

SUPREME COURT OF THE UNITED STATES
No. 142, Original

STATE OF FLORIDA,)
Plaintiff,)
V.)
STATE OF GEORGIA)
Defendants.)

VOLUME XV

TRANSCRIPT OF PROCEEDINGS

The above-entitled matter came on for HEARING before SPECIAL MASTER RALPH I. LANCASTER, held in the U. S. Bankruptcy Court, at 537 Congress Street, Portland, Maine, on November 29, 2016, commencing at 9:00 a.m., before Claudette G. Mason, RMR, CRR, a Notary Public in and for the State of Maine.

APPEARANCES:

For the State of Florida: PHILIP J. PERRY, ESQ.
JAMIE L. WINE, ESQ.
ABID R. QURESHI, ESQ.
DEVIN M. O'CONNOR, ESQ.
GEORGE C. CHIPEV, ESQ.

For the State of Georgia: CRAIG S. PRIMIS, ESQ.
DEVORA W. ALLON, ESQ.
BRITNEY A. LEWIS, ESQ.
ANDREW PRUITT, ESQ.

Also Present: JOSHUA D. DUNLAP, ESQ.

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1 PROCEEDINGS
2 MS. ALLON: Good morning, your Honor.
3 Georgia calls Dr. Sorab Panday.
4 THE CLERK: Please raise your right
5 hand.
6 Do you solemnly swear that the testimony
7 you shall give in the cause now in hearing
8 shall be the truth, the whole truth, and
9 nothing but the truth, so help you God?
10 THE WITNESS: I do.
11 THE CLERK: Please be seated.
12 Pull yourself right up to the microphone
13 and please state your name and spell your
14 last name.
15 THE WITNESS: My full name is Sorab,
16 S O R A B, last name is Panday, P A N D A Y.
17 MS. ALLON: Dr. Panday is an expert in
18 groundwater modeling.
19 And may I hand up a copy of his direct
20 to the Court?
21 SPECIAL MASTER LANCASTER: Sure.
22 DIRECT EXAMINATION
23 BY MS. ALLON:
24 Q. Dr. Panday, you recognize what I have just handed
25 out as your prefiled direct testimony?

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1 **A. Yes, I do.**
2 **Q.** And do you adopt it as your sworn testimony in
3 this matter?
4 **A. Yes, I do.**
5 MR. QURESHI: Good morning, your Honor.
6 SPECIAL MASTER LANCASTER: Good morning.
7 MR. QURESHI: Before I begin, I would
8 like to introduce my colleague, Ms. Devin
9 O'Connor, who is instrumental in assisting me
10 today.
11 SPECIAL MASTER LANCASTER: Good morning
12 and welcome.
13 MS. O'CONNOR: Good morning, your Honor.
14 MR. QURESHI: Your Honor, we have
15 cross-examination binders for Dr. Panday.
16 SPECIAL MASTER LANCASTER: Surprise.
17 MR. QURESHI: There are actually two
18 volumes. There's only 20 documents; but
19 because of the size of the documents, we
20 split it into two binders.
21 SPECIAL MASTER LANCASTER: Fine.
22 CROSS-EXAMINATION
23 BY MR. QURESHI:
24 **Q.** Good morning, Dr. Panday.
25 **A. Good morning.**

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1 Q. Sir, I would like to begin by discussing the
 2 geology and the groundwater hydrology of the ACF
 3 Basin. And to do that, I would like to turn to
 4 tab 1 of the first binder that was provided to
 5 you. That should include a copy of your direct
 6 testimony in this matter.
 7 **A. Yes, it is.**
 8 Q. May I request that you please turn to page 12 of
 9 your direct testimony.
 10 **A. Yes, I'm there.**
 11 Q. And I would like to begin by focusing on the map
 12 that you have depicted on page 12. You have the
 13 ACF Basin highlighted with five different
 14 aquifers in the area. Is that correct?
 15 **A. Yes. That's correct.**
 16 Q. I would like to walk through the identity of
 17 those five aquifers starting with the one that is
 18 at the southern tip of the ACF Basin. Do you
 19 have -- can you identify them and work our way
 20 up.
 21 **A. Yes. The southernmost aquifer that we see there**
 22 **is the Upper Floridan Aquifer.**
 23 Q. And that's depicted in the blue color?
 24 **A. That is depicted in the blue color.**
 25 Q. And above that in the turquoise color, is that
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1 the Claiborne Aquifer, sir?
 2 **A. The lighter blue color is the Claiborne Aquifer,**
 3 **yes.**
 4 Q. And above that in the purple, that is the Clayton
 5 Aquifer?
 6 **A. Yes. That's correct.**
 7 Q. And above that in green is the Cretaceous?
 8 **A. Yes.**
 9 Q. And the one at the top in the pink or salmon
 10 color is Crystalline Aquifer?
 11 **A. Crystalline, yes.**
 12 Q. Okay. And what you have depicted on this figure
 13 are the outcrop areas; is that correct?
 14 **A. Yes. That is correct.**
 15 Q. And by outcrop you mean the area where each of
 16 the depicted aquifers is closest to the surface
 17 of the earth?
 18 **A. Yes.**
 19 Q. Okay. So you would agree, sir, that putting
 20 aside the Upper Floridan Aquifer for the moment,
 21 the Claiborne, the Clayton, and the Cretaceous,
 22 they reach the surface in the middle and upper
 23 portions of the ACF River Basin?
 24 **A. Yes.**
 25 Q. Okay. And while you explain in your direct
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1 testimony that these particular aquifers have
 2 lower connectivity, lower transmissivity than the
 3 Upper Floridan, you acknowledge that they do
 4 directly intersect with the streams in the ACF
 5 River Basin in the depicted areas?
 6 **A. Yes.**
 7 Q. And if we're just focusing on the Claiborne,
 8 Cretaceous, and Clayton, there is approximately
 9 136 acres -- sorry, 136,000 acres in Georgia's
 10 portion of the ACF River Basin that are irrigated
 11 with water from the Claiborne, Clayton, and
 12 Cretaceous Aquifer?
 13 **A. I do not recall the numbers off the top of my**
 14 **head.**
 15 Q. I understand. Perhaps you can turn to page 46 of
 16 your direct testimony, and you will see a table
 17 on page 46.
 18 **A. Yes.**
 19 Q. Does that table refresh your recollection that
 20 there's about 136,000 acres that are irrigated
 21 with water from the Claiborne, Clayton, and
 22 Cretaceous?
 23 **A. In the outcrop area as well as underlying the**
 24 **Upper Floridan, yes.**
 25 Q. And in evaluating the groundwater hydrology, you
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1 did not exclude those acres?
 2 **A. No, I did not.**
 3 Q. And in your direct testimony, you calculate that
 4 at a peak summer month, the maximum impact that
 5 groundwater withdrawals from those three
 6 aquifers, the Claiborne, Clayton, and Cretaceous,
 7 have about a 21 cfs impact on streamflow?
 8 **A. That is correct.**
 9 Q. Okay. Do you know Dr. Wei Zeng of Georgia EPD?
 10 **A. Yes.**
 11 Q. Did you work with him in connection with this
 12 matter?
 13 **A. I have been on the phone with him with the**
 14 **attorneys present, but I haven't worked with him.**
 15 Q. Did you review the direct testimony he submitted
 16 in this case, sir?
 17 **A. I was looking at it briefly yesterday.**
 18 Q. And prior to yesterday, had you reviewed it?
 19 **A. No, I had not.**
 20 Q. And were you in court when Dr. Zeng was
 21 testifying?
 22 **A. No, I was not.**
 23 Q. Did you have an occasion to review Dr. Zeng's
 24 transcript from his trial testimony?
 25 **A. No, I have not.**
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1 **Q.** Okay. But you would disagree with anyone who
 2 says that the Claiborne, Clayton, and Cretaceous
 3 are not connected to any streams in the ACF River
 4 Basin?
 5 **A. The Claiborne -- these other aquifers are not**
 6 **connected when they are underlying the Upper**
 7 **Floridan Aquifer; that is correct.**
 8 **Q.** What about in the outcrop area?
 9 **A. In the outcrop areas they are incised by the**
 10 **streams in the basin.**
 11 **Q.** And when you say incised, what do you mean?
 12 **A. That means the streams do cut through these**
 13 **aquifers.**
 14 **Q.** Okay. So let me go back to the question I asked.
 15 If someone were to tell you that the Claiborne,
 16 Clayton, and Cretaceous do not connect with any
 17 of the rivers or -- the streams or rivers in the
 18 ACF River Basin, would you disagree with that?
 19 **A. I would agree with that if they are talking about**
 20 **the aquifers when they are underlying the Upper**
 21 **Floridan Aquifer.**
 22 **Q.** What about if they're talking about the basin in
 23 its entirety, sir?
 24 **A. Well, then in the upper portion, it is connected;**
 25 **and in the lower portion it is not. So I cannot**

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1 **just answer yes for the entire basin.**
 2 **Q.** Okay. So let's talk about the outcrop areas.
 3 Are they connected in the outcrop areas?
 4 **A. Yes.**
 5 **Q.** But you would disagree with someone that says
 6 they are not connected in the outcrop areas?
 7 **A. Yes.**
 8 **Q.** Sir, may I request that you turn to tab 3 of your
 9 binder.
 10 **A. Yes.**
 11 **Q.** Okay. Do you recognize the document behind
 12 tab 3?
 13 **A. No, I do not.**
 14 **Q.** Okay. This document is designated as FX-933.
 15 And it's a 1983 report titled Hydrogeology of the
 16 Clayton and Claiborne Aquifers in Southwestern
 17 Georgia. Are you familiar with the Georgia
 18 Geologic Survey?
 19 **A. I know that there is a Georgia Geologic Survey.**
 20 **Q.** Okay. And did you review any reports or
 21 publications that they issued in this matter --
 22 I'm sorry. Did you review any reports that they
 23 issued in connection with the work that you did
 24 in this matter?
 25 **A. I may have. I don't recall.**

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1 **Q.** But you don't recall looking at this particular
 2 one, sir?
 3 **A. No. I don't.**
 4 **Q.** May I direct you to page 1 of FX-933 and ask you
 5 to read the first paragraph under scope of study.
 6 If you would kindly read that to yourself, sir.
 7 **A. Just the first paragraph?**
 8 **Q.** I think the first paragraph would be fine.
 9 **A. Okay. I read that.**
 10 **Q.** Okay. When you prepared your direct testimony,
 11 were you aware that in 1983 the Georgia Geologic
 12 Survey had commissioned a study to evaluate water
 13 level declines in the Clayton and Claiborne
 14 Aquifers in southwestern Georgia because of
 15 increases in industrial, municipal, and
 16 agricultural water use?
 17 **A. No, I was not.**
 18 **Q.** And if you now turn to the left-hand column on
 19 the page, there's a paragraph that begins,
 20 measurements of water levels. And it carries on
 21 over to the right-hand side of the page. If you
 22 might take a moment to review that, I'll have a
 23 question about the last sentence of that
 24 paragraph.
 25 **A. Yes. I read that.**

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1 **Q.** Okay. Were you aware when you prepared your
 2 direct testimony that in 1983 the Georgia
 3 Geologic Survey had concluded that the outcrop
 4 areas of the Claiborne Aquifer -- that increases
 5 in withdrawals from that outcrop area could cause
 6 declines in baseflows?
 7 **A. I wasn't aware that -- of this document; but if**
 8 **you are withdrawing water, that could cause a**
 9 **decline in baseflows. That's not surprising to**
 10 **me.**
 11 **Q.** And the decline will vary depending on where
 12 you're withdrawing water from. Is that correct?
 13 **A. Sure. It would vary where you're withdrawing**
 14 **water from.**
 15 **Q.** And as a general matter, the closer you are to
 16 the stream, will it have a greater impact?
 17 **A. The closer you are to the stream, you will have a**
 18 **greater impact on the groundwater flow to**
 19 **streams.**
 20 **Q.** And that term is -- the groundwater flow to
 21 streams, is that called baseflow?
 22 **A. Yes. That is baseflow.**
 23 **Q.** Thank you, sir.
 24 Okay. And in evaluating the impact of
 25 groundwater withdrawals in the -- from the Upper

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1 Floridan Aquifer, you relied on a particular
 2 model to do that analysis?
 3 **A. That is correct.**
 4 **Q.** And the particular model you rely on is
 5 associated with two scholars, Jones and Torak; is
 6 that right?
 7 **A. Yes.**
 8 **Q.** And if you turn to tab 4, sir, you will see a
 9 USGS report written by Jones and Torak. Can you
 10 please take a moment to flip through tab 4. And
 11 the document is designated as Joint Exhibit 18,
 12 and confirm that this is the document you looked
 13 to to prepare your 2006 Jones and Torak model.
 14 **A. I believe this is the report that was produced by**
 15 **the Jones and Torak model -- for the Jones and**
 16 **Torak model.**
 17 **Q.** And I notice sometimes the model is referred to
 18 with different names. Sometimes it's called the
 19 MODFE model, but I'm going to try to refer to it
 20 as the 2006 Jones and Torak model so you will
 21 know what I'm talking about.
 22 **A. Very good.**
 23 **Q.** Sir, if you can please turn with me to page 70 of
 24 JX-18. And you will see a section entitled Model
 25 Limitations.

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1 **A. One-seven or seven-zero?**
 2 **Q.** Seven-zero.
 3 **A. Yes.**
 4 **Q.** And within this section on model limitations, I
 5 would request that you please turn to the
 6 paragraph that begins at the bottom of the
 7 left-hand column. And it starts with lack of
 8 accurate hydrologic data. Can you please read
 9 that to yourself, sir, as well as the paragraph
 10 that follows that one.
 11 **A. Yes.**
 12 **Q.** Okay. Were you aware of these model limitations
 13 when you determined that you used the 2006 Jones
 14 and Torak model?
 15 **A. Yes. All models do have limitations. However,**
 16 **they finally do conclude that this model is**
 17 **accurate for the purposes that they have used it**
 18 **for.**
 19 **Q.** Okay. Sir, in that paragraph -- the second
 20 paragraph I asked you to read relates to the
 21 adequacy of the irrigation pumpage details that
 22 are used in the model. Is that correct?
 23 **A. Right.**
 24 **Q.** Okay. And in order to obtain details on
 25 irrigation pumpage, you relied on information

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1 that was provided to you from Georgia EPD?
 2 **A. Right.**
 3 **Q.** And the EPD data that you relied on, it doesn't
 4 contain details on crop type; does it?
 5 **A. The data I believe does contain details on the**
 6 **different crop types. I had developed my**
 7 **irrigation estimates using metered pumping**
 8 **information, and that's what he's referencing**
 9 **here that every agricultural plot was not metered**
 10 **and that there was a statistical sample that was**
 11 **metered. And that was used for developing my**
 12 **irrigation depths.**
 13 **And I used irrigated acreage databases to**
 14 **evaluate the irrigated areas. And different**
 15 **crops would have used different amounts --**
 16 **different irrigation depths; but we averaged that**
 17 **over the whole basin.**
 18 **Q.** Okay. So you used an average rather than
 19 specifics associated with each particular meter;
 20 is that right?
 21 **A. We used an average because there is rotation of**
 22 **crops, so you cannot really consistently say that**
 23 **a certain crop was grown on a certain acreage.**
 24 **So that's the -- that's the way we did it.**
 25 **Q.** Okay. Sir, can you please turn to page 46 of

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1 JX-18. There is a section on page 46 entitled
 2 Parameter Uncertainty.
 3 **A. Yes.**
 4 **Q.** Okay. What does that mean? What does parameter
 5 uncertainty mean?
 6 **A. Parameter uncertainty means that there would be**
 7 **uncertainty in the parameters of the model.**
 8 **Q.** Okay. And what particular parameters exist in
 9 this 2006 Jones and Torak model?
 10 **A. The parameters, I believe, are the aquifer**
 11 **parameters, which is the transmissivity of the**
 12 **aquifer which determines how quickly the water**
 13 **can flow in the aquifer, is the storage**
 14 **coefficient of the aquifer which determines, I**
 15 **would say, the size of the voids within the**
 16 **aquifer which holds that water. So that would be**
 17 **another parameter.**
 18 **Q.** Sir, can you please review the last two
 19 paragraphs of the parameter uncertainty section.
 20 **A. Yes. I have read that.**
 21 **Q.** Sir, when you prepared your direct testimony, you
 22 knew that Jones and Torak had noted particular
 23 parameters in the model were, quote, little
 24 better than educated guesses, end quote. You
 25 knew that?

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1 **A. Yes. That's what's written here.**
 2 **I do want to point out that these -- these**
 3 **parameters are the -- what he talks about here,**
 4 **the overlying semiconfining unit heads are part**
 5 **of the hydrology and that the impact of pumping**
 6 **does not depend on the hydrology itself. It**
 7 **depends on the actual pumping.**
 8 **Q.** I understand that, sir.
 9 **A. So as far as my evaluation is concerned of the**
 10 **impact of pumping, it did not make a difference**
 11 **if I did not have the absolute correct hydrology**
 12 **for the system.**
 13 **Q.** Okay. When you prepared your direct testimony,
 14 you also knew that Jones and Torak had noted that
 15 particular parameters in your model were, quote,
 16 subject to large uncertainty?
 17 **A. That is correct. But they also finally noted**
 18 **that this model is accurate for the purposes of**
 19 **figuring out how much baseflow occurs in the**
 20 **basin.**
 21 **Q.** Okay. Sir, can you please turn with me to tab 5.
 22 **A. Yes.**
 23 **Q.** Tab 5 is a document designated as FX-49r. Have
 24 you seen this document previously, sir?
 25 **A. No, I have not.**

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1 **Q.** Okay. The portion of the document that I want to
 2 focus on is a March 29, 2013, e-mail from
 3 Mr. Woody Hicks. Do you know who Mr. Woody Hicks
 4 is?
 5 **A. I heard the name.**
 6 **Q.** Okay. Have you heard of the Jones Center?
 7 **A. Yes.**
 8 **Q.** Okay. What does the Jones Center do?
 9 **A. I'm not sure what they do. I have heard the**
 10 **name.**
 11 **Q.** And when you heard Mr. Hicks's name, is it in
 12 connection with the work on the ACF River Basin?
 13 **A. Yes.**
 14 **Q.** Okay. Can you please take a moment and review
 15 the e-mail from Mr. Hicks. It's at FX-49r.
 16 **A. Yes, I have read this.**
 17 **Q.** Okay. And I understand that you haven't seen.
 18 FX-49r previously, but had you previously heard
 19 any criticisms of the 2006 Jones and Torak model?
 20 **A. No.**
 21 **Q.** Okay.
 22 **A. It's the best available model to evaluate the**
 23 **impacts of pumping in the basin. And even**
 24 **Florida's experts agree with me on that.**
 25 **Q.** Okay. So you had never heard any scientist

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1 explain that the 2006 Jones and Torak model does,
 2 quote, only a fair job at best, end quote, of
 3 predicting the impact groundwater withdrawals
 4 have on surface flow?
 5 **A. No. Even the scientists who are on Florida's**
 6 **team have said that this is the best available**
 7 **model.**
 8 **Q.** And you would agree with me that Mr. Hicks
 9 criticizes that model in this e-mail?
 10 **A. I see that here, yes.**
 11 **Q.** Let's turn back to tab 4, the USGS publication at
 12 JX-18.
 13 **A. Yes.**
 14 **Q.** Now, the model is used to evaluate groundwater
 15 impacts on streamflow in a certain portion of the
 16 ACF Basin; is that correct?
 17 **A. This model has been developed for the Lower ACF**
 18 **River Basin, but the Upper Floridan Aquifer --**
 19 **yes, it's for the Upper Floridan Aquifer.**
 20 **Q.** And as you pointed out, it's for the lower
 21 portion of the basin where the Upper Floridan
 22 Aquifer exists.
 23 **A. Yes.**
 24 **Q.** And if you turn to page 2, I think it will show a
 25 map of exactly what you described.

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1 Is that correct?
 2 **A. Yes. That is the domain.**
 3 **Q.** Okay. And do you know how much of the ACF River
 4 Basin falls outside the model domain, as you
 5 described it?
 6 **A. A large portion falls outside as well, but most**
 7 **of the pumping occurs in the Upper Floridan**
 8 **Aquifer. Most the connectivity is in the Upper**
 9 **Floridan Aquifer. So as far as the model is**
 10 **concerned -- and that is what even Jones and**
 11 **Torak have done -- they have modeled the Upper**
 12 **Floridan Aquifer to evaluate the impacts because**
 13 **that is most significant. Other impacts are not**
 14 **significant.**
 15 **Q.** And we'll certainly get to the significance of
 16 those impacts as well as the impacts here, sir.
 17 But my question for you is when you were
 18 evaluating groundwater impacts on streamflow in
 19 areas outside the model domain, you did not use
 20 the 2006 Jones and Torak model?
 21 **A. I did not model the areas outside of this domain**
 22 **that we see here. I did evaluate what the impact**
 23 **of pumping could be to the streams. And since**
 24 **that impact was so small, I -- and same with**
 25 **Jones and Torak, they did not spend the effort of**

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1 **developing a model for that.**

2 **Q.** Okay. And instead, you relied on work that

3 others had done, including a consultant for

4 Georgia EPD called CDM; is that right?

5 **A.** **For the areas outside of this model area, I**

6 **looked at the hydrogeology. I looked at the**

7 **transmissivities of those aquifers. They are**

8 **significantly smaller than the transmissivity of**

9 **the Upper Floridan Aquifer. And as I mention in**

10 **my direct testimony, it's 25 to thousandths times**

11 **higher, the Upper Floridan Aquifer**

12 **transmissivity. And for the connectivity is so**

13 **much higher.**

14 **So when you look at these things, you can see**

15 **that the impact of pumping in this upper region**

16 **of the basin was negligible. As you pointed out**

17 **in my direct testimony, we saw that it was around**

18 **12 to 20 cfs.**

19 **Q.** Okay. I believe you said 21 cfs in your direct

20 testimony.

21 **A.** I believe it was 21 cfs then, yes.

22 **Q.** But my question, sir, was in order to look at

23 these areas outside the model domain, one of the

24 things you relied on was a study by Camp, Dresser

25 & McKee, CDM; is that correct?

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1 **A.** I also looked at the report by CDM.

2 **Q.** I want to focus now on the model itself, the

3 Jones and Torak model, and some of the outputs

4 from that model. One of the things that you

5 evaluated is the impacts in dry years versus the

6 impacts in what you call normal years; is that

7 correct?

8 **A.** Yes.

9 **Q.** And when you say a dry year, is that synonymous

10 with a drought year? Are you talking about the

11 same thing?

12 **A.** Yes.

