could you have used canoes, kayaks, rowboats?

A. Absolutely. In fact, the Klepper is the boat of choice in the braided rivers of Alaska, where these rivers just fan out into literally hundreds of channels that just dry up at a moment's notice, and you get out and drag it over and continue on.

And, you know, on the San Juan today we run braided channels, sandy, braided channels, and we run aground all the time, and it's always, oh, goddamnit; get out, pull it over, get back in, and continue on.

In dories, in canoes, in kayaks, in rafts,

it's very common, and braiding isn't a problem at all.

Q. We have an account of some guys in 1905 who took some iron boats down the Verde and got somewhere around Beasley Flats and decided they didn't want to go any further; that their boats were too heavy.

Does that change your opinion about whether or not historic boats were appropriate to use on the Verde?

A. No. I'm curious as to what an iron boat is. If they were the steel boats that were commercially available or something a blacksmith hammered out. But, you know, in any endeavor you'll find people who say this is stupid and they quit, and other people forge on through.

Q. So I guess the next question is, what does meaningfully similar mean? So let's talk about some boat characteristics, the things that make a boat suited for a particular use.

So would draw be one of those things?

A. Yeah, the amount of water a boat draws, and the kayaks and canoes would be very similar to today.

The wood boats are a narrower profile, and they're going to draw more than the big, wide rafts of today, which means you'll run aground a little more often, but...

Q. Okay. Handling?

A. Handling is entirely a function of the design of the boat. The wood boats that were designed with more of an up curve toward the end, which is already happening in the late 1890s on the San Juan and the Utah, those handle very well, similar to how a raft handles today.

Q. Weight?

A. Weight, depends on how you build them. You could build a wood boat that would be lighter than a raft. You could build one that could be far heavier.

The Edith, for example, is built to withstand major calamities and it's terribly overbuilt, so it's going to be a good deal heavier than a raft; but you could also build, with a light planking, a very light boat that you could pick up in one hand.

Q. Durability?

A. Durability, I will say modern rafts take a beating for a lot longer than a wood boat, but modern rafts are designed to be used over and over and over and over and over again; whereas the wood boats in those days were maybe going to do one trip, because there's nobody there in their car to drive them back to the put-in. They would probably build another boat. So in terms of durability, they would last a trip or

two, no problem.

Q. Cargo capacity?

A. Pretty similar. Kayaks today hold less than the historic ones because they're making them very small. The modern ones turn quicker. But they're terrible for expeditions. Something like a Klepper is the expedition boat of choice and the boat very similar in shape that I first learned to kayak with on the Verde and Salt, and we like that because you could put so much gear, their sleeping bags and food and beer, and so, yeah, but those things held about the same amount.

An open wood boat you can put a tremendous amount of gear in; some of the pictures of the old boats just heaped high with pelts and stuff. So I would say similar.

Q. Any other boat characteristics you can think of that we should talk about?

A. I don't know. I mean transport is one thing, but I think I kind of covered that. Rafts these days, they're easy to get to and from, mostly because there's roads and cars. I run a big wood boat and I take them everywhere where the rafts go. But in those days they're probably building them on site or in some cases bringing them in by rail.

Q. Okay. So I want to just highlight any possible differences to make sure I've got them. So the draw isn't really any different between boats today and boats in 1912; the laws of physics haven't changed or anything exciting like that?

A. No. As I said, the wood boats are narrower, and they're going to draw a bit more.

Q. And turn too?

A. Depends on the boat and what you put in it.

Q. All right. So has boat shape changed significantly; is a canoe today roughly the same shape as a canoe in 1912?

A. There's a million variations of canoes today. They were more standardized then. But canoes, in general, look a lot like canoes used to look.

Kayaks have gotten, just in the last few years, much shorter; just like skis now, shorter and wider. But still a similar shape. I mean I still paddle a Nanook of the North style kayak.

The rafts, as I say, are much wider than the old wood boats were, and so they do draw less and they can carry a bit more capacity, and they're made more maneuverable.

Q. When you're talking rafts, you're talking the big commercial style rafts that are used in the Grand

Canyon; not --

A. Well, the paddle rafts and small rowing rafts that are used on the Verde, and the Salt as well, are wider at the oarlocks than most of the historic wood boats were. They did start building them wide, a few folks, pretty early on, and it was like, wow, do these work better; but didn't really catch on until the '50s.

Q. Okay. But in 1912 there were some people building them a little wider?

A. There are some accounts I know in Oregon of these guys building these bathtub things, and people made fun of them, but they worked better.

Q. Is the weight of a wooden boat -- or, I'm sorry, is the weight of a boat made of modern material substantially different than that of a wooden boat?

A. Well, I mentioned that earlier. Depends on what kind of wood you use and what style of boat you're building. The canoes, light, thin planking, and you can come up with a very light boat. You can use heavy, thick planking and come up with a very heavy boat, so...

Q. Is there a difference once the wooden boat gets waterlogged?

A. They do take on a bit of water. Any boat that's strong enough to withstand boating is probably

not going to soak up a tremendous amount of water. What it does change, though, is the durability of the boat. Waterlogged wood is much more resilient to impact, really hard to break with a stick.

Q. Would you estimate -- how many pounds would you estimate difference spread for the Edith between its dry weight and its wet weight?

A. I would be pulling a number out of thin air, but I think 20, 30 pounds maximum. Really can't hold that much water, unless it's just completely rotten and holds a lot and the boat just falls apart.

Q. Is there a difference between the expectations of historic boaters and those of modern boaters?

A. Yeah. Modern boaters think everything is going to be just fine, and they've got a map and their buddies have all done it, and they think they're going to be able to drink beer all day and get to the end of the trip and be fine.

Historic boaters had no such preconceptions. They didn't know what was going to happen. They're explorers. They're mountain men. They're going into it cocky or they wouldn't be doing it; thinking I can do this, but ready for anything, you know, to sink their boat and hike out or whatever.

So totally different expectations. I mean their plan, obviously, is to take their boat and go down from one end of the river to the other, but historically they were planning on or expecting a lot of problems.

Q. If you were to build a boat from historical materials for the Verde, would it be a bit different from one you might build for the Grand Canyon?

A. Yeah, if -- but, of course, I know too much. You know, I've been a boat builder and I've run all these rivers; whereas those guys haven't. But I would build a smaller, lighter craft for a smaller river.

Q. Would it be different than what you might build for the San Juan?

A. Somewhere in between. You know, the San Juan's a bit more flow than the Verde. I would build a small, quick-turning boat for the Verde.

Q. The Salt?

A. The Salt, depends on the stretch. From the Route 60 bridge on down, I don't think -- for several miles I wouldn't be very happy to be in a wood boat. Other stretches of it, as you get further down, you could portage the nasty stuff and get away with it in a wood boat; and then, of course, down below Roosevelt a wooden boat would be fine.

Q. If you built a boat for one of these rivers and tried it out, do you think you might modify the design a bit after running it a time or two?

A. Depends how many trips I had in mind. Modifying a wood boat is a project, and so usually you build it and you run it and you make do with it.

If I was going to run it every year and the boat was wearing out, I might say, okay, I'm going to take some of these ideas; maybe I'll make a little more rocker or make it a little wider or a little smaller or a little bigger, but you're not going to, probably, change your whole shape between trips.

Q. But if you're doing like we were talking about historic boaters typically do, which is to make one run through, and then the next time they run through, build a new boat, you might build a slightly different boat the next time?

A. Yeah, yeah. If you're building a homemade boat, you would probably incorporate what you learned the last time.

This fellow Hum Woolley I mentioned, the mysterious Hum Woolley, who seems to have run the Grand Canyon in 1903, and probably before that, when he built that boat, the guy who helped him build it said he told me it was the best boat he had built yet, meaning he

was incorporating ideas from previous boats that were probably not so good.

Q. Perhaps starting out something like a cross between an outhouse and a horse watering trough?

A. Yeah. I mean Nevills, that was his first boat, and he built better and better boats. I still don't like his boats, but they're better than a horse trough.

Q. From your perspective, as someone who builds and runs historical replica boats, is information about modern recreational boating highly relevant to your decision about whether a river would be navigable in a historical boat?

If you know other people are running it in modern boats, does that inform your decision?

A. Yeah. Yeah, it depends on what kind of boats are being run on a river. You know, if it's just young, hairball guys in creek kayaks, I don't think I want to go down there in a wood boat. But if it's families in inflatables, I would say I could probably do that in a wood boat.

Q. People in canoes?

A. Canoes? Canoes are known for incompetent drivers. Not -- present company excepted. Canoes have more wrecks than anything.

So if people are routinely canoeing it who aren't good canoeists, I would certainly take a wood boat down there.

Q. Would you say, based on your experience as a boat builder and river-runner, that modern kayaks are meaningfully similar to kayaks used around 1912; in other words, that they have similar draw, handling, weight, durability, and cargo capacity?

A. Yeah, I would say meaningfully similar. The kayak that we have in the driveway, which is a 1910 style, is very similar to what I was paddling in 1970. In the last few years they have gotten shorter and a little more bulbous, but still pretty darn similar.

Q. And you're not saying that you know of any kayaks that were being used in Arizona in 1912, but they were available for sale in the United States, and they were used to carry cargo in other places around that time?

A. Yes.

Q. Would you say, based on your experience as a boat builder and river-runner, that modern canoes are meaningfully similar to canoes used around 1912; in other words, that they have similar draw, handling, weight, durability, and cargo capacity?

A. Even more so, yeah. You know, the

Peterborough freight canoes of 1900, they're probably still building that boat today. It's just a big, beautiful canoe and tough as nails, and it's called a freight canoe for reasons.

Q. Would you say, based on your experience as a boat builder and river-runner, that modern duck boats, dories, rowboats, and flatboats are meaningfully similar to duck boats, dories, rowboats, and flatboats used around 1912; in other words, that they have similar draw, handling, weight, durability, and cargo capacity?

A. In terms of hard boats, yeah. Yeah. The inflatable boats are different. Yeah.

Q. And you have experience with the canvas canoe?

A. I've never been in one. I've seen them. I've touched them. I've seen how they're put together. And I know that they were running them on swift rivers and small rapids, but that's about all I can tell you about them. Dave Rust was taking them all over the place at the turn of the century.

Q. In Arizona?

A. Arizona and Utah and the Colorado and others. You know, there's a canoe or something -- we don't even know what it is. -- down in Grand Canyon some

prospector kind of put together, and he dragged it up under a ledge and it's still there, and it looks like it's partially manufactured and partially jury-rigged as the parts broke or wore away, and the skin is gone, but, you know, there were people doing that.

Q. So let's talk about a particular historic boat we know was used for commercial purposes in Arizona around 1912, the Edith.

Let's say I invite you on a river trip on a river neither of us has run before. We know nothing of the characteristics of the river, its depth, width, or anything, and we don't have any maps. The only thing we know about this river is it's run by thousands of people in canoes every year.

Do you have any hesitation about putting the Edith on that river?

A. No. No. As I said, canoes go wherever wood boats go.

Q. Okay. Thank you very much for your testimony today.

(End of Video 1.)

CHAIRMAN NOBLE: Is that it?

MS. HERNBRODE: We have a little bit we go down and look at his boats, so...

It's shorter, though.

(Start of Video 2.)

MR. FULLER: Okay, we're on camera.

THE WITNESS: 16 foot 8; same size as a dory.

BY MS. HERNBRODE:

Q. Same length.

A. Length.

And 4 feet.

Q. Okay.

A. There's the Holmstrom boat. It's 6 inches wider.

Q. And the Julius is a later design?

A. 1930s. About a foot shorter.

Q. Okay. But, essentially, it's the same kind of construction?

A. Yeah.

Q. All right. And how many miles did you say you had had on the Julius?

A. About 4,000.

Q. All right. You hit a few rocks on the way?

A. Oh, yeah.

Q. But it doesn't have any big holes in it?

A. No holes.

Q. All right. Bottom looks all right?

A. Bottom looks fine.

The biggest problem the bottom had is transport. In Arizona we have low humidity, and waterlogged wood shrinks, swells, shrinks, swells, shrinks, swells, which in a boat you're going to keep and keep moving around in the desert, it's kind of a problem; but probably not that big an issue back then, because you're only using them a couple times.

Q. Okay. So let's talk a little bit about the Edith. Can you show us the cargo compartments on it or where they are?

A. Yeah. Big compartments here, that you open up these thumb screws, and you reach down in there and jam stuff all over inside.

Q. And that goes all the way to the front of the boat?

A. Goes from here all the way up to the point.

Q. Okay.

A. And, again, in the Kolb boat they lined that with zinc, and that's because they wanted to try and keep something draw. Didn't succeed.

Q. Okay. And then you've got one in the back too?

A. A larger one in the back. You can actually put a tremendous amount in this boat. And I cheated on one of my runs in this and I built a couple cargo boxes

that just sit in here, but it's an open cockpit. But the Kolbs actually talk about having a box in there, but I don't know what it was. So I took that liberty and built a big box.

Q. Okay. And I notice that it has canvas on the top?

A. Yeah, and this is traditional. You stretch canvas over the deck and then paint the canvas, and the canvas lasts a tremendously long time, incredibly tough. It's not glued on. It can shift around.

Q. But there's wood under the canvas?

A. Yeah, there's wood just like this. So these are built the same, and they have a plank bottom, which takes great abuse, and you can see these runners along the bottom that are oak that take a lot of the major hits. And then the sidewalls are screwed on and then riveted, overlapping riveted. That's called lapstrake construction, copper rivets. And then the deck is thin planking with canvas over the top and paint.

Q. So when we talk about a wooden canvas canoe, would it be made similar to the top?

A. The ones I know of, yeah. What you do is you would make a frame and run very thin wooden planking, wooden strips along it, and then stretch canvas over the top of that. And I've seen it done. At WoodenBoat

school they built a few of them, and it's an amazing process.

Q. And the canvas adds a little bit of --

A. It's waterproof and it's strong, and it goes on very tight, just like this. So your exterior is going to look a lot like that.

Q. And I think you have a poster board there with a picture of the Edith with a hole in there?

A. Yeah.

Q. Not this Edith with a hole in there.

A. Yeah, that's the Kolb brothers, and they took a side hit. And when I built this replica, I looked at the construction of the way the side was built, and I went, boy, if you took a really hard hit, the whole side would collapse. And I think it's just the guys in Racine who built it, never occurred to them to build it for that kind of strength.

Q. It's made --

A. Another boat builder might have built it a little different.

Q. It's made to hit things with the front --

A. Yeah.

Q. -- not with the side?

A. (Witness nodded.)

Q. But as long as you keep your boat pointed

downstream, you should be okay?

A. Yeah. Basically, these side ribs, these oak side ribs, just butt-joint onto the interior corner board, so there's nothing to keep that side from just blowing in. These little boards here, they're just butt-jointed onto that chine log, which is really silly. But that's not the standard for the day. That just happens to be how the Edith was built.

But it's is a very typical type of construction. It's a peculiar design, because it was the one that Nathaniel Galloway came up with, having run the Palisades up in Utah, and he thought flat from side to side, upturned ends. And he was right, and they're pretty good. And in their day I mean these were the rocket ship. These were the best thing going.

Q. It doesn't fit it quite as well as your modern dory?

A. No. The shorter and fatter you make them, the better they float.

So this one is 1930s; 6 inches wider, a foot shorter. It was way longer. And then a dory is going to be another foot wider on the bottom and probably 2 feet shorter on the bottom and flared sides, and so you get the runoff would be way out here, which gives you a tremendous amount more leverage. So that's the

evolution to where we are today.

Q. Okay. There was some evolution in how you run rivers too, running them facing forward rather than facing backwards?

A. Well, Galloway started facing downstream in the 1890s, and he's famous for that, and it's called the Galloway-style; but Bert Loper was doing it in the 1890s on the San Juan, and he didn't ever meet Galloway until years later.

And so it's a style that's going to evolve anywhere in shallow water. If you're rowing backwards, you're gonna crash. If you turn around and row upstream, you're going to see what you're doing and you're going to slow down and you're going to move sideways.

So I think anywhere where they were running shallow, rocky streams, that exact same style evolved almost instantaneously or they gave up on it.

Q. Have you ever hit something pretty hard with either one of these boats?

A. Yeah. I hit this one hard enough to stop and bounce it in Upset Rapid.

Let's see if we can find where it hit. I don't think you can see it.

Q. And that's on the Colorado in Grand Canyon?

A. No, you can't even see it.

Yeah. Yeah. What happened was just in a very big rapid. There was a rock at the bottom of one lane that sort of surfaces for about every 20th boat, and I got unlucky.

Q. All right.

A. The Edith took some pretty good bottom hits up in Lodore, at pretty good velocity as well. The steepest rapid in the system is called Hell's Half Mile. It was never run until the 1920s, when Bert Loper ran it in an 18-foot Galloway.

And so I ran this through it and I hit a rock pretty good, but it didn't do any damage.

We could hoist it up and -- oops, the hoist is gone.

Q. That's all right.

A. I don't want to go down under it. My knees don't want to do that.

Q. All right.

A. But, yeah, these plank boats are very strong.

Q. Okay. And it's got some copper on the edges to kind of deck the corner?

A. Yeah. The copper is a bit of a mystery to me, why they would use copper. It's very soft for a protection. All it really does is hold in the mud and

the water and the rock.

Q. All right. Makes it pretty when it's sitting up here.

A. It sure does. It does. It's kind of confusing and expensive, but...

Q. All right. So let's talk a little bit about your Klepper here.

A. Das Klepper, das boat from Germany.

Q. Okay. So this is a modern Klepper?

A. Yeah. This is a modern 1970s --

Q. Modernish. Modernish Klepper then.

A. 1974.

Q. All right.

A. But it's the exact same design as they started making in 1910 when Hans Klepper first came up with the concept and canvas and canvas with rubber on it on the bottom originally. Now it's a tougher material.

Q. But the same shape, same rib system?

A. Same shape, same system; a bunch of metal ribs with clips on them and some big frames that just fold in there and a pontoon, and even those originals had a little inflatable thing here made of rubber.

Q. Which helps you --

A. It gives you a little more buoyancy, bounce

off a few more things. It's a neat boat.

Q. How much cargo can you put in it?

A. A ridiculous amount of cargo. You can fill this entire end with cargo; and from your feet forward -- your feet are going to be probably right about here for a big guy like me. -- you can fill all that with cargo.

And I would say this. Until some of the very, very modern inflatable kayaks came out, oh, in '70s, '80s, '90s, this was the boat of choice in Alaska for expedition boating, was the Klepper.

And an American guy came out with them shortly thereafter, Folbot. Jack Kissner started making Folbots, which were cheap Klepper knockoffs. They weren't as good, but it was an ingenious design. They're incredibly strong. They have a lot of flex to them, and they look like they would explode if you look at them crosswise, but they take tremendous impacts.

Q. So you could bounce off a lot of rocks in that?

A. Yeah.

Q. Even if they --

A. There's a guy in the 1930s -- let's see. -- Harold Leich, took one up to Grand lakes in Rocky Mountain National Park headed for the Gulf of

California; went through Gore Canyon, went through Granby Gorge, which is under the lake now, all the way down to Grand Junction in the damn thing and broke every stick in it and just taped them together and kept going in a Klepper, and that's a rough ride, and that's a very early Klepper too, because he had a used one in the early '30s.

And then he bought some wood and built a box and headed for the Gulf rowing his box. Didn't even look like a boat. Got most of the way through Cataract Canyon and was looking at a rapid in the dusk, one more rapid, and hit something in the flow and, boom, hit the boat, and that was the end of his trip and he had to hike out.