13 **Q.** Okay. And when we think about baseflow, the

14 amount that groundwater is contributing to the

15 stream in a dry year, is that lower than it would

16 be in a normal year?

17 **A.** Yes. That is correct. In a dry year, you have

18 less rainfall, so your water -- groundwater

19 levels are lower; and, therefore, you're going to

20 have less groundwater flow to streams. In a wet

21 year the groundwater levels themselves are

22 higher; and, therefore, you have more of that

23 groundwater flow to streams.

24 **Q.** I see. So when you have lower groundwater

25 because of a drought, for example, you will have

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1 less baseflow, less contribution to streams?

2 **A.** That is correct.

3 **Q.** Sir, can you please turn to tab 6.

4 **A.** Yes.

5 **Q.** Do you recognize this document?

6 **A.** Yes.

7 **Q.** This is designated as FX-934. And this was part

8 of the materials that you provided to Florida

9 when you submitted your expert report in this

10 case; is that correct?

11 **A.** This was part of my discovery material, yes.

12 **Q.** And the spreadsheet reflects outputs from the

13 model runs that you had performed?

14 **A.** The spreadsheet reflects the baseflows that the

15 model provided.

16 **Q.** Okay. And it provides baseflows in three

17 different months -- 1992, 2011, and 2013, normal

18 conditions, and dry condition. Is that right?

19 **A.** It provides baseflow for four different year --

20 well, for three different years, 1992, 2011, and

21 2013. And it also provides baseflow values for

22 no irrigation pumping at all and also the Georgia

23 EPD 2011 simulation that they had conducted.

24 **Q.** Okay. And my question was for each of the years

25 that you ran, 1992, 2011, and 2013, you compared

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1 a dry scenario, a drought scenario with a normal

2 scenario; is that fair?

3 **A.** No. That is not right. What I did here -- this

4 is an intermediate step. And from this I

5 calculated the baseflow reductions. And that is

6 what I compared.

7 **Q.** Okay. But I want to focus on --

8 **A.** I did not compare the baseflow values themselves.

9 **Q.** I understand that, sir. But I want to focus on

10 this particular document on this intermediate

11 step before we get to the other step.

12 In this intermediate step, this document

13 depicts the normal year and drought year

14 conditions as produced by the model that you ran;

15 is that correct?

16 **A.** Yes. This document -- this shows me the baseflow

17 values that came out of the model that I ran --

18 the models that I ran.

19 **Q.** And for a drought versus normal year condition?

20 **A.** For drought year conditions and normal year

21 conditions. I don't know what you mean by

22 versus.

23 **Q.** I -- if I used versus, I apologize. I didn't

24 mean to.

25 **A.** I wasn't comparing drought and normal years here.

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1 **I was comparing drought years to drought years of**
 2 **pumping/without pumping, and normal years to**
 3 **normal years. So that's what I wanted to**
 4 **clarify.**
 5 **Q.** Understood. But if you look at each of those
 6 years, '92, 2011, and 2013, and you look at the
 7 months March through August, you have higher
 8 baseflow in the dry conditions versus the
 9 baseflow in normal conditions. The number for
 10 baseflow in a dry year is higher than the number
 11 for baseflow in a normal year; is that correct?
 12 **A. Yes.**
 13 **Q.** And that result is true for all three years, the
 14 '92, 2011, and 2013?
 15 **A. Yes. It is consistent. I have always used the**
 16 **same hydrology for what I termed as the drought**
 17 **years, and I have used the same hydrology for**
 18 **what I have termed as the normal years.**
 19 **Q.** And that's consistent with what you have done.
 20 But I think you described that baseflow in a
 21 drought year you would expect to be lower than
 22 baseflow in a normal year?
 23 **A. Yes.**
 24 **Q.** Sir, I would like to now talk about impact
 25 factors. And that -- that's another output from

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1 the model?
 2 **A. We can compute an impact factor from the model,**
 3 **yes.**
 4 **Q.** Okay. And you explained earlier today, in fact,
 5 as well as in your direct testimony that impact
 6 factors vary depending on a variety of factors,
 7 including the distance of an irrigation well from
 8 the stream?
 9 **A. Let me clarify first. There are several**
 10 **different types of impact factors. The**
 11 **basin-wide impact factor for an annual average**
 12 **condition is what I was talking about**
 13 **specifically. I believe that's what you are**
 14 **referring to. And for that, that is the impact**
 15 **of pumping divided by the absolute pumping value**
 16 **throughout the basin.**
 17 **So in that sense, if you have pumping close**
 18 **to the streams, your impact is going to be**
 19 **larger. If your pumping is further away from the**
 20 **streams, your impact is going to be smaller.**
 21 **Q.** Yes. And we'll certainly talk about the annual
 22 average impact factor. But what I'm focused on
 23 now is the fact that impact factors will vary all
 24 throughout the basin depending on where you're
 25 pumping from, the relative impact that pumping

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1 will have on baseflow will vary. You said so
 2 yourself?
 3 **A. Yes.**
 4 **Q.** Can you please turn to tab 7, sir.
 5 **A. Yes.**
 6 **Q.** This is a document designated as Joint
 7 Exhibit 71. Have you seen this document before?
 8 **A. Yes.**
 9 **Q.** Okay. And the document is a publication by L.
 10 Elliott Jones. Is that the Mr. Jones from the
 11 Jones and Torak model?
 12 **A. I believe so.**
 13 **Q.** Okay. I want to focus on page 3 at the map on
 14 JX-71.
 15 **A. Yes.**
 16 **Q.** Okay. Can you tell us what this map shows?
 17 **A. Yes. This is the location-dependent impact**
 18 **factor. So essentially what this shows is that**
 19 **if at any point in this map, if you are pumping,**
 20 **then the color indicates what that impact would**
 21 **be of pumping from that location on the streams.**
 22 **So when you see the color is red, it's closer**
 23 **to the streams; and the impact is larger. And**
 24 **when the color is blue, that is further away from**
 25 **the streams; and the impact is less.**

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1 **Q.** And the areas where there's dark red, the impact
 2 factor would be close to -- or somewhere between
 3 90 to 100 percent?
 4 **A. That's what is shown on this map.**
 5 **Q.** Okay. And how would you describe the 90 to 100
 6 percent? What does that number represent?
 7 **A. That is the percentage of pumping which is**
 8 **captured from the baseflow. So that would be the**
 9 **reduction of the baseflow to streams as a result**
 10 **of pumping. And that value is the percentage of**
 11 **that pumping value.**
 12 **Q.** Okay. And the little red dots throughout the
 13 map, what do those represent?
 14 **A. Irrigated acres by node in the model.**
 15 **Q.** So you understand that to be the location of the
 16 irrigation that's done in the model domain?
 17 **A. I believe so.**
 18 **Q.** Okay. You have reproduced this particular
 19 graphic in your expert testimony; don't you?
 20 **A. I believe so.**
 21 **Q.** All right. So you are familiar with it?
 22 **A. Yes.**
 23 **Q.** Okay. Sir, would you agree that as depicted in
 24 the map we're looking at, the impact factors will
 25 vary anywhere from, you know, .1 all the way to

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1 90 to 100 percent?

2 **A. That is correct. This is the steady-state impact**

3 **factor.**

4 **Again, there are so many different impact**

5 **factors that I do want to clarify which impact**

6 **factor we're talking about because that can get**

7 **confusing.**

8 **Q.** I think it is important to clarify that because

9 one of the things you do in your direct testimony

10 is you criticize Florida's expert for what you

11 call abandoning the impact factor. Do you recall

12 that testimony?

13 **A. I don't think I said that he abandoned the impact**

14 **factor. If I recall, he's changed his number for**

15 **the impact factor. That's what he did from his**

16 **expert report to his direct testimony.**

17 **Q.** Okay. And we'll certainly look at that, but I

18 want to first direct you to paragraph 86 of your

19 direct testimony. That's behind tab 1. And

20 paragraph 86 is page 49, sir.

21 **A. Yes.**

22 **Q.** Okay. And you will see in the middle of the

23 paragraph you actually state that Florida has now

24 abandoned the opinion?

25 **A. This is paragraph 86. Right?**

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1 **Q.** That's correct, sir, on page 49.

2 **A. Yes.**

3 **Q.** Okay. So you do recall using those words?

4 **A. Yes. And, again, that's exactly what I was**

5 **saying. They have abandoned the 40 percent**

6 **number, and now they're using a 60 percent**

7 **number. That's what I was saying.**

8 **Q.** Yes. And that's exactly what I would like to

9 explore next, sir. The 40 percent number, the 38

10 to 40 percent that you ascribed to Florida's

11 expert, Dr. David Langseth, it's not in his

12 expert report. Correct?

13 **A. He has the 40 percent number in his expert report**

14 **the. The 38 percent number or around 38 percent**

15 **is what I had obtained through all my model**

16 **simulations.**

17 **Q.** And the 40 percent number that you're associating

18 with Dr. Langseth, he actually says that that's

19 the number that Jones and Torak had derived in

20 their 2006 model. He doesn't adopt it; does he?

21 **A. Dr. Langseth never ran any groundwater model. He**

22 **used the report of the Jones and Torak model --**

23 **2006 model; and he extracted impact factors from**

24 **that.**

25 **Q.** My question for you, sir, is Dr. Langseth never

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1 adopted the 40 percent impact factor that's

2 associated with Jones and Torak as his own. He

3 never said, this is the impact factor that I'm

4 endorsing. In fact, he always proposed a range;

5 isn't that true?

6 **A. He use the 40 percent impact factor value in his**

7 **conservation scenarios in the multiple scenarios**

8 **that he provided in his expert report. That 40**

9 **percent value was, I believe, also used then by**

10 **other Florida experts when they were evaluating**

11 **their scenarios of conservation for Georgia's**

12 **agricultural pumping.**

13 **So the 40 percent value was adopted by them.**

14 **They used it in all their calculations.**

15 **Q.** Okay, sir. Perhaps we can refresh your

16 recollection if we go to tab 8. That is

17 Dr. Langseth's expert report.

18 **A. Yes.**

19 **Q.** Tab 8 is FX-795. And you recall reviewing this;

20 don't you, sir?

21 **A. Yes.**

22 **Q.** And it's a lengthy expert report, so I'll direct

23 you to particular pages; and you can let me know

24 if you recall reviewing these previously.

25 I would like to first turn to page 54. On

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1 page 54 is a section entitled Conservation

2 measure scenario, 50 percent reduction in

3 agricultural withdrawals in the Georgia portion

4 of the ACF Basin. Do you see that?

5 **A. I don't see that.**

6 **Q.** Okay. That's my fault because I should have

7 referred you to the prior page for the heading.

8 The heading appears on page 53, section 5.2

9 titled Conservation measure scenario, 50 percent

10 reduction in agricultural withdrawals in the

11 Georgia portion of the ACF River Basin.

12 **A. Yes.**

13 **Q.** And then on page 54, the paragraph right before

14 the table, perhaps you could read that to

15 yourself, sir.

16 **A. Yes. I read that.**

17 **Q.** Okay. And you will see that he lists an average

18 annual impact factor for the cells that he's

19 selected in his conservation scenario of .56;

20 isn't that right?

21 **A. This is the impact factor -- the impact factor**

22 **that he selected for his conservation scenario.**

23 **And this is not the basin-wide impact -- these,**

24 **again, are different impact factors.**

25 **Q.** I understand, sir. If we could now turn to page

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1 SS7.

2 I think SS stands for summary statement, so

3 it should be in the front.

4 **A. Thank you.**

5 **Q.** And I want to focus on a paragraph where

6 Dr. Langseth discusses the Jones and Torak model.

7 And it's a paragraph that begins, for my

8 evaluation.

9 **A. Yes.**

10 **Q.** And my question is really you understand that

11 Dr. Langseth had characterized the Jones and

12 Torak model as conservative?

13 **A. That's what he says, yes.**

14 **Q.** Right. And you understood that that was his

15 position when you prepared your direct testimony?

16 **A. I have referenced each of his concerns about the**

17 **model in my expert report.**

18 **Q.** Okay. And my question, again, was you understood

19 that he was characterizing it as a conservative

20 model and that he further characterized it at the

21 bottom of this paragraph I just directed you to

22 as a model that was designed to produce biased,

23 low results. Did you understand that?

24 **A. Yes. I know that that's his position. And I**

25 **have refuted his position in my expert report.**

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1 **Yes.**

2 **Q.** But to the extent that you are ascribing to him

3 as endorsing a 40 percent impact factor, you knew

4 that he had these beliefs with respect to the

5 2006 Jones and Torak model? You knew that?

6 **A. He stated this, yes. But he still also stated**

7 **that it is the best model available to determine**

8 **the impact of pumping. And he has used the 40**

9 **percent value, too, in his report -- in his**

10 **expert report for the conservation scenarios.**

11 **Q.** Dr. Panday, did you review Dr. Langseth's

12 deposition transcript?

13 **A. I was there for a couple of his -- days of his**

14 **deposition. But I don't believe I have reviewed**

15 **his deposition transcript.**

16 **Q.** He was deposed for four days, as you know.

17 **A. That is right. But I wasn't there for his**

18 **other -- other depositions.**

19 **Q.** Okay. Were you there for the last deposition in

20 August?

21 **A. No. I was there for the depositions before --**

22 **before mine was -- before my deposition occurred.**

23 **Q.** Did you ever become aware that at his August

24 deposition, he explained that the impact factor

25 is a range between 40 to 60; and it could be

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1 higher? Did anyone ever tell you that?

2 **A. I see that in his direct testimony; but I -- and**

3 **in Dr. Hornberger's direct testimony as well.**

4 **But that's all I know about that.**

5 **Q.** And did you ever follow up to see if he said that

6 at his deposition?

7 **A. No, I did not. I don't have his deposition.**

8 **Q.** All right. So before you wrote down Florida has

9 abandoned this opinion, you didn't go back and

10 check to see if they ever talked about it at

11 their depositions?

12 **A. In the direct testimony and in Dr. Hornberger's**

13 **direct testimony, they start using 60 percent**

14 **instead of 40 percent. So that's why I say that**

15 **they have abandoned the 40 percent because**

16 **this -- all the expert reports used 40 percent;**

17 **and when the direct testimonies come, they all**

18 **started using 60 percent.**

19 **Q.** But you understand that the depositions occurred

20 before the direct testimony was submitted?

21 **A. Yes.**

22 **Q.** And did you ever review all of Dr. Langseth's

23 deposition?

24 **A. No, I did not.**

25 **Q.** I want to stay on this topic of abandonment. I

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1 want to move on to a different document. Can you

2 please turn with me to tab 9.

3 **A. Yes.**

4 **Q.** Okay. Sir, you previously worked for a company

5 called Hydrogeologic?

6 **A. Yes.**

7 **Q.** Okay. And Hydrogeologic was retained by the

8 Northwest Florida Water Management District in

9 the late 1990's to conduct groundwater modeling?

10 **A. Yes.**

11 **Q.** Okay. And in particular, the groundwater

12 modeling that was performed for the Northwest

13 Florida Water Management District, it involved

14 the ACF Basin; did it not?

15 **A. We had several projects with them, and I believe**

16 **one of them was for the ACF River Basin.**

17 **Q.** Okay. And the document that is behind tab 9,

18 FX-594, that relates to the ACF Basin; does it

19 not?

20 **A. Yes.**

21 **Q.** And you worked on that project?

22 **A. Yes.**

23 **Q.** Okay. When you were working on that project, did

24 the Northwest Florida Water Management District

25 pressure you to reach a certain conclusion?

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1 **A. No.**

2 **Q.** The document designated as FX-594 was authored by

3 you?

4 **A. Yes.**

5 **Q.** And it's dated June 1998. Did you prepare it in

6 or around that time?

7 **A. Yes. Yes.**

8 **Q.** Can I ask you to review the last two sentences of

9 the first paragraph on page 1.

10 You're certainly free to read the entire

11 paragraph, but my questions are going to focus on

12 that.

13 It's the first page of FX-594.

14 **A. Yes.**

15 **Q.** Okay.

16 **A. I have read the last two sentences, too.**

17 **Q.** At the time you wrote these two sentences that

18 there exists a high degree of hydrologic

19 interaction between the aquifers and the streams

20 and floodplains and estuaries of the basin, did

21 you believe it to be true?

22 **A. Yes.**

23 **Q.** And do you believe it to be true today?

24 **A. Yes.**

25 **Q.** And the focus of the work you were doing was to

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1 quantify the net groundwater discharge and the

2 fluctuations in the streams and rivers that

3 discharge in Apalachicola Bay?

4 **A. I believe this work was to build upon an earlier**

5 **model by Torak and McDowell, which was just a**

6 **steady state model. And we evaluated**

7 **sensitivities to certain parameters in this**

8 **project, and we converted the model from a steady**

9 **state model to a transient model. So we looked**

10 **at the behavior of the system for transient**

11 **cyclic conditions.**

12 **Q.** Okay. My question was just really designed to go

13 at the last sentence on the page to see if the

14 whole work was intended to quantify the impact

15 that the groundwater fluctuations would have on

16 the river and the bay. Is that why you did this

17 work?

18 **A. Can you repeat your question, please.**

19 **Q.** Sure.

20 **A. I did not quite follow you.**

21 **Q.** The last sentence on the first page --

22 **A. Yes?**

23 **Q.** -- did that accurately describe the work you were

24 doing for the Northwest Florida Water Management

25 District?

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1 **A. The last sentence is the entire hydrologic**

2 **system, therefore, needs to be quantified to**

3 **examine the effects of the various water uses**

4 **upon each other and upon discharge to streams**

5 **that flow into Apalachicola Bay. It's -- it**

6 **really does not describe the work we did.**

7 **The work we did was run the model for**

8 **sensitivity simulations and run the model for**

9 **transient simulations. So that is the work we**

10 **did.**

11 **Q.** And, actually, I meant to direct you to the last

12 sentence on the bottom of the page. And that

13 describes the work. So I apologize for that.

14 **A. That is correct.**

15 **Q.** Okay.

16 **A. The last two sentences actually talk about the**

17 **work that was done here. Okay. The current**

18 **study expands on these previous modeling efforts**

19 **by examining a cyclic transient behavior of the**

20 **system for monthly varying current and estimated**

21 **future pumping rates.**

22 **And then it says the focus of this work is to**

23 **quantify the net groundwater discharge and its**

24 **fluctuations to streams and rivers that discharge**

25 **into the Apalachicola Bay.**

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1 **Q.** Okay. Thank you, sir.

2 Can we now turn to the conclusions of this

3 work on page 25.

4 **A. Yes.**

5 **Q.** And the conclusions actually run onto page 26,

6 but I'm interested in the two paragraphs on 25.

7 So if you might read those to yourself.

8 **A. Yes.**

9 **Q.** I'll have a couple of follow-up questions after

10 you finish.

11 **A. Yes. I have read that.**

12 **Q.** Okay. There's a reference in the first paragraph

13 to the Newton, Bainbridge, and Woodruff reaches.

14 **A. Yes.**

15 **Q.** What does that represent?

16 **A. Those are reaches on the Flint River.**

17 **Q.** Okay. And when you wrote the Newton, Bainbridge,

18 and Woodruff reaches are the most affected by

19 pumping, did you believe that was a true

20 statement at the time?

21 **A. Yes.**

22 **Q.** And when you wrote that the effects of the

23 individual reaches result in a cumulative effect

24 in flow reduction of the Apalachicola River, did

25 you believe that was a true statement at the

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1 time?

2 **A. Yes.**

3 **Q.** And in the conclusion section, you write that the

4 total reduction in streamflow is approximately 60

5 percent of total groundwater pumped during one

6 annual cycle. Do you see that?

7 **A. Yes.**

8 **Q.** Okay. And did you believe that was a true

9 statement at the time?

10 **A. Yes. We used that on the model at the time. And**

11 **at that time we did not have very good estimates**

12 **of agricultural irrigation in the area. And for**

13 **that model, we did get the 60 percent number.**

14 **And that model has been updated by the**

15 **Georgia EPD, by the USGS. They have looked at**

16 **irrigation. They have tried to be a lot more**

17 **accurate with their irrigation estimates. And**

18 **there is a new model now.**

19 **Q.** Okay. And in this report, do you advise the

20 Northwest Florida Water Management District that

21 the information you're presenting them might be

22 inaccurate?

23 **A. We have -- at that time we used the best**

24 **information that was available.**

25 **Q.** I understand.

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1 I want to move on to a different topic now,

2 sir; and that is your opinion that the

3 groundwater pumping in the Lower ACF Basin has

4 a minimal impact on streamflow at the

5 Florida-Georgia line.

6 **A. Yes.**

7 **Q.** Okay. And you testified that that relationship

8 holds even in drought conditions and peak

9 irrigation in the Lower ACF Basin; is that right?

10 **A. Yes.**

11 **Q.** If you turn to page 27 of your direct testimony,

12 you have a graph that looks at groundwater

13 pumping in the Upper Floridan Aquifer and

14 compares it to streamflow at the Chattahoochee

15 Gage.

16 I'll give you a moment to get there.

17 **A. Yes. Yes.**

18 **Q.** And for this figure, you estimate that the total

19 streamflow reductions, because of groundwater

20 pumping in July 2011, amount to about 511 cfs?

21 **A. The total pumping in the Upper Floridan Aquifer**

22 **in Georgia provided a baseflow reduction --**

23 **maximum baseflow reduction of 511 cfs, yes.**

24 **Q.** And, again, we're just looking at the model

25 domain; we're not looking at the entire basin?

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1 **A. We're looking at the Upper Floridan Aquifer; that**

2 **is correct.**

3 **Q.** And you then compare that to what are the

4 observed flows at the Chattahoochee Gage; is that

5 correct?

6 **A. That's what this figure compares, yes.**

7 **Q.** Okay. So you're comparing modeled results to

8 observed flows; is that right?

9 **A. That is correct.**

10 **Q.** Okay. But you're just looking at groundwater;

11 isn't that right?

12 **A. This impact is just from groundwater, what we see**

13 **in this figure, yes.**

14 **Q.** Okay. And do you know what the total Georgia

15 withdrawals -- I'm sorry, the total Georgia

16 estimated reductions to streamflow were in July

17 of 2011?

18 **A. I have provided an estimate of the net -- I can**

19 **point you to it; it's in my direct testimony --**

20 **of the net impact of all of Georgia's pumping on**

21 **baseflow in the basin, yes.**

22 **Q.** I'm actually not asking about just groundwater

23 pumping. I'm asking about everything.

24 **A. Right.**

25 **Q.** Groundwater pumping, plus surface water

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1 irrigation, municipal and industrial use. Do you

2 ever compare that to the flows at the

3 Chattahoochee Gage?

4 **A. I have not compared the municipal and industrial.**

5 **I have not included the municipal and industrial**

6 **pumping from surface waters. I have included**

7 **agricultural pumping in the basin. I have**

8 **included agricultural withdrawals from surface**

9 **waters also in the basin.**

10 **Q.** Do you know what the total number that Georgia

11 estimates -- Georgia EPD estimates that it

12 reduced streamflow by in 2011? Do you know what

13 that number is?

14 **A. No, I don't. My number that I have for all of**

15 **agricultural irrigation pumping in the basin is**

16 **less than a thousand cfs.**

17 **Q.** But you agree, sir, that groundwater, surface

18 water, it all has a cumulative impact on flows

19 that Florida receives?

20 **A. Every impact is added up; so you have a**

21 **cumulative impact, yes.**

22 **Q.** Okay. And if you want to figure out what that

23 cumulative impact is, we can go to -- as

24 estimated by Georgia, we can go to Dr. Zeng's

25 testimony. And that's behind tab 10 of your

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1 binder.

2 In particular, I'll direct you to a figure

3 that's on page 7 of his testimony.

4 **A. Yes.**

5 **Q.** Okay. And you will see that in July 2011, the

6 total consumptive use as estimated by Georgia is

7 roughly 1800. Do you see that?

8 **A. Yes.**

9 **Q.** And if you compare that to the state line flows

10 during that month, do you know what the impact

11 is? 1800 divided by 5,000?

12 **A. I can do the math.**

13 **Q.** Okay. 36 percent, right?

14 **A. I'm not sure. I don't have a calculator with me.**

15 **Q.** Okay. Sir, I'm ready to move to another topic.

16 And for this, I think we're going to rely

17 principally on the second binder; but we may come

18 back to the first one, because that's got your

19 prefiled direct in it. So just keep it handy.

20 The focus of these questions is going to be

21 whether you evaluated Georgia EPD documents when

22 you rendered your opinion that groundwater

23 withdrawals only have a minimal insignificant

24 impact. Did you ever compare that against

25 documents that Georgia EPD itself had published

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1 on this topic? That's going to be the focus of

2 this line of questioning.

3 Did you review the Flint River Basin Regional

4 Water Development and Conservation Plan,

5 sometimes called the Flint River plan, from 2006

6 in your work?

7 **A. I have looked at documents which talk about state**

8 **water planning. I'm not -- if you can point me**

9 **to the exact document, I'll tell you if I have**

10 **reviewed that one.**

11 **Q.** Certainly. And that's going to be the document

12 behind tab 11. This is JX-21. It's dated

13 March 20, 2006, and entitled Flint River Basin

14 Regional Water Development and Conservation Plan.

15 Now, do you recall reviewing this in the

16 course of your study, sir?

17 **A. I believe I saw this yesterday or day before**

18 **yesterday. And I was trying to recall if I had**

19 **seen it earlier.**

20 **There are some figures in there which are**

21 **similar to what I have seen before.**

22 **Q.** Okay. If you might turn to pages 19 and 20, you

23 will see a list of Stakeholder Advisory Committee

24 members and Technical Advisory Committee members.

25 This is 19 and 20.

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1 **A. Yes.**

2 **Q.** Take a moment to look at those names. Do you

3 recognize any of those people?

4 **A. I know some of the names. I know the name of --**

5 **I have seen the name Dr. Golladay. I have seen**

6 **the name Woody Hicks, Mark Masters. And that's**

7 **it.**

8 **Q.** Okay. We just talked about Mr. Woody Hicks

9 earlier today. Did you talk to any of these

10 people in connection with doing your work here,

11 sir?

12 **A. No, I have not. But I have spoken a little bit**

13 **with Mark Masters because I have run into him**

14 **during the course of this work.**

15 **Q.** Okay. I want to look at particular statements in

16 this plan and ask you if they're consistent with

17 the conclusions that you have reached in this

18 matter.

19 We can start by looking at page 15 of JX-21.

20 And there's a paragraph that begins, water use in

21 the Flint River Basin. And if you might read

22 that paragraph to yourself.

23 **A. Yes. I have read it.**

24 **Q.** Okay. Sir, do you agree that groundwater

25 withdrawals can reduce streamflow and, therefore,

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1 degrade aquatic habitats?

2 **A. Yes. Groundwater withdrawals can reduce**

3 **streamflow, and locally there could be habitats**

4 **that could be affected by that.**

5 **Q.** Okay. And we're certainly going to address that

6 issue, whether the impacts are local or more

7 regional; but you do agree with the statement?

8 **A. Yes.**

9 **Q.** Now, can you please turn with me to page 21; and

10 we'll review a series of technical findings.

11 **A. Yes.**

12 **Q.** And we're going to focus on technical finding 2

13 and 3 in particular.

14 **A. Yes.**

15 **Q.** Have you had a chance to look at 2 and 3?

16 **A. I will read them now.**

17 **Q.** Okay. Thank you.

18 **A. Yes. I have read that.**

19 **Q.** Okay. Is technical finding 2 consistent with the

20 conclusions that you reached in this matter, sir?

21 **A. I do not know the full context of this document.**

22 **But I can confirm that in some sub-basins, the**

23 **impact of pumping to streamflow can be large; and**

24 **in some sub-basins, there is barely an impact.**

25 **And that's pretty much what I take from this**

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1 **technical finding 2.**

2 **Q.** Okay. The same question with respect to

3 technical finding 3, is that consistent with the

4 conclusions you reached in this matter?

5 **A.** **Again, over here I don't know the context of the**

6 **entire document. But he says that the data he**

7 **has provides evidence that agricultural**

8 **irrigation compounded the effect of climatic**

9 **drought on streamflow. So essentially he is**

10 **saying that both the drought and pumping can have**

11 **these impacts which -- and, again, he's talking**

12 **about local aquatic habitats.**

13 **Q.** Okay. He writes -- the authors write that the

14 data provides the clearest evidence that

15 agricultural irrigation compounds the effect of

16 drought on streamflow. Isn't that right?

17 **A.** **That's what he says here.**

18 **Q.** All right. And he goes on to say that that

19 effect is more pronounced during drought. Do you

20 agree with that?

21 **A.** **Yes. There will be less baseflow during**

22 **droughts. I agree with that.**

23 **Q.** Okay. And do you agree that irrigation compounds

24 the impacts of drought on groundwater discharge

25 into streams?

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1 **larger impacts; some watersheds could have less**

2 **impacts. I agree with technical finding 3**

3 **inasmuch that if you are pumping groundwater, it**

4 **will impact streams. And that if you are in**

5 **drought conditions, the baseflow is going to be**

6 **even less.**

7 **Q.** Sir, did you evaluate the impact of agricultural

8 irrigation on blue hole springs in Georgia?

9 **A.** **No, I did not.**

10 **Q.** All right. Do you know what blue hole springs

11 are?

12 **A.** **I believe these are springs which get water from**

13 **groundwater.**

14 **Q.** That's right. And if you -- that's exactly

15 right. And if you turn to page 67 and 68 of

16 JX-21, there is some discussion of this topic.

17 Do you recall reviewing this in the course of

18 your work here, sir?

19 **A.** **I don't know if I read this very document. But I**

20 **recall that Florida had brought up blue hole**

21 **springs, so I had looked at that as well.**

22 **Q.** And is that discussed in your direct testimony?

23 **A.** **I'm not sure I have referred to blue hole springs**

24 **in my direct testimony. I have looked at the**

25 **local impacts that Florida has discussed.**

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1 **A.** **Pumping of groundwater will reduce the flow of**

2 **groundwater to streams. But how much, the**

3 **quantity, is what I have evaluated in my**

4 **evaluation.**

5 **And he -- he's -- this is a general**

6 **statement. And it does. I agree. If you pump**

7 **groundwater, you're going to affect streams.**

8 **Q.** Do you -- do you know who put this together, this

9 particular document?

10 **A.** **No, I don't.**

11 **Q.** Well, if you look on the cover page, that might

12 give you --

13 **A.** **Yes.**

14 **Q.** -- some insights.

15 **A.** **I was just going there.**

16 **Yes. It says it was produced by Georgia**

17 **Department of Natural Resources Environmental**

18 **Protection Division. Carol Couch, director;**

19 **Robin J. McDowell, plan coordinator.**

20 **Q.** Okay. And we'll look at their quantification of

21 amounts in other documents. But the technical

22 findings 2 and 3 are consistent with the

23 conclusions you reached in this matter?

24 **A.** **I agree with what he says in technical finding 2**

25 **that when you pump, some watersheds could have**

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1 **Q.** The -- the particular blue hole spring that's

2 referred to here is -- referred to here is Radium

3 Springs. Have you heard of Radium Springs

4 before?

5 **A.** **Yes, I have.**

6 **Q.** And you know it's the largest natural spring in

7 Georgia?

8 **A.** **I don't know about that.**

9 **Q.** You were unaware of that?

10 **A.** **No, I don't know if that's the largest spring in**

11 **Georgia, no.**

12 **Q.** Okay. It says here on page 67 that the flow in

13 Radium Springs has been measured at 49,000

14 gallons per minute. Do you see that?

15 **A.** **Yes.**

16 **Q.** And, sir, were you aware that Georgia EPD says

17 that Radium Springs went dry for the first time

18 in recorded history because of drought and

19 increased withdrawals?

20 **A.** **I have done a little analysis of Radium Springs.**

21 **I looked at the flows in Radium Springs and**

22 **minimum flows during droughts in past years,**

23 **earlier years. And I don't recall the exact**

24 **numbers, but they were small. They were, I**

25 **believe, less than 10 cfs, if I recall. And if**

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1 **that became dry, so your -- the difference is 10**
 2 **cfs. And I don't think that has much of an**
 3 **impact flow into Florida.**
 4 **Q.** Okay. So the answer to my question is, yes, you
 5 were aware that it went dry?
 6 **A. I have reviewed the data, yes. And it had gone**
 7 **dry recently. But the flows were very low in**
 8 **previous droughts as well.**
 9 **Q.** And according to JX-21, the flow was measured at
 10 49,000 gallons per minute. That's approximately
 11 70.6 million gallons a day?
 12 **A. I see that. I don't know the context of that. I**
 13 **don't know whether this is an annual average. I**
 14 **don't know which year this was in.**
 15 **Q.** Okay. Sir, do you know what a 7Q10 value is?
 16 **A. I have heard of that, but I don't -- I'm not too**
 17 **sure what it is.**
 18 **Q.** Okay. Did you associate it with being a low flow
 19 metric?
 20 **A. I believe it's some sort of flow metric. I'm not**
 21 **sure whether it's a low flow metric.**
 22 **Q.** But as a groundwater hydrologist, you haven't
 23 come across that before?
 24 **A. I don't use this often in my work, no.**
 25 **Q.** Can we please turn to page 134.

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1 **A. Yes.**
 2 **Q.** Okay. I'm interested in the table at the top of
 3 the page, this table 6.8. Do you recall
 4 reviewing that previously?
 5 **A. No, I haven't. I haven't seen this.**
 6 **Q.** Okay. If you will follow along with me, you will
 7 see that the table represents the streamflow at
 8 three different locations along the Flint River.
 9 Ichawaynochaway Creek, do you know where that
 10 is?
 11 **A. Yes.**
 12 **Q.** Okay. Flint River at Bainbridge, do you know
 13 where Bainbridge is?
 14 **A. Yes.**
 15 **Q.** And Spring Creek near Iron City; do you know
 16 where that --
 17 **A. Yes.**
 18 **Q.** Okay. And the first row talks about the 7Q10,
 19 the low flow measurement pre-1970's. And you
 20 will see that for Ichawaynochaway Creek, that's
 21 at 140 cfs. For Flint River at Bainbridge,
 22 that's at 2500. And at Spring Creek, it's 15.
 23 Do you -- are you following me?
 24 **A. I see those numbers. I don't know what they**
 25 **represent. I don't know what the 7Q10 is.**

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1 **Q.** It's a low flow metric, sir.
 2 **A. That's what you represent to me, but I don't**
 3 **understand what the metric does.**
 4 **Q.** The metric represents the lowest seven-day
 5 average over a 10-year period.
 6 Go down to the column that talks about -- the
 7 row that talks about current model. This is
 8 referring to the current level of agricultural
 9 irrigation as of 2006. And Georgia EPD is
 10 evaluating the impact it has on streamflows in
 11 the Flint River at these three locations. And
 12 under the current 2006 conditions, the level of
 13 agricultural irrigation reduces the streamflow
 14 7Q10 value from 140 to 20. Do you see that?
 15 **A. That's what this table says. Yes, I see what it**
 16 **says here.**
 17 **Q.** And at Flint River Bainbridge it goes from 2500
 18 to 1500. Do you see that?
 19 **A. This table says that the number 2500 for**
 20 **pre-'70's data shows -- went down to 1500 for the**
 21 **current model data.**
 22 **Q.** Okay. And the current model data was as of 2006;
 23 is that right?
 24 **A. Where does it say that? Could you please point**
 25 **me to that?**

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1 **Q.** It's the cover page. We just looked at it.
 2 Right?
 3 That's when this report was issued.
 4 **A. This document was written in March of 2006, so**
 5 **I'm not sure. The model could have been another**
 6 **year model.**
 7 **Q.** Okay. You never studied this table, sir, before
 8 rendering your opinions on groundwater
 9 withdrawals?
 10 **A. No.**
 11 **This is not relevant to my case. I don't**
 12 **know what 7Q10 is. I don't know what that metric**
 13 **is.**
 14 **I have evaluated the net flow or the impact**
 15 **of pumping within Georgia on the net flow in the**
 16 **basin into Florida -- to Lake Seminole, I would**
 17 **say. And --**
 18 **Q.** And -- sorry.
 19 **A. And that's what I evaluated. So I didn't need**
 20 **to -- and I don't know what 7Q10 metric is.**
 21 **Q.** So was it important to you as part of your
 22 analysis to see what Georgia EPD had determined
 23 the impact of agricultural pumping would have
 24 been?
 25 **A. I have looked at Georgia EPD's work for overall**

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1 **impact of groundwater pumping in the basin.**
 2 **There were a lot of documents that came my way**
 3 **which have little local impacts, and I did not**
 4 **look at those documents.**
 5 Q. Because you didn't think that they were material
 6 to your analysis?
 7 A. **That is correct. They were not material to my**
 8 **analysis because these are small and local**
 9 **impacts. And I add them all up because finally**
 10 **the objective is to add up, to look at the net**
 11 **impact. So that is what I was done.**
 12 Q. Okay. So a reduction of Flint River flow from
 13 2500 to 1500, a reduction of a thousand cfs is
 14 not material to your work?
 15 A. **I don't think it's the same as a reduction of a**
 16 **thousand cfs. This is some metric which is a**
 17 **7Q10 metric. And I'm not sure what that is. And**
 18 **you're representing to me that that is an actual**
 19 **reduction. It is some metric that is reproduced,**
 20 **and that is what this table says.**
 21 Q. Okay. And that's what Georgia EPD prepared?
 22 A. **The state -- this report was prepared by Georgia**
 23 **EPD, yes.**
 24 Q. Okay. Let's go on to a discussion on what
 25 Georgia EPD determined with respect to the
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1 Clayton Aquifer. And if you will turn with me to
 2 page 76, please.
 3 A. **Yes.**
 4 Q. And the section I'm interested in is 5.1.2. It's
 5 fairly lengthy, but the provisions that I'm
 6 interested in begin in the sixth line down. And
 7 it's a sentence that starts with, in the coastal
 8 plain the heavily used Clayton Aquifer.
 9 A. **Yes.**
 10 Q. Okay. Do you agree with Georgia EPD that the
 11 Clayton Aquifer is heavily used?
 12 A. **That is a relative term, I guess. It may be**
 13 **heavily used. But the most-used aquifer is the**
 14 **Upper Floridan Aquifer.**
 15 Q. Do you agree with Georgia EPD that the Clayton
 16 Aquifer has experienced, quote, extreme head
 17 declines?
 18 A. **I cannot know.**
 19 Q. Do you agree with Georgia EPD that groundwater
 20 withdrawals from the Clayton Aquifer, quote,
 21 caused adverse effects on other water users where
 22 the Clayton Aquifer is being used, end quote?
 23 A. **I do not know what the context of this is.**
 24 Q. Okay. Sir, when were you engaged in this matter?
 25 A. **I believe April of 2015.**
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1 Q. And have you been working on this matter
 2 continuously since that time?
 3 A. **I have been working on this, yes.**
 4 Q. Okay. Can we please turn to page 145, sir.
 5 And I would request that you read the
 6 paragraph at the bottom of the page that begins,
 7 the most severe drought conditions. It continues
 8 on through on page 147.
 9 A. **Yes. I have read that.**
 10 Q. Okay. Do you agree with Georgia EPD that
 11 groundwater withdrawals significantly impact
 12 streamflow in drought years when irrigation is
 13 intense and the aquifer has not recharged from
 14 the previous year?
 15 A. **I do not know the context of this, but**
 16 **groundwater withdrawals will have some impact;**
 17 **and drought-related impacts are definitely there**
 18 **in Spring Creek, yes.**
 19 Q. Okay. But you're unable to say whether those
 20 impacts are significant in the way that Georgia
 21 EPD has characterized it?
 22 A. **We have not quantified what is the impact of**
 23 **drought versus what is the impact of pumping.**
 24 **And that is what I have been focusing on. There**
 25 **is no evaluation or analysis saying this much**
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1 **percentage was the drought impact and this much**
 2 **was the pumping impact.**
 3 Q. Okay. If we can jump ahead to tab 22 -- it's the
 4 last tab in the binder -- the document designated
 5 as FX-82. Actually, a September 6, 2011, memo
 6 from Dr. Wei Zeng to Georgia EPD director Allen
 7 Barnes. Have you seen this before, sir?
 8 A. **I'm not sure. I know of some of this**
 9 **information, but I don't think I have seen this**
 10 **before. So --**
 11 Q. Okay. Let's focus on the first page for a
 12 moment, the section entitled Groundwater
 13 Conditions. And in that section Dr. Zeng notes a
 14 clear lack of recharge and replenishment of
 15 groundwater storage after the conclusion of the
 16 2011 growing season. Do you see that?
 17 A. **Yes.**
 18 Q. Did your model results indicate a clear lack of
 19 recharge and replenishment to groundwater
 20 discharge storage in 2011?
 21 A. **That is not what I was modeling. My modeling was**
 22 **focused on the impact of pumping. So I did not**
 23 **evaluate what recharge does to the system. I was**
 24 **specifically looking at how much reduction in**
 25 **baseflow occurs because of pumping within**
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1 **Georgia.**

2 **Q.** So you didn't look at recharge after a winter

3 season when it's generally wet?

4 **A. I have looked at water level data. I have looked**

5 **at streamflow data. But I have not modeled**

6 **recharge or wet -- I have not modeled -- I have**

7 **not modeled less recharge in 2011 or more**

8 **recharge in other seasons, as you are asking me.**

9 **Q.** So when you conclude that a multi-year drought

10 doesn't have any greater impact on streamflow,

11 you haven't modeled it; but you just looked at

12 data?

13 **A. I modeled the impact of pumping in a multi-year**

14 **drought. I have analyzed that.**

15 **So what I did is I looked at the impact of**

16 **pumping in the first year. I looked at what**

17 **residue remains going into the following year.**

18 **So, again, I have specifically looked at the**

19 **impact of pumping. I have separated that out**

20 **from the impact of all these other factors.**

21 **Q.** Including groundwater recharge?

22 **A. Including groundwater recharge; that is correct.**

23 **Q.** All right. Did your model lead you to conclude

24 that the lack of groundwater recovery in 2011

25 was, quote, stunning?

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1 assessment?

2 **A. If you show me the document, I could recall.**

3 **Q.** Certainly. And it's behind tab 12.

4 It's designated as JX-160.

5 **A. Yes, I believe I have seen this document before.**

6 **Q.** Sir, you're aware that this March 2010 report

7 focused on the availability of groundwater in

8 select priority aquifers?

9 **A. I don't know the entire purpose of this document.**

10 **But I have evaluated from this document the**

11 **safe -- the safe yield issues that Florida**

12 **brought up.**

13 **Q.** Dr. Panday, you said safe yield. Might you mean

14 the sustainable yield criteria?

15 **A. That's what I meant. Sorry. The sustainable**

16 **yield.**

17 **Q.** That's fine. The select aquifers that are

18 considered in JX-160 include three that are in

19 the Georgia portion of the ACF Basin, sir. And

20 if you look at page S-2, it will list those.

21 **A. Yes. I see it.**

22 **Q.** And the three that lie within the Georgia portion

23 of the basin that are considered here are the

24 Upper Floridan Aquifer in the Dougherty Plain,

25 the Claiborne Aquifer in the Coastal Plain, and

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1 **A. I did not model the 2011 conditions of the change**

2 **in the last -- in the two drought years. I only**

3 **modeled the impact of pumping. And recharge**

4 **would have dropped, and that would have dropped**

5 **the baseflow itself. But I did not model the**

6 **effect of recharge. I just isolated out the**

7 **impact of pumping, and that was small.**

8 **Q.** So if there's a multi-year drought and recharge

9 is small, you can't tell us how much that will

10 reduce baseflow?

11 **A. I can tell you how much the pumping has reduced**

12 **the baseflow.**

13 **Q.** That's not my question.

14 **A. Right. But that's what I analyzed.**

15 **Q.** So you can't tell us how much the absence of

16 recharge will impact streamflow --

17 **A. I have --**

18 **Q.** -- is that right?

19 **A. I have not modeled that. But I can certainly**

20 **look at the streamflow information; and we can**

21 **see that if there is lack of recharge, then**

22 **you're going get less streamflow. And we have**

23 **seen that in the signature.**

24 **Q.** Okay. In the course of your work, sir, did you

25 review EPD's March 2011 groundwater availability

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1 the Cretaceous Aquifer in the Coastal Plain; is

2 that right?

3 **A. Those three aquifers do lie in the ACF River**

4 **Basin; that is correct.**

5 **Q.** Okay. And when you reviewed this document as

6 part of your analysis, did you also review the

7 comments the U.S. Fish and Wildlife Service made

8 to the State of Georgia about its groundwater

9 availability assessment?

10 **A. If you point me to those comments, I would**

11 **probably recollect.**

12 **Q.** Certainly. It's behind tab 13. And the comments

13 are in the form of a letter that's the second

14 page of FX-320.

15 **A. No, I have not seen this.**

16 **Q.** Okay. You're welcome to read the entire letter,

17 sir. It's only three pages.

18 I'm going to direct you to the section on the

19 groundwater availability assessment at the bottom

20 of the second page and carrying over to the third

21 page. I'll request that you review that section.

22 SPECIAL MASTER LANCASTER: Counsel,

23 while he's reviewing that, do you have an

24 estimate of how much longer you think you

25 will be?