But, yeah, Kleppers are amazing boats.

Q. So if you had one of these in 1912 and you ripped a hole in the bottom, what did you do?

A. Get out a needle and thread and sew it shut. You could sew a little piece of bear skin or something. I don't know. Patch it with goo, tar. But you would patch it up. You have to.

Q. And you would bring some sort of patch kit and you would recover?

A. I would. I mean maybe the first time you took it out, you would think, oh, it's invulnerable and

then you would rip it; and if you try it again, you would take a patch kit.

Q. Okay. And it folds up into those bags over there?

A. Yeah. Yeah, these are the original Klepper bags, the skin and the ground ripped it's got on this bag. Rats been eating it.

And here is the spray deck for paddling whitewater. Goes around you.

Q. Did they have those in the early days?

A. I don't know. I don't know.

And it's got a rudder and foot pedals, if you want to use it as a seat kayak, and I think the originals had something like that. This is aluminum, so it's much more modern. And a little inflatable seat and a little backrest.

Very ingenious boat. Still being made today, but basically the same design. And they're no longer the preferred boat because the brand-new inflatables are a lot easier to deal with. And there's people still using them in Alaska.

Q. Okay. Thank you very much for showing us and talking to us about your boats.

A. Sure. Let's put the Klepper back up here and away another day.

(Direct Examination Via Video concluded.)

MS. HERNBRODE: Would you like me, Mr. Chairman, to ask Mr. Dimock a few more questions, or would you like to break a little early for lunch?

CHAIRMAN NOBLE: Is it your intent to have Mr. Dimock do some direct --

MS. HERNBRODE: It is.

CHAIRMAN NOBLE: -- testimony?

MS. HERNBRODE: Very briefly direct.

CHAIRMAN NOBLE: Let's have him do it now.

MS. HERNBRODE: Okay. Brad, if you'll come up and sit right here.

DIRECT EXAMINATION CONTINUED LIVE

BY MS. HERNBRODE:

Q. All right. For the record again, Brad, can you introduce yourself?

A. I'm Brad Dimock, Flagstaff, Arizona.

Q. Okay. I just had a couple of additional questions. You make some modern dories out of wood, right?

A. Yes.

Q. Okay. Some have fiberglass or part

fiberglass?

A. Correct.

Q. The entirely wood ones, is there anything about what they're made of that makes them more durable? Is modern lumber somehow more durable than the historic lumber?

A. Well, plywood is more durable than planks, but we're using much thinner plywood, so you end up it's kind of a trade-off. The boats we built for Grand Canyon have just quarter inch plywood on the side and they explode, so...

Q. The cedar that you used in the Edith --

A. Uh-huh.

Q. -- my understanding is that historic cedar had fewer knots in it and all and so it was a little bit stronger wood than the cedar that is available today; is that true?

A. Yeah. That's true for most kinds of wood you can get today. All the old growth is gone, and so the nice clear, beautiful wood that the old boats were built out of is all gone. So now we use wood with knots all over the place and have to cut around them and replace them, and it's inferior to what the old boats had.

Q. Was modifying your boat along the way and

learning as you go kind of a common way of learning to boat in the 1800s and early 1900s?

A. I would guess it was. You know, in the big factories back East, you know, you learned from a great master; but the home builders are certainly learning as they go. And if you look at the Oregon boat builders, you can see year by year how they were starting to change due to how the boats performed.

Q. The early boatmen that you've studied all sort of taught themselves?

A. Yeah, some of them taught themselves. Some of them had them built, like the Kolb brothers had that thing built, but it was to Galloway's specifications; and he had sort of learned by trial and error what shapes worked.

Q. And they taught themselves how to boat as well?

A. Sort of. Not very well.

Q. And you ran both the Julius and the Edith through Cataract Canyon?

A. Yeah.

Q. And that's a pretty seriously rocky, rapidy sort of canyon?

A. Yeah, it's -- only about half of Cataract Canyon remains. The rest is under Lake Powell. But

it's a very rocky stretch.

Q. And fairly high velocity, so if you're hitting a rock, you're hitting it pretty hard?

A. Yeah, yeah, they're steep, rocky rapids. It's a nasty place.

Q. Different than the Verde?

A. Yeah. The Verde is much calmer. You know, you can still crash into rocks, but I don't think you're going to hit them with the impact that you would hit them in the big rivers.

Q. You're familiar with the international system of rating rapids?

A. Uh-huh.

Q. Even though Colorado rapids are rated differently?

A. Grand Canyon has its own weird system, yeah.

Q. Is a Class I rapid an impediment to a wooden boat?

A. No. A Class I rapid is really -- means you have to be awake. You know, I mean there's maybe a rock or maybe some little waves.

Q. Class II rapid?

A. Not much more to it. You know, you've got to get up to Class III before you're really in any danger of having much of a problem, I think.

Q. Before you even really have to think about what you're going to do?

A. Well, you have to think. People drown in their bathtubs and people flip their boats on Class 0 water and drown, so...

Q. When we were talking about the Edith, you talked about the fact that a Galloway boat pivots better than older designs. Why is pivoting important?

A. Well, if you're going to miss a rock, you're going to have to alter your course if there's a rock in your way, and if you've got a keel along the bottom of your boat, you're just going to track right into it, and so the idea is if you're slowing your momentum by rowing upstream and you can pivot, then you can turn and move back and forth. And so the boats that pivot better are much better in rocky streams.

Q. Are modern boating skills necessary to run the Verde, or could you have run it if you were Galloway?

A. Galloway could have run it fine. A lot of our modern skills aren't applicable to those smaller rocky streams.

Q. You wrote an article in Arizona Highways, which has been introduced as X070-2, in 2004 about running replica boats through the Grand Canyon; is that

correct?

A. Correct.

Q. And the boat you were running was the Julius?

A. Right.

Q. Which was that second boat you were showing us at the shop?

A. Yeah, modified lapstrake Galloway.

Q. So slightly newer design --

A. Yeah.

Q. -- than the Edith.

On Page 12 of the Arizona Highways article, you talk about how most boatmen on the Colorado train on rubber rafts and never find a reason to press their luck with a fragile boat.

What do you mean by that?

A. Well, commercially, we're running very heavy loads with large, litigious people, and you don't really want to take chances. And the modern boats, you know, you can land in the rocks, you can park in the rocks, you can bounce off rocks and walls. And the wood boats you can't do those things. So, you know, people who aren't really into wood boats think it's really silly to run them anymore, and they would rather run an inflatable. It's easier.

Q. You also wrote an advertisement for Arizona

River Adventures, which has been entered into evidence as X070-1, where you're talking about a river trip that you're going to be on running wood boats.

A. Uh-huh.

Q. And you say that the modern method of rowing where you push downstream works better than even the Galloway method of pulling upstream while facing downstream.

Can you elaborate a bit on those two methods?

A. Well, I was just describing the Galloway-style, where you row upstream, slow your momentum, move back and forth to avoid obstacles.

Grand Canyon is not shallow, and we've found, starting in the 1970s, early '80s, that you push ahead and run it more like a kayak or a motor boat would, and it works better in big, deep water with no rocks. And we all sort of relearned boating at that time.

I later went back up to the upper Colorado and the upper Green in a wood boat and was trying to row like that and crashed all over the place and went straight back to the Galloway technique for small, rocky rivers. It really is dependent on the type of water.

So in that article I was writing about Grand Canyon, and I said, yeah, it works better down there;

but it doesn't work very well at all on the shallow, rocky streams.

Q. And there's also a Wooden Boat People blog that you wrote, which has been entered into the evidence as X070-4. Do you often post on Wooden Boat People?

A. Not anymore. I started my own blog, and I'll go on there once in a while when I'm bored and see what they're up to and make comments. But I used to post some of my exciting boat building adventures there.

Q. In that article you talk about chines. What are chines?

A. The chine is the corner between the side of a boat and the bottom of the boat, and in the old style boats it's usually a fairly squared corner where two planks meet.

Q. The place where Edith has that copper on it, is that the chine?

A. Correct. Correct.

Q. When you talk about building the Euphrates, it's a modern-style dory?

A. Correct.

Q. Not a replica boat?

A. Correct.

Q. And so they're putting -- you're looking at a

foam floor and some fiberglass on it to increase durability because they're going to run it over and over again, is that --

A. Right, right. The commercial boats in Grand Canyon, most of them we cover in fiberglass for years and years of abuse.

Q. How many times do those boats get used a year?

A. Depends. Just a couple times up to five, six, seven, eight times.

Q. A year?

A. Yeah.

Q. And we also have in evidence a couple of blogs from Fretwaterlines, which are X070-3 and X070-5. That's your blog, the Fretwaterlines?

A. Yeah, that's mine.

Q. And we have to be careful we don't talk over each other or she starts giving us really nasty looks. She had ammunition yesterday. You wouldn't want to have been here for that.

In your blog for April 10, 2011, titled "Edith in the Wild," you talk about your first river experience in the Edith. Can you tell us a little bit about that?

A. It's a tough boat to row compared to the

modern wooden boats. It's long and narrow compared to a modern boat, which makes it harder to pivot; and so when you get in the big hydraulic currents that you get in the big rapids in Grand Canyon, it sometimes just takes off, and very difficult to control. Smaller rapids it moves quite well, though.

Q. It didn't surprise you that the Edith didn't handle as well as a modern boat?

A. No. It's simple geometry. You know, it's, what did we say, 16'8" by 4 feet wide, and a modern boat is about that long by 6 feet wide, so radically different geometry.

Q. Okay. And you did take the Edith through Grand Canyon?

A. Yes.

Q. Did it require forethought and luck, as you predicted in your blog?

A. Well, it always require a bit of luck, but I ran it like I would run a normal boat and just took my hits in it.

Q. You still think you could take the Edith on the Verde or any other river boated by thousands of canoeists every year?

A. Yes.

Q. And in your blog post from January 3rd, 2013,

the boat you were building at that time was a replica Nevills boat?

A. Correct.

Q. And it's a plywood boat?

A. It's plywood, yeah.

Q. So much later?

A. Yeah, 1938.

Q. You do talk a bit about the Edith. Did you make any structural improvements to the Edith like you talked about doing on the Nevills boat?

A. The only thing that was inauthentic on the Edith was I did not put in the zinc linings inside them. Other than that, same type of wood, although knottier, because you can't get the clear stuff, and I didn't paint it gray.

Q. You didn't use any modern fasteners on the Edith?

A. No. All old bronze screws and copper rivets.

Q. You did add those boxes to it, but you had run it several times without the boxes?

A. Yeah, I've run it without the boxes, and then I added some just because I was going to do a commercial trip and needed to haul more gear.

Q. Gives you a handy place to keep things you might need?

A. Yeah.

Q. So if you hit a rock really hard sideways in your Edith, you would likely have the same problem as the Kolb brothers?

A. Probably the exact same problem, yeah; that the whole side would collapse.

Q. Is that something you would worry about on the Verde?

A. Well, I would try and avoid it, but I don't think -- there's a rapid called Verde Falls that I think I would probably lower the boat through on ropes rather than risk getting out of control on the initial drop and then this big rock, and if you broached on it, you would have that problem.

Q. So it's not the drop in Verde Falls you're worried about; it's the rock sort of center after that?

A. Yeah, it's the consequence after perhaps becoming out of control from the first drop.

MS. HERNBRODE: Okay. That is all I have, Mr. Chairman.

CHAIRMAN NOBLE: Let's break for lunch.

COMMISSIONER HORTON: Could I ask him a couple questions?

CHAIRMAN NOBLE: Sure, Jim.

COMMISSIONER HORTON: Do you know Kim

Crumbo?

THE WITNESS: Very well.

COMMISSIONER HORTON: He's a hell of a strong fellow.

THE WITNESS: Frighteningly so.

COMMISSIONER HORTON: And were you -- did you work for the original owner of Dories at any time?

THE WITNESS: I did for 10 years, for Martin Litton.

COMMISSIONER HORTON: Martin Litton. I was trying to think of his name. So you have a hell of a lot of experience taking a boat through the Grand Canyon.

THE WITNESS: More than most. There's a few senior to me out there.

COMMISSIONER HORTON: It would be hard to know that, but anyway, that's pretty impressive.

CHAIRMAN NOBLE: Any other Commissioners have questions for Mr. Dimock at this time?

Okay. Then we'll reconvene at 1:30.

(A lunch recess was taken from 11:58 a.m. to 1:30 p.m.)

CHAIRMAN NOBLE: Let's go on the record and have George do a roll call.

DIRECTOR MEHNERT: Commissioner Henness.
COMMISSIONER HENNESS: Present.
DIRECTOR MEHNERT: Commissioner Allen.
COMMISSIONER ALLEN: Present.
DIRECTOR MEHNERT: Commissioner Horton.
COMMISSIONER HORTON: Here.
DIRECTOR MEHNERT: Chairman Noble.
CHAIRMAN NOBLE: I are here.
DIRECTOR MEHNERT: We have a quorum and we are ready to go.
CHAIRMAN NOBLE: And it is 1:30, and Mr. Hood was very appreciative that we waited.
MR. HOOD: Let the record reflect it is 1:30 on the nose.
MR. HELM: Whose nose?
CHAIRMAN NOBLE: Mr. Heilman, go ahead, please.
MR. HEILMAN: Thank you.

CROSS-EXAMINATION

BY MR. HEILMAN:

Q. Hi, Mr. Dimock. My name is Jeff Heilman. I represent the Salt River Project in these proceedings. I just wanted to ask you some questions about the video testimony that we watched this morning.

A. Okay.

Q. They're submitted under X066, and there's two videos, the one where you're talking in your house and then the one outside. The one in your house I'm going to refer to as Video 1, and the one where you're showing the boats will be Video 2.

A. Okay.

Q. Does that work for you?

A. Yeah.

Q. Okay. I've also tried my best to transcribe what you and Ms. Hernbrode were saying. If I get that wrong, please correct me, but let's wait until after I'm done so we don't mess up the court reporter.

And then, finally, for the record, I'll do my best to approximate which minute of the video we're talking about, but they're not exact timestamps, so forgive me if they're a little off.

So in Minute 0 of Video 1, you said that you worked as a historian and written biographies of river characters and river history.

Do you have a degree in history?

A. I do not.

Q. Any other formal training in history?

A. No.

Q. In Video 1 Ms. Hernbrode asked you if you've

ever run the Verde River, and you state "I ran the Verde a lot back in the 1970s in kayaks and rafts."

She then asked you how come you haven't run it since the '70s, and you reply, "My attention has been elsewhere. I've been working commercially for most of my river-running, and that's up north and in the Grand Canyon."

Does that sound right?

A. Correct.

Q. When you say that most of the river runs you do are commercial, what kind of commercial operations are we talking about?

A. I work for a rafting company out of Flagstaff in the Grand Canyon and occasionally up in Utah.

Q. Okay. So that same company also has boating trips in Utah?

A. No, other river companies.

Q. Gotcha.

Besides the Colorado River, what other rivers do you run commercially?

A. The San Juan, the Green, the Yampa, and the upper Colorado.

Q. And you said you live in Flagstaff; is that correct?

A. Correct.

Q. About how far away is Flagstaff from the Verde River?

A. About an hour, about 50 miles.

Q. Okay. And you've never thought about running commercial trips on the Verde River?

A. No, I haven't.

Q. Why is that?

A. I make quite a bit of money in Grand Canyon. It's a much higher paid job, and I don't enjoy short trips. I like the one and two and three-week trips.

Q. And so you haven't been on the Verde River in a boat since the 1970s; is that correct?

A. I believe I did a trip in the 1990s or maybe 2000.

Q. Okay. But, still, it's been a while since you've been on there?

A. It's been a while.

Q. And I believe you stated you've taken your replica boats on a number of other rivers; is that correct?

A. Yes.

Q. Which rivers have you taken the Edith on?

A. The Edith has been on Lodore Canyon and the upper Green River and Cataract Canyon and Grand Canyon.

Q. And the Julius has been on even more?

A. Many, many more; from the source of the Green up in the Wind River Mountains all the way to Lake Mead; and the Rogue River source to sea; the Salmon River from Salmon, Idaho to Lewiston; the Yellowstone from Yellowstone Park to Billings; and the San Juan as well.

Q. And how do you take those boats to those different places; what does that entail?

A. I have a little trailer that I tow behind my little Toyota van.

Q. So you've taken your replica boats all over the country, but never taken them on the Verde River?

A. No. I'm usually taking them where they were taken historically, and my main interests are the Colorado River boaters, so I've been following their tracks with those boats.

Q. Have you discussed the possibility of putting your replica boats on the Verde River to prove that you can actually navigate it?

A. We have, and we have actually talked about doing that this year, but I'm recovering from two knee surgeries and a hernia, so I have not been able to do it this year. I would love to, though.

Q. Okay. At Minute 2 of Video 1, you and Ms. Hernbrode were discussing your trips on the Verde

River, and she asked you "The trips you went on the Verde, did you portage on those trips?"

And you replied, "I believe we portaged around the Verde Falls once or twice when we had something that we thought was inappropriate, like a big canoe or something."

Why would a big canoe be inappropriate for running the Verde Falls?

A. Well, almost any canoe would be. An open canoe might very likely swamp; and the other boat we have is a decked canoe, but we were really amateurs at the time, so the portage is quick and easy and we did that.

Q. And what other kinds of craft would be inappropriate for running the Verde Falls?

A. I think most anything. Well, kayaks are fine because you have such quick recovery. It just depends on who's running the boat. If it's something you're likely to get out of control and bash into this one big rock below there, you might want to think about not running it.

Q. And your replica boats would be in that inappropriate category?

A. For me, yeah. I'm not young enough to think I can get away with that anymore.

Q. And then a little bit later in Video 1, she asked you, "Do you remember how long the portage was?"

And you respond, "I don't remember it being much of a project at all. I think you just get out on the right bank and walk around the main drop and get back in."

What kind of boat were you in when you portaged the Verde Falls?

A. Canoes.

Q. Canoes?

And would that portage be more difficult if you were running one of your replica boats?

A. It would. You might want to just lower it by ropes, just drop The Falls with a couple of ropes.

Q. Approximately how much do your replica boats weigh?

A. Anywhere from 300 to 500 pounds.

Q. And that's for both the Julius and the Edith?

A. Yeah.

Q. How thick is the wood in the hull?

A. The floor on those are seven-eighths of an inch to an inch thick of pine or fir planking or cedar. The walls are five-eighths to three-quarters-inch thick.

Q. Could you portage the Verde Falls by yourself

in one of your replica boats?

A. I couldn't portage it. I could line it, probably, figure a way with ropes to line it.

Q. And I think you might have said that in the video, but how much cargo can you hold in the Edith, for instance?

A. A lot. I mean there's a tremendous amount of room in there, more than I would want to row, depending on, you know, how dense it is. If you're carrying iron ore, you wouldn't put much in it.

Q. How much weight would you feel comfortable rowing?

A. I would have to pull a number out of my head. Half a ton or a ton, somewhere in there.

Q. Up to a ton?

A. Yeah. I mean they're incredibly buoyant. That would be like four great big people, and it wouldn't be tough for a half a ton.

Q. If you had half a ton of cargo in your boat when you had to either portage or line Verde Falls, that would make it more difficult, wouldn't it?

A. Probably take it out and carry it around.

Q. At Minute 3 of Video 1, you talked about -- more about portaging. You state, "The one time I know I portaged, my girlfriend and I were just learning to

paddle a two-man decked canoe and flat water is scary. So Verde Falls was just like we're not going to do that."