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1 MR. QURESHI: Your Honor, I believe I
 2 have about 40 minutes.
 3 SPECIAL MASTER LANCASTER: Why don't we
 4 take a recess.
 5 MR. QURESHI: Certainly. Thank you.
 6 (Time Noted: 10:28 a.m.)
 7 (Recess Called)
 8 (Time Noted: 10:38 a.m.)
 9 SPECIAL MASTER LANCASTER: I forgot to
 10 tell you that Devon has an L. L. Bean
 11 catalog. You can look at that to see, if you
 12 want to. They're predicting that they're
 13 going to have 350,000 pair of boots for Cyber
 14 Monday. So I think they didn't hear the
 15 weather report because it's going to be rain.
 16 But, anyway, if you want to look at it,
 17 feel free.
 18 MR. QURESHI: Thank you, your Honor.
 19 BY MR. QURESHI:
 20 Q. Dr. Panday, do you -- going back to Exhibit
 21 FX-320, do you agree with the U.S. Fish and
 22 Wildlife Service's opinion that the groundwater
 23 availability assessment was of minimal use?
 24 A. **I do not know the context of this document. I**
 25 **believe the context of this document is local.**

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1 **And once you get into that local level, I don't**
 2 **know what they're arguing there.**
 3 Q. On page 2 of the letter, right in the section
 4 that talks about groundwater availability
 5 assessment, U.S. Fish and Wildlife explains that
 6 performing a groundwater assessment independent
 7 of a surface water availability assessment is of
 8 limited utility. Do you agree with that?
 9 A. **You can always add the two impacts and see the**
 10 **net impact. So I don't agree that if you do them**
 11 **separately and look at the net impact that it is**
 12 **of limited utility.**
 13 Q. Okay. And you referenced earlier the local
 14 impacts. Are you referring to your conclusion
 15 that violation of the sustainable yield criteria
 16 that Georgia EPD set itself only has local
 17 impacts?
 18 A. **They are exactly that. They are local impacts.**
 19 **That's, in fact, what this document -- the**
 20 **earlier document you showed me presented.**
 21 **It showed the whole map. They were pumping**
 22 **throughout the aquifer. And then they noted**
 23 **where that local impact occurred as a result of**
 24 **pumping throughout the aquifer. That is correct.**
 25 Q. Okay. And in your direct testimony when you

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1 render that opinion, you refer to a specific
 2 report that was prepared by CDM; is that correct?
 3 A. **Yes.**
 4 Q. If you can turn to tab 15, you will see that
 5 document marked as JX-57.
 6 A. **Yes. Yes.**
 7 Q. So this is a document that was prepared by a
 8 consultant on behalf of EPD that led you to
 9 conclude that violations of the sustainable yield
 10 criteria only have a local impact; is that right?
 11 A. **This document showed me that the impact was**
 12 **local. If we look at figure 5, it shows the top**
 13 **line -- up at the top of the basin where the**
 14 **impact had occurred, the sustainable yield**
 15 **criteria were met.**
 16 **And I had the MODFE model, so I could**
 17 **actually go into the model and see what the**
 18 **baseflow was for that stretch of the stream. I**
 19 **could see what -- the base for unpumped**
 20 **conditions and that 40 percent reduction is what**
 21 **the impact is supposed to be, which would**
 22 **violated. So that 40 percent was really**
 23 **negligible.**
 24 **So I looked at this document as well as**
 25 **looked at the Jones and Torak model to determine**

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1 **that the impact was negligible.**
 2 Q. And do you know if the consultants who prepared
 3 JX-57 relied on the Jones and Torak model in
 4 performing their analysis?
 5 A. **I believe they did.**
 6 Q. Okay. And that's the same model you rely on?
 7 A. **That is correct.**
 8 Q. Okay. And you read the entirety of JX-57, sir?
 9 A. **I may have at some stage.**
 10 Q. Okay. Sir, if you look with me to page 4, and in
 11 the paragraph under section 2.2 there is a
 12 discussion about total withdrawals within the
 13 modeled domain as 157 million gallons per day.
 14 Is that right?
 15 A. **That's what it says here, yes.**
 16 Q. Okay. And so to understand what occurred here,
 17 what the authors of this report did is they
 18 compared that 157 million gallons per day against
 19 a sustainable yield criteria to see what the
 20 impacts would be; is that right?
 21 A. **I'm not sure that is correct. I believe what**
 22 **they did is that they had certain criteria. One**
 23 **was the -- one was a 30-foot drawdown within the**
 24 **aquifer. The second was a 40 percent reduction**
 25 **of streamflow.**

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1 **So what they did then was to pump in**
 2 **different sub-areas to figure out how those**
 3 **criteria could be met. So they kept increasing**
 4 **the pumping.**
 5 **I don't clear how they did it, but finally**
 6 **they came up with a basin-wide pumping level.**
 7 **And they upped that until any of these reaches'**
 8 **sustainable yield criteria -- those two criteria**
 9 **we talked about -- were violated. And the**
 10 **criteria that got triggered was the 40 percent**
 11 **reduction in streamflow.**
 12 **And there were two simulations they had done.**
 13 **For one of them, that occurred in Muckaloochee**
 14 **Creek, which is the top corner of the basin; and**
 15 **that was a negligible amount. And for the second**
 16 **simulation which they did which gave them the**
 17 **range, the violation occurred in Mosquito Creek**
 18 **which is, again, a small section. It's a small**
 19 **stream which flows into the Lake Seminole.**
 20 **Q.** And as you describe in your direct testimony, the
 21 impacts at Muckaloochee -- Muckaloochee Creek are
 22 about 1.7 cfs and at Mosquito Creek it's about .7
 23 cfs. And you say those are negligible local
 24 impacts; is that right?
 25 **A. That's correct.**

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1 that after their modeling was complete, Georgia
 2 EPD received information noting that 157 is not
 3 the right number; the actual withdrawals are
 4 somewhere in the range of 450 to 590 million
 5 gallons per day. Isn't that what it says?
 6 **A. That's what it says here, yes.**
 7 **Q.** Okay. And, in fact, that range is what's
 8 used by the regional council for the Lower
 9 Flint-Ochlockonee water region; isn't that right?
 10 **A. I have no idea about that.**
 11 **Q.** You didn't look at this sustainable yield
 12 criteria assessment that is in the Lower
 13 Flint-Ochlockonee plan?
 14 **A. No, I don't know about Ochlockonee.**
 15 **Q.** Let's turn to that, sir. It's behind tab 14.
 16 Have you ever seen this regional water plan
 17 before?
 18 **A. You know, the front page looks familiar; but I**
 19 **don't believe I have seen this before. A lot of**
 20 **documents came across my desk. And, again, I**
 21 **would have flipped through the documents and**
 22 **determined that this is not for the entire basin;**
 23 **and so I didn't look at it further.**
 24 **Q.** Okay. And the model domain that you relied on is
 25 the Lower Flint region; isn't it?

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1 **Q.** But you realize that the 157 million gallons per
 2 day number that CDM relies on was not the total
 3 agricultural water withdrawals in this region.
 4 You're aware of that?
 5 **A. CDM did not rely on this 157 million gallons per**
 6 **day, I believe, in their modeling simulations.**
 7 **As I mentioned, what they did is they had their**
 8 **criteria; and they stopped simulating pumping and**
 9 **increasing the pumping. And then at a certain**
 10 **level of pumping, they noticed certain criteria**
 11 **were triggered. So that's what I believe they**
 12 **did.**
 13 **And then they compared it to the net pumping**
 14 **in the basin and say, oh, the net pumping in the**
 15 **basin was larger than what this model told us for**
 16 **that sustainable yield criteria. That's what I**
 17 **believe they did.**
 18 **Q.** Right. The net pumping was greater than 157
 19 million gallons per day. If you looked at
 20 page 16, sir, in the conclusions section, if you
 21 take a moment to review that and review the
 22 paragraph that begins during 2010, and read that
 23 to yourself.
 24 **A. Yes. I read this paragraph.**

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1 **A. It's the Upper Floridan Aquifer. It's the Lower**
 2 **Flint as well as the Chattahoochee -- Lower**
 3 **Chattahoochee River as -- which has parts of it**
 4 **is in Alabama; and as well the model extends**
 5 **slightly into Florida also.**
 6 **Q.** But -- okay. But your testimony is that you
 7 didn't spend time reviewing FX-24 because it
 8 didn't deal with the whole basin; is that what
 9 you said?
 10 **A. I guess so. I don't -- I -- this is just not**
 11 **familiar to me.**
 12 **Q.** Okay. Sir, I direct you to page 3-7. There is a
 13 section on groundwater availability. And the
 14 section runs through 3-10. My questions are
 15 really going to focus on the table that is on
 16 page 3-9. And it's labeled table 3.3,
 17 Groundwater results for assessed aquifers in
 18 Lower Flint-Ochlockonee region, current
 19 conditions. Do you see that?
 20 **A. Yes. I see that.**
 21 **Q.** Okay. Have you ever seen this table before?
 22 **A. No, I don't believe so.**
 23 **Q.** Okay. This table compares the current
 24 groundwater withdrawals against the sustainable
 25 yield criteria that Georgia EPD set by itself.

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1 And it does that for three different aquifers
 2 that are in the ACF Basin, the Claiborne Aquifer,
 3 the South Central Georgia Upper Floridan, and the
 4 Upper Floridan Aquifer in the Dougherty Plain.
 5 Are you with me?
 6 **A. Yes.**
 7 **Q.** Okay. And you will see that the estimated
 8 groundwater withdrawals from the Upper Floridan
 9 Aquifer range from 450 to 587 million gallons per
 10 day. Right?
 11 **A. That's what it says here.**
 12 **Q.** All right. But the sustainable yield for
 13 groundwater withdrawals in the Upper Floridan
 14 Aquifer in the Dougherty Plain is between 237 to
 15 328. Isn't that right?
 16 **A. That's what it says here. And, again, the**
 17 **sustainable yield criteria was the 40 percent**
 18 **reduction in any streamflow; and that was**
 19 **triggered with these numbers in small upper**
 20 **reaches of the basin which had low flow itself.**
 21 **So when that low flow of 1.7 cfs that you**
 22 **mentioned, for example, when 40 percent reduction**
 23 **of that is an even smaller reduction.**
 24 **Q.** So you're referring to --
 25 **A. So it's a local impact, and I did not evaluate**

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1 **this any further.**
 2 **Q.** You're referring to JX-57, the document we were
 3 just looking at?
 4 **A. No. You mentioned the number 1.7 from my direct**
 5 **testimony, which I looked -- took from**
 6 **Muckaloochee Creek.**
 7 **Q.** And you derived that number by relying on JX-57;
 8 isn't that right?
 9 **A. I derived that number by relying on the model. I**
 10 **looked -- I had the Jones and Torak model. I had**
 11 **a run without any pumping. So for that run**
 12 **without any pumping I could go to the streams and**
 13 **add up what baseflow is occurring to those**
 14 **streams. And this document which you mentioned**
 15 **did show which reach was violated. So I went to**
 16 **that reach and calculated what the flow was for**
 17 **that reach.**
 18 **So I relied on the model as well as the**
 19 **document to show me where the reach was violated.**
 20 **Q.** But the document we were talking about, JX-57,
 21 used a number of calculated withdrawals that was
 22 much lower than the actual number that Georgia
 23 EPD itself provided?
 24 **A. That is correct. The number that they have for**
 25 **the sustainable yield which they're showing me on**

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1 **this table is between 237 and 328 mgd. And that**
 2 **is a case, as I explained to you, what they did**
 3 **is they took the model; and they kept ramping up**
 4 **pumping to see when any reach was -- violated**
 5 **that 40 percent criterion.**
 6 **Q.** So it's your testimony that the difference
 7 between the current groundwater withdrawals and
 8 the sustainable yield criteria, if we look at it
 9 in cfs, it's roughly 122 -- I'm sorry, 188 to 540
 10 cfs difference?
 11 **A. I haven't done the math. From this table, if**
 12 **your math is correct, that's what it may be.**
 13 **But, again, as I mentioned, the sustainable**
 14 **yield criteria is something local within Georgia.**
 15 **And if you can add up that 1.7 with what happened**
 16 **at Mosquito Creek, it's still negligible compared**
 17 **to the flow into Florida.**
 18 **Q.** If you rely on JX-57 that uses outdated
 19 agricultural withdrawal information?
 20 **A. JX-57 never used agricultural withdrawal**
 21 **information in the model. Like I mentioned, in**
 22 **the model what they did is they pumped, and they**
 23 **kept increasing the pumping until that criterion**
 24 **was violated. Then what they did is they**
 25 **compared that to what they believed was the**

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1 **estimated groundwater withdrawal.**
 2 **So they never used that number in their**
 3 **calculations. That's comparing that to the**
 4 **number that they came up with in the modeling**
 5 **scenarios. And that modeling scenario had, I**
 6 **believe, these numbers on the right-hand side of**
 7 **the table, and those numbers violated the**
 8 **criteria which we discussed which were in the**
 9 **upper reaches of the basin in Muckaloochee Creek**
 10 **and in Mosquito Creek.**
 11 **Q.** And you realize that this is the Lower
 12 Flint-Ochlockonee Regional Plan; it has nothing
 13 to do with the Upper Flint?
 14 **A. This is the Lower Flint. And as you mentioned,**
 15 **it's the Ochlockonee region as well. And so that**
 16 **is, I believe, outside of the Flint River Basin**
 17 **also.**
 18 **I don't know what analysis they have done for**
 19 **this. But it seems they are talking about**
 20 **another basin here, the Ochlockonee --**
 21 **Q.** Okay.
 22 **A. -- region.**
 23 **Q.** Was it material to your conclusions that Georgia
 24 EPD determined that the groundwater withdrawals
 25 from the Upper Floridan Aquifer were between 188

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1 to 540 cfs in excess of the sustainable yield

2 criteria? Was that important to your

3 conclusions?

4 **A. It is totally irrelevant to my conclusions**

5 **because I am not looking at local impacts. I**

6 **have been studying the net impact of pumping**

7 **within the basin.**

8 **Q.** Sir, are you familiar with a Georgia law called

9 the Flint River Drought Protection Act?

10 **A. I have heard of that.**

11 **Q.** Okay. You know that was passed and signed into

12 law in Georgia in 2000?

13 **A. No, I do not know that.**

14 **Q.** Okay. Have you ever seen the document behind

15 tab 16 previously?

16 **A. No, I have not.**

17 **Q.** Okay. May I request that you take a moment to

18 read the paragraph at the bottom of page 30 that

19 continues onto the top of page 31.

20 **A. Yes, I have read that paragraph.**

21 **Q.** Okay. Did you ever review any studies by EPD

22 that evaluated whether the high use of irrigation

23 would dramatically reduce the flow of the Flint

24 River?

25 **A. Georgia EPD has conducted modeling studies for**

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1 **various years, and I have seen those modeling**

2 **studies. They have done a modeling study for**

3 **2011 conditions. They have done a modeling study**

4 **for 2007 conditions. They have done modeling**

5 **studies for 2001 conditions. So I have seen**

6 **those.**

7 **Q.** Okay. And the Flint River Drought Protection Act

8 was passed in 2000. So did you see any studies

9 during that time frame that talked about the high

10 use of irrigation potentially dramatically

11 reducing the flow to the Flint River?

12 **A. No. I have not seen any studies. And if it was**

13 **before 2000, they probably did not have a very**

14 **good handle on the agricultural irrigation. A**

15 **lot of the agricultural irrigation studies were**

16 **done -- and I believe a lot of them were -- some**

17 **of them were concluded in 2005. And that was**

18 **published by Dr. Hook. And then they were doing**

19 **more metering, and I believe in 2008 they had an**

20 **even better handle on what the agricultural**

21 **irrigation was.**

22 **Q.** Do you have any understanding as to why the Flint

23 River Drought Protection Act was passed?

24 **A. No, I do not.**

25 **Q.** You didn't look into that issue?

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1 **A. No, I do not -- did not.**

2 **Q.** Okay. Your conclusions in this matter, sir, are

3 that groundwater withdrawals have a minimal

4 impact on streamflow in Florida. And you go on

5 to say that climatic changes are the principal

6 causes of reductions in streamflow to Florida.

7 Is that right?

8 **A. I say it's weather patterns. When you're in a**

9 **drought, you're going to have less flow. When**

10 **you're in a normal or wet conditions, you're**

11 **going to have more flow.**

12 **Q.** And as we looked at earlier, irrigation during

13 droughts will exacerbate the reduction in flows?

14 **A. Irrigation during drought has an impact on the**

15 **baseflow, but the quantity of that impact is what**

16 **I have quantified.**

17 **Q.** Okay. Have you performed a literature review to

18 determine whether there are any scholars who

19 disagree with your conclusions?

20 **A. I don't know any scholars who have reviewed my**

21 **conclusions and are disagreeing with them.**

22 **Q.** Have you reviewed -- have you conducted a

23 literature review to evaluate the work of other

24 scholars who look at the impact of river flow

25 into Florida and whether that's caused by

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1 irrigation or whether that's associated with

2 changes in weather patterns?

3 **A. I have reviewed the Jones and Torak model.**

4 **That's what I have reviewed.**

5 **Q.** And you didn't look at anything else?

6 **A. I looked at data. I looked at precipitation**

7 **data. I looked at streamflow data. I looked at**

8 **groundwater level data.**

9 **Q.** Let's turn to a document behind tab 17 or

10 FX-49d1. It's entitled Impacts of agricultural

11 pumping on selected streams in southwestern

12 Georgia by David W. Hook -- I'm sorry, David W.

13 Hicks and Stephen W. Golladay. Do you recall

14 looking at this report, sir?

15 **A. No, I did not. I haven't seen this -- I don't**

16 **recall seeing this before.**

17 **Q.** But you recognize the name of the author David W.

18 Hicks as Woody Hicks?

19 **A. Yes. I recognize the name of both authors.**

20 **Q.** Can you please turn with me to page 27, sir. And

21 take a look at the middle paragraph that begins,

22 with our analysis of climate data.

23 **A. Yes.**

24 **Q.** Have you had an opportunity to read that to

25 yourself?

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1 **A. I'll read it.**
 2 **Yes. I have read that.**
 3 **Q.** Okay. Do you agree with the conclusion that
 4 there's no climatologic indication that more
 5 recent droughts were more severe or persistent
 6 than those in the past?
 7 **A. I do not know about that. I have looked at the**
 8 **precipitation data from 1975 through 2015. I**
 9 **have looked at water level data from '75 through**
 10 **2015 and streamflow also for the same time**
 11 **period. And what I have found is that there are**
 12 **more severe and multi-year droughts occurring**
 13 **after 2000. 2000-2001 was a severe, multi-year**
 14 **drought. 2006-2007 was a severe, multi-year**
 15 **drought. 2010-'11, going into '12 -- pushing a**
 16 **little into '12 was a severe, multi-year drought.**
 17 **And when we compare that to similar droughts from**
 18 **the 1975 period we don't see such multi-year,**
 19 **severe recurring droughts.**
 20 **Q.** So is the answer to my question, yes, you
 21 disagree with the conclusion here?
 22 **A. No. The answer is I haven't studied climate**
 23 **since the 1930's to now. That's what my answer**
 24 **is.**
 25 **Q.** Okay. What about the conclusion that the primary

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1 **Sumatra Gage is the gage just upstream of -- is**
 2 **the last gage upstream of the Apalachicola Bay.**
 3 **So I looked at flow differences between those two**
 4 **gages.**
 5 **Q.** And over what time period did you conduct your
 6 analysis?
 7 **A. I looked at this, again, from 1975 through the**
 8 **current time period, the data that was available.**
 9 **Q.** Are you aware of any measurement errors
 10 associated with either of those USGS gages?
 11 **A. During my deposition it was brought up that there**
 12 **were possible errors in those gages.**
 13 **Q.** And prior to it being raised at your deposition,
 14 were you aware of that fact?
 15 **A. I don't remember the time lines, but I believe**
 16 **there was some memos following our expert report**
 17 **which did talk about the Sumatra Gage and the**
 18 **difference in flow between the Chattahoochee and**
 19 **Sumatra Gages.**
 20 **Q.** Are you aware of a USGS letter from July 2016
 21 that highlights these anomalies in measurements
 22 at the Sumatra Gage?
 23 **A. At my deposition I was shown two correspondences**
 24 **from the USGS. The first one with an earlier**
 25 **date was from, I believe, a field person who does**

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1 factor that's causing record low streamflows and
 2 other alterations to the regional hydrology is
 3 water use? Do you disagree with that?
 4 **A. I do not know the context of this. He may be**
 5 **talking about some specific context where it**
 6 **might be critical to him. But as far as I'm**
 7 **concerned, I don't believe that the impact to the**
 8 **entire basin is substantial compared to the flows**
 9 **that are going into Florida.**
 10 **Q.** Did you know that Georgia EPD had funded this
 11 project in FX-49d1?
 12 **A. No. I don't know about this project.**
 13 **Q.** No one ever mentioned it to you during your work
 14 on the case?
 15 **A. No.**
 16 **Q.** Let's talk now about your opinion that the
 17 Sumatra and Chattahoochee Gage flows show an
 18 increased loss of water over time. Do you recall
 19 giving that opinion?
 20 **A. Yes.**
 21 **Q.** And in order to reach this conclusion, you looked
 22 at flows at the Chattahoochee Gage as well as the
 23 USGS Sumatra Gage; is that right?
 24 **A. Right. The Chattahoochee Gage shows how much**
 25 **flow is coming across the state line, and the**

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1 **this work, the professional who does that work.**
 2 **And that one indicated -- did not indicate that**
 3 **there were any errors in there.**
 4 **And, again, I do not -- I wasn't sure of the**
 5 **correspondence from Florida to the USGS asking**
 6 **whatever they were asking. So I don't know how**
 7 **that went.**
 8 **But then later on, I believe there was**
 9 **another correspondence; and this came right from**
 10 **the top. And, again, I don't -- I didn't see the**
 11 **correspondence from Florida to the USGS; but from**
 12 **the USGS to Florida the correspondence did**
 13 **indicate that there were errors in the Sumatra**
 14 **Gage between, I believe, 1990 and 2002. So if I**
 15 **look at the period before 1990 and I can look at**
 16 **the period after 2002, then I believe the USGS**
 17 **had no problem with that.**
 18 **Q.** Okay. Did you ever talk to the USGS about the
 19 Sumatra Gage?
 20 **A. No, I did not.**
 21 **Q.** Other than looking at the letter that was shown
 22 to you at your deposition, what independent
 23 investigation did you do on the accuracy of the
 24 Sumatra Gage?
 25 **A. I did not.**

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1 **Q.** You just presented it in your direct testimony to
2 this Court?
3 **A.** **I'm -- there are professionals at the USGS who**
4 **create this data and put it on their website. I**
5 **am not a professional who looks at streamflow**
6 **gaging data and quality assurance, that and then**
7 **publish it. I'm not that professional. I'm a**
8 **groundwater modeler.**
9 **Q.** Okay. So looking at stream gage is not part of
10 your expertise; is that your testimony?
11 **A.** **I do not go and look at stream gages; that is**
12 **correct.**
13 **Q.** But you --
14 **A.** **I do pick up data from the USGS from stream gages**
15 **for precipitation, for water levels; and we use**
16 **that in our modeling analysis.**
17 **Q.** Okay. And when is the last time you were on the
18 USGS website?
19 **A.** **Probably a couple of months ago.**
20 **Q.** Okay. Were you on there before you submitted
21 your direct testimony?
22 **A.** **Let me clarify. I have been on the USGS website**
23 **for my other work. I don't believe I have been**
24 **on the USGS website specifically for this after**
25 **my direct testimony.**

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1 **that the data errors possibly were between 1990**
2 **and 2002.**
3 **Q.** I'm not talking about the letter. I'm talking
4 about the website. You haven't been back on
5 there, and you presented this information to this
6 Court. Right?
7 **A.** **I haven't been back on there. I was on there**
8 **previously for my expert testimony. And that's**
9 **where I originally got my data from. Yes.**
10 **Q.** Sir, in your testimony you point to a comparison
11 between the work that Dr. Sunding has done
12 against work that Dr. David Langseth has done for
13 Florida. And you recognize that Dr. Sunding is
14 Florida's economic expert, and Dr. Langseth is
15 Florida's groundwater expert; is that right?
16 **A.** **That's correct.**
17 **Q.** Okay. And you explained that the peak summer
18 streamflow benefits that Dr. Sunding talks about
19 in his conservation scenarios are not possible to
20 achieve. You make that assertion; is that right?
21 **A.** **Yes. That's correct.**
22 **Q.** And you point to Dr. Langseth's work as the
23 support for this assertion?
24 **A.** **I look at several things to support my assertion.**
25 **Q.** Did you look at Dr. Hornberger's testimony?