Did I -- does that sound right?

A. Yeah. That was the first time we had been in a decked canoe.

Q. Could you tell me what a decked canoe is?

A. It looks more like a kayak, so that you get down in it and kneel and put spray decks around, and so it looks like a kayak. But they're a whitewater racing canoe.

Q. And what did you mean by flat water is scary?

A. Well, just getting in the thing was scary when we first got in it, because we had never been in it before, so flat water was even scary, so...

Q. What is flat water?

A. Still water.

Q. At Minute 3 of Video 1, Ms. Hernbrode asked you, "Have you ever run a dory on the Verde?"

And you reply, "I haven't. By the time I got to dories, again, my eyes were pointed northward. You might want to line or portage at Verde Falls, but I never looked at it with a doryman's eye, so I would have to reassess."

Why might you want to portage or line the

Verde Falls in a dory?

A. As I stated earlier, if you get out of control in that first drop, it's very likely to broach on a big boulder at high speed, and dories don't like that.

Q. At Minute 3 of Video 1, Ms. Hernbrode asked you if you wear a life vest when you run a river. And you reply, "I do. It's the law, and in a bouncy river it's only common sense. We used to not wear them unless there was an actual obvious threat ahead."

When did that law requiring life vests come into place?

A. Probably before I was born. But I worked with a lot of rebels in Grand Canyon and we would take them off in the flat water on a hot day, but we don't anymore.

Q. And what did you mean by bouncy river?

A. Yeah, anything where you might bounce overboard.

Q. Would you consider the Verde a bouncy river?

A. Yeah, in a lot of places.

Q. And then when you said, "We used to not wear them unless there was an actual obvious threat ahead," what is an actual obvious threat?

A. A rapid.

Q. So you would have them in the boats?
A. Yeah.
Q. At Minute 6 Ms. Hernbrode asked you, "Do you check the USGS gage records when you run a river?"
And you reply, "Sometimes we did. It was a lot harder in the '70s to get that information. We didn't have a worldwide web. So we would usually just go and look and say, 'Hmm, there's no water. Let's go do something else.' I went to run the east Verde one time and that happened, so we went over and ran the Camp Verde down stretch instead."
So there have been occasions where you've gone to a river and there hasn't been enough water for you to run your boats?
A. Yeah. The east Verde is where it goes through Payson there or Snowflake. I forget. That you've really got to have floodwater to get on the east Verde, but there's just about always enough to go down the main fork of the Verde.
Q. At Minute 6 of Video 1, you state, "Well, I started at Prescott College, which, to be nonnegligent, made us wear helmets and jackets for all of our kayaking. So it was available. Kayaking was just starting to pick up in the early '70s. They invented the plastic kayak, which was more durable than the

fiberglass ones and the skin ones before that, and that's sort of when I got into kayaking."

Why did the invention of plastic kayaks make kayaking more popular?

A. They were cheaper and they were more durable. The fiberglass boats will shatter if you hit a rock hard enough; and the plastic ones, after a couple generations of plastic ones, they got them to where they were pretty much unbreakable. They're like Tupperware.

Q. And the fiberglass kayaks were more durable than the canvas ones before them then, correct?

A. Maybe yeah, maybe no. The wood and the canvas ones are probably quite a bit tougher than the fiberglass ones, but the fiberglass ones were lighter.

Q. But neither the plastic or fiberglass boats were available in 1912, right?

A. Correct.

Q. At Minute 7, you say that as a historian, you use newspapers in your research all the time.

How many newspaper articles have you read about boating on the Colorado River?

A. A lot. I mean I've written three books and traveled all over the country looking through microfilm, old newspapers and -- I don't know. Lots.

Q. So it's not difficult for you to find newspaper articles about boating on the Colorado River?

A. Well, it's difficult to find them. You have to go through a lot of stuff if it's not well-indexed, and most of them are not indexed well.

Q. But you say there are a lot of them out there, you've read a lot?

A. Yeah. Like you go to Utah, the Mormons have indexed the entire gamut of Utah newspapers. So it's very easy in Utah.

Q. At Minute 11 of Video 1, Ms. Hernbrode asks you, "How much draw does a fully loaded commercial dory take?"

And you respond, "A fully loaded dory is a very heavy boat for its size, and it can --"

CHAIRMAN NOBLE: Mr. Heilman, we appreciate your ability to read. Jody doesn't.

MR. HEILMAN: I'll slow down. Sorry.

BY MR. HEILMAN:

Q. And you respond, "A fully loaded dory is a very heavy boat for its size, and it can draw, with the heaviest load we run, 10 to 11 inches, and that's tough to row."

When you say it's a very heavy boat, do you have an idea of how much it weighs?

A. I would guess we're looking at a ton and a half at that point.

Q. And why do you say that's tough to row?

A. Well, the more weight you get in it, the more sluggish they are, and they just get to a point where it's not much fun and it's a whole lot of work. And so I would rather row something that's not overloaded. But we almost always start overloaded on the Grand Canyon trip, because it's two to three weeks of gear.

Q. At Minute 12 of Video 1, Ms. Hernbrode asks you about your boat building education, and you state, "My boat building education sort of began self-taught as we would break dories, crashing dories, and we would fix them on the river and then fix them better when we got back to the warehouse, taking them apart and rebuilding them. I broke one in two in 1988 and had to do a full rebuild over the winter and eventually started building complete boats, and all sorts of different techniques."

CHAIRMAN NOBLE: Thank you, Mr. Heilman, that's much better.

BY MR. HEILMAN:

Q. How many times have you crashed a dory and had to fix it on the river?

A. Oh, maybe two dozen.

Q. And are you more likely to crash one of those dories if it's fully loaded?

A. It's not so much the load as the rapid, the situation, the water level.

Q. How long does it take you to fix a dory on the river?

A. Most wrecks it takes us half an hour or less.

Q. And what happened when you broke the dory in two in 1988?

A. I spent all night fixing it.

Q. But you still fixed it on the river?

A. Yeah.

Q. At Minute 14, Ms. Hernbrode asked you some questions about boats used by the Kolb brothers on their trip. Without measuring it, you guessed that it would be about 18 feet long, about 4 feet wide, and fully loaded could weigh about a ton.

Does that still sound about right to you?

A. Well, we went down and measured it. It was 16'8". I had forgotten exactly how long it was. But the rest of it's correct.

Q. You don't know, do you, whether you could take an 18 foot long, 4 foot wide, one-ton boat down the entirety of the Verde River in its ordinary and natural conditions?

A. Well, I haven't done it. I believe I could do it.

Q. When Ms. Hernbrode asked you, "How much weight can she carry," you say, "Boy, that boat could carry a lot, and, of course, the more you put in, the less manageable it becomes, but I bet you could put a ton in that boat."

What do you mean by the more you put in, the less manageable it becomes?

A. Well, as I said earlier, the heavier they are, the more difficult they are to row. It's just physics. You're deeper in the water. There's more weight out there. Takes more strength to get it moving, slow it down, change its direction.

Q. At Minute 15, Ms. Hernbrode asked you what kind of cargo you could put in the Edith, and you state, "You could put skins, if you're out there being a trapper. You could put a fair amount of mining supplies in it. You could fill it full of staple goods and go down the river being a merchant."

Did you discuss using these boats to haul mining equipment with anyone from the State Land Department before you recorded the video?

A. No.

Q. At Minute 17, Ms. Hernbrode asked you if the

Kolb brothers had any issues on their boating trip through the Grand Canyon.

So you said, "They had a lot of issues. Neither one of them knew how to row when they started, and they had been told by Galloway and Stone the theory and the technique, but learning that technique is not that easy in any old wooden boat, and so they crashed and burned. Well, they didn't burn, but they crashed the boat. They had to patch a lot and portage them, line them, push them over rocks, but they're tough American men. It doesn't matter what gets in your way, you find a way to overcome it, just the way a lot of boating was done in those days."

What do you mean when you say learning that technique is not easy in any old wooden boat?

A. Learning to row isn't easy in any boat, wooden or not. Some people pick it up quicker, some don't; but it's difficult.

Q. Is that specific to rivers with whitewater, as compared to like a lake?

A. Yeah. You know, when you're dealing with rocks and walls coming at you and you have to learn to react and control that boat with these two levers, it takes a while.

Q. Were the Kolb brothers carrying any pelts or

skins on their trip?

A. Not that I know of.

Q. Mining equipment?

A. I doubt it.

Q. And staple supplies to sell to other people?

A. No.

Q. If they had been carrying, let's say, mining equipment, skins, or supplies they wanted to sell, that means the boats would have been heavier and even less manageable?

A. Correct.

Q. So they would have possibly crashed it more often as a result?

A. Possibly.

Instead, they had a lot of camera gear, which was also very heavy.

Q. But not as heavy as mining equipment?

A. Not as heavy as mining equipment, no.

Q. And if you had something like mining equipment, that would make portaging and lining more difficult as well, right?

A. Uh-huh, more to carry around.

Q. And given how often they crashed and how often they had to patch, they might have lost or ruined some of those pelts or that mining equipment or the

supplies they intended to sell in those crashes, correct?

A. Very possibly.

Q. At Minute 17, Ms. Hernbrode asked you about the picture of the Kolb brothers looking through a hole in the Edith.

And you state, "Emery had just watched his brother flip over in the deep water, and so he pulled into the shallow sideways and, pow, T-boned the thing. And that boat in particular was not designed to be hit from the side, and the whole side collapsed."

Could you explain what you mean, and I know you touched on this in the video, but what you mean when you say "that boat in particular was not designed to be hit from the side"?

A. Yeah. In the framework of a boat, usually the stiffeners that would go across the floor of the boat are firmly fastened to the ones that go up the side of the boat. For some reason, the way they built the Edith, those sideboards just butt-jointed against the floor of the boat. So if you hit it from the side, they would just give way. They weren't fastened at the base, which is very peculiar.

Q. Yeah.

A. And I don't know why they did that.

Q. I've actually watched some of your videos that you have on YouTube of you rowing your boat through some whitewater. It's not always exactly easy to keep your boat pointed straight down the river, is it?

A. No, it is not.

Q. And that would be especially true if the boat was full of cargo, as opposed to light?

A. Yeah.

Q. Have you ever hit a rock with the side of your Edith?

A. No.

Q. But have you ever wrecked a dory that way, hitting from the side?

A. I have had a couple good side hits, yeah.

Q. At Minute 18, Ms. Hernbrode asked you about the Kolb trip. "I think you said they lined or portaged some of the rapids?"

And you reply, "They did. Lining, where you're actually lowering the boat through the water without picking it up, is difficult work, with slippery rocks and the boat pulling against you, but it's a lot of times easier than actually unloading it and carrying the boat, especially when there's just two of you. So they lined a lot and portaged some."

Why do you say that lining is difficult work?

A. Well, you've got the entire force of the river pushing against the boat, and you're trying to hold that rope while you're standing in slippery, muddy rocks. Very easy to hurt yourself, break an ankle or something, rope burns, boat gets away, or the nose catches the current and pulls out.

I've done a little bit of it just to see what it's like. It's terrifying.

Q. And do you have to unload the boat when you line the boat?

A. You don't have to, and depending on the situation, sometimes they did, sometimes they didn't.

Q. And when you say the boat's pulling against you, it would pull against you more if it had that stuff in it and it was heavier, correct?

A. Yeah.

Q. And what do you mean when you say "Lining the boat is a lot of times easier than actually unloading it and carrying the boat, especially when there's just two of you"?

A. Well, if the boat weighs 500 pounds, it's hard for two people to carry it; whereas they might be able to brace themselves and lower it, where gravity is working with you, rather than actually pick that boat

up and portage it around.

Q. So a single person by themselves could not portage a 500-pound boat?

A. It's actually been done. Buzz Holmstrom portaged Big Drop 2 with a 500-pound boat, and nobody knows how he did it; but there's pictures.

Q. But the Kolb brothers weren't able to portage their boats by themselves?

A. They were. They did.

Q. They were together, though, right?

A. Yeah. They portaged one boat at North Canyon Rapid, and it took them all day, and they said to hell with that and ran the other one through.

Q. At Video 1, Minute 19, Ms. Hernbrode asks you, "And you built a replica of the boat the Kolb brothers used to float the Colorado?"

And you reply, "I did for the centennial of their trip. I built an exact replica, used the same type of wood, the same type of hardware, same techniques, and the only thing I didn't do authentic was I could not bear to paint it battleship gray, which is what they did. I left it natural."

I think you said earlier -- Ms. Hernbrode was asking you about that. -- the wood that they actually used is now -- you can't get it, correct?

A. Right. You can get the same species, but it's just got knots in it now.
Q. The old growth is stronger?
A. Yeah, and lighter and better.
DIRECTOR MEHNERT: Is this new?
MR. HEILMAN: No, this is X069.
BY MR. HEILMAN:
Q. This is one of your actual blog posts from your -- the Fretwaterlines blog.
A. Correct.
Q. Is that your current blog?
A. Correct. Yeah.
Q. And in this particular post, are you discussing the replication of the Edith, or is it a different boat?
A. This is a 1938 boat, the WEN, and I'm creating a replica of that.
Q. And you talk about some of the things you did with that boat, like using quick-drive powder-coated deck screws in places where it will never show.
A. Uh-huh.
Q. Did you do anything like that when you built the Julius replication?
A. For the Julius and the Edith, we did not. We used all brass and bronze.

Q. In the second paragraph you discuss putting a more effective brace on the splash guard and making the entire gunwale system structurally sound.

A. Correct.

Q. Did you have to do anything like that when you replicated the Edith or the Julius?

A. I didn't. The Julius was very well-designed. The Edith, you know, I thought about that joint I was telling you about, but I went ahead and did it, did it like they did. I can't think of anything I did different on the Edith from the original.

Q. Even changing the joinery at all, like you did in this one?

A. No. My joinery may not be as fine as the Racine Boatworks, though.

Q. At Minute 20 of Video 1, Ms. Hernbrode asked you if you would be concerned about hitting rocks if you took your Edith on the Verde River.

And you reply, "I'd be concerned, but not horribly concerned. You know, boatmen hate to hit rocks, but on a river like that, you would be hitting them all of the time, and wood is tremendously resilient and it wouldn't be a real problem."

What do you mean when you say you would be hitting rocks all of the time on the Verde River?

A. Well, it's a shallow river in places, where it goes out into gravel bars and such, and it would just be hard not to hit some of those; but you're not going to hit them hard. You can hit them with the floor of the boat.

Q. At Video 1, Minute 20, Ms. Hernbrode asks you, "Would you be concerned about scraping the bottom?"

And you reply, "No. Bottoms are made to be scraped. You've got an inch or so of wood, and on most boats there are runners of oak that are beneath that, which take a lot of impact."

Did the Kolb brothers' boats have oak runners on them?

A. Yes.

Q. They did?

And I know you discussed with Ms. Hernbrode your Wooden Boat People blog post.

A. Yeah.

Q. That's X070.

And you were talking about a replica you were doing for other people; is that correct, the Euphrates?

A. Oh. That wasn't a replica per se. That was a 1970s style dory that we were building for a friend of mine. A 1971 design.

Q. And in that blog post, in the second paragraph, you say "I get to frame them in sweet-swelling Port Orford Cedar and build them mostly out of Meranti plywood, but we decided to go with a foam floor and radiused glass chines due to the track record for damaged floors and chines in the Grand Canyon."

What did you mean by "the track record for damaged floors and chines in the Grand Canyon"?

A. Well, that's where you usually will hit, is the floor or that chine corner, and a square one breaks quicker than a round one. A round one dissipates the impact better.

Q. And the Grand Canyon has a particular track record for damaging --

A. Well, it has a track record of us taking those boats down 20, 30, 40. My boat's been down over a hundred times, and the floors are the parts that get beaten up.

Q. And you said that you would be hitting rocks all the time on the Verde River, right?

A. Uh-huh.

Q. So are foam floors and radiused glass chines -- do they protect the floor better?

A. The foam floor, which is a rigid foam

fiberglass inside and outside, it's a sailboat technology, and a couple years ago, when we built that, we still thought that those outlasted the wood floors. And it turns out maybe they don't. So I can't give you a yea or nay on that. There are various theories. But all floors get beat up.

Q. But there weren't foam floors -- they weren't building boat like that in 1912, right?

A. No. No.

Q. At Video 1, Minute 21, Ms. Hernbrode asked you, "And Edith isn't the only replica boat you've built?"

And you reply, "No. I've built a modified Galloway, which is the next step in the evolution. Built in the 1930s originally; shorter, wider, and more up-kick, so trending more towards a modern dory that we have today, and that one I've run all over the West. And it's built in the old plank style, unvarnished, unpainted. And it's got about 4,000 miles on it on rough, shallow rivers."

That's the Julius, correct?

A. Correct.

Q. And you've run this boat all over the West, and it has over 4,000 miles on it?

A. Yeah.

Q. But not the Verde, correct?
A. Correct. I ran it everywhere where the original designer of the boat had run it.
Q. And it sounds like you heavily favor this replica over the Edith; is that correct?
A. The more modern the hull, the easier they are to row; and, yes, I do.
Q. Why is a shorter boat an improvement in design in these types of wooden boats?
A. Well, it's -- and you're seeing that in all the sports. Skis are getting shorter, surf boards are getting shorter. When a ballerina spins and pulls her legs in, she spins quicker. It's physics. A shorter boat is going to turn better. A wider boat will have more buoyancy in the middle. It will spin better.
Q. A wider boat will spin better?
A. Yeah.
Q. And why is a boat -- you say the term up-kick, which I'm not sure I understand. Why is a boat with more up-kick an improvement in design?
A. I'm talking about the floor as it goes from end to end. If it's perfectly flat, you've got that out in water. It's hard to spin. If it has up-kick or rocker or rake -- there's a lot of terms for that, and so the more modern boat's got more and more of that,

and so they tend to turn better because they're not dragging on the water out there.

Q. And the Julius is a replica of a boat designed from the 1930s, correct?

A. It's a modified concept based on what the Edith is. They're both Galloway boats, but the Julius was built by an Oregonian, and he was probably looking at early dories as well, so...

Q. But it was an evolution of that type of boat?

A. It's an evolution, yeah.

Q. So that type of boat was not available in 1912?

A. As far as we know, no one was building a boat that looked like that; but there are a couple of early boats that have later been like thirdhand described as looking more like an Oregon boat than what Galloway was running.

Q. But comparably, boats that people were running on rivers in the Southwest, they were longer and narrower, with less up-kick?

A. The ones we know of; but the home-built ones that never survived, people would build them all different shapes.

Q. At Minute 22 of Video 1, Ms. Hernbrode asked you, "And you build more modern boats as well?"

And you replied, "Mostly I build what we call dories, which is an Oregon drift boat design, which evolved in Oregon in the 1930s. The really great designs came around the 1960s and '70s, and those are designs that we still use today. The last 40 years nothing has evolved."

What were the really great designs, innovations that came around in the '60s and '70s?

A. Well, that Oregon drift boat, as I say, it got a bit wider. They started tilting the sides out, which makes them stable when they start to tip, and it moves the oarlock further out. You can use a bigger oar. And they brought the ends up into these very high prows on both ends that really break through the water, so they became much, much better whitewater boats.

Q. But boats with that type of design weren't around in 1912, right?

A. Well, again, not that we -- not that have survived. The 1896 Flavell boat was never photographed, and a person who saw it said it was such a good boat he built a boat that he thought looked like it, and he said it looked like those Oregon boats you see today.

So it's hearsay that someone may have thought of that shape back then, but the ones that survived,

the Galloway boats, no.

Q. At Minute 23 of Video 1, you mention something called freight canoes. What are freight canoes?

A. They're big, heavy canoes used for hauling a lot of goods. They came out of Canada, you know, the Voyageur canoes and all that, but great big, beefy canoes.

Q. How big are we talking?

A. Gosh, I would have to look it up, but I think they got them up over 20 feet; but all different sizes, heavily built, and very tough boats.

Q. What rivers were they used on, historically?

A. All over the Canada and Northern United States, New England.

Q. Were they used in the Southwestern United States at all?

A. I know some made it this far. You could have them delivered by train.

Q. At Minute 30, Ms. Hernbrode asked you about using canoes, kayaks, and rowboats on a braided, sandy river.

And you replied, "Absolutely. In fact, the Klepper is the boat of choice in the braided rivers of Alaska, where these rivers just fan out into literally

hundreds of channels that dry up at a moment's notice, and so you get out, drag it over, and continue on. And, you know, on the San Juan on the day we ran braided channels, sandy, braided channels, we ran aground all the time, and it's always get out, pull it over, get back in, and continue on. In dories and canoes and kayaks and rafts, it's very common, and braiding isn't a problem."

So it's your opinion that the San Juan River is a sandy, braided river?

A. In places, the lower San Juan, where it's been inundated by Lake Powell and gone back down, you get a lot of sandbars and braids. In the upper San Juan above Bluff, you get a lot of gravel bar braids.

Q. And those sandbars and gravel bars would run you aground sometimes?

A. Sometimes. It's annoying.

Q. And you said on the San Juan River you ran aground all the time?

A. In low waters.

Q. And you were in the Klepper; is that correct?

A. In any kind of boat. I haven't run a Klepper on the San Juan. I've run other kayaks.

Q. Does that happen to you on the Colorado River

ever?

A. Grand Canyon? It is exceedingly rare. It's not a gravel bar sort of a river.

Q. At a Minute 31, Ms. Hernbrode asks, "So I guess the next question is, what does meaningfully similar mean? So let's talk about some boat characteristics, the things that make a boat suited for a particular use. So would draw be one of those things?"

And you reply, "Yeah, the amount of water a boat draws, and the kayaks and canoes would be very similar to today. The wood boats are a narrower profile, and they are going to draw more than the big, wide rafts of today, which means you'll run aground more often."

So the boats people like the Kolb brothers were using in 1912 were narrower than the rafts that we're using today?

A. Correct.

Q. In fact, the Edith is even more narrow than Julius, right?

A. Correct.

Q. So the boats in 1912 had a greater draw than these modern boats?

A. Depending on their length, yeah. If it's the

same length and narrower, it's going to draw more.

Q. And that will cause you to run aground more often?

A. If you're in shallow water.

Q. At a Minute 33 of Video 1, Ms. Hernbrode asks you if durability of boats in 1912 were meaningfully similar to boats used today.

And you replied, "Durability, I will say modern rafts take a beating a lot longer than a wood boat, but modern rafts are designed to be used over and over and over and over again; whereas the wood boats in those days were going to do one trip, because there is nobody there in their car to drive them back to put them in. So in terms of durability, they would last a trip or two, no problem."

So the boats in 1912 that they were using were only durable enough to survive a trip or two; is that correct?

A. They would last until you wreck them, but they would certainly last a trip or two, yes. Again, I mean, you can wreck anything. But a wood boat won't last as long as a rubber boat.

Q. And even on those trips themselves, there's an expectation that they would have to repair them occasionally?

A. Yes.

Q. So if you wanted to use these boats to move mining equipment, animal skins, supplies you would want to sell, you would have to build a new boat for every trip you would take, basically?

A. Depends on the river. I know on the San Juan they would drag the boat all the way back up and use it again, rather than build a new one, because the lumber was hard to come by. And they were carrying a lot of mining gear up there in shallow boats, shallow rivers.

Q. And most modern recreational boaters use their boats over and over and over again, right?

A. Yeah.

Q. And most modern recreational boaters don't expect to have to repeatedly repair their boat on a trip?

A. No.

Q. At Minute 38 of Video 1, Ms. Hernbrode asks, "Is there a difference between the expectation of historic boaters and those of modern boaters?"

And you reply, "Yeah. Modern boaters think everything is going to be just fine, and they've got a map and their buddies have all done it, and they think they're going to be able to drink beer all day and get to the end of the trip and be fine. Historic boaters

have no such preconceptions. They didn't know what was going to happen. They're explorers. They're mountain men. They're going into it cocky or they wouldn't be doing it. I can do this, but ready for anything. So it's totally different expectations. I mean their plan obviously is to take their boat and go down from one end of the river to the other, but historically they are planning on or expecting a lot of problems."

What kind of problems were historic boaters expecting on those trips?

A. Oh, my gosh, everything from boat wrecks to hostile natives to impassable gorges. They never knew.

Q. Things like boat wrecks modern boaters don't have to worry about?

A. Oh, they do. There was a spectacular one last week in Grand Canyon. But people still wreck boats and pin rafts and tear them up pretty bad, and the dories get busted up.

Q. You actually mentioned earlier today that you build -- or the dories that you run commercially, it's only a quarter-inch thick, is that what you said?

A. The side panels.

Q. And you said they explode?

A. You hit them hard, they just...pow, yeah.

Q. How often does that happen on your trips?

A. Hardly ever.

Q. At Minute 39, Ms. Hernbrode asks, "If you were to build a boat from historic materials for the Verde, would it be a bit different from one you would build for the Grand Canyon?"

And you reply, "Yeah, but, of course, I know too much. You know, I've been a boat builder and I've run all these rivers; whereas those guys hadn't. But I would build a smaller, lighter craft for a smaller river."

How much smaller of a boat would you build to navigate the Verde River compared to the boats you build for the Colorado?

A. Oh, a couple feet shorter, probably.

Q. Would it be -- and lighter, would you use different materials or --

A. Boy, you know, I would have to sit and think about that for a while, what I would build to run the Verde with; but I think I would build it fairly light.

Q. How would you build it lighter compared to --

A. You know, just use light cedar framing and light cedar planking.

Q. Someone who did not have your experience on the Colorado might try to use a longer and heavier craft on the Verde?

A. Yeah. They might do anything.
Q. And they would likely be less successful than you would in the boat you designed?
A. Probably. You know, we have so much experience now that those guys didn't. They were just -- there was no skill set out there.
Q. At Minute 39, Ms. Hernbrode asks you if you would ever build a different boat for the Verde River than you would for the San Juan River.

And you replied, "Somewhere in between. You know, the San Juan has a bit more flow than the Verde. I would build a small, quick-turning boat for the Verde."

So the boat you would build for the Verde River is even smaller than a boat you would build for the San Juan?
A. Yeah, if I was building a different boat for each river.
Q. Why would you want the boat for the Verde to be more quick-turning than the boat for the San Juan?
A. Well, because you're going to run into a lot of shallows, a lot of rocky stretches. You want to be able to move quickly, dodge whatever rocks you can, and pick it up and carry it if you run aground.
Q. Would that boat that you would build for the

Verde be able to hold one ton of cargo that you estimate the Edith could hold?

A. Probably not very well, not a whole ton. But, again, we're getting pretty hypothetical here.

Q. And if you loaded the boat you built for the Verde, the hypothetical boat -- this is my last question about it. --

A. Okay.

Q. -- with cargo at its max capacity, that would defeat your efforts somewhat to make it more maneuverable and quick-turning, correct?

A. Absolutely.

Q. At Minute 42, Ms. Hernbrode asks, "From your perspective, as someone who builds and runs --"

CHAIRMAN NOBLE: That was your last question before.

MR. HEILMAN: Last question about the hypothetical boat.

CHAIRMAN NOBLE: Oh, okay.

MR. HEILMAN: We're coming close, though.

THE WITNESS: He's got a lot more pages.

BY MR. HEILMAN:

Q. At a Minute 42, Ms. Hernbrode asks, "From your perspective, as someone who builds and runs

historical replica boats, is information about modern recreational boating highly relevant to your decision about whether a river would be navigable in your historical boat? If you know other people are running it in modern boats, does that inform your decision?"

You reply, "Yeah, it depends on what kind of boats are being run on the river. You know, if it's just young, hairball guys in creek kayaks, I don't think I want to go down there in a wood boat."

So would you say that the use of creek kayaks by young, hairball guys is not relevant to your decision about whether a river would be navigable?

A. I think it's very relevant. Those guys are going off waterfalls and bouncing off rocks. It's a very specialized kind of boat. They're running things that are insane.

But if you're running it in a traditional kayak or a canoe, yeah, you can run a boat.

Q. So the fact that they would use that river would be almost a sign that you shouldn't use your historic boat?

A. Well, if that's the only kind of boating that's being done there.

Q. Okay, now shifting over to Video 2. That's the one where you were showing Ms. Hernbrode your

boats.

I notice that neither you nor Ms. Hernbrode were filming the video. Who was the camera person?

A. Was it --

MS. HERNBRODE: Jon.

THE WITNESS: One of these people there, yeah.

BY MR. HEILMAN:

Q. It was Mr. Fuller; does that sound right?

A. Sounds right.

Q. Was Mr. Farmer there, Don Farmer?

A. Who is Mr. Farmer?

Q. I guess that answers the question.

MS. HERNBRODE: There's your answer.

THE WITNESS: I don't know Mr. Farmer. I'm not good with names.

BY MR. HEILMAN:

Q. When were you approached to become a witness in these proceedings?

A. Last year I got an e-mail from Joy asking about historic boats and if I knew anything about them.

Q. So you didn't know Mr. Fuller prior to --

A. No.

Q. -- that going on? Okay.

Did you have discussions about --

CHAIRMAN NOBLE: Whoa, you've been with McGinnis way too long.

Is this going to be ten more?

MR. HEILMAN: No.

CHAIRMAN NOBLE: No, no, I'm just giving you a hard time. We hope we don't upset you. Please go ahead and do as much as you want to.

BY MR. HEILMAN:

Q. Okay. At Minute 5 of Video 2, you were talking about the Galloway-style boats. You say, "This is a very typical type construction. The peculiar design was one Nathaniel Galloway came up with, and he was up in Utah, and he thought flat from side to side, upturned ends. And he was right. They're pretty good. And in their day these were the rocket ships. These were the best thing going."

I believe you were talking about the Edith at that point?

A. Yeah, that style boat.

Q. So the boats the Kolb brothers had, you would consider that to be the rocket ships of boats at that time?

A. It was the best anybody had come up with that survives historically that we know about.

Q. So would you say that those boats were on the

cutting edge of technology at that time?

A. Yeah. It's a dull cutting edge, but...

Q. And then at a Minute 11, Video 2, you tell a story would Harold Blake, is that right?

A. Leich, L-E-I-C-H.

Q. In that story, he was on a Klepper?

A. Yeah.

Q. And that was in the 1930s?

A. Correct.

Q. Was that a canvas Klepper?

A. Yeah. It was before they had Hypalon, which is a type of rubber they use now.

Q. And I believe you stated that he broke every stick in it and just taped it together and kept going in the Klepper?

A. Probably not every stick, but he shattered it repeatedly and just kept splinting it with sticks he found along the way, and he kept going.

Q. But at some point on his trip he had to build a new boat, right?

A. Well, he got down below what he felt he needed a kayak for around Grand Junction and built a very clumsy wooden box of a boat and continued on.

Q. And he ultimately wasn't able to reach his destination?

A. He ultimately crashed it and sank it and had to walk out with one shoe, which was too bad. He was already below the hardest stuff.

MR. MCGINNIS: Trying to make myself useful.

CHAIRMAN NOBLE: See, this is what you like to use Mr. McGinnis for. It's probably one of his better uses, supporting you.

MR. HEILMAN: That's right.

BY MR. HEILMAN:

Q. So this is X071. It's another one of the blog posts from your Fretwaterlines blog, right?

A. Uh-huh.

Q. In the second paragraph, you pose the question "What's a Galloway boat like to row?"

And in the next paragraph you write "Wet. Awkward. Slow to turn. But fast, easy to power through the wind, and kind of fun in its own sick, weird, twisted way. The eight-foot oars are both too long and too short at the same time. A bit too long for a 45-inch oarlock-to-oarlock canoe - it is impossible to get enough leverage inside the oarlock to take a good, mighty stroke; yet the oar is too short to really get the boat moving in the big water. The other thing is that with its long, narrow profile, she draws

water from end to end and is nearly impossible to pivot in the big water. Oh-and the stern, which is at the downstream end of the boat, is low enough so that even modest waves crash over it, crash over the splashboard, and then squarely in my face and the oversized cockpit quickly swamps. These are problems. But I've rowed worse. The Powell boat is even tougher in big water, being another five or more feet long and no wider. What I came to realize is that the Galloway-style boat is far closer to a Powell boat than I had imagined, far more distant from Nevills boat that superseded it. Truly a transitional hull, but it is small wonder that Nevills' boat eclipsed it so suddenly and definitely in 1938. I had expected Edith to row somewhat like the Holmstrom boat I built ten years ago, since that was a modified Galloway, being the same lines, but shortened a foot and a half and widened nearly a foot. Not even close. Holmstrom was far further ahead of his time than I had guessed."

And you're talking about your replica of the Edith, correct?

A. We're talking about the Edith and the Julius there. The Holmstrom boat is the Julius.

Q. Oh, gotcha. Okay.

And the Nevills boat, when was that invented?

A. 1938.

Q. And you said that was a huge step forward in boating tech --

A. Yeah. It went to 5 feet wide amidship and just made a tremendous difference, and shorter and more up-kick.

Q. And when was the Holmstrom boat invented?

A. 1937. So it's just a year ahead or year earlier than the Julius, or a year earlier than the Nevills boat.

The Julius was the last Galloway-style boat ever built until I started replicating them.

Q. Then moving on to -- you talked about this, the thing you wrote for Arizona Raft People; is that the right -- Arizona Raft Adventures. I'm sorry.

A. Oh, right, on their blog, yes.

Q. "Rowing Wooden Dories." You talked about in the 1960s --

MR. MCGINNIS: Sorry, got interrupted by Vanna.

BY MR. HEILMAN:

Q. In the sixth paragraph, under the second photo, it states "In the 1960s conservationist Martin Litton brought these boats to the Grand Canyon, decked them over, rechristened them wooden dories after the

similar-looking Grand Banks fishing boats, and began running commercial river trips in them. They worked great; it caught on."

Does that mean that people weren't running commercial boats in the Grand Canyon until the 1960s?

A. No, it means that wooden boats had kind of gotten eclipsed by rubber boats starting in the 1950s, and the last few people running wooden boats had basically Nevills boats, which are very low to the water until they just get inundated. And when Martin brought these high-sided dories down, they were just so much better that they eclipsed all the other wooden boats. But, still, the rubber boats are the main boat.

Q. But then people started running commercial, these dory boats commercially?

A. Yeah, Martin Litton did, and now most river companies have a few in their fleet.

Q. And this is the last exhibit that I'm going to ask you about.

This is X072. It's the Arizona Highways, July 2004, which you discussed with Ms. Hernbrode earlier today. Let's turn to Page 6 of the magazine, which actually isn't paginated. It's the cover of your article.

A. The picture.

Q. This is an article you wrote, correct?
A. Right.
Q. Turning to the next page, Page 8, the fourth paragraph on that page, which is in the second column, you write "My world reverberates with a deep baritone roar. I'm entering Granite Falls, one of the largest rapids on the Colorado River - one that most early river runners portaged around or lowered their boats by rope down the boulder-studded shore. Boat designs and techniques have evolved, however, and navigating this maelstrom is now standard procedures. But the tiny cedar boat I am rowing is not standard."
And the picture to the right of that paragraph, that's you in the Julius?
A. That's me in the Julius in Granite Falls.
Q. And that's the boat you mean when you say "my tiny cedar boat"?
A. Yeah.
Q. All right. Let's turn to Page 12, the third paragraph there in the first column. You write "But wooden boats are still in the minority, rowed by the eccentric and the devoted. Most oarsmen train in inflatable rafts, and the majority of them never find a reason to press their luck with a fragile boat."
So you would agree that your Julius replica

is fragile compared to modern recreational boats?

A. Compared to a raft.

Q. And the 1911 Edith, that's even more fragile, at least on the sides?

A. Edith is, I think, tougher. Well, it's as tough as the Julius, yeah. They're both heavily overbuilt.

The modern boats, the dories, are quite fragile, which is what is being rowed commercially in Grand Canyon. They won't take near the hit that these old ones will. And there's some pictures of them in there too somewhere. Page 8, those colored boats are the modern dories, and those are the ones with the quarter-inch sidewalls, and those are quite fragile.

Q. Okay. And then on Page 13 of this article, the first column, last paragraph, you write "But we're not always that fortunate. If we have had better luck than some of the pioneers did, perhaps it is because on this trip we have almost 500 transits of Grand Canyon beneath our belts."

What did you mean by "we're not always that fortunate"?

A. Well, there were a lot more boat wrecks in the early days.

Q. And then what did you mean when you wrote "we

had better luck than some of the pioneers did"?

A. Well, luck is a pretty funny word. I mean we got through without crashing, and a lot of them didn't. But is it luck, is it skill? It sounds cocky if you say it's skill, so you say it's luck.

Q. Earlier today, when I asked you about whether you talked about maybe putting one of your boats on the Verde, you said that we talked about possibly trying to row one down the Verde. Who did you mean by we?

A. When I was interviewed.

Q. And that discussion happened before the interview or during it?

A. That day sometime. I'm not sure. I had just come out of knee surgery.

Q. Did Mr. Fuller, Mr. Farmer, or anyone else ask you to borrow one of your replica boats so they could try to run them on the Verde?

A. No.

Q. You also said that you ran your replica boats on all of the rivers the original designer of the boat ran them on; is that correct?

A. That's true with the Holmstrom boat, yeah.

Q. As far as you know, the designer of the Edith never ran the Edith on the Verde, correct?

A. I don't believe Galloway ever got this far

south.

Q. Or anyone else?

A. Any Grand Canyon boater, no.

Q. So the designer of the Julius or no?

A. No.

MR. HEILMAN: I think that's all the questions I have for you.

THE WITNESS: Okay.

CHAIRMAN NOBLE: Okay. We'll take a break, 15 minutes. Let's be back about 2:48.

(A recess was taken from 2:33 p.m. to 2:48 p.m.)

CHAIRMAN NOBLE: Mr. Hood, please proceed.

MR. HOOD: Thank you, Mr. Chairman.

CROSS-EXAMINATION

BY MR. HOOD:

Q. Good afternoon, Mr. Dimock.

A. Good afternoon.

Q. We haven't had a chance to meet yet. My name is Sean Hood, and I represent Freeport Minerals Corporation.

A. Okay.

Q. Thank you for coming by this afternoon to

talk about your tape and the testimony you've given. I've just got a few follow-up questions, and I'm going to do my best to be brief. Because I'm following Mr. Heilman's cross-examination, I'm going to bounce around a little bit.

A. Okay.

Q. So if you're not sure what I'm getting at or if I've moved off of a topic and you're unsure, let me know, okay, and we'll get centered.

A. All right.

Q. The first thing I wanted to ask you about, Arizona Raft Adventures, is that one of the companies that you've worked for?

A. Yes.

Q. And, essentially, when you're talking about these commercial boating activities, you're talking about tourists are paying you and others to run them down the river?