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1 **Q.** Okay. What about before your direct testimony;
2 did you go on there to get the Sumatra Gage
3 measurements?
4 **A.** **We had got that at my -- during my expert report**
5 **time.**
6 **Q.** So you didn't go back and see if that data is
7 still live, is still available?
8 **A.** **No, I didn't go back.**
9 **Q.** All right. Did anyone tell you that -- other
10 than lawyers, that because you saw this letter
11 suggesting there may be measurement errors, you
12 ought to go back and check yourself to see if
13 it's still there?
14 **A.** **No. But I believe yesterday I heard that some of**
15 **that data was removed in the USGS website.**
16 **Q.** Okay. Does that cause you to reconsider your
17 opinion on the Sumatra Gage?
18 **A.** **No, it does not. The letter from the director of**
19 **that section of the USGS indicated that the gages**
20 **were wrong between 1990 and 2002, I believe. So**
21 **I can look at data pre-1990 and post-2002, and I**
22 **come to the same conclusion.**
23 **Q.** Okay. How do you know that?
24 You haven't been on the website; right?
25 **A.** **The letter from the USGS mentioned specifically**

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1 **A.** **I have looked at portions of Dr. Hornberger's**
2 **testimony.**
3 **Q.** Do you realize that Dr. Langseth is the
4 groundwater expert for Florida?
5 **A.** **Right. That is correct.**
6 **Q.** And Dr. Hornberger is the hydrologist expert for
7 both groundwater, surface water, and consumptive
8 use for Florida?
9 **A.** **I believe Dr. Hornberger was the surface water**
10 **expert; that's what I was given to believe.**
11 **Q.** Right. But you didn't compare Dr. Hornberger's
12 analysis and assessments with Dr. Sunding's; did
13 you?
14 **A.** **I'm not sure that doctor -- and I may be wrong,**
15 **that Dr. Hornberger had conservative scenarios in**
16 **his testimony. I believe Dr. Sunding had that.**
17 **And he relied, I believe, on Dr. Langseth's**
18 **groundwater impact factors to provide him with**
19 **the numbers that he could calculate his**
20 **scenarios.**
21 **Q.** And you recognize, sir, that Dr. Sunding has
22 things in his conservation scenarios that aren't
23 mentioned in Dr. Langseth's analysis. Do you
24 appreciate that fact?
25 **A.** **Dr. Langseth's direct testimony and expert report**

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1 **did not mention some of the scenarios which**
 2 **Dr. Sunding had in his report, yes.**
 3 **Q.** Okay. And you also realize that they're looking
 4 at different things. Right?
 5 **A.** I believe Dr. Langseth was looking at certain
 6 **conservation scenarios, and Dr. Sunding was**
 7 **looking at some other conservation scenarios.**
 8 **Q.** Right. And Dr. Sunding's conservation scenarios
 9 involved a -- one of them at least involved a
 10 2000 cfs conservation scenario using a peak
 11 summer month of 2011 drought. Do you recall
 12 looking at that?
 13 **A.** Yes. I recall that. And I disagree with his
 14 **calculation itself because he, again, used impact**
 15 **factors to do his calculations. And these are**
 16 **the seasonal impact factors. And there are many**
 17 **different impact factors. And the seasonal**
 18 **impact factors that were originally developed**
 19 **were developed using the Jones and Torak model.**
 20 **Then he uses a different pumping from the Jones**
 21 **and Torak model. So there's a discrepancy there.**
 22 **And then in the conservation scenario, he**
 23 **says you can eliminate pumping just within a**
 24 **certain month or within a certain time period.**
 25 **And if you eliminate that, then that also changes**

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1 **factors have changed.**
 2 **So even Dr. Langseth's analysis, he changes**
 3 **the impact factors. He changes the spatial**
 4 **distribution, while I believe Dr. Sunding changes**
 5 **spatial as well as the temporal distribution of**
 6 **pumping, in time.**
 7 **Q.** Because they're looking at different things.
 8 Right?
 9 **A.** I believe they're looking at different
 10 **conservation scenarios.**
 11 **Q.** And you compared them against one another?
 12 **A.** I haven't compared them against one another. I
 13 **have looked at each of them separately.**
 14 **And when you talk about Dr. Sunding's**
 15 **scenario of 2000 cfs conservation, I specifically**
 16 **addressed that. When we talk about Dr. Langseth's**
 17 **scenarios, I specifically addressed those.**
 18 MR. QURESHI: Nothing further, your
 19 Honor.
 20 SPECIAL MASTER LANCASTER: Thank you.
 21 MS. ALLON: Your Honor, may I just hand
 22 up two exhibits for the redirect examination?
 23 REDIRECT EXAMINATION
 24 BY MS. ALLON:
 25 **Q.** Dr. Panday, I want to just start by clearing up

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1 **the impact factor. That changes the seasonal**
 2 **impact factor.**
 3 **So essentially you need to run a model if you**
 4 **want to see such specific impacts.**
 5 **Q.** In the comparison you did between Dr. Sunding and
 6 Dr. Langseth, you're comparing two different
 7 things. You're comparing a peak summer month in
 8 the 2011 drought, which is what Dr. Sunding did
 9 for his conservation scenario, against what
 10 Dr. Langseth evaluated, and that was a
 11 representative drought year that consisted of six
 12 different years, not 2011. Did you appreciate
 13 that?
 14 **A.** Dr. Langseth's analysis for the net pumping
 15 **during drought were for several drought years.**
 16 **However, when Dr. Langseth did his conservation**
 17 **scenarios, he did not look at that. He only**
 18 **looked at how much he could reduce. And, again,**
 19 **when he did that, he reduced things in a**
 20 **hydrologically efficient manner, as he calls it.**
 21 **So he removed agricultural pumping from right**
 22 **near the streams. And that is where your impact**
 23 **factor is largest. So when you remove that, then**
 24 **that is not the model with which the impact**
 25 **factors were developed. So now, the impact**

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1 one issue from the cross-examination. Do you
 2 recall on your cross there was some discussion
 3 about whether Dr. Langseth, Florida's groundwater
 4 expert, had initially adopted a 40 percent impact
 5 factor. Do you recall that?
 6 **A.** Yes.
 7 **Q.** Okay. And Florida's counsel said during
 8 cross-examination that Dr. Langseth had never
 9 adopted 40 percent as his impact factor. Do you
 10 recall that?
 11 **A.** I believe he said that. Yes.
 12 **Q.** And you had said that you had recalled some
 13 deposition testimony from Dr. Langseth. And I
 14 would like to turn to Dr. Langseth's deposition
 15 transcript, which I have handed up.
 16 And I want to look specifically at page 356
 17 of Dr. Langseth's transcript. Are you there?
 18 **A.** Yes. I'm there.
 19 **Q.** And do you see on line 14 I asked Dr. Langseth,
 20 so 40.6 is your annual impact factor for pumping
 21 just from the Upper Floridan Aquifer?
 22 And he answered, average annual impact
 23 factor, transient impact factor for pumping just
 24 for the Upper Floridan.
 25 Was that the deposition testimony that you

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1 were referring to when you testified that
 2 Dr. Langseth had, in fact, adopted a 40 percent
 3 impact factor?
 4 **A. Yes.**
 5 **Q.** Now, Florida's counsel also said during your
 6 cross-examination that on his last day of
 7 deposition, Dr. Langseth had switched and adopted
 8 a 60 percent impact factor. Do you recall that
 9 questioning?
 10 **A. Yes.**
 11 **Q.** Let's take a look at some testimony from the last
 12 day of Dr. Langseth's deposition. It's on page
 13 1079 of Dr. Langseth's transcript.
 14 **A. Yes. I'm there.**
 15 **Q.** And do you see that on line 22 I asked, are you
 16 changing the opinion in your first report as to
 17 the proper impact factor?
 18 And Dr. Langseth testified, I consider -- in
 19 the context of doing this work, I consider 40.8
 20 percent versus 40.6 percent to be essentially the
 21 same thing.
 22 And is this the testimony you were referring
 23 to when you said that Dr. Langseth had used a 40
 24 percent impact factor in his work?
 25 **A. I'm sorry. You said page 1078?**
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1 **Q.** 1079.
 2 **A. And on line?**
 3 **Q.** Line 22 through line 4 of the next page.
 4 **A. Essentially the same number, that is correct.**
 5 **Q.** Now, Florida's counsel also walked you through a
 6 1998 hydrogeologic study which they claim
 7 supported a 60 percent impact factor. Do you
 8 think using that study with respect to the
 9 analysis in this case is appropriate?
 10 **A. No, it is not. That study has been updated, and**
 11 **that study is outdated.**
 12 **Q.** Let's take a look at what Dr. Langseth had to say
 13 about the hydrogeologic reports. And if you turn
 14 to Dr. Langseth's report, which I handed out, and
 15 you look at page 37 of Dr. Langseth's expert
 16 report.
 17 **A. Okay.**
 18 **Q.** And I want to start the paragraph that starts, I
 19 also screened out. Do you see that?
 20 **A. Yes.**
 21 **Q.** Okay. And can you just read that paragraph to
 22 yourself and let me know when you have had a
 23 chance to do that.
 24 **A. Yes. I have read that.**
 25 **Q.** And how do you interpret what Dr. Langseth is
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1 saying in that paragraph about the hydrogeologic
 2 report that Florida is now relying on?
 3 **A. There's nothing to interpret, really. He said it**
 4 **in clear words, I also screened out use of the**
 5 **model developed by Hydrogeologic, Inc., 1998,**
 6 **since it was based on the Torak and McDowell --**
 7 **it should have been 1996 -- and Torak and**
 8 **McDowell 1996 models.**
 9 **And previous statement was, this**
 10 **consideration screened out the following models**
 11 **developed by Torak and McDowell 1996.**
 12 **So they have screened out that model, and**
 13 **they have screened out the hydrogeologic model.**
 14 **Q.** So Dr. Langseth himself screened out use of the
 15 hydrogeologic model; is that right?
 16 **A. That is correct.**
 17 **Q.** Taking a step back for a minute, I want to ask a
 18 very basic question which is what is groundwater?
 19 **A. Groundwater is water under the ground that exists**
 20 **in the voids or crevices between the soil or**
 21 **rock.**
 22 **Q.** And we also talked a lot about aquifers. What is
 23 an aquifer?
 24 **A. An aquifer is the soil or rock under the ground**
 25 **that contains and transmits groundwater.**
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1 **Q.** And what does groundwater have to do with the
 2 issues in this case?
 3 **A. Groundwater feeds the rivers and streams in the**
 4 **ACF River Basin. And pumping of groundwater can**
 5 **impact that flow to the streams. And that is**
 6 **what I have done is to evaluate the impact of**
 7 **that pumping on the groundwater flow to streams.**
 8 **Q.** Why is groundwater pumped in the ACF Basin?
 9 **A. Groundwater is pumped in the ACF Basin for**
 10 **agricultural use as well as for municipal and**
 11 **industrial uses. Most of the groundwater use in**
 12 **the ACF River Basin is for agricultural use with**
 13 **very little use for municipal and industrial**
 14 **purposes. And also at the same time, most of the**
 15 **agricultural use is through groundwater with a**
 16 **less amount of water from surface water sources**
 17 **for agriculture.**
 18 **Q.** You said that groundwater feeds the rivers and
 19 the streams. What are the factors that influence
 20 how groundwater flows into rivers and streams in
 21 the ACF Basin?
 22 **A. The flow of groundwater to rivers and streams in**
 23 **the ACF Basin is governed by multiple factors,**
 24 **including weather and pumping. When the weather**
 25 **is wet, the groundwater levels are higher; and**
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1 **you have more baseflow to streams. When the**
 2 **weather is dry, the groundwater levels are lower;**
 3 **and you get less baseflow to streams.**
 4 **With regards to pumping, pumping also affects**
 5 **the groundwater levels and the baseflow to**
 6 **streams; but there are many variables involved**
 7 **with that. And what I mean by that is if you're**
 8 **pumping close to the stream, the impact is going**
 9 **to be larger. If you are pumping away from the**
 10 **streams, the impact is going to be smaller.**
 11 **The aquifer properties also determine how**
 12 **pumping would impact the baseflow, the flow of**
 13 **groundwater to streams. And, for instance, if**
 14 **the aquifer is more transmissive, then you have a**
 15 **higher impact factor. If the aquifer is --**
 16 **has -- the storage spaces are larger, if the**
 17 **storage capacity of the aquifer is larger, then**
 18 **you're going to have a larger time lag effect**
 19 **before that impact reaches the streams. You can**
 20 **be pumping in several locations, so there is the**
 21 **interaction of pumping between those several**
 22 **locations as well.**
 23 **So you really need a groundwater model to be**
 24 **able to resolve all these interactions and to be**
 25 **able to then just isolate and separate the impact**

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1 **of pumping from all these other impacts.**
 2 **Q.** And as a part of your analysis in this case, did
 3 you conduct groundwater modeling to quantify the
 4 impact of groundwater pumping on flow into the
 5 streams and rivers in the ACF Basin?
 6 **A.** **That is exactly what I have done. My modeling**
 7 **was to evaluate the impact of pumping on the**
 8 **groundwater flow to streams.**
 9 **Q.** And what groundwater model did you use for your
 10 analysis?
 11 **A.** **I used the Jones and Torak 2006 MODFE model for**
 12 **my analysis.**
 13 **Q.** Why did you decide to use that model?
 14 **A.** **Because that model, the Jones and Torak MODFE**
 15 **model, was specifically designed to evaluate the**
 16 **impact of pumping to baseflow in the Lower ACF**
 17 **River Basin. And that is exactly what I did is**
 18 **to evaluate the impact of pumping.**
 19 **Also, as we saw here, Florida's experts also**
 20 **believe it's the best model available to do this**
 21 **impact calculation.**
 22 **Q.** Did Florida's experts also run the Jones and
 23 Torak model?
 24 **A.** **Florida's experts did not run any groundwater**
 25 **model. They used published results from the 2006**

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1 **report of Jones and Torak; and they extracted**
 2 **impact factor, scaling factors from that. And**
 3 **they used those scaling factors in their**
 4 **analysis.**
 5 **Q.** Do you think that scaling approach is as reliable
 6 as actually running the model?
 7 **A.** **No, it is not. When you are doing scaling, you**
 8 **are relying on the pumping distribution that**
 9 **was -- that was there in the model.**
 10 **First thing is you have to have a model to**
 11 **even develop those scaling factors. So they used**
 12 **the model that was run by Jones and Torak, the**
 13 **reported results. And they used those results to**
 14 **create the impact factor.**
 15 **Now, when you use those impact factors, as**
 16 **long as the pumping distribution doesn't change,**
 17 **you can scale things up and down. But Florida**
 18 **has not done that. They have changed the**
 19 **distribution of pumping. They have changed the**
 20 **timing of pumping. And if you're doing that, you**
 21 **need to run a groundwater model to accurately**
 22 **describe the impact.**
 23 **Q.** So when you actually ran the model yourself, how
 24 did you use the model to quantify the impact of
 25 groundwater pumping on streamflow?

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1 **A.** **The first thing I did was to evaluate the**
 2 **groundwater pumping that was going on in the**
 3 **basin. So I evaluated agricultural irrigation**
 4 **pumping as well as municipal and industrial**
 5 **pumping. Once I had the pumping distributions**
 6 **and timing, I implemented that into the MODFE**
 7 **model; and I ran the MODFE model for that case.**
 8 **I ran the MODFE model for the same hydrologic**
 9 **situation, but without any pumping. When I take**
 10 **the difference between those two, I get the**
 11 **impact of pumping.**
 12 **So that is how I used the MODFE model.**
 13 **Q.** And what were the different hydrologic
 14 simulations that you had?
 15 **A.** **I had done hydrologic simulations for what I call**
 16 **normal conditions and what I call dry conditions.**
 17 **So there were two different hydrologies. And I**
 18 **used those to evaluate my pumping impacts.**
 19 **Q.** Now, on cross-examination, counsel for Florida
 20 was asking why your dry hydrologic conditions
 21 actually modeled more contribution to streamflow
 22 than your normal scenario; and you had said it
 23 doesn't matter. Why is that?
 24 **A.** **Right. It does not matter, because the impact of**
 25 **pumping to streamflow is not dependent on the**

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1 **actual baseflow itself. The impact is just a**
 2 **certain percent of the pumping value regardless**
 3 **of that baseflow.**
 4 **Q.** I want to actually turn back to the exhibit that
 5 Florida's counsel used with you. So it's in the
 6 binders that they handed out at tab 6. And it's
 7 FX --
 8 **A. Yes, I'm there.**
 9 **Q.** -- 934. Do you see that?
 10 **A. Yes I see that.**
 11 **Q.** And can you describe how you used the data in
 12 this chart.
 13 **A. Right. We can see what I have done is I did**
 14 **simulations for the different years -- for the**
 15 **acres for the different years, and the**
 16 **different years being 1992, 2011, and 2013. And**
 17 **for those years, I evaluated the pumping for --**
 18 **the pumping requirements for normal conditions as**
 19 **well as for dry conditions. For dry conditions**
 20 **you need more irrigation depth than for normal**
 21 **conditions.**
 22 **Once I did that, I ran the model. You get**
 23 **the results of the baseflow from this model; and**
 24 **you can subtract out the no pumping case for the**
 25 **same hydrology from the pumping case for the same**

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1 **pumping within Georgia was slightly over 500 cfs.**
 2 **And the number is 511 cfs that the model gave.**
 3 **Q.** And that's the maximum impact?
 4 **A. And that is the maximum monthly impact. And that**
 5 **occurred in July.**
 6 **Q.** Now, in your direct testimony, you characterize
 7 the impact of groundwater pumping, this impact,
 8 as minimal or negligible. What's the basis for
 9 that opinion?
 10 **A. I compared this impact of groundwater pumping to**
 11 **the actual flow occurring at the Chattahoochee**
 12 **Gage into Florida. And in that respect, I say**
 13 **that this impact is negligible.**
 14 **Q.** Let's turn to page 27 in your direct and take a
 15 look at demonstrative 15. Is this the comparison
 16 that you were just referring to?
 17 **A. That is correct. This is one of the comparisons**
 18 **I was referring to. This is for the dry**
 19 **conditions.**
 20 **Q.** And can you describe what demonstrative 15 shows?
 21 **A. Right. This is a chart showing the baseflow and**
 22 **the impact of pumping over an annual cycle. The**
 23 **blue line shows the impact of pumping over the**
 24 **annual cycle. And the maximum of 511 cfs in July**
 25 **is part of that blue line there. And then the**

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1 **hydrology. And the hydrology impacts go away,**
 2 **and I'm left with the impact of pumping on**
 3 **baseflow.**
 4 **Q.** So if there was an error or miscalculation or an
 5 inaccuracy, as a hypothetical, in your hydrologic
 6 conditions, would that impact your conclusions
 7 about the impact of pumping?
 8 **A. No, it does not. The hydrology does not affect**
 9 **the impact of pumping. Your impact factors also**
 10 **are developed without concern of hydrology. They**
 11 **are developed because of the -- it's the portion**
 12 **of the pumping that matters.**
 13 **Q.** Let's turn in your written direct to page 25, and
 14 I would like to look at demonstrative 13.
 15 **A. Yes.**
 16 **Q.** Does demonstrative 13 show some of the results of
 17 your groundwater modeling?
 18 **A. Yes. It does.**
 19 **Q.** Okay. And can you describe what demonstrative 13
 20 shows?
 21 **A. Demonstrative 13 shows the impact of groundwater**
 22 **pumping for normal and dry conditions from my**
 23 **modeling analysis for 2011 irrigated acreages.**
 24 **And we can see that for dry conditions, the**
 25 **impact was slightly over 500 cfs. The impact of**

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1 **red line shows the actual streamflow occurring**
 2 **into Florida at the Chattahoochee Gage. And we**
 3 **can compare these two lines, and this is where I**
 4 **say that the impact of pumping is negligible**
 5 **compared to flow into Florida.**
 6 **Q.** Now, you testified earlier that one of the
 7 factors that influences how groundwater flows
 8 into the rivers and streams is weather or
 9 precipitation. What analysis did you do to reach
 10 that conclusion?
 11 **A. Yes. What I did was I -- since this case is**
 12 **about flow of water into Florida, I evaluated the**
 13 **flow of water into Florida at the Chattahoochee**
 14 **Gage. And from looking at the flow signature, I**
 15 **evaluated that most of the baseflow impacts are**
 16 **weather related and not pumping related.**
 17 **Q.** Let's turn to page 30 in your written direct.
 18 And I would like to focus on demonstrative 18.
 19 Can you describe what the graph in demonstrative
 20 18 shows?
 21 **A. Yes. This graph shows the streamflow at the**
 22 **Chattahoochee Gage, which is into Florida,**
 23 **between 1975 and 2015. The lowest line, the**
 24 **purple line, shows the minimum flow. So for**
 25 **every month we can see the average. We can take**