A. Correct.

Q. So it's recreational for them. Obviously has a commercial component, because you're doing it for a living?

A. Exactly.

Q. Okay. And you've been doing that, I saw in the article that's X072, you've been doing that for

over a quarter century in the Grand Canyon?

A. Forty-four years.

Q. Okay. And is it fair to say that the vast majority of your boating experience is in the Grand Canyon or the Colorado?

A. Correct.

Q. You talked about having some prior experience on the Verde in the 1970s in kayaks, I believe; is that right?

A. Kayaks, canoes, and small rafts.

Q. And small rafts, okay.

And then I think in response to one of Mr. Heilman's questions, you said you've also been back to the Verde one time, either in the '90s or maybe in 2000; is that about right?

A. Yeah.

Q. And what craft were you on for that trip?

A. Gosh, I'm trying to think. It was a kayak.

Q. A modern plastic kayak?

A. Plastic kayak.

Q. And for those of us who are not avid boaters, a plastic kayak is probably various different kinds of plastic. Probably don't mean anything different to me. They might to you. Are you able to differentiate among the different kinds of plastic?

A. Not really. They're mostly some sort of a polyethylene.

Q. Okay. And is that the same sort of plastic kayak that sort of proliferated in the '70s?

A. Yeah.

Q. And that's when that whole thing became very popular?

A. They've used a lot of different plastics. They've got some really tough ones now.

Q. And are those a variation on the polyethylene, or is it a different plastic?

A. I'm not exactly sure.

Q. And so you've done kayaks, canoes, and rafts on the Verde. Most of that was done in the 1970s and then the one trip here in the '90s or in 2000, correct?

A. Right.

Q. And you've also, in addition to your considerable experience boating in the Grand Canyon, on the Colorado, you've done a lot of historical research concerning boating on the Colorado; is that right?

A. Correct.

Q. Have you done any similar research concerning boating on the Verde?

A. No.

Q. So you're not going to be able to add

anything to these proceedings in terms of boating accounts that have occurred on the Verde in historic times --

A. Correct.

Q. -- say 1912, before 1912; you don't have any of that information?

A. No.

Q. You mentioned a few times, both on your video and then in your live testimony, this notion that back -- turning the clock back a hundred years or thereabouts, circa statehood, things were different then. Boatmen were different then. Your average citizen out in the West was different than we are. Correct?

A. (Witness nodded.)

Q. Is that right?

A. Yes.

Q. And handier, as a general matter, right?

A. I would say more often than not.

Q. I bat about 50/50 changing a light bulb, so I wouldn't have done very well in the West in 1912. Of course, I wouldn't have had to change light bulbs, I suppose. But I probably would have died if I tried to run a river. I know my limitations, or at least a lot of them.

So, basically, you would expect that that sort of western American man faced with a challenge would be able to craft a boat that's suitable to the watercourse; is that right?

A. Some would.

Q. Uh-huh, some would. Not everybody, not Larry, Dick, and Sam; but somebody, when met with a need and a challenge, would be able to craft a boat that would be suitable for the stream?

A. Sure.

CHAIRMAN NOBLE: You mean they had lawyers back then too?

THE WITNESS: They shot them.

CHAIRMAN NOBLE: If they could catch them.

BY MR. HOOD:

Q. I would have been in big trouble in the American West circa 1912.

But I just want to make sure I'm understanding. You're painting a picture of a time when people were, I think you used the word, adaptive or more adaptable, something along those lines; is that right?

A. Yeah, yeah. I mean in the areas I do know about, the San Juan and the Green, people were doing

that. People with no boat building training were building crafts and going down the river, and some did a lot better than others.

Q. Okay. And so if we're -- and obviously you have vast experience building boats, you have vast experience boating on the Colorado right?

A. Uh-huh.

Q. And if we're going to take you back in time to 1912 and say, "Mr. Dimock, we need you to craft -- we need you to build the right boat for us to be supplying these military installations along the Verde," do you feel you could meet that challenge?

A. Well, we could build something that I think would work and see how it worked and maybe adapt.

Q. If the first try didn't work, you would have adapted --

A. Yeah.

Q. -- and found a boat that worked?

A. Yeah, and I imagine there would be portaging and dragging involved.

Q. And that's because -- and you've been, I think, straightforward. -- the Verde is a shallow, rocky river?

A. Correct.

Q. Okay. So you're going to have -- even when

you pick the right boat and you build the right boat, you're going to be hitting rocks; is that right?

A. Unless it's real high water.

Q. Right.

A. You might run pretty clean.

Q. Under more ordinary circumstances, normal flows, you're going to hit rocks, you're going to have probably some things you're going to need to portage, correct?

A. I believe so.

Q. Okay. And so these adaptive Western Americans, if met with a need for using the river, you think they would have been able to satisfy that need; they would have adapted and figured out a way to build the right boat to serve that task?

A. I would think so.

Q. I want to talk a little bit about -- let me show you. This is Figure 5. This is just for the record. You don't need to worry about this, Mr. Dimock. This is Figure 5 from Mr. Burtell's report, which is Freeport 1, X009. Again, it's Figure 5.

And this shows some rapids that exist along sort of the upper portion of the Verde River, and these are all I or I+ rapids. I'm pretty sure about that.

The record will correct me if I'm off and there's a II in there. But these are all I's, I+'s, I believe.

It's been so long since you have had any regularity on the Verde River. Do you have any familiarity with any of these rapids?

A. These look to be above the stretch that I'm most familiar with. Is this like up around Perkinsville? Does anyone know?

Q. This is Segment 1, so it's very likely that this would have been upstream from where you were boating. I think that's probably a good guess.

A. Yeah, I've paddled through there. Yeah, that's pretty far up the river.

Q. Right, it is.

Well, let me ask you this: You talked about you think you could get the Edith down the Verde; is that right?

A. Well, we never really said where we were starting and stopping.

Q. Okay. Well, let's --

A. I mean starting way up by Sullivan Lake, it's probably not going to work so well.

Q. Not going to work.

Where do you think is the farthest upstream you could get the Edith onto the Verde and get it all

the way down to the Salt?

A. I would think somewhere around Perkinsville.

Q. Let me ask you, if you had the Edith, let's say you got it in the river upstream of these rapids. Just looking at these rapids as they're portrayed in these photographs, are these rapids that you would feel comfortable running in the Edith, or are these things you would be looking to line or portage?

A. You would be lining or portaging in these guys here at this water level.

Q. Because these rocks would be smacking the wood around pretty good; is that right?

A. Yeah. You would hang up in this Guv Drop one. It doesn't look like you would get through at that water level.

Q. And so you described the lining and portaging process earlier today. You would hope you've got at least one compadre with you to help you with those processes; is that right?

A. You would hope, but you might not.

Q. You talked about some of the history of early boating on the Colorado River and the accounts that you came across in your research, and you've written books, and you mentioned one example of a circumstance where there was somebody who supposedly had done it before

Powell; did I write that down correctly?

A. There is an account.

Q. What was his name? I missed the name.

A. James White.

Q. James White, okay. And it sounded like there's -- is there scholarly debate as to whether that trip actually took place?

A. Yes, there is.

Q. What's the evidence, what's the evidence that it did take place?

A. He was found in where upper Lake Mead is now near the mouth of the Virgin River in a sunbaked, half-naked, half-starved, semi-delusional state on a very primitive log raft. And when they nursed him back to health, he said he had started up in the San Juan Mountains, gone down the San Juan River on foot, and then north till they hit the Colorado. He said they were attacked by Indians. One of his buddies was killed. He and the other guy ran down to the river, built a log raft and started floating, and then his buddy fell off and drowned at some point. And he said he was out there two weeks.

Q. Goodness gracious, quite a trip.

A. Yeah, and so --

Q. I wouldn't have made it.

A. -- the debate is where did he really start that float. And most early historians were actually river-runners that were offended by the thought someone could survive on a raft and did their best to discredit him.

Q. Do you think he actually made that trip, or do you have some --

A. I think it's the most logical answer.

Q. And what was the source of skepticism among some other scholars? Was it just that there was no support for it aside from his own word?

A. There was no witnesses, no one to say he really started anywhere in particular.

Q. Other than what he said?

A. Other than what he said.

They all believed he was telling what he believed to be the truth. They said he was too dumb to make up a lie. But any of the other stories that the skeptics made up were even less probable that he would have survived at that time, so...

Q. So some scholars had skepticism about the veracity of what he was saying or at least the accuracy of what he was saying?

A. Right.

Q. But there may not have been a better, more

reasonable explanation for what happened?

A. Right.

Q. So it's certainly possible that when you just have someone saying, "Hey, I went and ran this river," and you don't have any support for it, you don't have witnesses, it may not have happened, right?

A. Yeah.

Q. Correct?

A. Correct.

Q. I think I heard you say that. I just wanted to make sure it was on the record.

A. I was choking when I said yes.

Q. Oh, you've got water. Are you okay?

A. Yeah.

Q. Great.

You talked a little bit about the collapsible canvas canoes that were available circa statehood?

A. Right.

Q. And I think you said that that was before, is that -- now they're Hypalon?

A. No, the collapsible can -- well, there's two ones we spoke of. The Klepper --

Q. That's for the kayak, not for the canoe.

A. Okay, yeah.

Q. Okay. Sorry, I had that backwards.

A. Those collapsible canoes, I don't know if they have a modern day equivalent.

Q. Okay. So those collapsible canvas canoes, if you're running down the Verde and going through these sorts of rapids, is that canvas going to be tested pretty thoroughly in terms of its ability to hold up?

A. These rapids at that water level, I think I might carry around. Those are pretty low and rocky there.

Q. Okay. And just for the record, that, again, was Figure 5 from Mr. Burtell's report, which is X0079, Freeport 1.

You talked on the video about modern boatmen having -- and I have this in quotes, so I hope I got this right. -- a hundred years of growing skills, and you talked about how people in the late 1800s and in the early 1900s, they were kind of doing this as they went; they didn't have a lot of history to draw from like we do now; is that fair?

A. Correct.

Q. And so what are some of the skills that have developed over the last hundred years that are so critical to what -- you know, you said we can run anything now. We've got the knowledge. We've got the background. We've learned from our predecessors and

built upon that. What are some of those skills that we have now that they didn't have back in 1912?

A. Well, it's just being able to it's called reading water, you know, looking at a complex set of rocks and differential currents and knowing what that will do to a boat, and then being able to position your boat such that you use those strange currents to further your goal of surviving; and it's very complex stuff and it takes a long time to learn to do it well.

Q. Is it the equivalent of someone sort of computing the physics in their mind visually as to what's likely to happen, or is it --

A. Yeah. It's a time-space thing, and some people get it like that and others never get it.

Q. How is it that you and your contemporaries benefited from the experiences of your predecessors such that it's this continuum of a hundred years of knowledge that's grown?

A. Well, I started learning in the '70s from people who learned in the '60s from people before them; and, honestly, it was pretty primitive even in the early '70s of some of the techniques in those rapids, and it's still changing. You know, we're still -- we'll teach a new trainee in about two hours what it took us 20 years to figure out. It's frustrating.

Damn those kids. And they're better than we are.

Q. Well, and here's where I think I have a correct note on the collapsible kayak. Those were canvas, and now they're Hypalon; is that right?

A. The kayak, yeah.

Q. Okay. And is the Hypalon going to stand a better chance of getting through those Figure 5 rapids than the canvas would have?

A. I think you can make it through there in a Klepper, yeah. And the collapsible canoes were much flimsier than a Klepper. You know, even the old Klepper you might be able to bounce down through that.

Q. By the old Klepper, do you mean the circa 1912 Klepper?

A. Yeah.

Q. And what material was that, remind me?

A. I believe it was a rubberized canvas.

Q. A rubberized canvas.

A. Yeah.

Q. Okay. And what's going to do a better job down those Figure 5 rapids, the current Hypalon or the old-time --

A. The more modern.

Q. The more modern is going to be better for that?

A. Yeah, the tougher stuff. Be longer before you've got to fix it.

Q. You said at one point that in Arizona you would imagine that people were either buying the steel boats that you could order, and you said 50 bucks and they'll show up by train, or building their own by, I guess, homemade, basically, boats; is that right?

A. Uh-huh. That's my guess.

Q. Yeah.

A. That's what we're seeing in Grand Canyon.

Q. The steel boats, do you think those are the kind of boats that you would want to use on the Verde, the shallow, rocky type of small stream?

A. Boy, not most of them. Most of them were modeled like the Major Powell boats that have sort of a round belly and a bit of a keel to them, and that keel is very vulnerable in shallow streams.

I think they did have some flat-bottomed steel boats, which would have been fine.

Q. From a weight perspective, is that a good choice for the Verde?

A. They were fairly light, really. They didn't weigh that much. They were cheap steel with ribs in them. Sometimes they had wood ribs in them.

Q. So from your perspective, those

flat-bottomed, smaller steel boats would have been a fine choice for the Verde?

A. Probably so.

Q. Do you have any -- I don't think you've looked into whether any were used on the Verde. You don't have any information about that?

A. I don't, no. I mean I heard the stories of the iron boat, but Lord knows what that was. Was it a sheet steel or was it made out of horseshoes? I don't know.

Q. What was the design?

A. Yeah.

Q. What was -- okay.

And then the other point about the home-built boats is you said unless we have a picture, we don't really know what it was, correct?

A. Correct.

Q. So even if someone says I've got a -- I made a boat out of X, Y and Z materials, unless you have a photograph, you're not really able to tell what that boat was capable of doing; is that right?

A. Huh-uh.

Q. Correct?

A. Correct.

Q. Hard to compare any of those home-built boats

unless we've got a good picture --

A. Yeah.

Q. -- to anything that we have today, right?

A. Exactly.

Q. Yeah.

San Juan River you have some experience on as well, you've described; is that right?

A. Quite a bit.

Q. Yeah.

And you talked about some steamboat adventures, and you said that the steamboats didn't prove practical on the San Juan; is that right?

A. Steamboats were on the Green and Colorado.

Q. That was the Green and Colorado.

A. Yeah.

Q. Okay.

A. There are pictures of something that looks like a steamboat, but I think it's a dredge on the Colorado; great, big, huge wooden thing during the mining days of the 1890s.

Q. So when you made the statement on your -- and I misunderstood you on the tape when you said that they didn't prove practical. What stream were you talking about?

A. The Green, upper Green, and the Green and

Colorado stretch between Green River, Utah and Moab, Utah.

Q. Okay, okay. And you've alluded to this, but my note was not clear. What boats have you used on the San Juan River?

A. I've used kayaks, canoes, rafts, dories, and one Galloway-style boat, motorized rafts. I think that's about it.

Q. And you mentioned earlier the San Juan is a somewhat larger, higher-flowing river than the Verde, correct?

A. Yes.

Q. And I gather that it sort of surprises you the result from the courts that the San Juan is deemed nonnavigable; is that fair?

A. It does.

Q. That surprises you?

A. It does.

Q. What is your understanding of what it means to be a navigable stream?

A. My understanding is that you can conduct commerce in some sort of a floating vessel moving along that river, which you could. I mean there were trappers and miners and boaters on that river. So I was surprised to hear that.

Q. And you've engaged in recreational boating on numerous occasions on the San Juan?

A. Oh, yeah. That sort of commerce didn't exist then, but it does now.

Q. Right.

What times of year have you run the San Juan?

A. I've run it in December and then March probably through October. So most of the year.

Q. Is it similar to the Verde; that you're going to get your best, most consistent water sort of in the early spring, when you're getting the snowmelt runoff?

A. That or monsoons. The highest water on the San Juan is usually August or September. But, of course, all my experience is after the dam went in, the Navajo Dam, so I don't know what spring runoff used to be like. Never looked it up.

But we also do get high flows out of the Animas and the Mancos River onto the San Juan, so the highest consistent flows are more in June, and then the flood flows are August, September.

Q. Okay. Mr. Heilman asked you an interesting question about whether Mr. Fuller asked you if he could use the Edith or one of your other boats to come down the Verde, and you said no one asked you that; is that right?

A. No one's ever asked me to borrow that boat.
Q. Let's get into hypotheticalville again. If, on the day of your testimony videotaped, they said, "Hey, can we borrow this for a week and go take this on the Verde," what would you have said?
A. That depends on who's borrowing that boat and what I know of their boating skills. I put a lot of work into it. I've got friends I would let do it, but I know their boating skills and they're not going to abuse it too badly.
Q. When they encounter things that would concern you, you would hope that they would line or portage, as appropriate?
A. I would trust their judgment.
Q. You said that for the Verde, if you were going to design your ideal boat for that stream, you said, "I would build a small, light craft that could be maneuvered quickly," and you talked a little bit about that with Mr. Heilman.
And so this would be something considerably different from the Edith; is that right?
A. Yeah, I would go shorter and wider, knowing what I know now today, and depending on if he wants me to put a ton of mining gear in it, I'll build a bigger boat. But it depends on what we're doing with it,

filling it up with stuff or just taking one or two people.

Q. If you're just worried about -- well, what would be the dimensions of that small boat that you would want to build that would be wider, but you would want to have a flatter bottom, and shorter I think you said? Roughly, what would be --

A. What are we doing with it?

Q. Let's say you're supplying food up and down the river, you're hauling food goods.

A. Up around Perkinsville or --

Q. Yes.

A. -- down below?

Q. Sure.

A. I would go with a fleet of pretty small ones for that far up the river. You get down by Camp Verde and we would go bigger boats.

Q. So pretty small ones, what are they? Describe for us what you would probably have in mind.

A. I wouldn't go much bigger than a canoe. You know, maybe 2 or 3 foot bottom up on that upper stretch. My mind's been wrapped around the lower stretch until I saw these pictures, so...

Q. And you say a fleet of canoes, and that's because in order to move a reasonable amount of food,

you would need several of them?

A. Yeah, or one guy who's really busy.

MR. HOOD: That's all I have, Mr. Dimock. I appreciate your time.

THE WITNESS: All right.

MR. HOOD: Thank you.

COMMISSIONER HENNESS: Mr. Chairman.

CHAIRMAN NOBLE: Yes.

COMMISSIONER HENNESS: I have a question.

CHAIRMAN NOBLE: Sure. You have a question for Mr. Dimock?

COMMISSIONER HENNESS: Yes, please.

CHAIRMAN NOBLE: Okay.

COMMISSIONER HENNESS: Obviously the day of statehood there were no structures, artificial structures, on the system at that time; but there are now. The types of boats that you've described here today, how -- would it have any effect on the type of boat, the difference between high water and low water in the canyon?

THE WITNESS: On the Verde?

COMMISSIONER HENNESS: No, on the Colorado.

THE WITNESS: Well, people were taking

the same kind of boats in high and low water, but encountering different problems with them. High water is really turbulent and swirly on the Colorado.

COMMISSIONER HENNESS: Does that come into effect in your timing?

THE WITNESS: Well, before the dam it did.

COMMISSIONER HENNESS: But not now.

THE WITNESS: Now that the Glen Canyon Dam is in place, it really doesn't matter. It's all within a pretty narrow --

COMMISSIONER HENNESS: How big a change is it? Can you describe it?

THE WITNESS: Well, the cubic feet per second on the Colorado now goes between 8,000 cubic feet per second to maybe 20. Historic floods would go up to 150 to 200,000.

COMMISSIONER HENNESS: Have you ever run it at those levels?

THE WITNESS: I ran it at over about a hundred thousand in 1983, when the dam was about to fail.

COMMISSIONER HENNESS: I remember that very well.

THE WITNESS: It was exciting.

COMMISSIONER HENNESS: Thank you, Mr. Chairman.

CHAIRMAN NOBLE: Thank you.

Who is next?

COMMISSIONER HORTON: I wanted to say --

CHAIRMAN NOBLE: Sure.

COMMISSIONER HORTON: I wanted to thank Mr. Dimock. He had a very unusual perspective and expertise that we appreciate.

THE WITNESS: Thank you.

CHAIRMAN NOBLE: Most certainly we do.

THE WITNESS: Am I done?

CHAIRMAN NOBLE: But we're not quite done with you.

THE WITNESS: Oh, boy.

MR. BREEDLOVE: I think we have some more.

MS. HERNBRODE: I just have -- I thought you were shaking your head no.

MS. MONTGOMERY: Yeah, I am. I think Sean got them. Thank you.

MS. CAMPBELL: Same with me. You're so skilled.

MS. MONTGOMERY: I didn't say that.

MR. HELM: I can do it from here. I

just have one question.

CROSS-EXAMINATION

BY MR. HELM:

Q. You described to one of Mr. Hood's questions a boat you would build to supply the forts along the river or the Verde?

A. Yeah.

Q. When he asked you for the optimum description of that boat.

A. Yes.

Q. Would that boat be the same boat you would design if you were simply designing a boat to transport yourself and one or two other people down the river from Perkinsville to Phoenix or someplace?

A. No. If you're hauling supplies, you want a bigger boat.

MR. HELM: Thank you.

REDIRECT EXAMINATION

BY MS. HERNBRODE:

Q. I just have a few more, Brad, and then you'll be free to go.

A. Yippee.

Q. When you were talking about a bouncy river or

an open and obvious threat, you're talking about rapids there?

A. Right.

Q. And are you talking about Class I or II rapids or bigger rapids than that?

A. Oh, anything where it looks like there's a chance you're going to be bounced around or knocked out of the boat.

Q. So you could have a long Class I that's choppy you might bounce out on?

A. Yeah. I mean it all depends on who put the classification on it. Those things are not to be trusted.

Q. And people can fall out of a boat on flat water?

A. More people drown on Lake Powell than in Grand Canyon.

CHAIRMAN NOBLE: Well, that's because they're more intoxicated on Lake Powell.

THE WITNESS: That is correct, sir, and they usually have their zipper down because they fell out of the boat when they were peeing. That's true.

CHAIRMAN NOBLE: It is.

BY MS. HERNBRODE:

Q. What kinds of equipment were the Kolb

brothers carrying in the Edith and the Defiance?

A. They had a lot of photographic equipment and they had some movie camera equipment, tripod, film, food, and a lot of ropes, blocks, and tackles for lowering themselves around rapids, what looked to be insufficient clothing.

Q. Any idea of how much weight they were carrying?

A. I don't know.

Q. But we're not talking digital cameras; we're talking those big heavy things?

A. Yeah, big cameras, box cameras, stereo cameras. They had all kinds of cameras.

Q. Glass plates?

A. No.

Q. Boats like the Edith were designed to haul cargo; that's what Galloway was looking to do, right?

A. He was a trapper. That's what he designed them for.

Q. When you had side hits in the modern dory, did they wreck the boat?

A. I've busted them completely in two before.

Q. Are you still running the boat you broke in half?

A. Yeah.

Q. How old is it now?
A. Forty-four years.
Q. You were asked about the floors wearing out on Grand Canyon dories, and I want to make sure this is very clear in the record. The floor and chines wearing out is a problem because Grand Canyon boats are expected to take so many trips, not because the floor and chines will wear out on a single or even several trips; is that true?
A. Correct. You can break one to pieces on a single trip, but it's unusual.
Q. But the wearing out, the fiberglassing the bottoms and stuff is to deal with the repetitive nature of their trips?
A. Yeah. Yeah, they're commercial workhorse boats.
Q. We talked a lot about boat building technology and its evolution. In your opinion, would the technology that's evolved since 1912 be necessary to run the Verde? Do you have to have a more modern boat to run the Verde?
A. No. I think it makes it easier, but you don't need it.
Q. Do you ever repair rubber rafts on the Colorado?

A. Yes.
Q. Do flips happen on the Colorado?
A. Quite regularly.
Q. Are there some fun terms that have been designed to describe flips just because they happen so regularly?
A. Oh, there's dump trucks and Maytags. That's pop, pop, pop, pop, pop, pop. And you do it faster, then it's a window shade.
Q. Do you have a yard sale --
A. Yard sale, yeah.
Q. -- with the equipment downstream once you've flipped a boat?
A. Yeah. In the commercial boats, you know, it's usually we've got them up, right side up, no yard sale, everything's rigged in; but the private trips are pretty exciting to watch.
Q. Were wooden boats used for commerce in the 18 and 1900s?
A. Yeah. That's all there were. A lot of stuff was done on the lower Colorado, up in Utah.
Q. Supposing your knees were heeled, you could take the Edith out, a boat exactly the same as a boat built in 1911, and use techniques that were used to row in 1911, and make it down the Verde with no problem?

A. I wouldn't say no problem, especially on this upper stretch. You would have a lot of problems, but you could do it.

Q. So assuming there are -- we have miraculously gotten rid of all the dams on the Verde, because I understand those would be a problem in the Edith, where would you put her in?

A. I don't think I would go above Perkinsville in a wood boat. That upper stretch in there is just really -- it looks like that.

Q. So at Perkinsville; run it down through Cottonwood, Camp Verde, Beasley Flats?

A. Yeah. Yeah, I don't know what's under those dams down there, but I don't think there was much.

Q. If they looked like the stuff above it or below it --

A. Yeah.

Q. -- you would be okay?

A. Yeah. And you would probably want to do some rope work around Verde Falls.

Q. Okay. Anywhere else?

A. Not that I can think of.

Q. Run it all the way down to the junction with the Salt?

A. I would go to the ocean if you've got the

flow.

Q. When did Galloway first build a Galloway-style boat?

A. Oh, in the early 1890s he's recorded as building them up in -- up around Vernal, at the steep, rocky stuff up there.

Q. Is it surprising to you that people built boats and ran them on the Verde in the 18 and 1900s?

A. No.

Q. You have had some experience with boats of an older design than the Galloway boats?

A. Yeah. The Powell-style boat, we've run replicas of that in Grand Canyon.

Q. You ran a Powell replica through Grand Canyon?

A. Yes.

Q. Once, twice?

A. Ran one once and ran support for another run.

Q. Those were associated with --

A. Movies, yeah.

Q. You didn't build those boats, though?

A. No. They're very difficult to build. They're an extremely sophisticated hull.

Q. Were Powell boats the rocket ships of their time?

A. Well, it was the only thing anyone had tried. Running rapids in rowboats was unheard of, and Powell thought that these harbor craft would be really good because they were tough and fast; but he didn't take into account that you really couldn't turn them at all, and so they had a lot of problems with them. They portaged a lot.

But, again, with modern boating techniques, we can run all those rapids down there. It's kind of terrifying, but...

Q. In a harbor you want a keel, so that when you stroke, the boat keeps going straight?

A. Uh-huh.

Q. In a river you don't want a keel because you want to be able to turn?

A. Correct, in a rocky river. You would be fine on the Mississippi.

Q. Would you be inclined to loan someone you don't know very well a boat you spent several months building?

A. No.

Q. That's why we didn't ask.

Would a wood boat shatter like a fiberglass boat?

A. Depends on the boat. Fiberglass can just

completely shatter. The big plank boats will take tremendous hits. If you hit them on the end, it's just like pounding a fence post; nothing happens at all.

Q. Is a fiberglass boat very easy to repair on the river?

A. I hate fiberglass boats. Duct tape. That's what we use.

Q. Those photos that you were shown by Mr. Hood --

A. These ones?

Q. Yeah, out of Mr. Burtell's report. Could you run those in a canoe or kayak with no problem?

A. I have, actually. I didn't even recognize them, it's been so long; but, yeah, we've run all that upper stuff in kayaks.

Q. And a canoe?

A. I have not done it in a canoe.

Q. Do you think you could?

A. Yeah.

Q. How about at higher water in the Edith?

A. Probably.

Q. Canvas canoe?

A. Canvas like those flimsy little collapsible turn of the century ones?

Q. Yeah.

A. No. Those were more of a flat water boat. But something like a Peterborough, like the tough canvas-covered wood canoes, yeah.

Q. Have you run Cottonwood to Camp Verde?

A. Yeah.

Q. And you could do that in a canoe or kayak?

A. Yeah.

Q. The Edith?

A. Yeah.

Q. A canvas canoe?

A. Yeah.

Q. The stretch you're most familiar with is Beasley Flat down?

A. Beasley Flat to Childs.

Q. And you could run that in a canoe or kayak?

A. Yeah.

Q. Or the Edith?

A. Yeah. And, again, probably take precautions at Verde Falls.

Q. And the same thing for below the dams?

A. I have not been below the dams.

Q. Okay.

A. I understand it's pretty casual, but I haven't been there.

Q. With the James White story, there were other

problems with his story that historians were debating about other than the lack of witnesses?

A. Well, they just thought it couldn't be done.

Q. There was problems with timing as to where he put on and where he came off and things like that?

A. Not really.

Q. Okay.

A. He said it took two weeks. Again, with no witness for when he put in, it's hard to say you can't do it in that amount of time; but in two weeks you could do that, what he thought he did. And the actual geography affixed to his story was not put there by him, because he didn't know where he was.

He said he left and went north from the San Juan toward the Colorado. That's all he knew. And then all the other stories that were written about him, they started putting place names on things that he never put on, so...

James White, the alternative, one is to have walked in a very short time from up near Four Corners to Peach Springs or beyond through the Hualapai Nation, who was at war with the whites right then. That's probably not going to work out. And to go the northern route would have taken more than a month longer than he had to do it.

And he was witnessed going into the San Juan Mountains. So you have to find a way to get him down to the Virgin River somehow. And, you know, I've always said I've watched people rowing hard in the wrong direction in Grand Canyon for years, and they always seem to come out, and may have done better on a log.

So, you know, I think he could have done it. I think if you launched a hundred James White, a bunch of them would drown, but...

Q. Or be stuck in an eddy somewhere?

A. But you only need a couple of them to make it through, you know. It's an unlikely story, but there's a lot of stuff that happens that's unlikely.

Q. If you read an account of a successful boating trip from the 1890s and it's noted that they were using a small boat, but no photograph is shown of the boat, do you question whether that account took place? Do you have to have a photograph in order to document that a trip took place?

A. I would want some more evidence than a small story, but you certainly don't need to see the boat. You know, like the Hum Woolley account, there's a very good diary that has descriptions of place that seem accurate enough that there's not much question he did

it. We would love to see the boat. The drawing of it looks very modern. Looks like Buzz Holmstrom's boat. It's pretty neat.

MS. HERNBRODE: Okay.

CHAIRMAN NOBLE: Is there anyone else who has questions for Mr. Dimock?

Mr. Dimock, that concludes your testimony before this Commission. You are welcome, of course, to remain with us and enjoy the rest of the discussion.

THE WITNESS: Enjoy?

CHAIRMAN NOBLE: We certainly appreciate your being here. We appreciate the information that you provided, and we thank you.

THE WITNESS: Thanks. Hope things go well.

CHAIRMAN NOBLE: Okay. Let's see. It's 3:30. Are we going to have at Mr. Burtell?

MS. HERNBRODE: We need a minute or two to set up, Mr. Chair.

CHAIRMAN NOBLE: Oh, we do?

MS. HERNBRODE: We're going to run the computer again.

CHAIRMAN NOBLE: Okay. We will break for 15 minutes. That will be our final break of the

day.

(A recess was taken from 3:30 p.m. to 3:47 p.m.)

CHAIRMAN NOBLE: Let's begin.

CROSS-EXAMINATION CONTINUED

BY MR. SLADE:

Q. Good afternoon, Commissioners, Mr. Chairman, Mr. Burtell.

A. Good afternoon, Mr. Slade, again.

Q. Again, Eddie Slade with the Arizona Attorney General's Office, representing the Arizona State Land Department. I wanted to mention we have Cheryl Doyle here with the State Land Department. She's been here for, I think, almost every day.

When we left off, we were talking about the map and the baseflow depths, and if we can put that up. I just want to touch on that for a little bit longer. And we are looking at Mr. Hjalmarson's collection of those baseflow depths that were surveyed from the GLO surveys, and that is Mr. Hjalmarson's second addendum X059, Page 29.

A. I'm sorry, Mr. Slade.

Q. No problem.

And you had calculated the flow was higher

than baseflow because you took the width, you multiplied it by the depth, you multiplied it by the velocity, and then you got the flow in cfs; is that correct?

A. Generally that's what I did and compared that to Mr. Hjalmarson's estimates of flow in the lower Verde. I believe he cites the Bureau of Reclamation average flow at, I think, 700 cfs. Again, that's average annual flow.

Q. And, again, the reason we're concerned with these depths is we want to know if it's good evidence for determining if the river is susceptible based on the depths of the river; is that your understanding?

A. I believe that's what he was using the data for or trying to use it for, yeah.

Q. And you've used that data for the same thing. You've decided that from your perspective it's not good data, and so you haven't used it for your susceptibility?

A. It was due to the uncertainties that I thought were related to it and the time of year that the data were collected, particularly in the lower portion. Even though I evaluated stream depth, certainly, as a factor, I didn't feel that these GLO data was useful for that purpose.

Q. Did you include those depths in your original report?

A. Which depths are you -- when you say did I include those depths, which depths are you referring to?

Q. Did you include the survey depths from the various GLO surveys that Mr. Hjalmarson has compiled here?

A. The ones in his box that says baseflow?

Q. Yes.

A. No, I didn't include those in my report.

Q. So you hadn't seen those depths before you made your determination that the Verde is not navigability; is that correct?

A. That's incorrect. I had not looked at the bottom three, even though now, as you have corrected me, the township 2 north, 7 east, he wasn't suggesting that that was baseflow. I'm not sure why he listed it then.

But the ones further up I did or at least -- let me get this right. Yeah, the township 16 north, 3 east, I had looked at that. In fact, I believe I also looked at another township up in that area.

As I mentioned during my direct testimony yesterday, Mr. Slade, Phil Pearthree, who works for the

Arizona Geological Survey, did a separate report on geomorphology, and among other things, as I think I read yesterday, he did discuss the use of those survey data as a means of looking at depths for the upper Verde. And so I was familiar with them and certainly read those.

And as I think I indicated yesterday, Mr. Pearthree -- and this would be the colored squares that are more up in the northern part of the Verde. And as I think I said yesterday, he indicated that the survey notes up here indicated 0.5 meters of depth, which is about 1.5 feet, so...

Beyond that, no.

Q. So you had looked at township 16 north, range 3 east; is that correct?

A. Yes.

Q. And do you remember what the exact language in that survey is?

A. I believe, unless I'm mistaken, yesterday I actually read -- and I have a copy of the 16 north, 3 east here, and I think --

Q. Correct.

A. -- I read to the benefit of the Commission yesterday the same quote that Mr. Hjalmarson has cited, calling it a beautiful stream, average depth of 3 feet,

et cetera, et cetera.

Q. And that wasn't taken -- that survey wasn't done during this controversial 1911 February and March period, was it?

A. No. In fact, I think the point I tried to make yesterday is it was made in May, during a time when I thought it was baseflow, which is typically baseflow conditions in May on the Verde, which was another reason why, if you go through the exercise of width times depth times velocity, you come up with a number that is almost two times higher than Mr. Hjalmarson's estimate of flow in that area.

Q. Sure. Unless, of course, as we discussed earlier, the width isn't actually the perpendicular width and the velocity is more of a velocity of a pool?

A. Oh, I couldn't disagree with you more there, Mr. Slade. This is specifically the surveyor's general description of the river. So this isn't an issue of whether or not you're some angle. I'll read it again for the benefit of the Commission.

"The Verde River, a beautiful stream of clear, pure water, with an average width of 100 links and an average depth of 3 feet, flows in a southeasterly direction," et cetera.

I don't think, when Surveyor Foster wrote

that, he was thinking about, well, if I came across the river and I wasn't exactly perpendicular to it. He's calling it a hundred links wide, so I think that's his general feeling of the width of the river if he's looking across it in a perpendicular fashion.

Q. So you feel better about that survey than the 1911 ones?

A. Oh, no, I didn't say that. No, I'm just saying that in this area this is what he said.

Q. Okay. And he said it was an average depth of 3 feet?

A. His words.

Q. And have you looked at township 13 north, range 5 east?

A. I have.

Q. Do you recall what the language there says about the depth of the river?

A. Yeah, and I cheated here, because Dr. Littlefield actually presented that, and he has the direct quote from Foster, the same surveyor, describing the river in that area.

Q. And as long as you have it open, if you wouldn't mind reading that quote.

A. Sure, absolutely. And for the record, since I'm not reading it from the surveyor's notes, this is

Page 35 of Dr. Littlefield's April 3rd, 2014 report prepared on behalf of SRP.

Q. And that's Exhibit X002.

A. And he says, "The Rio Verde flowing through the township in a southeast direction is a stream with banks about 3 feet high and of uniform width. The amount of water flowing with gentle current through its channel at an average depth of about 3 feet varies but little during the different seasons of the year and seldom overflows its banks."

Q. And that's pretty consistent with the township 16 north that we just looked at, where they said an average depth of 3 feet. Actually, it's the exact same; is that right?

A. I apologize, Mr. Slade.

Yeah, and what struck me about that was it made me start to question Mr. Foster a little bit, because when I compared where township 13 north is 5 east to where township 16 north, 3 east is, I was surprised, because I would expect the river not to be as deep way up at 16 north, 3 east than I would down at 3 north, 5 east.

And the reason I say that is 16 north, 3 east -- and if I could have a second to refer to my map here where I labeled the different townships.

13 north, 5 east, that township is in the Camp Verde area. So it's downstream of most of the major confluences of the Verde. That's 13 north, 5 east.

But then when you go to 16 north, 3 east, which is the other one, you're up in the Clarkdale area. So between the Clarkdale area, that township, you get Oak Creek comes in, Beaver Creek. So you get more water coming into the stream.

And so I was a little bit taken back that Foster, I don't know if it's coincidentally, has the same depth of the river in two different places where even Mr. Hjalmarson would indicate that there is an increase in flow between those two points.

So it did make me pause again and kind of question, but for a different reason, whether or not what Mr. Foster was writing down was just kind of a general feel or whether it's something rigorous.

Exactly the same depth for two townships that are that far apart, I'll just say again for the record that I think the surveyors were out there for the purpose of surveying, and I don't think we should ignore or disregard the data that they have regarding channel widths and depths, but they should be taken with a bit of a grain of salt or, more importantly, that it really wasn't what their function was. It

wasn't their main purpose.

Q. So we should use this as, in your words, a line of evidence?

A. I don't think in this case, and with the thousands of pages that the Commission is dealing with, that no rock should be left unturned if it might help, and I think everyone on both sides has turned those rocks over, and this is another one that we shouldn't ignore.

CHAIRMAN NOBLE: Perhaps it should be no riffle should go unmeasured.

MR. SLADE: Or no pool should go unmeasured.

CHAIRMAN NOBLE: Correct. That's right.

THE WITNESS: For once I'm not commenting, which I know is very rare in this proceeding.

BY MR. SLADE:

Q. I'm sure our court reporter appreciates that.

A. I imagine so, and you too.

Q. That's true.

As we move on from those surveys, and let's just talk a little bit about the work that Mr. Hjalmarson did to try to figure out if those were baseflow periods. And, specifically, we're looking at

township 3 north, range 7 east and township 4 north, range 7 east.