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1 the monthly flows for every month, and that was
 2 plotted for every month. The monthly minimum
 3 flow, the minimum flow that month, was plotted
 4 for every year in the purple line.
 5 When I look at that minimum flow, you can see
 6 that it really isn't a declining trend. You can
 7 see that, yes, the minimum flow goes lower during
 8 dry periods. And the dry periods I indicated
 9 with the red bars. But they are slightly higher
 10 in the wet periods or normal periods. The wet
 11 periods I indicated with the blue bars. And
 12 normal periods are the white, the blank bars.
 13 I also plotted the maximum flow -- maximum
 14 monthly flow of every year in the blue line. And
 15 we can -- the difference between that minimum
 16 flow and the maximum flow is the variation of
 17 flow every year. And we can see that that
 18 variation of flow every year is in the tens of
 19 thousands of cfs.
 20 Finally, on this chart I also show in the
 21 orange line the annual flow at the Chattahoochee
 22 Gage. And from this what I see is that the
 23 annual flows can be lower in dry year and higher
 24 during the wet years. And, again, when I look at
 25 the difference between a dry year flow and a wet

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1 year flow, that difference is in the tens of
 2 thousands of cfs.
 3 So I wanted to evaluate these are the impacts
 4 of climate, of -- I should say weather.
 5 Q. And what --
 6 A. Dry periods or wet periods.
 7 Q. What did you conclude from this analysis about
 8 the relative impacts of groundwater pumping and
 9 weather?
 10 A. Right. The relative impacts of groundwater
 11 pumping are negligible compared to the
 12 weather-related impacts.
 13 Q. Let's turn to page 31, the next page in your
 14 written direct. And I want to look at
 15 demonstrative 19. Can you describe for the Court
 16 what is shown in demonstrative 19.
 17 A. Yes. This is where I have compared the impacts
 18 of pumping within Georgia to the weather-related
 19 impacts. There are eight bars on this figure.
 20 The first two bars show the impact of all of
 21 pumping within Georgia during 2011 dry
 22 conditions. And we can see that the average
 23 impact, which is in the blue line with the number
 24 304 there, and that is the average impact of
 25 pumping. And the maximum impact -- monthly

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1 impact is 538 cfs of all pumping within the
 2 basin.
 3 And we can compare these two to the red line
 4 in the weather-related impacts, which is -- the
 5 minimal flow across the state line is 5,000 cfs,
 6 and we can compare that to the 500 cfs of maximum
 7 impact; or we can compare the annual average flow
 8 of 300 cfs with the annual average flow at the
 9 Chattahoochee Gage of 19,000 cfs. And that is
 10 also negligible.
 11 Finally the middle two bars, which are the
 12 60 cfs annual average baseflow reduction from
 13 1992 conditions. So if Georgia were to curtail
 14 its pumping to 1992 conditions, the benefit would
 15 be 60 cfs average annual or 112 cfs monthly
 16 maximum baseflow.
 17 And we can compare those again to the 5,000
 18 number and to the average 19,000 number flow.
 19 Finally, the last two bars on the chart
 20 indicate -- the second last bar indicates the
 21 average fluctuation within a year. So within a
 22 year the average fluctuation of flow at the gage
 23 is more than 36,000 cfs. And on the last bar we
 24 can see the fluctuation between a dry year and a
 25 wet year. And we can see that difference is

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1 27,000 cfs.
 2 So we can see all these weather-related
 3 impacts here. And we -- what -- I needed to
 4 present this so we can compare that with the
 5 impacts of all of Georgia's pumping as well as
 6 with the impacts of curtailing Georgia's pumping
 7 to 1992 levels.
 8 Q. And what conclusion do you reach from this
 9 comparison?
 10 A. Yes. The conclusion I reach from this comparison
 11 is that the impact of pumping is negligible
 12 compared to the weather-related impacts.
 13 Q. I want to talk a little bit about groundwater
 14 levels in the ACF Basin. Now, Dr. Hornberger has
 15 testified that Georgia's groundwater pumping has
 16 altered the natural hydrology of the basin by
 17 lowering groundwater levels. Do you agree with
 18 that conclusion?
 19 A. No, I do not.
 20 Q. Why not?
 21 A. First off, I have evaluated groundwater levels at
 22 several wells in the basin. And that showed me
 23 that some water levels are increasing. Some
 24 wells have stable, we feel, levels. And some
 25 wells have declining water levels. So there is

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1 no basin-wide trend of decreasing water levels.
 2 Secondly, I have also looked at how
 3 agricultural irrigation has increased within
 4 Georgia from the '70's through the 1990's; and
 5 the largest increases had occurred in that time
 6 period. And I look at water levels during that
 7 time period, and water levels seem to be
 8 generally stable during that time period or even
 9 slightly increasing. So when you see that
 10 increase in agricultural irrigation within
 11 Georgia and compare it to groundwater levels, you
 12 don't see groundwater levels decreasing as a
 13 result.
 14 Q. Now, in your direct testimony on page 62, in
 15 demonstrative 37 you actually show groundwater
 16 information for a well that is in Florida, not in
 17 Georgia. Why are you showing groundwater
 18 information from a well in Florida?
 19 A. Yes. Demonstrative 37 is groundwater level --
 20 shows groundwater levels from a well in the Upper
 21 Floridan Aquifer right adjacent to the ACF River
 22 Basin, but not within the ACF River Basin. And
 23 the reason I show this is because the -- this
 24 water level signature that I see in this graph is
 25 very similar to the water level signatures that

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1 A. Yes. As we see in this graph, the largest
 2 increases in pumping within Georgia occurred --
 3 within the basin occurred between 1975 through
 4 the 1990's. And the blue -- that's the red line.
 5 And the blue line shows the water levels at the
 6 well in the basin in the Upper Floridan Aquifer.
 7 And we can see that the water levels are not
 8 declining as a result of this increased pumping.
 9 The gray bars show the annual precipitation
 10 at the gage within the basin, and the water
 11 levels generally follow that trend.
 12 In fact, Dr. Langseth in his expert testimony
 13 also said that water levels generally follow
 14 precipitation, recharge trends, though they may
 15 lag in time.
 16 Q. Now, the last piece of analysis that you had
 17 mentioned with respect to groundwater levels was
 18 an analysis that you did of long-term trends in
 19 different wells. And if you turn to page 60 and
 20 you look at demonstrative 35, is that the
 21 analysis you were referring to?
 22 A. Yes. Demonstrative 35 shows the trend analysis
 23 that I have done in Upper Floridan Aquifer water
 24 wells.
 25 Q. And what did you find in that analysis?

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1 we see in wells within the Upper Floridan Aquifer
 2 in Georgia.
 3 As you can see here, water levels decline in
 4 the dry season and rise back up every year in the
 5 wet season. However, if you look at 2011 and
 6 2012 -- and this is a well in Florida -- you see
 7 that the rise has not been complete. But then
 8 when you get back into 2013, you see that the
 9 rise in water levels is pretty much full compared
 10 to previous.
 11 And this is the same signature we see for
 12 wells in Georgia. So what I understand from that
 13 is that this could be regional precipitation or
 14 weather-related issues. And you cannot have the
 15 same signature here in Florida in a different
 16 basin because of pumping in Georgia.
 17 Q. Now, you said before that another analysis you
 18 had done was you compared pumping to groundwater
 19 levels to see if there was a correlation or an
 20 inverse correlation between the two.
 21 And let's look at demonstrative 38 in your
 22 direct testimony on page 63. And does that show
 23 the results of your analysis?
 24 A. Yes. That is correct.
 25 Q. And can you describe what you found?

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1 A. I have done two different trend analyses. The
 2 second to last column shows my results from my
 3 linear trend analysis. And that shows that some
 4 wells indicated a declining trend, some wells
 5 indicated an increasing trend, and some showed a
 6 generally stable trend.
 7 I also did this Mann-Kendall statistical
 8 trend analysis, and that also shows that all
 9 wells are not decreasing. Some are stable. Some
 10 are decreasing, and some are increasing in the
 11 basin.
 12 Q. And based on all these analyses that you have
 13 done with respect to groundwater levels, what
 14 have you concluded about the general health of
 15 the aquifer in the Upper Floridan?
 16 A. The general health of the aquifer in the Upper
 17 Floridan is good.
 18 We see, if you look at the monthly water
 19 level changes also, that water levels drop in the
 20 dry period and rise back in the wet period. They
 21 may not rise back fully during droughts or
 22 multi-year droughts; but once there is a return
 23 of normal precipitation or wetter periods, you
 24 see that the water levels bounce right back up
 25 and that the aquifer gets fully recharged.

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1 **Q.** Now, during your cross-examination you were asked
 2 about a variety of local issues including the
 3 sustainable yield analysis in Spring Creek. And
 4 I think if you go to demonstrative 46 in your
 5 direct testimony -- it's page 76 -- you have a
 6 chart that summarizes your analysis as to all of
 7 those.

8 **A. Yes. That is correct.**

9 **Q.** And can you describe the analysis that's
 10 reflected in demonstrative 46.

11 **A. Yes, I can. Again, the last four bars are the**
 12 **same bars that we saw earlier which indicate the**
 13 **weather-related impacts. Now, starting from the**
 14 **first of those bars, the first one shows the**
 15 **maximum agricultural withdrawals from surface**
 16 **water irrigation in the basin; and that is 333**
 17 **cfs. And then average -- the second bar there**
 18 **shows the impact of a 10 percent error in Upper**
 19 **Floridan Aquifer pumping estimates. So if there**
 20 **were errors in the pumping estimates and if there**
 21 **was a 10 percent error, you would get 54 cfs**
 22 **impact into the 10 percent error throughout the**
 23 **basin.**

24 **Around 54. I say 538 cfs is the entire**
 25 **impact of pumping; so 10 percent of 538 is 53.8,**

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1 **And finally, the blue hole springs which were**
 2 **referred to was Radium Springs. So I evaluated**
 3 **against the flows at Radium Springs. And minimum**
 4 **flows could be as low as 4 cfs in previous**
 5 **droughts.**

6 **So, again, when we compare all these numbers**
 7 **to the weather-related factors on the right, the**
 8 **minimum flow or the annual average flow or the**
 9 **fluctuation in flow every year, or the**
 10 **fluctuation in flow between wet and dry years,**
 11 **you can see that these numbers are negligible.**

12 **Q.** The last topic that I would like to cover is
 13 Dr. Sunding's conservation scenarios. Now,
 14 you talked a little bit about this on
 15 cross-examination; but are you aware that
 16 Florida's economist has said that Georgia can
 17 increase flows by 1700 cfs just from a reduction
 18 in agricultural irrigation?

19 **A. I believe he said that, yes.**

20 **Q.** And do you have an opinion about whether it's
 21 possible to achieve 1700 cfs from a reduction in
 22 agricultural irrigation?

23 **A. Yes, I do have an opinion of that.**

24 **Q.** Okay. And what is your opinion?

25 **A. It is not possible.**

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1 **so 54 cfs.**

2 **The next, third, bar indicates the water**
 3 **level impacts. What I had done is I conducted a**
 4 **model simulation in steady state -- by steady**
 5 **state I mean long-term impacts -- to see if there**
 6 **was a 2-foot decline basin-wide in water levels**
 7 **everywhere, then you could get an impact of 39 to**
 8 **217 cfs.**

9 **Then I go to the sustainable yield issues or**
 10 **the local issues which we talked about. And when**
 11 **I evaluated that sustainable yield criteria at**
 12 **Muckaloochee Creek, that was less than 1 cfs.**

13 **I evaluated flows at the Iron City Gage. And**
 14 **in the earlier period of record, before there was**
 15 **irrigation also, when there were droughts, those**
 16 **flows could be as less as -- as low as 10 to 20**
 17 **cfs. I -- I believe as less as 10 cfs. And Iron**
 18 **City Gage showed no flow in the current drought.**
 19 **So the difference between 10 cfs off a previous**
 20 **drought and no flow for the current drought is**
 21 **around 10, which is what I'm indicating here.**

22 **The next one is Mosquito Creek, which also**
 23 **came up in the sustainable yield study. And that**
 24 **had an even minor impact. It was less than a**
 25 **fraction of a cfs.**

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1 **Q.** Why do you say that?

2 **A. First thing is Dr. Sunding has used impact**
 3 **factors to do his calculations. And those impact**
 4 **factors change when you change your distribution**
 5 **of pumping or when you change your timing of**
 6 **pumping. He needs to have run a model to**
 7 **evaluate that.**

8 **Technically, if you look at the impact of all**
 9 **agricultural pumping within Georgia, which I have**
 10 **shown, it is around -- it's less than a thousand**
 11 **cfs. That's my calculation.**

12 **Also, Dr. Langseth had done a calculation**
 13 **during his deposition. And in that calculation,**
 14 **he was -- he got less than 1700 cfs.**

15 **And even if you now take his 40 percent**
 16 **impact factor and change it to 60 percent impact**
 17 **factor for groundwater pumping and add what he**
 18 **claims is the impact of surface water flows,**
 19 **surface water withdrawals, you still get less**
 20 **than 1700 cfs.**

21 **Q.** So you're saying that whether you use your
 22 numbers or Dr. Langseth's numbers, it doesn't
 23 matter. If you stopped all pumping --
 24 groundwater pumping in the ACF Basin, you still
 25 would not get the 1700 cfs that Dr. Sunding says

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1 you can conserve?

2 **A. All agricultural pumping, yes. I agree.**

3 MS. ALLON: I have nothing else, your

4 Honor.

5 Thank you.

6 SPECIAL MASTER LANCASTER: We'll take a

7 noon recess now.

8 Counsel, you can -- can you give me an

9 estimate of how long you think you will be --

10 guesstimate?

11 MR. QURESHI: Less than 30 minutes.

12 SPECIAL MASTER LANCASTER: Pardon?

13 MR. QURESHI: Less than 30 minutes.

14 SPECIAL MASTER LANCASTER: Terrific.

15 Thank you.

16 (Time Noted: 11:58 a.m.)

17 (Recess Called)

18 (Time Noted: 12:52 p.m.)

19 SPECIAL MASTER LANCASTER: Thank you

20 again, counsel, for the rain.

21 MR. QURESHI: You're welcome.

22 RE-CROSS-EXAMINATION

23 BY MR. QURESHI:

24 **Q.** Good afternoon, Dr. Panday.

25 **A. Good afternoon.**

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1 **Q.** Sir, I want to start with discussing the 511 cfs

2 streamflow impact associated with groundwater

3 pumping according to your model.

4 **A. Right. In Georgia?**

5 **Q.** In Georgia.

6 **A. Yes.**

7 **Q.** Now, to be clear, that's just groundwater

8 pumping?

9 **A. That is correct, just the impact of groundwater**

10 **pumping in the Upper Floridan Aquifer.**

11 **Q.** And you're not considering total amount of

12 consumptive use by Georgia when you say that

13 that's a negligible amount compared to state line

14 flows?

15 **A. I have not done the analysis of the total**

16 **consumptive use in Georgia; correct.**

17 **Q.** Do you know what the total agricultural estimated

18 use was in July of 2011 according to Georgia EPD?

19 **A. No, I do not know the values that Georgia EPD has**

20 **for the July 2011 calculations. But I do have**

21 **estimated irrigated -- estimated irrigation from**

22 **agricultural irrigation pumping for 2011**

23 **conditions, which I got from Georgia EPD's**

24 **databases; and I have that for groundwater as**

25 **well as surface water for agricultural**

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1 **irrigation.**

2 **Q.** Okay. So for agricultural irrigation in July of

3 2011, the maximum impact of streamflow is 511

4 cfs?

5 **A. For pumping in the Upper Floridan Aquifer within**

6 **Georgia, that is correct.**

7 **Q.** Okay. Let's look at what Georgia EPD says is the

8 total agricultural consumptive use on an average

9 basis in July of 2011. If you will turn with me

10 to tab 10 of your first volume, please. And you

11 will recognize tab 10 as the direct testimony of

12 Dr. Zeng. Right?

13 In particular, please go to --

14 **A. Yes.**

15 **Q.** -- page 23. You can see a figure 9 there.

16 **A. Yes. I see that figure 9.**

17 **Q.** All right. So for July 2011, the total monthly

18 average agricultural consumptive use, according

19 to Dr. Zeng, is about 1400 cfs.

20 **A. I'm not sure which year it is, but the largest**

21 **one there near the end is around 1400 cfs.**

22 **Q.** Okay. And let's assume that 511 cfs of that is

23 associated with agricultural irrigation. Where

24 is the other 900 cfs coming from? Who is using

25 that?

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1 **A. I do not know what this consumptive use is. This**

2 **is not the agricultural. I don't know if this is**

3 **the agricultural pumping or whether this is the**

4 **impact to baseflow.**

5 **Q.** Does the label at the bottom of the chart help

6 you, total monthly average agricultural

7 consumptive use?

8 **A. It doesn't, because consumptive use has been used**

9 **in different ways. Consumptive use could be just**

10 **the water that was used, or it could be the**

11 **reduction in baseflow. So there were two**

12 **different definitions for consumptive use.**

13 **Q.** And you have no idea how Georgia EPD used it?

14 **A. I believe they have used it in both ways, if I'm**

15 **not mistaken.**

16 **Q.** And do you know how Dr. Zeng used it in his

17 direct testimony?

18 **A. I'm not sure.**

19 **Q.** All right. If we assume that the 511 cfs of the

20 total 1400 is the work you did, the withdrawals

21 associated with agricultural pumping, do you have

22 any idea as to where the remaining 900 cfs is

23 being used or consumed in the agricultural

24 sector?

25 **A. No, I do not know about this.**

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1 Q. Okay. Dr. Panday, during redirect, you talked a
 2 little bit about groundwater levels. Do you
 3 recall that?
 4 A. Yes.
 5 Q. In fact, in your direct testimony in section 9,
 6 you state that, quote, there is no evidence of
 7 groundwater pumping in the ACF River Basin
 8 causing long-term depletion of the Upper Floridan
 9 Aquifer.
 10 Do you recall making that testimony?
 11 A. Yes.
 12 Q. Okay.
 13 A. **Specifically basin-wide declines.**
 14 Q. Basin-wide declines. But you do acknowledge that
 15 individual wells have declined?
 16 A. **Yes. Some wells have declined, some wells have**
 17 **increased, and some wells have been stable.**
 18 **Correct.**
 19 Q. Let's take a look at the particular table you
 20 were reviewing with counsel for Georgia. I
 21 believe that was on page 60 of your prefiled
 22 direct. That's behind tab 1.
 23 This is the trend analysis for the 20 wells.
 24 A. **Yes. I'm there.**
 25 Q. And the time period that you have looked at here
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1 A. **I have -- this trend analysis is for the entire**
 2 **record of -- period of record from '75 through**
 3 **2015. But when I looked at the individual wells,**
 4 **I do have statistics, I believe, for pre-'92**
 5 **conditions and post-'92 conditions.**
 6 Q. And those statistics, if you recall, showed that
 7 18 of the 20 wells are declining post-1992; isn't
 8 that true?
 9 A. **I do not recall. But I do recall that Florida**
 10 **had done a trend analysis for post-1992**
 11 **conditions and pre-1992 conditions. And in that,**
 12 **a lot of those wells showed declining water**
 13 **levels post-1992, yes.**
 14 **And I'm not surprised about that because**
 15 **you're starting off with high water levels in**
 16 **1992 through 1998. There were either normal or**
 17 **average weather conditions -- precipitation**
 18 **conditions. And then after that, we start**
 19 **getting into these multiple multi-year severe**
 20 **droughts. So the water levels started off high**
 21 **in 1992 and dropped after that. So that's not**
 22 **surprising.**
 23 **I, myself, have done an analysis starting**
 24 **from 1998, which is just before those droughts**
 25 **hit. And when you look at the water levels**
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1 is 1975 through 2015?
 2 A. **That is correct. Any data that was available**
 3 **within that time period has been analyzed.**
 4 Q. Okay. And of these 20, 11 are decreasing or
 5 potentially decreasing?
 6 A. **From the linear trend analysis, I see one, two,**
 7 **three, four, five, six showing a declining trend.**
 8 **And from the Mann-Kendall statistics, it shows**
 9 **one, two, three, four, five of them with a**
 10 **decreasing trend, with one, two, three, four,**
 11 **five, six of them with a probably decreasing**
 12 **trend.**
 13 Q. Okay. So it's a total of 11 that are either
 14 decreasing or probably decreasing?
 15 A. **From the Mann-Kendall statistical analysis, that**
 16 **is what it shows.**
 17 Q. All right. And from the Mann-Kendall statistical
 18 trend analysis, it shows five as being stable?
 19 A. **And it shows five as being stable; correct.**
 20 Q. And three with no trend?
 21 A. **And three with no trend, yes.**
 22 Q. And one that's increasing?
 23 A. **Yes.**
 24 Q. And you actually looked at this -- these 20 wells
 25 pre-1992 and post-1992 as well; didn't you?
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1 **pre-1998, they do not show a declining trend.**
 2 **And that was, in fact, when agricultural pumping**
 3 **increased. The most increases occurred in**
 4 **Georgia during that period of time. And then**
 5 **when you look at the post-1998 -- also in my**
 6 **direct I have that -- there is no declining trend**
 7 **again, because we started off low; and we are**
 8 **staying low.**
 9 Q. Sir, is your testimony that agricultural
 10 irrigation increased in 1998, not in the '70's?
 11 A. **No, I did not say that. I said maximum**
 12 **agricultural increases occurred from the '70's**
 13 **through the '90's. That's what I said.**
 14 Q. Sir, can you please look at tab 21 of your
 15 binder. Tab 21 is JX-83. It's a USGS report
 16 entitled Groundwater Conditions in Georgia,
 17 2010-2011. Have you seen this report previously,
 18 sir?
 19 A. **Yes. I believe I have seen this report**
 20 **previously.**
 21 Q. Okay. Can you turn with me to page 12. On
 22 page 12 there's a discussion that begins on a
 23 paragraph that starts with groundwater pumping is
 24 the most important human activity that affects --
 25 do you see that?
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- 1 **A. Yes, I see that.**
- 2 **Q.** Can you read that paragraph to yourself.
- 3 **A. Yes, I read that.**
- 4 **Q.** Okay. And you agree with the statements in that
- 5 paragraph; don't you?
- 6 **A. It says that the most important human activity**
- 7 **that affects groundwater storage and the rate of**
- 8 **discharge from an aquifer is groundwater pumping.**
- 9 **So he's specifically talking about human**
- 10 **activity, and I guess that is the case. I mean,**
- 11 **there could be other human activities like**
- 12 **dredging or something that could impact the**
- 13 **groundwater flow to streams. But I guess that's**
- 14 **not a common daily activity, and groundwater**
- 15 **pumping might be.**
- 16 **So I agree that from human activities,**
- 17 **groundwater pumping can affect the storage as**
- 18 **well as the discharge from the aquifer.**
- 19 **Q.** Okay. And then there is a hydrograph of a
- 20 particular well in Randolph County. Do you see
- 21 that?
- 22 **A. Yes, I see that.**
- 23 **Q.** And that shows a trend line; doesn't it?
- 24 **A. Yes, it does.**
- 25 **Q.** And that's decreasing, sir?