You've contended that they were not, based on your calculation of flow that we've already discussed. Mr. Hjalmarson has contended they are. And my understanding of his contention is that he bases it on the precipitation records that were officially recorded for that time period and the temperature records that were officially recorded for that time period. Is that your understanding?

A. I believe so, yes.

Q. So let's take a look at some of those temperature records. I'm on X059. That's Mr. Hjalmarson's second addendum.

Pardon me.

A. Mr. Slade, if I can interrupt as you're getting the pages.

The other thing I considered was not just the average flow recorded by the USGS for the months of January and February and March, but in addition to that, there were a series of newspaper articles, which I didn't have a chance to discuss when I did my direct testimony, that may or may not be of value to go through.

And then the third factor would be the months

of February and March, based on all of what I've read, for people that run the river and looking at the historic flow data, that's the period of time when the river typically runs the highest.

So those were all factors, to me, that in their entirety would suggest to me it's not baseflow.

Q. Okay.

A. And I have -- oh, okay, so Page 32, and this is his addendum. Okay.

Q. Would you agree that during the months of February and March, there are times when you do have baseflow?

A. I don't think we know, because we don't have -- and if we did, we wouldn't be having to spend so much time on this. We simply don't have daily runoff records for the month of February that we can use. We have these monthly averages, which are high, but we don't have daily data.

And if we had daily flow data, we could compare that to his or others' estimates of baseflow and maybe figure that out. But I don't have enough data, Mr. Slade, to make the conclusion just based on the precipitation records and the data we do have that, one, during the month of February 1911 it was baseflow.

Q. And you're saying you don't have enough information to also decide that there is some baseflow during February and March?

A. I think it's anything is possible, but I think in this situation it's highly unlikely. If you look at historic records and recent records for those months on the Verde River, as well as the newspaper articles, indicating it was a very wet winter that winter, it would -- I would find it more unusual than expected or reasonable that there was much, if any, baseflow during those months.

Q. It turns out Mr. Hjalmarson did provide some information about that, so let's look at that.

A. Okay.

Q. I'm actually on X059, second addendum, Hjalmarson, and I'm on Page 14.

A. Okay.

Q. And in your opinion, what was the baseflow; what's the baseflow during the months of February and March?

A. My memory -- when you say the typical baseflow in those months, I don't think I would characterize that question, because one would have to do a baseflow separation analysis, I think, for those months because those are months when there is typically

a considerable amount of snowmelt. And baseflow, as Mr. Hjalmarson and I think most of the hydrologists in the room would consider, is that which is driven by groundwater inflow. So you can't simply look at the total flow in February, even during a dry year, and just assume that what you're looking at is baseflow.

Q. Okay. What's the median flow that you reconstructed for the Bartlett Dam area?

A. At least that's a question I can answer. Whether it's right or wrong, I can answer.

So I'm referring now to my report, and in my Table 5 -- unfortunately, I spoke a little too quickly. -- I looked at median flow and 25th percentile flow. I didn't look at monthly flow.

And so when you look at the typical hydrograph for the Verde River, my guess is that the typical flows would fall in the range of being higher than the 25th percentile. Because the 25th percentile, you're suggesting that about three-quarters of the year the flow is less and the other quarter of the year it's higher. And so the high flow months are typically February and March and maybe a bit of January thrown in.

So if I were to try to estimate, I would say that the median flows during those months are certainly

higher than 570.

Q. Okay.

A. And if you would like -- it would take me a second to dig out. Mr. Fuller, in his 2003 report, I believe he does calculate median flow based on the gages in that area. So if you would like, I could pull that out. It would take a minute, though.

Q. Not right now, but maybe we'll get there.

A. Okay.

Q. So you've got the below Bartlett Dam reconstruction at the 25th percentile, which you would consider roughly baseflow, at 570 cfs; is that correct?

A. I'm sorry, I must have misspoke. The 25th percentile is the high flow events. It's what would occur during January, February and March, high flow. I'm not suggesting that's baseflow.

Q. Sure.

A. I'm saying that's the flow that would occur during those months that's high.

If I were to try to, based on my flow reconstruction, look at baseflow, I might -- I don't know. I would have to give it more thought. -- adopt Mr. Hjalmarson's technique at looking at the 90th percentile flow, which is what he used. I didn't

do that. And, of course, the 90th percentile is going to be substantially less than that.

Q. Let's go with the median. You've got the median flow at 437 cfs for below Bartlett Dam, is that right, from your Table 5? This is Burtell X009.

A. Yes.

Q. We've got flow up here.

Debi, if you could zoom in on that graph.

This is at February 1933. And do we have -- we've got one little blip up there on the far right that's going above 450, but for the most part, everything's below 450, and there's a large chunk that's 350 and below; is that correct?

A. It is. You know, the problem, Mr. Slade, I have with this is I don't know what type of year 1933 was.

Q. Sure. Well, I'll stop you there because we're going to go to 1934 too, and we'll take a look at that.

A. Okay.

Q. Let's look at Page 17, the same report.

A. Okay. All right, I'm looking at it.

Q. And this is February 1934, again, from Hjalmarson X059, second addendum, and if we could zoom in on that graph.

For most of that month everything is well below 300; is that correct?

A. Yes, that's what it shows.

Q. And, again, your median was 437?

A. That's right. Sure.

Q. And, again, it's important to look at multiple years, right?

A. I would think so.

Q. Okay. So let's look at 1935, Page 20.

A. Okay.

Q. If you could zoom in on that.

And here we see a wetter February; is that correct?

A. It looks a lot wetter than those two previous years.

Q. Sure. So there's some variability in February?

A. There is.

Q. Okay. And let's go to the last one, Page 23. This is 1936, still February.

A. Okay.

Q. If we could zoom in on that.

Again, we see some variability, but we see for a large portion of that year -- now, this is a logarithmic graph. That first section, what would your

estimate be on -- what is that flow rate?

A. Let me see. That's a log scale. So some -- are you suggest -- are you -- could you give me what --

Q. From February 1st through --

A. 1st through --

Q. -- call it February 15th.

A. Yeah, I would say on average we're looking at about 300 cfs would be baseflow.

Q. Okay. Well below your median of 437, right?

A. Which I think would be quite expected and certainly less than the average flow during that month in 1911 when the survey was done, which the average was about 2,000 of the month where Mr. Hjalmarson used the survey notes.

Q. Sure. But if you just wanted to look at an average and you took this February, your average would be skewed by a large event that comes on between February 22nd and February 29th, where it goes up to about 5,000; is that right?

A. For this year that's what's happening, sure.

Q. And there's another large event that goes about 1,500, something like that.

So if you talked about February in an average flow sense, you would sort of be missing the whole picture, wouldn't you?

A. You know, maybe it would benefit -- it would just take me a second. -- to pull the median flow that I believe Mr. Fuller calculated for February, because that would be a median value as opposed to an average.

And as you're saying, and I fully admit, these high flow years have a tendency of skewing the averages. So I'm certainly understanding why median would be of value. So maybe there would be some value in, again, looking at the median flow, as Mr. Fuller calculated and presented in his report.

Q. Again, maybe we'll come back to that or you can do that on redirect.

A. Okay, sure.

Q. We won't do that right now.

A. All right.

Q. So we're seeing baseflow in February?

A. It would help to see the rest of the hydrograph that goes on the other side, but certainly flows at that level would suggest that it was baseflow for that year.

I would, though, quickly want to point out, Mr. Slade, that I would want to look at it in a broader context to see whether the '30s might have been -- those couple years in the '30s might have been on the dry side, because when you have continued dry years,

even your baseflow is likely going to go down.

So I'm not sure why Mr. Hjalmarson happened to pick this stretch. I don't know if he says in his report why he picked '34, '35 and '36 and why he didn't pick some other years, but I certainly would ask the Commission to wonder why he's just providing us those three years and not others.

Q. Did you provide any information about baseflow in February or March?

A. From my evaluation of navigability, I looked at flows much bigger than baseflow. I looked at median flows and 25th percentile flows. So, quite frankly, I didn't think these lower flows were as important.

And, again, my depth analysis, as we talked about in my table, are for depths much greater than these baseflows. So if we're trying to figure out the susceptibility of the Verde River for floating, I think I was more conservative by looking at median flows than Mr. Hjalmarson by looking at baseflows or some other amount.

Q. But you've made the contention that we should not consider the depths that the GLO surveyors came up with because they were in baseflow or because they were not in baseflow.

And my question is did you provide any evidence on February or March baseflow or not baseflow?

A. What I provided, at least I attempted to, was to provide evidence that indicated that it was more in a flood condition, and that was the newspaper articles, number one; and the average flow data for the month that, again, for those two months, as I recall, the average daily flow was over 2,000 cfs for those two months.

So, again, my focus, Mr. Slade and I mean no disrespect, I was focused more on -- I wasn't worried about baseflow. I wanted to see whether or not Mr. Hjalmarson's use of those depth measurements could have been affected by floodwaters and, thus, be less characteristic. So I was looking at it from the other side, if you will, of the statistics.

Q. Have you studied surveying at all?

A. I am not a licensed surveyor, if that's what you're asking.

Q. Have you ever gone out and done a survey?

A. I have done some -- certainly done a lot of surveying with a GPS; but with a rod and a -- a few times, but I was usually just the stupid guy holding the rod. I wasn't the guy that was signing the survey

notes.

Q. Did you ever survey during a flood?

A. Most of the -- well, the surveys that I've been involved with were not in an area of running water.

Q. Do you think a surveyor would cross the river when it's flooding?

A. It all depends on how high the water is and what the flood is. A hundred-year flood, that's a brave boy. A two-year flood, depending on how wide the water might spread out in the floodplain, maybe so. It's a tough question to ask without having a specific reach of the river where you're looking at.

Q. Well, have you seen the Verde River? Have you been to the Verde River?

A. I certainly have, yes.

Q. And what's your experience on the Verde River? Could you tell us what you've seen and what you were there for?

A. Probably the most systematic time that I spent on the Verde River, Mr. Slade, was Phil Pearthree, again, Dr. Pearthree, of which we've talked. When I was with the Department of Water Resources and I was in the adjudication section, the department contracted Mr. Pearthree to map the younger floodplain

deposits and the river deposits in the Verde River and its tributaries. So I spent with Mr. Pearthree, which was very enjoyable, I guess it was a three or four-day field trip, where we went up the Verde, pretty much all the way up to Sullivan, and we also went up several of the tributaries. So I have certainly some on-the-ground feel for what the river is.

Q. When you say all the way up to Sullivan, can you be specific --

A. I'm sorry. Sullivan Dam. Excuse me.

Q. Sure. Can you be specific about exactly where you started and where you ended?

A. The way the field trip was designed, like a lot of field trips, it wasn't start at the south and work, you know, in a straight path up. We took lots of side turns and went up tributaries.

So as I recall, we ended up starting kind of halfway up the river and then worked our way up, but then came back down again. So, you know, again, we were trying to be efficient, and I didn't organize the field trip; Dr. Pearthree did, so...

Q. And I would like to know a little more about that, but is that the extent of your experience on the Verde?

A. Certainly I have had other experience. Are

you talking about on-the-ground field trips, if you will.

Q. On the ground, seeing the river.

A. The other work that I've done, actually recently, is I did a project in the Camp Verde area where I worked with a nonprofit, as well as the City of Camp Verde, and we looked at agricultural lands and water uses in the Verde River area as it -- within the boundary of Camp Verde. So on the ground in that area.

Q. Now, my understanding of that paper is you did a lot of aerial farm surveying. How much of that time during that study was spent by the river?

A. We spent a couple of days on the ground ground-truthing, if you will, that mapping.

Q. And you're mapping the surrounding areas; you're trying to figure out where the farms are, where the agriculture use is, what the domestic use is like around the river; is that correct?

A. That would be a fair assessment, sure.

Q. So you're not necessarily by the river; you weren't studying the river. You were actually studying the uses of the river?

A. Yeah, I think your question was, is, well, what experience do I have in the Verde area -- maybe I misread or misunderstood what your question was. -- in

the Verde River area.

But in terms of doing an actual fieldwork on the river, it would be related to that field trip with Dr. Pearthree.

Q. Okay. And did you ever cross the Verde River during that field trip?

A. I don't recall crossing.

And I should, actually, Mr. Slade, apologize. There was one other field trip that I took with the Department of Water Resources related to the Water Atlas where we hiked in at the Sullivan Lake Dam and then worked our way specifically along the river down, which in, I think, now what your expert calls Segment 0.

Q. So you never crossed the Verde River?

A. Not that I -- well, on foot you mean as opposed to --

Q. On foot.

A. -- yeah, going over a bridge.

On foot, no.

Q. Have you ever stuck your toe in the river?

A. Yes.

Q. So --

CHAIRMAN NOBLE: An expert.

MR. SLADE: You've stuck your toe in the

river, Mr. Chairman?

CHAIRMAN NOBLE: No, he's an expert.

MR. SLADE: Well, that's what we're trying to find out.

BY MR. SLADE:

Q. So when you say that a surveyor could cross in floodwater on the Verde --

A. Oh, Mr. Slade, that's not what I said. I did not say that.

Q. Then please go ahead. Can a surveyor cross in the flood state of the Verde?

A. You have to tell me what flood we're talking about. Are we talking about a one-year flood or a hundred-year flood?

Q. Let's look at this hydrograph. Where would a surveyor -- at what point would he prefer to survey the river?

A. I would have to go out to the area where he's surveying and probably do an exercise closer to what Dr. Mussetter did where I create several cross-sections along the river and route that water through the river and see what the depths are related to a certain flood event. I didn't do that, so...

Q. But the GLO surveyors aren't actually all that interested in the river depth, as we talked about

before. They are interested in the sections and the section lines; is that correct?

A. That's the task that they were given.

Q. So they're trying to make their job as easy as possible, getting those section lines down, east to west and north to south, would that be a fair assumption?

A. Yes.

Q. So if you're trying to make that as easy as possible, on this hydrograph, where would you do that?

A. Under this particular hydrograph, which, again, isn't the February 1911, when the guys were actually out there, I think any reasonable person would say you would rather pick when the flow was lowest.

Q. Let's go to Page 32, please.

A. Okay.

Q. Second addendum, Hjalmarson, X059.

And this is the February 19th daily precipitation -- excuse me, February 1911 daily precipitation records for the whole Colorado Valley, which includes the Verde Valley; is that correct?

A. Yes.

Q. Page 32.

A. For the precip stations at that time that were recording, and, of course, this is not just the

Verde Valley. This, I think, is the whole state of Arizona.

Q. Right.

A. Or, I'm sorry, it's a district. District 9, Colorado Valley.

Q. And it includes the Verde Valley; is that correct?

A. Yes.

Q. So do you have any understanding of how accurate these precipitation records are?

A. I didn't do that research, but they were filed or published by the Department of Agriculture Weather Bureau, and like the U.S. Geological Survey, these were very careful people in terms of how they would measure things. I would give these some pretty high credibility.

Q. And on your charts that you prepared, if we look at -- we're going to stay on here, but if you could also look at your chart of X054, Freeport 38. It's your chart of the February 1911 GLO survey, township 3 north, range 7 east. And on that chart you've listed dates when the surveys were done, and it starts with 2-18-1911 and it ends with 2-24-1911; is that correct?

A. It is.

Q. Okay. So we can see what the precipitation was like on those days by using this record; is that correct?

A. That's correct.

Q. So let's pick a day. Let's pick the 22nd of February, 1911.

A. Okay.

Q. And let's look on here. And as we move through here, I'm going to denote everything that says Verde as the watershed, and I'm going to tell you the precipitation on that day and then the two days prior.

A. Okay.

Q. And if I heard you correctly this morning, you said it took about one day for water to move through the watershed; did I hear you correctly?

A. When I said that, I think it was with lots of conditions about, well, how recently had it rained in the watershed, et cetera. So I would not want to be on the record for making a blanket statement like that without it clear that I was saying that under the circumstances of a watershed that's been getting a lot of rain for the last month or two, that, yes, a rain event in the watershed under that type of a saturated condition within a day might be observed downstream.

Q. Okay. And you submitted some newspaper

articles about January and February and leading into March 1911, and, indeed, that was a wet period; is that correct?

A. Those newspaper articles certainly suggested that.

Q. So it was saturated, as you said?

A. Yes.

Q. Okay. So water would move pretty quickly?

A. Certainly quicker than it would if it had been a long drought period.

Q. Okay. But you're not sure about a day, so let's say two days. Is that fair?

A. I'm sorry, you said I'm not sure about a day?

Q. You're not sure how long water would take to come through the watershed, if it's a day or plus or minus; is that correct?

A. Well, the other thing, of course, that we're not talking about is how big of a precipitation event do you have to have before you might see an increase in flow all the way down at the bottom.

And, again, that's the type of analysis that neither Mr. Hjalmarson nor I have done, and that is essentially a rainfall runoff model where, you know, is a tenth of an inch of rain at one precipitation gage somewhere in the watershed, is that going to give us

enough indication of whether that is a runoff-sized storm event. That analysis wasn't done. In fact, as far as I know, Mr. Hjalmarson didn't do it, and I certainly didn't do it.

Q. But you could still get a little ballpark understanding of what the watershed was doing when you look at these precipitation records; is that true?

A. That's what Mr. Hjalmarson is using it for.

Q. So you're saying, when you look at these precipitation records, you can't tell when it was raining and you can't tell when that rain would have been in the river?

A. What I'm saying is that I can certainly tell when it's raining. I can certainly tell the difference between an event that was a tenth of an inch versus an inch. I will say that an inch of rain is going to create a lot more water than a tenth. But beyond that, Mr. Slade, without actually modeling the watershed, I can't do that.

Q. But you did say earlier that you thought it took about a day? Those are your words, not mine.

A. Those were my words after I asked you several questions about what conditions the watershed is under.

Q. Okay. And what conditions were those when you said it was a day?

A. I said that it is a possibility that if the watershed, in its entirety, was fully saturated and you get an event -- and I asked you how big of a rain event, and I don't think you provided me that. I said that, you know, a large storm event, but I don't know what large is, in a fully saturated watershed might generate flow that could be seen down at the bottom of the watershed within a day.

Q. Okay. So you said large.

A. But I don't know what large is.

Q. What does large mean to you in terms of precipitation? How much precipitation is large; an inch, 2 inches, 5 inches?

A. Again, Mr. Slade, I don't mean to be disrespectful, but if you have an inch of rain over a very small surface area of the watershed, that's a big rain event. But if that rain event is localized and only affected that portion of the watershed, then it's a large rain event that might not have had much effect on the flows at all. So --

Q. I don't think we disagree with that at all.

A. Okay.

Q. I'm trying to find your upper end. Pick a pretty large rain event. How long is it going to take to come down the river?

A. And I'll say, Mr. Slade, that I can only speak in generalities; that a precipitation event that is unusual for that month, and without actually studying typical precipitation records for those days in February, I can't say. I can't answer your question. I'm trying to. I would like to answer your question, but I haven't done the modeling.

Q. I'm confused.

A. Okay.

Q. Is that typical of a hydrologist to study precipitation and understand the movement of water? That's typical of your field; is that correct?

A. Oh, indeed. But I think any hydrologist who has spent any time in his profession would not take a few days of precipitation record and try to infer how much water is going to be measured at a gage that's 40 or 50, a hundred miles away.