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- 1 **those wells during the 2010 to 2011 period by as**
- 2 **much as he says. I don't know these numbers, but**
- 3 **they would decline because of the drought.**
- 4 **Q.** Okay. And did you -- did you study this data in
- 5 connection with issuing your direct testimony?
- 6 **A. I don't believe I have looked at this.**
- 7 **This is a local impact, again. There are**
- 8 **wells where it says that the impacts are higher.**
- 9 **There are wells where it says that the impacts**
- 10 **could be lower.**
- 11 **And, again, I was evaluating the impacts of**
- 12 **baseflow due to pumping. So my specific**
- 13 **objective was not to look at water levels, but to**
- 14 **look at how much the -- there is a reduction in**
- 15 **baseflow because of pumping in Georgia.**
- 16 **Q.** But you rendered an opinion that there is no
- 17 evidence that groundwater levels are declining?
- 18 **A. That is correct. In the Upper Floridan Aquifer.**
- 19 **Q.** But that's not what you looked at?
- 20 **A. I looked at the data for different wells in the**
- 21 **Upper Floridan Aquifer to evaluate that.**
- 22 **Q.** Sir, you're not a climate expert?
- 23 **A. No, I'm not.**
- 24 **Q.** Okay. And you're not a hydroclimatologist?
- 25 **A. No, I'm not.**

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- 1 **A. Yes, it is. But this line is not in the Upper**
- 2 **Floridan Aquifer, and it's just one well.**
- 3 **Q.** Your testimony is that Randolph County is not in
- 4 the ACF Basin?
- 5 **A. No. It said over here that this is a Clayton --**
- 6 **completed in the Clayton Aquifer in Randolph**
- 7 **County. It specifically says that in the last**
- 8 **sentence of this paragraph you made me read.**
- 9 **So --**
- 10 **Q.** My question is is this in the ACF Basin?
- 11 **A. It is in the ACF Basin, yes. It's not in Upper**
- 12 **Floridan Aquifer is what I said.**
- 13 **Q.** Let's look at the Upper Floridan Aquifer on
- 14 page 24.
- 15 **A. Yes. I'm there.**
- 16 **Q.** Okay. And you can read the paragraph right
- 17 before the reference section.
- 18 **A. Yes. I read that sentence.**
- 19 **Q.** Okay. And do you agree with the statements
- 20 there?
- 21 **A. I do not know the context of this. It says here**
- 22 **during 2010 and 2011 water levels in all wells**
- 23 **declined at some particular rate, which reflects**
- 24 **drought conditions that existed in 2010 and 2011.**
- 25 **So I do agree that water levels dropped in**

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- 1 **Q.** So, in fact, at your deposition you weren't aware
- 2 as to what that meant?
- 3 **A. Right.**
- 4 **Q.** All right. Do you know now?
- 5 **A. Someone who looks at the hydrologic impacts of**
- 6 **climate. I believe that's what it would be.**
- 7 **Q.** And when you examined precipitation data in this
- 8 case, you had not done that type of analysis
- 9 previously; is that correct?
- 10 **A. What kind of analysis are you specifically**
- 11 **referring to?**
- 12 **Q.** The analysis that you did in this case, and that
- 13 is evaluating trends in precipitation.
- 14 **A. I looked at the precipitation data across the**
- 15 **basin. And I looked at how much the average**
- 16 **precipitation was pre-'92, and I looked at the**
- 17 **average precipitation post-'92. That's what I**
- 18 **have done.**
- 19 **Q.** I understand that, sir. I'm talking about
- 20 outside of this engagement, outside of this
- 21 project, did you ever have any other project
- 22 where you looked at precipitation trends?
- 23 **A. I have used precipitation data in other models.**
- 24 **In this modeling I haven't even used the**
- 25 **precipitation data for my model. I have looked**

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1 **at the precipitation data to see what it tells me**
 2 **about the basin.**
 3 **This is like my due diligence which I do to**
 4 **understand the system. So that is when I looked**
 5 **at precipitation data. I looked at streamflow**
 6 **data. I looked at water level data for that**
 7 **purpose.**
 8 **Q.** Okay. And when you looked at precipitation
 9 trends, you looked at select rain gauges in the
 10 ACF Basin?
 11 **A. I selected -- yes, rain gauges across the ACF**
 12 **River Basin.**
 13 **Q.** And how many rain gauges did you look at, sir?
 14 **A. I don't remember the exact number; but there were**
 15 **a few, I believe.**
 16 **Q.** Okay. And if you look at -- I think it's figure
 17 C-2 in your report. It's demo 20 of your
 18 prefiled direct.
 19 I think there's seven. Does that sound right
 20 to you?
 21 **A. What am I looking at, please?**
 22 **Q.** I'm trying to understand how many rain gauges you
 23 looked at across the entire basin. Does the
 24 number seven sound correct to you?
 25 **A. It may be -- I thought eight or 10, yes. A small**

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1 **number. But I don't know the -- I don't recall**
 2 **exactly if it was seven.**
 3 **Q.** Why don't we get the exact number.
 4 If you look at page 33 --
 5 **A. Of my direct?**
 6 **Q.** Yes, sir.
 7 **A. Yes. Yes.**
 8 **Q.** I count eight. Is that what you get?
 9 **A. Yes. There were eight stations, but -- that is**
 10 **correct.**
 11 **Q.** Do you know how many stations exist throughout
 12 the entire basin?
 13 **A. No. But there are several more.**
 14 **Q.** Okay. Do you know that climatologists typically
 15 rely on a gridded precipitation data in
 16 formulating precipitation trends?
 17 **A. I don't know what climatologists do. But we use**
 18 **gridded data if needed. We use the point**
 19 **measurement data as well.**
 20 **Q.** What did you use here?
 21 **A. I have looked at the point measurement data. I**
 22 **haven't looked -- used this in a model.**
 23 **Gridded data is good when you have to cover**
 24 **the entire region; and you put that -- those**
 25 **numbers in a model. So you need coverage**

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1 **overall.**
 2 **What I have done here is just to examine what**
 3 **the precipitation was between 1975 and current**
 4 **conditions across the basin. So I just selected**
 5 **data -- I selected gauges which had a long -- a**
 6 **period of record that existed between 1975 and**
 7 **2015, as much as was available.**
 8 **Q.** Do you know who Dr. Dennis Lettenmaier is?
 9 **A. Yes, I know who he is.**
 10 **Q.** Have you read his prefiled direct testimony in
 11 this matter?
 12 **A. No, I have not read his prefiled direct**
 13 **testimony.**
 14 **Q.** Okay. Did you read his deposition transcript?
 15 **A. No, I have not. I have seen his expert report**
 16 **briefly when it had first been put out.**
 17 **Q.** Okay. And you understand that he's a
 18 hydroclimatologist?
 19 **A. I don't know exactly what he does. I believe**
 20 **he's a professor.**
 21 **Q.** Okay. Sir, we talked a little bit about
 22 Dr. Sunding; and then you were asked some
 23 questions about that on redirect. You're aware
 24 that his conservation scenarios include
 25 eliminating evaporation from farm ponds?

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1 **A. I believe he was looking at all agricultural**
 2 **reductions of pumping in his conservation**
 3 **scenarios.**
 4 **Q.** Right. I'm not talking about pumping now. I'm
 5 talking about reducing evaporation from farm
 6 ponds. Do you realize that that was a component
 7 of his conservation scenario?
 8 **A. I do not recall that.**
 9 **Q.** All right. So when you said that the 2,000 cfs
 10 that he's proposing is not achievable, you didn't
 11 consider that?
 12 **A. Essentially the farm ponds are also filled by**
 13 **groundwater pumping or by surface water stream**
 14 **when the weather is wet. So those farm ponds are**
 15 **not taking away anything from dry weather. In**
 16 **fact, in dry weather they have collected water so**
 17 **you don't have to pump as much.**
 18 **So the farm ponds was part of the database**
 19 **that was given to me. And I approximated that 70**
 20 **percent of that water -- the farm ponds water**
 21 **came from groundwater, and 30 percent came from**
 22 **surface water. So the farm ponds were accounted**
 23 **for in the water consumption.**
 24 **Q.** And do you know that Dr. Sunding explained that
 25 you could save 271 cfs from reducing evaporation

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1 from farm ponds? Do you know that?

2 **A. I do not know what Dr. Sunding has done in this**

3 **regard.**

4 **Q.** Okay. Have you heard about the Georgia Water

5 Resources Institute?

6 **A. I'm not sure.**

7 **Q.** Okay. Have you heard of Dr. Georgakakos?

8 **A. I have heard the name, yes.**

9 **Q.** How about Dr. Martin Kistenmacher?

10 **A. I'm not sure.**

11 **Q.** Okay. Were you in court at all last week

12 when we were discussing the UIF report issued by

13 GWRI?

14 **A. I was in court for a short period during**

15 **Dr. Hornberger's testimony.**

16 **Q.** Okay. Sir, if you could turn to tab 19 of

17 volume 2 of your binder, I'm going to ask you if

18 you have ever seen this document before.

19 **A. No, I have not seen this document before.**

20 **Q.** Okay. So in your work on this, you're not

21 familiar with criticisms by the Georgia Water

22 Resources Institute of the agricultural water

23 consumption numbers provided by Georgia EPD?

24 **A. I don't know if there was a criticism. You're**

25 **telling me that there was a criticism. I don't**

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1 BY MR. QURESHI:

2 **Q.** I may have asked you this previously, Dr. Panday.

3 Have you read the entirety of Dr. Langseth's

4 transcript?

5 **A. No, I have not.**

6 **Q.** Okay. Well, I'll direct you to page 1028,

7 line 24, through 1030, line 3.

8 **A. Okay. I read this.**

9 **Q.** Okay. The next section I want you to read is on

10 the following pages, page 1032, line 3, to 1033,

11 line 9.

12 **A. Yes. I read this.**

13 **Q.** Okay. Does this inform your understanding of

14 Dr. Langseth identifying a range of potential

15 impact factors from 41 all the way up to 87

16 percent?

17 **A. I have not seen this before.**

18 **Q.** Okay. So when you said that he had abandoned his

19 opinion, it was not based on reading this

20 transcript?

21 **A. That is right. They were -- Florida has been**

22 **using the impact factor of .6 in the direct**

23 **testimonies that were submitted. That's why I**

24 **said that. And previously they used the impact**

25 **factor of .4. And that is why I said that they**

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1 **know that there was.**

2 **Q.** I'm asking you if anyone has ever told you that

3 there was a criticism?

4 **A. No. I don't know that.**

5 **Q.** Okay. Has anyone ever told you that GWRI

6 estimated that up to 1200 cfs a year is lost to

7 evaporation from farm ponds? Did you ever hear

8 that before?

9 **A. Not before now, no.**

10 **Q.** Okay. Sir, you were shown a portion of

11 Dr. Langseth's testimony during your redirect

12 examination. Do you recall that?

13 **A. Yes. I do.**

14 **Q.** Okay. And it was for a particular day. I

15 believe Mr. -- Dr. Langseth was deposed for four

16 days. Does that sound correct to you?

17 **A. I believe he was deposed for four days, yes.**

18 **Q.** Okay. I'm going to show you a transcript for

19 another day. I don't think you were at this

20 particular day of his deposition, but I want to

21 see if that relates at all to your understanding

22 of the impact factor range that Dr. Langseth

23 provided.

24 MR. QURESHI: Your Honor, may I provide

25 the deposition transcript?

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1 **had abandoned the .4 impact factor and selected**

2 **.6 impact factor instead.**

3 **Q.** You understand that this deposition that you are

4 looking at was given before the prefiled direct

5 was submitted in August?

6 **A. Right. It was in August.**

7 **Q.** And you hadn't read this when you wrote your

8 prefiled direct?

9 **A. No, I have not.**

10 **Q.** Okay.

11 MR. QURESHI: Nothing further.

12 SPECIAL MASTER LANCASTER: Redirect?

13 MS. ALLON: Yes, your Honor, very

14 briefly.

15 REDIRECT EXAMINATION

16 BY MS. ALLON:

17 **Q.** Dr. Panday, I just want to go back to one exhibit

18 that counsel for Florida was asking you about

19 just now. It was behind tab 21 in your binder on

20 page 24, the USGS report.

21 **A. Yes. I'm there.**

22 **Q.** Page 24?

23 **A. Yes. I'm there.**

24 **Q.** And counsel for Florida had asked you about five

25 wells that are discussed on page 24, and he said

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1 that there were declining trends in those wells.
 2 And he asked you had you ever considered these
 3 trends when you formed your opinions about
 4 groundwater trends in the ACF Basin. Dr. Panday,
 5 are all of these wells even in the ACF Basin?
 6 **A. I'm not sure that they are.**
 7 **Q.** And, in fact, if you go back to your direct
 8 testimony on page 71, for example, you can look
 9 at the map there. And if you just put it side by
 10 side --
 11 **A. Yes.**
 12 **Q.** -- you can see, for example, if you look at
 13 Thomas County, it's in the bottom right-hand
 14 corner of your demonstrative 42. And it's in
 15 this map that counsel for Florida was showing
 16 you. That's outside the ACF Basin; isn't that
 17 right?
 18 **A. Yes. That is correct. In fact, looking at this**
 19 **map at the bottom of page 24 of Exhibit 21 here,**
 20 **it shows the blue area shaded where these wells**
 21 **are. And these wells are outside of the ACF**
 22 **River Basin.**
 23 **Q.** Are wells outside of the ACF Basin relevant to
 24 your analysis of groundwater trends inside the
 25 ACF Basin?

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1 **A. No, they're not.**
 2 MS. ALLON: Thank you, your Honor.
 3 Nothing further.
 4 SPECIAL MASTER LANCASTER: Anything
 5 further?
 6 MR. QURESHI: May I just ask one
 7 question?
 8 SPECIAL MASTER LANCASTER: Sure.
 9 RE-CROSS-EXAMINATION
 10 BY MR. QURESHI:
 11 **Q.** Dr. Panday, sticking with page 24, the well on
 12 the left-hand side next to where it says Flint
 13 River, is that in the Flint River Basin?
 14 **A. When I look at the little map with it, it shows**
 15 **it to be at the edge of the Flint River there.**
 16 **Q.** And Thomas County that Georgia's counsel
 17 highlighted for you, how many wells are in Thomas
 18 County there?
 19 **A. None. But the point I believe she was trying to**
 20 **make is that most of the wells are further east**
 21 **of Thomas County. So now, they're even further**
 22 **away from the ACF River Basin.**
 23 **Q.** But there is one on the Flint River; isn't there?
 24 **A. There is one that -- which seems to be on the**
 25 **Flint River, yes.**

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1 **Q.** Okay.
 2 MR. QURESHI: Thank you, your Honor.
 3 SPECIAL MASTER LANCASTER: Redirect?
 4 MS. ALLON: Nothing else, your Honor.
 5 Thank you.
 6 SPECIAL MASTER LANCASTER: Doctor --
 7 THE WITNESS: Yes, your Honor?
 8 SPECIAL MASTER LANCASTER: -- you have
 9 heard the old saying there are lawyers and
 10 there are lawyers; and there are doctors and
 11 there are doctors. Yes?
 12 THE WITNESS: No, I haven't heard it
 13 before. But it's quite funny.
 14 SPECIAL MASTER LANCASTER: In the same
 15 token, are there models and there are models?
 16 THE WITNESS: There are models and there
 17 are models, yes.
 18 SPECIAL MASTER LANCASTER: And it --
 19 does it make a difference as to which model
 20 you pick?
 21 THE WITNESS: It can make a difference
 22 as to which model we pick and also what the
 23 objectives of the modeling are.
 24 SPECIAL MASTER LANCASTER: And does
 25 it -- can it make a difference as to what you

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1 put in the model?
 2 THE WITNESS: It makes a difference as
 3 to what you put into the model, again,
 4 depending on the objectives of the model,
 5 your Honor.
 6 And if you want, I can explain a little.
 7 What I meant was that if you put in
 8 weather-related conditions which could be
 9 different, then you could get different
 10 answers. But if the objective of the model
 11 was the impact of pumping, then that -- what
 12 you put in with regards to the
 13 weather-related impacts do not make a
 14 difference on the impact of pumping.
 15 SPECIAL MASTER LANCASTER: So if
 16 somebody picked a model and put certain
 17 things in, they might get certain results?
 18 THE WITNESS: Right.
 19 SPECIAL MASTER LANCASTER: Let me ask
 20 you this. Have you heard of the Battle Bend?
 21 THE WITNESS: I heard about this
 22 yesterday, your Honor.
 23 SPECIAL MASTER LANCASTER: Do you know
 24 where it's located?
 25 THE WITNESS: I Google-Mapped it, and I

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1 saw that the Google Map showed it right in
 2 the middle of a lake somewhere in Florida
 3 along the Apalachicola River, I believe.
 4 SPECIAL MASTER LANCASTER: So if the
 5 United States Supreme Court were to order
 6 that the Battle Bend be disengaged, what
 7 effect would that have?
 8 THE WITNESS: I'm not sure I understand
 9 your question.
 10 SPECIAL MASTER LANCASTER: Well, suppose
 11 that the Supreme Court said get rid of Battle
 12 Bend; disengage it so it doesn't connect
 13 anymore. What effect would that have?
 14 THE WITNESS: I'm not sure, your Honor.
 15 SPECIAL MASTER LANCASTER: Okay.
 16 Suppose the Supreme Court ordered that a
 17 canal be created between the Tennessee River
 18 and the Chattahoochee River. What effect
 19 would that have?
 20 THE WITNESS: I'm not sure, your Honor.
 21 SPECIAL MASTER LANCASTER: There are, I
 22 think, some 300 sloughs in this area?
 23 THE WITNESS: I do not know, your Honor.
 24 SPECIAL MASTER LANCASTER: Well, suppose
 25 the Supreme Court ordered that they all be

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1 blocked. What effect would that have?
 2 THE WITNESS: I would not know, your
 3 Honor. I have been analyzing the groundwater
 4 effects on pumping.
 5 SPECIAL MASTER LANCASTER: Right. And I
 6 understand that. I understand your
 7 testimony. I just thought I would take a
 8 chance that you might be able to answer.
 9 Somebody else will be able to -- they're
 10 going to get asked the questions, too.
 11 You probably don't know the answer to
 12 this one either. Oysters are male and then
 13 they become female?
 14 THE WITNESS: I do not know, your Honor.
 15 SPECIAL MASTER LANCASTER: Okay. I
 16 think I'm going to strike out, but let me ask
 17 you a couple of more questions. What would
 18 happen if below Bainbridge and above Sumatra,
 19 the gages -- what would happen if all of the
 20 water flowing in were stopped?
 21 THE WITNESS: I believe it would be very
 22 difficult to stop all the water flowing
 23 downstream, your Honor. You could build a
 24 dam, but then water levels would rise and
 25 flow over. So --

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1 SPECIAL MASTER LANCASTER: Okay.
 2 THE WITNESS: I don't think we can stop
 3 the water at Bainbridge.
 4 SPECIAL MASTER LANCASTER: Let me ask
 5 you another question, which will indicate my
 6 ignorance even further.
 7 If it rains and rains and rains and
 8 rains, are you going to get more groundwater?
 9 THE WITNESS: Your Honor, I believe
 10 right now you know more about this case than
 11 I do or a lot of us do. But -- so when you
 12 say forgive my ignorance, I think you know a
 13 lot more than we do.
 14 But at the same time, if it rains and
 15 rains, the water levels will rise up to the
 16 maximum. And once the aquifer is fully
 17 recharged, it cannot rise anymore. You're
 18 going to get runoff.
 19 SPECIAL MASTER LANCASTER: So -- and
 20 if it doesn't rain at all, you get a
 21 drought.
 22 THE WITNESS: Yes, your Honor. And the
 23 groundwater levels will drop because of the
 24 drought.
 25 SPECIAL MASTER LANCASTER: It seems

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1 to me, as a layman, the more rain you get,
 2 the more water you get; the less rain you
 3 get, the less water you get.
 4 Is that right?
 5 THE WITNESS: That is correct, your
 6 Honor.
 7 SPECIAL MASTER LANCASTER: Thank you.
 8 MS. ALLON: Nothing else, your Honor.
 9 MR. QURESHI: Nothing further, your
 10 Honor.
 11 SPECIAL MASTER LANCASTER: You're off
 12 the hook.
 13 THE WITNESS: Thank you, your Honor.
 14 MS. ALLON: Georgia is ready to call its
 15 next witness, Dr. Phil Bedient.
 16 SPECIAL MASTER LANCASTER: Thank you.
 17 While he's taking the stand, I just got
 18 an e-mail from my legal assistant -- we don't
 19 have secretaries anymore -- from my legal
 20 assistant saying that Governor Deal was
 21 making a talk about something. Do you know
 22 what he's talking about?
 23 MS. ALLON: I don't, your Honor.
 24 SPECIAL MASTER LANCASTER: Okay. Just
 25 curious.