Q. So we're not sure how long it takes. It could be a day, could be three days, could be no time at all?

A. Depending on the preceding moisture conditions in the watershed, the extent of the storm, the area of the precip event, the intensity of the precipitation event, all those are factors.

Q. Sure.

A. And I simply didn't look at those factors.
Q. So let's go ahead and look at the 22nd. And as I said, I'm going to move down there. I'm going to list the precipitation on the 22nd of February, 1911, where it says Verde, and I'm going to mention the precipitation for the two days prior. Is that fair?
A. Okay.
Q. Okay?
A. Sure, I'm with you.
Q. The first one we come to is Camp Verde, and it doesn't seem like that gage was working at all because there's no precipitation at all in February, and we know that's not true.
A. Unless something really weird hydrologically was happening, I would probably agree with you there.
Q. The next one we come to is Cave Creek. There's no precipitation on the 22nd. There's nothing on the 21st. There's nothing on the 20th. There's nothing on the 19th, 17th. I skipped the 18th. 18th nothing, 17th nothing, and the 16th we have .04.
So from the 17th to the 22nd there's no rain; is that correct?
A. That's what this table says.
Q. And when we look at Jerome, 22nd, nothing. The first time we see precipitation is back on the

16th; is that correct?

A. Yes.

Q. Natural Bridge, 22nd, no precipitation. The first time we see precipitation is back on the 16th?

A. Yes.

Q. Okay. So that's six days?

A. Yes.

Q. Payson, 22nd, no precipitation. First time, back on the 16th, so six days, correct?

A. Yes.

Q. And just so we cover our bases here, if we look at Flagstaff --

A. Okay.

Q. -- on the 22nd there's no precipitation, and that watershed says the Little Colorado but my understanding is it's a good gage of precipitation generally for the Verde watershed to look at Flagstaff; is that correct?

A. I haven't heard -- I haven't heard that before.

Q. Well, if we look on the 22nd in Flagstaff, there's no precipitation. If we look on the 21st, there's no precipitation. And on the 20th we have .04 of an inch, and there's some precipitation moving from the 20th earlier; is that correct?

A. Yeah, but let me counter and say, well, okay, Payson on the twenty -- or let's see. So Payson -- well, which Flagstaff are you looking at?

Q. I was looking at --

A. First Flagstaff?

Q. -- the first Flagstaff.

A. The first Flagstaff.

Q. That's right.

A. So on the 19th, Flagstaff had .2 inches of rain on the 19th. But then I go down to Prescott, and they just had a trace on the 19th. Payson didn't have anything. Jerome didn't have anything. And Prescott didn't have anything or just a trace.

So I'm not so convinced that just because -- I'm not convinced, based on that, that Flagstaff is necessarily an indication of a correlation with these other gages, at least for that date.

Q. Sure, and fair enough. We'll just use the Verde ones.

A. Okay.

Q. And most of those were about six days went by before the 22nd occurred, and there was no precipitation during those six days; is that correct?

A. Yeah, and, you know, what's even more unique to me is that you can continue that through the 24th

and the same holds. I think it stayed dry through the 24th, and you got a small rain event starting on the 25th.

But the surveyor's notes on the 24th, they said by that time, quote, the high water had come. So there had been no less than probably five or six days preceding the 24th where the precip records say there was no rain but a trace; but the surveyors are saying the high water had come.

So, again, I guess that's my point; is that I don't think these precipitation records are necessarily a gage of the flow.

Q. Okay. You referred to the 24th. In fact, wasn't this township also surveyed on other days besides the 24th?

A. Absolutely.

Q. Okay.

A. And --

Q. And it was surveyed into March and it was surveyed in early February; isn't that true?

A. I don't know about March.

Q. Do you have the other days that it was surveyed?

A. Those two sections, I don't.

Q. Okay. So on the 24th -- because I agree with

you, that's an inconsistency. We see no precipitation, and then here we've got something that says these certain sections -- I'll just read it out. "The line between Sections 29 and 30 was run at a time when the water in the river was very low."

So that's the 24th is the survey section of 29 and 30; is that correct?

A. Yeah, and what they did is they -- this is -- all of these survey results in this table, including this quote, were done in February 1911. So I didn't put the results between 29 and 30 because, as I understand, it wasn't an east/west line. It was more north/south.

Q. Okay.

A. And if it was north/south, then it would be -- it wouldn't be representative of the width of the river because you would be following along the river.

And so that's why I'm just putting in data here where they crossed the river in an east/west fashion and have depths and widths, because the river is generally a north/south running river.

Q. Okay. What they say on the 24th, I'll read it again --

A. Okay.

Q. And if you could let me finish.

A. Sorry.

Q. "The lines between Sections 29 and 30," and those are the sections we're talking about on the 24th, "was run at a time when the water in the river was very low, and it was possible to run on the sand bar. When the lines through the south half, middle and north half of Section 29 were run, the high water had come, and it was impossible to reach 16th and quarter section cors." I don't know what that means.

A. Corners.

Q. Corners.

So the second part there, they're talking about a different time. The first part is the 24th.

A. Yeah, and I guess my point, Mr. Slade, is, and I apologize, I'm just trying to make the point that as we were walking through these days, 22nd, 23rd, I said, well, let's include the 24th; and you find that five or six days prior to the 24th, where the surveyors came back to 29 and 30 and they said the river was running high, there wasn't any precip recorded at the very gages that Mr. Hjalmarson says is an indication that look at the gages to look at flow.

So there seems to be an inconsistency between looking at precip gages and high water on the river. And my explanation for that is that this is a time of

snowmelt.

Q. Well, I've got to come back to this.

A. Okay.

Q. Because the second sentence there, I thought you just agreed, the second sentence, where they said the high water had come, is not on the 24th?

A. No, Mr. Slade, if you look on Page 53, they revisited 29 and 30 on the 24th.

Q. They did the first sentence, which says "It was run at a time when the water in the river was very low, and it was possible to run on the sand bar."

The second sentence is a different time. It got included on the 24th, but as we see from the precipitation records, that was not the time when the high water came. That was a time either in late February or March. Isn't that correct?

A. No, because if you read the second sentence in its entirety, it says "When the lines through the south half, middle and north half of Section 29 were run, the high water had come, and it was impossible to reach the 16th and the quarter sections."

Notice that I was unable to put any width or depth data for that, for that time.

Q. The survey section that's being measured here is the line between 29 and 30; is that correct?

A. That's right.
Q. Okay. The second sentence talks about Section 29, not the line between 29 and 30, which is referenced in the first sentence?
A. Right. They had -- they revisited Section 29. I could go back, and I think we submitted the survey notes into evidence, Mr. Slade, and I can find out what days in February they first were in Section 29 and 30, or at least along the border; and then on the 24th they came back to Section 29 to, obviously, survey some interior points, and at that time it was running high.
Q. According to you.
A. If you would like to look at the survey notes, we could.
Q. That would be helpful. We'll come back to that.
A. Okay.
Q. Either way, on the 22nd, when six days --
A. Okay, now we're back to --
Q. We're back to the 22nd.
A. Okay.
Q. The 22nd, when six days had passed and there's no precipitation in the Verde watershed, according to these records, we know depths were

recorded, and we've got recorded depths of -- and correct me if I'm wrong -- 2 and a half feet, 2 and a half feet, 3 feet, and 2 and a half feet; is that right?

A. That's what this surveyor said, yes.

Q. And we could go back and do that from the 22nd up through the 18th, and we already know that six days prior there was no precipitation. So if we went to the 21st, we could read those depths, and we know there was no precipitation for five days prior, and so on and so forth. That would make sense, right?

A. It would make sense, I don't understand what you mean.

Q. It would make sense in the pattern we've set up; that if we went to the 21st, five days prior there was no precipitation; if we went to the 20th, four days prior. Is that correct?

A. Is there a question there? I'm sorry, I don't understand.

Q. The question is how many days prior from the 21st was there precipitation?

A. I guess we could -- if you wanted to pick a particular gage and do that exercise, we could.

Q. We could. We could figure out that there was a certain amount of time that had passed?

A. Yes, you could take a gage and say, all right, surveyors were out there on the 21st. We have got various gages in the watershed. When was the last time it rained at Gage A? We could do that exercise.

Q. Sure, and similar to what we just did for the 22nd?

A. Correct.

Q. And did you do that exercise?

A. What I did was I focused on the 22nd.

Q. Mr. Burtell, did you do that exercise that we just talked about?

A. And what exercise is that, looking at every single day?

Q. Looking at the survey day.

A. Okay.

Q. Going back to the precipitation record and seeing when it rained and noting that anywhere in your report or in your presentation.

A. Well, as I indicated earlier, I didn't include this in my report.

To answer your second question, as I've testified to, I indicated that I looked at the precip prior to the statement of "impractical to survey up the channel on account of high water." So that was the only day that I looked at the preceding days to figure

out when the last time it had rained. I did not do that exercise for all of the other days or all of the other section crossings.

MR. SLADE: And, Debi, could we put up X054-38, please?

And we'll move on, Mr. Chairman, from this conversation briefly, but I realized the Commissioners have not had the option to be looking at what Mr. Burtell and I have been looking at, unfortunately.

BY MR. SLADE:

Q. Okay. And this is what we've been looking at, and that's the 22nd of February. And that's the conversation we had earlier on the 22nd where it says on account of high water, and that's where we were talking about the section line, and you and I disagreed about whether they were talking about going through the river or if there was water that they couldn't cross because it was snowmelt; is that correct?

A. You and I seem to be disagreeing on that, yes.

Q. And the 22nd is also the time when six days prior and during that period, there was no water in the watershed, from a precipitation record?

A. Yes.

Q. I would like to talk a little bit more about your experience on the Verde?

A. Okay.

Q. And we'll move away from the surveys.

A. Okay. I think everyone will be happy about that.

Q. Would you agree that seeing a river like the Verde is helpful in your understanding of the river?

A. When you say understanding, understanding what?

Q. Understanding the flow rates and the depths that correspond.

A. In terms of the flow rates, I would think what's most valuable is a long-term record of streamflow measurements by the U.S. Geological Survey or, in the case of the Verde, SRP.

Q. And if you're trying to understand where those gages are, the gage readings, the gage system, is it helpful to see the gages in person?

A. Again, to better understand the flow rates or --

Q. To understand what the depth measurement from the gage reading means for the course of the river and the depth along the river, is it helpful to see where those gages are on the river?

A. A photograph or in person I think would both be helpful. And when I say photograph, Mr. Slade, I would say both an aerial photo, a topo map would be valuable, and an on-the-ground photo; all of those could help.

Q. Have you been on the ground to any of the gages?

A. I have seen the Clarkdale gage, but I haven't walked up and knocked on the gage head, if you will. And that would be the only one that I visited in person.

Q. When you said seen the Clarkdale gage, were you on an overflight? In person. Excuse me. Let me start over. Were you by the river?

A. As I recall, I was, you know, I don't know, a quarter mile away or something and looking down. I'm a little rusty on it. But I have not visited every single one of the gages or any of the gages and spent any time looking at them.

I've trusted -- I have, however, looked at historic photographs of when the gages were first installed. I got those from the U.S. Geological Survey. And so I have had kind of a unique opportunity, that many haven't, to see how the gage was actually constructed, old photos.

Q. And I believe Mr. Hood asked you previously about the gage locations, and there's been a lot of conversation about that and what the depths represent, the USGS depths that can be discerned from those gages, what they represent on the river; are they closer to the pool, are they closer to the riffle.

And I believe you answered a question that he asked. He said, "Well, the gage reading would be a certain depth, but then as you move to the river, it would be significantly more shallow."

Do you remember that question?

A. I'm not -- in generalities, yes. I remember that discussion about gage location and depths of pools versus riffles and things like that.

Q. And what was your answer to that?

A. Well, I probably would need to go back and read the transcript, but --

Q. Well, how do you answer it right now?

A. Thank you. That would be a little easier.

Mr. Hjalmarson I think did a Herculean effort of trying to describe what is a little complicated unless you've seen these gages; is the gage sites measure the stage, the water level, where the gage in the old days had a float and now they have pressure transducers.

But where the gage is located is not -- is usually in an area -- there's lots of factors, and we can talk about those, about why you put a gage in a particular place. But you don't want to put a gage in the middle of a rapid or a riffle, where it's very shallow and turbulent flow.

So you want to put a gage in where the cross-section is hopefully somewhat stable. You've got flow velocities there that are high enough that you're not going to get a bunch of sediment built-up there, which has effects.

So that's where you're measuring the stage. But the stage then has to be related to the discharge, how much water is actually flowing through the stream. And so then the GS, independent of their measurements of the depth of water at the gage, they have to relate that depth to how much water there is in the stream, and so they'll go out and they'll take so-called direct measurements. And I have used those, as you've seen extensively, in establishing my rating curves.

And those direct measurements are taken in the vicinity of the gage. You need to be fairly close so that you don't have more water coming in or seepage or something that would cause your flow measurement to be different than the flow right where the stage is

being measured. But you don't want to measure that direct discharge in a riffle, because of all those reasons that I talked about.

So it's not unusual -- and I believe maybe this is where you're asking, Mr. Slade. We looked at the Clarkdale gage, and you could see where the gage was. If you looked even more closely, you could see where the trolley was, the cableway where they do during high flows. And then there is a riffle, which is a section control in front.

And so I guess the point I'm saying is that where they measure stage, in that case it was more in a pool area, but that's -- as Mr. Hjalmarson said, and I would agree, if a pool gets too deep, you're going to get -- it's going to be difficult physically to get out there. So you're going to measure discharge at a point near that gage, but not necessarily or always at the same place.

Very long-winded answer, but it's a complicated concept. There are two different things being measured for the same purpose.

Q. I appreciate that response.

My next question is have you ever gone out to any of the gages on the Verde to see what the depth was like where they measured it and then what it was like a

little downstream at the riffle?

A. I have not done that. I did present into evidence the USDA, in the same document that Mr. Hjalmarson admitted into evidence, did show cross-sections at both the Paulden riffle and at the Paulden pool. So they did that. I have not done that.

Q. So you don't have an idea, when Mr. Hood asked you a question about the difference in depth where from where it was measured to -- the measurement depth to the riffle depth, you don't have an idea of what that difference is for the Clarkdale gage or the Camp Verde gage or any of the other gages that you have used?

A. What I can say with confidence is that where they're doing the direct measurement is going to have an average depth which is greater than the riffle.

Q. But you can't say how much greater?

A. No.

Q. Could be a tenth of an inch?

A. Very unlikely, because if you're a tenth of an inch difference from where the riffle is, it's likely you're going to be close enough to the riffle that there's turbulence, and that's the very spot where you don't want to be trying to measure discharge.

Q. But tough to discuss if you haven't seen it

and you don't know what it looks like, would you agree with that?

A. I would disagree insofar as, for the purposes of what I was doing, I was more worried about maximum depths; that is, trying to come up with a conservative high value for the depth related to the gage. Not -- when I say maximum, I don't mean the maximum area in the cross-section, but where the channel might be -- the depth might be more rather than less.

And, granted, if all of the cross-sections that the USGS, when they took their direct depth measurements, were at the pools, we would get even greater depths than I did for my rating curves.

But my rating curves, again, were an attempt to figure out what the limiting factor was for navigation, and to truly be limiting, you would go out to all the riffles and rapids along the river and measure there. But those would be less than the data that I used for my rating curve.

So I'm more interested in making sure that my numbers are not too low. And they would be too low, perhaps, if I just focused on the riffles. But the riffles are where navigation is limiting. So that's really where the action is, I think, in terms of limitations to navigation.

Q. But you can't tell us how much less it would be from the numbers you put down in your report to the riffle?

A. I can only say that they're greater.

Q. Do you think someone that went down the river in a boat or walked on the river or swam in the river or looked at the river at those gages would have a better understanding than you would about how the depths change from where the gage is measured, the gage depth, to the riffle?

A. Are you suggesting that this person is swimming the entire Verde River?

Q. I'm saying if you went out there and you found out where the gage readings were for depth --

A. Okay. Stage.

Q. Not the gage height.

A. Oh, okay. All right.

Q. The gage depth that you plotted in your curves.

A. I didn't plot gage depth.

Q. The hydraulic depth versus --

A. Yeah.

Q. -- flow.

A. Yeah, I plotted the average depth that was measured by the USGS when they take their direct

discharge measurements in the vicinity of the gage.

Q. Okay. So if you went out to the direct discharge measurement sites --

A. Okay.

Q. -- which we call somewhere in between the pool and the control, and you saw where that measurement was taken and then you went downriver either in a boat or you walked it, if it was shallow enough, or you stood by the river, would you have a better understanding of how the depth changes as it approaches the riffle than your understanding, because you haven't done that?

A. Better understanding.

If they're out there with a wading rod, I would say they would have much better data than I have. I know pools are typically deeper than riffles, and it's a transition. So if they're out there with a wading rod and they can actually plot, as Dr. Mussetter did along the lower Verde, then as Dr. Mussetter's cross-sections, which were very insightful, they show the riffle-pool-riffle sequence, and you can see that in cross-sections.

Is that more valuable? I still think what's limiting is the depth at the riffle, and so I'm not exactly how much -- or how sure that would improve my

navigability determination.

Q. You've done some other studies. San Pedro, you've done a couple studies there; is that correct?

A. Are we referring to navigability studies?

Q. Navigability and otherwise.

A. Yes.

Q. And you visited the river for those studies?

A. The San Pedro I had visited, also with Dr. Pearthree, because he was contracted by the Department of Water Resources for that same purpose as he was for the Verde. So we spent on the order of three or four days. No, actually that was two separate field trips, so I think it was a week, when all was said and done, marching up and down the Verde and its two main tributaries.

Q. And for the San Pedro study, did you ever cross the river?

A. In that circumstance I have. In fact, I visited the Charleston gage about a year or so ago, and, yeah, I got down in the river and crossed it.

Q. Why didn't you cross the Verde River when you were there?

A. Why didn't I cross the Verde. When I was on the -- when I was on the field trip with Dr. Pearthree?

Q. Yes.

A. Why did I not cross the river.

For the purposes of what we were doing, it wasn't necessary. We weren't trying to get -- I hate to ask why did the chicken cross the road, but why did the hydrologist not cross the river in that circumstance; we didn't have any reason to go on the other side of the river, so we just didn't do it.

MR. SLADE: Mr. Chairman, I see it's 5:00. I'm happy to keep going, but I'm wondering if you want to stop?

CHAIRMAN NOBLE: About how much more do you have left?

MR. SLADE: A significant amount.

CHAIRMAN NOBLE: Okay. We will reconvene at 9:00 a.m. in the morning, and please remember that tomorrow at 1:30 we intend to do a scheduling conference. So have a good evening, and we will see you tomorrow.

(The proceedings adjourned at 5:01 p.m.)

STATE OF ARIZONA)
COUNTY OF MARICOPA)

BE IT KNOWN that the foregoing proceedings were taken before me; that the foregoing pages are a full, true, and accurate record of the proceedings, all done to the best of my skill and ability; that the proceedings were taken down by me in shorthand and thereafter reduced to print under my direction.

I CERTIFY that I am in no way related to any of the parties hereto, nor am I in any way interested in the outcome hereof.

I CERTIFY that I have complied with the ethical obligations set forth in ACJA 7-206(F)(3) and ACJA 7-206 (J)(1)(g)(1) and (2). Dated at Phoenix, Arizona, this 11th day of April, 2015.

JODY L. LENSCHOW, RMR, CRR
Certified Reporter
Arizona CR No. 50192

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