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1 MS. ALLON: I can check.
 2 SPECIAL MASTER LANCASTER: If you find
 3 out, let me know if it has anything to do
 4 with us.
 5 MS. ALLON: I will, your Honor.
 6 SPECIAL MASTER LANCASTER: Thank you.
 7 THE CLERK: Please raise your right
 8 hand.
 9 Do you solemnly swear that the testimony
 10 you shall give in the cause now in hearing
 11 shall be the truth, the whole truth, and
 12 nothing but the truth, so help you God?
 13 THE WITNESS: I do.
 14 THE CLERK: Please be seated.
 15 Pull yourself right up to the microphone
 16 and please state your name and spell your
 17 last name.
 18 THE WITNESS: Philip Bedient,
 19 B E D I E N T; Philip, one L.
 20 MS. ALLON: Your Honor, Dr. Bedient is a
 21 hydrologist and an expert on reservoir
 22 operations.
 23 May I hand up a copy of his direct
 24 testimony?
 25 SPECIAL MASTER LANCASTER: Please.
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1 DIRECT EXAMINATION
 2 BY MS. ALLON:
 3 Q. Dr. Bedient, do you recognize this as your
 4 prefiled direct testimony?
 5 A. Yes, I do.
 6 Q. And do you adopt this as your sworn testimony in
 7 this matter?
 8 A. I do.
 9 CROSS-EXAMINATION
 10 BY MS. WINE:
 11 Q. Good afternoon, Dr. Bedient. My name is Jamie
 12 Wine, and I'm counsel for the State of Florida.
 13 A. Good afternoon.
 14 MS. WINE: Your Honor, we have a cross
 15 binder, as you might expect. May we approach
 16 with it?
 17 SPECIAL MASTER LANCASTER: Certainly.
 18 MS. WINE: I got it into one though. I
 19 excerpted some documents, but it was my goal
 20 to keep this in one.
 21 SPECIAL MASTER LANCASTER: Thank you.
 22 BY MS. WINE:
 23 Q. Dr. Bedient, I would like to start out by asking
 24 you about your offset theory. Okay?
 25 A. Sure.
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1 Q. Now, you believe that to the extent Georgia were
 2 to reduce its consumption on the Flint River, the
 3 Corps would hold back water on the Chattahoochee
 4 in order to offset the increased flows from the
 5 Flint. Correct?
 6 A. Yes. That is correct.
 7 Q. And you refer to this in your prefiled direct
 8 testimony as the Army Corps, quote, offset
 9 operation. Correct?
 10 A. Yes.
 11 Q. And your opinions depend heavily on this.
 12 Correct?
 13 A. My opinions are related to the offset, but that's
 14 just part of the operations that go on within the
 15 ACF Basin by the Army Corps.
 16 Q. Okay. I think you said that the offset operation
 17 was at the crux of your report. Do you recall
 18 saying that?
 19 A. Well, especially during low flows and drought
 20 times; that is correct.
 21 Q. Okay. And you're familiar with the RIOP, which
 22 is the Revised Interim Operating Plan for the
 23 Corps. Correct?
 24 A. I am.
 25 Q. And the RIOP establishes minimum release
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1 requirements from Woodruff Dam to the
 2 Apalachicola River. Correct?
 3 A. It sets minimum release standards for the
 4 maintenance of fish and wildlife and endangered
 5 species.
 6 Q. So it is the RIOP that establishes these minimum
 7 release requirements. Correct?
 8 A. That is correct.
 9 Q. Okay. And you were in the courtroom last week
 10 when Dr. Zeng testified; is that correct?
 11 A. When doctor who testified?
 12 Q. Dr. Zeng, Wei Zeng.
 13 A. Oh, yes. Yes.
 14 Q. I might be mispronouncing his name.
 15 A. No.
 16 Q. So if I am, I apologize.
 17 A. That's okay.
 18 Q. Okay. And you were here?
 19 A. Yes.
 20 Q. Do you recall when he came over to the big
 21 screen, and he put up a table from the RIOP that
 22 set forth some of the minimum release
 23 requirements; and he was explaining the RIOP to
 24 the Court?
 25 A. I do.
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- 1 Q. And he explained the different circumstances
- 2 under which the minimum release requirements are
- 3 determined. Correct?
- 4 A. **Correct.**
- 5 Q. And he talked about three factors, time of year,
- 6 basin inflow, and composite storage. Do you
- 7 recall that?
- 8 A. **Yes. Those are the three main drivers that sort**
- 9 **of, if you will, dictate the outflow and all of**
- 10 **that from Woodruff Dam.**
- 11 Q. And he also noted that there was a 5,000 cfs
- 12 minimum release requirement when the Corps is in
- 13 something called drought operations. Correct?
- 14 A. **Yes.**
- 15 Q. Okay. During this explanation, Dr. Zeng did not
- 16 ever use the term offset operation. Correct?
- 17 A. **I didn't listen to it that closely.**
- 18 Q. Okay. Did you look at his prefiled direct
- 19 testimony?
- 20 A. **I have -- I have glanced through it; but I have**
- 21 **not studied it.**
- 22 Q. Okay. From your glance through of his prefiled
- 23 direct testimony, do you recall whether Dr. Zeng
- 24 ever used the term offset operation?
- 25 A. **No, I don't.**

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- 1 A. **I'm not sure if it was something that I came up**
- 2 **with or if it was something that we determined**
- 3 **within the group.**
- 4 Q. Okay. Well, you're familiar with the Corps
- 5 October 2015 Draft Environmental Impact Study for
- 6 the Water Control Manual update. Correct?
- 7 A. **I'm familiar with it. Yes.**
- 8 Q. Okay. And that represents the Corps' most
- 9 comprehensive description of its reservoir
- 10 operations in the ACF Basin?
- 11 A. **I believe so.**
- 12 Q. And it totals over 4200 pages?
- 13 A. **I know it's extensive.**
- 14 Q. Don't worry. I didn't put the whole thing in
- 15 front of you.
- 16 A. **Please don't. Thank you.**
- 17 Q. And are you aware that the term offset operation
- 18 is nowhere among those 4200 pages?
- 19 A. **If you're telling me that, I wouldn't be**
- 20 **surprised. It -- again, it's a term that is used**
- 21 **in my demonstrative No. 12 in my direct testimony**
- 22 **to offer up, if you will, a concept so that it's**
- 23 **easily understandable.**
- 24 Q. And you know that offset operation is not
- 25 actually an operating protocol of the Corps.

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- 1 Q. Or even the term offset?
- 2 A. **No, I don't.**
- 3 Q. And you didn't use the term offset operation in
- 4 your expert reports; did you?
- 5 A. **I would have to go back and -- and carefully look**
- 6 **or study those reports. They're fairly**
- 7 **extensive.**
- 8 Q. Okay.
- 9 A. **It's a -- it's a term that I have used simply**
- 10 **because it -- when we say offset, it's something**
- 11 **that's fairly easy to understand.**
- 12 Q. Well, we looked for the term offset operations in
- 13 your two reports which are in your binder. I'm
- 14 not suggesting that you look through them right
- 15 now, but we couldn't find that term anywhere in
- 16 your two expert reports. But we do see it when
- 17 we get to your prefiled testimony. Correct?
- 18 A. **Yes. And I believe that there's a graphic that**
- 19 **sort of demonstrates the offset.**
- 20 **And we call it the offset because, again,**
- 21 **we're trying to simplify a fairly complex**
- 22 **phenomenon. And by calling it offset, we think**
- 23 **that's an easily understandable definition.**
- 24 Q. Are you the one who made up the term offset
- 25 operation?

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- 1 Correct?
- 2 A. **Well, no; that's not true at all. I believe we**
- 3 **have got plenty of information, plenty of data,**
- 4 **plenty of plotted, if you will, hydrographs and**
- 5 **response curves from the reservoirs that clearly**
- 6 **show that offset is taking place, especially**
- 7 **during drought conditions.**
- 8 Q. It's not a term that's defined like drought
- 9 operations is in any of the Corps materials;
- 10 correct?
- 11 A. **I will agree with what you just said, yes.**
- 12 Q. And this is precisely why the U.S. Government
- 13 says that you and Georgia are speculating when
- 14 you assert that the Corps will offset any water
- 15 conserved on the Flint. Correct?
- 16 A. **Well, now, that statement comes out of the -- the**
- 17 **U.S. Government position, I recall reading that.**
- 18 **And while they go on to talk about that, they**
- 19 **were also mainly talking about annual flows and**
- 20 **all sorts of flows. And they also say in that**
- 21 **exact statement that a lot of this is subject to**
- 22 **a lot more study, and there's more data that**
- 23 **needs to be evaluated.**
- 24 Q. Sir, you recall reading the Government's brief?
- 25 It was an amicus brief that they filed in

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1 opposition to Georgia's motion to dismiss in this
 2 case?
 3 **A. I recall seeing it, yes.**
 4 **Q.** Okay. And do you recall that in that brief the
 5 United States responded directly to the argument
 6 put forth by Georgia and you that the Army Corps
 7 would increase impoundments upstream to offset
 8 increased flows from the Flint River; didn't it?
 9 **A. You would have to show me the document before I**
 10 **could --**
 11 **Q.** Okay. We can pull that up.
 12 MS. WINE: Let's put that up on the
 13 screen.
 14 BY MS. WINE:
 15 **Q.** We have got it here. I think it's in tab 4 of
 16 your binder as well, if that's easier for you.
 17 **A. Sure.**
 18 MS. WINE: Mr. Walton, if we could turn
 19 to page 19 of that brief.
 20 Let's put 18 and 19 on the screen,
 21 actually.
 22 BY MS. WINE:
 23 **Q.** Dr. Bedient, the section on page 18 that starts
 24 under the heading B is the section that I'm
 25 referring to where the Army Corps is responding

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1 to this offset argument.
 2 MS. WINE: And if we could now,
 3 Mr. Walton, let's just blow up 19 -- page 19.
 4 And we have got some language already
 5 highlighted there.
 6 BY MS. WINE:
 7 **Q.** Sir, is this the brief that you recall reading
 8 from the United States Government?
 9 **A. Yes.**
 10 **Q.** And you recall that the United States first
 11 recognized that a cap on Georgia's consumption,
 12 particularly on the unregulated Flint River, as
 13 they call it, could increase the amount of water
 14 flowing into Florida. Correct?
 15 I'm just looking at that first highlighted
 16 sentence, sir.
 17 **A. Well, it's difficult with these types of**
 18 **documents to simply look at a single sentence and**
 19 **pull it out of context.**
 20 **Q.** Okay. I'm going to read on; but for now, I'm
 21 just wondering if you see right there in that
 22 sentence that the government says that it's at
 23 least plausible that a cap on Georgia's
 24 consumption, particularly with respect to the
 25 Flint River, which is unregulated by the Corps,

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1 would increase the basin inflows and thereby
 2 increase the amount of water flowing into
 3 Florida.
 4 **A. I see the sentence. I do.**
 5 **Q.** And, sir, the Government goes to say that Georgia
 6 gives Flint River short shrift by suggesting that
 7 the Corps in this circumstance would just offset
 8 the increased flows from the Flint. Correct?
 9 **A. Right. I see that.**
 10 **Q.** And then they go on to say that the offset theory
 11 is actually entirely unwarranted speculation. Do
 12 you see that?
 13 **A. I see what they're saying in this brief. But**
 14 **they also go on to say that we cannot say at this**
 15 **juncture without further factual development that**
 16 **Florida would not be able to receive any minimum**
 17 **flow that might be adjudicated entirely through**
 18 **other caps and other issues. And in addition, we**
 19 **have done extensive studies as part of this work**
 20 **that clearly shows that there are many, many**
 21 **times with respect to the way that the Army Corps**
 22 **of Engineers operates under the RIOP, especially**
 23 **in drought conditions.**
 24 **Q.** Sir --
 25 **A. There are many, many times when Florida will not**

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1 **receive any additional flows in the system.**
 2 **Q.** Sir, you're not trying to suggest to this Court
 3 that you know more about how the U.S. Army Corps
 4 operates than the U. S. Government itself; are
 5 you?
 6 **A. No. I would not.**
 7 **Q.** Okay. Now, your offset theory depends on the
 8 assumption that the Corps is only going to
 9 release the minimum amount and no more. Correct?
 10 **A. Well, the offset theory -- first of all, this**
 11 **is -- this is -- it's within the RIOP; and the**
 12 **RIOP is a very complex document. And under**
 13 **certain conditions -- under certain conditions --**
 14 **there are periods where this offset will occur,**
 15 **especially when flows are below 5,000.**
 16 **Q.** So during a low flow period?
 17 **A. Well, or during a drought-type period, yes.**
 18 **Q.** All right. If we can put that brief back up and
 19 keep reading --
 20 MS. WINE: Jon, can you pull that back
 21 up?
 22 Thanks.
 23 BY MS. WINE:
 24 **Q.** So the Government also says here that an
 25 increased flow during wet times would provide a

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1 cushion during low flow periods so that the Corps
 2 could maintain a flow rate of greater than 5,000
 3 cfs for a longer period of time without any
 4 alteration of the Corps' operations.
 5 Do you see that, sir?
 6 **A. I see that.**
 7 **Q.** And, sir, by referring to a cushion, you
 8 understand that the U. S. Government is
 9 describing how water conserved under a
 10 consumption cap would add to the reserves that
 11 already exist in the Corps' reservoirs. Correct?
 12 **A. Again, I see all of that. But they go on to**
 13 **say -- first of all, they said that this is**
 14 **plausible. That's all they said in both of the**
 15 **these statements. And then, lastly, they said**
 16 **that without factual -- further factual**
 17 **development, they really can't say much more at**
 18 **this point in time.**
 19 **Q.** The Corps was -- excuse me, sir. The Government
 20 was noting that more water in the system from the
 21 Flint is a good thing. Right?
 22 **A. They were making that statement. And, again, the**
 23 **way that the current system is operated based**
 24 **upon the way in which the Army Corps of Engineers**
 25 **has gone through the DEIS, the system is operated**
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1 **such that they hit this minimum 5,000 cfs under a**
 2 **variety of conditions, low flows and drought**
 3 **flows. And that does help maintain a -- if you**
 4 **will, well above a minimum flow, minimum 5,000**
 5 **that's contained well within the RIOP.**
 6 **Q.** Thank you, sir.
 7 Sir, I have another question about your
 8 offset theory. Do you recall in your February 29
 9 expert report you cited the deposition testimony
 10 of somebody named Steve Leitman?
 11 **A. I think I vaguely remember that, yes.**
 12 **Q.** And you characterized him as Florida's chief
 13 hydrologic modeler during the ACF Compact
 14 negotiations. Do you recall that?
 15 **A. I do.**
 16 **Q.** Okay. First of all, do you know whether
 17 Mr. Leitman is actually a hydrologist?
 18 **A. Well, I said that in my -- I mean, I said that in**
 19 **my report. So I stand by what I said there.**
 20 **Q.** Do you know that he does not have a Ph.D. in
 21 hydrology?
 22 **A. One does not have to have a Ph.D. in hydrology to**
 23 **be a hydrologist.**
 24 **Q.** Do you know that he's currently enrolled in a
 25 correspondence course at the Kwazulu University
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1 in South Africa attempting to get his Ph.D. in
 2 hydrology?
 3 **A. No, I don't.**
 4 **Q.** And, sir, you cited Mr. Leitman in your
 5 deposition -- sorry, in your expert report. And
 6 then at your deposition you were confronted with
 7 what Mr. Leitman said about water flowing uphill.
 8 Do you recall that?
 9 **A. Yes. There was a discussion about that concept**
 10 **in my depo. I remember.**
 11 **Q.** Okay. And Mr. Leitman had said that water can
 12 actually move upstream. Correct?
 13 **A. He did say those words, yes.**
 14 **Q.** Okay. And you said that's -- that's not correct.
 15 Water cannot literally flow uphill to the
 16 reservoirs. Correct?
 17 **A. And if, indeed, that's what he meant, then that's**
 18 **what I said in my depo. Water can't flow uphill;**
 19 **that's correct.**
 20 **Q.** Now, sir, I would like to explore further your
 21 assumption that the Corps will release only the
 22 minimum discharged amounts when those minimums
 23 are in effect. Okay?
 24 **A. Okay. Sure.**
 25 **Q.** So let's pull up first the RIOP table. This is
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1 the one that Dr. Zeng walked through as well.
 2 It's in tab 5 of your binder.
 3 **A. Okay.**
 4 MS. WINE: Mr. Walton, this is JX-72 at
 5 page 13.
 6 **A. Okay. I see it.**
 7 **Q.** Okay. Now, if we look at the fourth column over
 8 that's titled Releases from JWLD, do you see
 9 that?
 10 **A. Give me just a second.**
 11 **Yes.**
 12 **Q.** And JWLD means Jim Woodruff Lock and Dam; is that
 13 correct?
 14 **A. Right.**
 15 **Q.** And the values that are listed under there
 16 represent the minimum releases for the various
 17 scenarios outlined. Correct?
 18 **A. They do.**
 19 **Q.** Okay. So if we look down at the bottom left
 20 where it says zone 4, do you see that?
 21 **A. Yes.**
 22 **Q.** Okay. So zone 4, if we go over to the column
 23 under Releases from JWLD, there is a 5,000 figure
 24 there. Correct?
 25 **A. Yes. There's a greater than or equal to 5,000**
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1 **figure right there --**
 2 **Q.** Okay.
 3 **A.** -- **within zone 4.**
 4 **Q.** Oh, I'm sorry. I didn't mean to interrupt you.
 5 **A.** **Within zone 4.**
 6 **Q.** And zone 4 is when the Army Corps is in drought
 7 operations. Correct?
 8 **A.** **That is correct.**
 9 **Q.** And as you pointed out, there is a greater to or
 10 equal sign there before the 5,000. Correct?
 11 **A.** **Yes.**
 12 **Q.** And that means that the Corps must release the
 13 minimum amount of 5,000 cfs. Correct?
 14 **A.** **That's what that table means, yes. It does.**
 15 **Q.** But it could release more; couldn't it?
 16 **A.** **Well, as a matter of fact, the operations by the**
 17 **Army Corps of Engineers with respect to this**
 18 **basin include meeting seven project purposes;**
 19 **fish and wildlife being just one of those,**
 20 **recreation being another, water supply,**
 21 **navigation, and a host of others that are listed**
 22 **in my expert -- in my testimony. So all of those**
 23 **have to be balanced with respect to the way this**
 24 **system is operated. That's how the Corps**
 25 **operates the ACF Basin. And it operates that**

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1 **only time that they would potentially release**
 2 **more than 5,000 would be for some sort of**
 3 **emergency type situation that might be occurring**
 4 **downstream, some kind of a navigational issue or**
 5 **perhaps for a sudden need for hydropower, some**
 6 **sort of an emergency situation. Other than**
 7 **that -- other than that -- they are going to meet**
 8 **the minimum 5,000 discharge during the drought**
 9 **condition. And they are going to try to refill**
 10 **those reservoirs to the maximum possible.**
 11 **Q.** So, sir, the answer to my question, again, is
 12 that, yes, they could release more than the
 13 5,000; that's what the greater than or equal to
 14 means?
 15 **A.** **Under a few conditions they could do that, yes.**
 16 **Q.** And in that sense the 5,000 minimum release
 17 amount is not a target. Right?
 18 You know that?
 19 **A.** **As a matter of fact, they -- based on the data**
 20 **that I have seen, especially from 2011 and**
 21 **2012 -- and we had extensive conversations about**
 22 **targets and minimums in my deposition, I**
 23 **believe -- it's pretty clear that all through**
 24 **those serious droughts in 2011 and 2012, they**
 25 **were both targeting and hitting the minimum of**

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1 **with the reservoirs -- all of the reservoirs in**
 2 **place.**
 3 **And, in fact, while they're meeting this**
 4 **minimum flow, while they're meeting the minimum,**
 5 **they're also trying to refill those reservoirs to**
 6 **the maximum level possible. And the only way**
 7 **they can do that during drought times is to keep**
 8 **it as close to the minimum as possible while they**
 9 **are refilling reservoirs.**
 10 **If they start to try to release more than the**
 11 **5,000 down here, then they are violating their**
 12 **overall management principles.**
 13 **Q.** Sir, I'm not sure if you answered my question or
 14 if you have given me one answer. But I was
 15 simply asking if under zone 4 under these
 16 circumstances in drought operations where it says
 17 greater than or equal to 5,000, we agree that the
 18 Corps must release at least 5,000 cfs. Correct?
 19 **A.** **We do.**
 20 **Q.** And all I'm asking is could the Corps release
 21 more?
 22 **A.** **Under these conditions, there are -- first of**
 23 **all, if you look back at 2011 and 2012, if you**
 24 **look at the data, you find that they released**
 25 **very, very close 5,000 much of the time. The**

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1 **5,000.**
 2 **Q.** Sir, the answer to my question is that, no, the
 3 5,000 is not a target. It's just a minimum.
 4 Correct?
 5 **A.** **I think in certain instances it's both a target**
 6 **and a minimum.**
 7 **Q.** Okay. Sir, if you -- are you familiar with the
 8 DEIS where it talks about this very point and
 9 explains that minimum releases are minimums, not
 10 targets?
 11 **A.** **I have seen statements to that effect, but I have**
 12 **also seen statements in the DEIS where it says**
 13 **it's a target and a minimum. So there are an**
 14 **equivalent number of statements.**
 15 **It's a huge document and --**
 16 **Q.** Right.
 17 **A.** **-- it just depends on where you happen to be in**
 18 **the RIOP during which operation you're talking**
 19 **about.**
 20 **Q.** Sir, have you looked at the statements that are
 21 tied to this table or tables just like it that
 22 say that the minimums are minimums, not targets?
 23 We can walk through them. We walked through
 24 this last week with Dr. Zeng.
 25 **A.** **I have no argument with your question.**

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1 Q. And are you familiar with the biological opinion?
 2 A. **I'm familiar with it.**
 3 Q. That's from the U.S. Fish and Wildlife Service?
 4 A. **Yes.**
 5 Q. And do you know that there's identical language
 6 in the 2012 biologic opinion warning that flow
 7 rates are prescribed minimums and not targets.
 8 Correct?
 9 A. **I have seen that, I believe, yes.**
 10 Q. Okay. Now, your prefiled testimony does not
 11 reference any of these DEIS or biological opinion
 12 warnings that the RIOP flow minimum is not a
 13 target; do you?
 14 A. **I don't think so.**
 15 Q. And to the contrary, you continue to describe the
 16 release minimum as a target throughout your
 17 prefiled direct testimony submitted in this
 18 court. Right?
 19 A. **Well, there was some discussion of that in my**
 20 **deposition. And, again, the way in which they**
 21 **operated this system during 2011 and 2012 from --**
 22 **from my demonstratives 5 and 6 in my direct**
 23 **testimony clearly show to me that it was not only**
 24 **a minimum, but they were shooting for it. They**
 25 **were shooting for something close to 5,000 for**

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1 only 5,000 cfs crossing the state line and no
 2 more. Correct?
 3 A. **That's what it says.**
 4 Q. Okay. And you say that the Corps will maintain
 5 the 5,000 cfs minimum throughout drought
 6 operations even if basin inflow exceeds 5,000
 7 cfs. Correct?
 8 A. **Yes.**
 9 Q. And you also note that from December to
 10 February -- this is now going onto 21 --
 11 actually, I'm sorry. It's on the top of 20, the
 12 winter refilling season.
 13 A. **On the top of where?**
 14 Q. Top of page 20, I'm sorry, winter refilling
 15 season.
 16 A. **Okay.**
 17 Q. You say that during this season, December to
 18 February, the Corps maintains the 5,000 cfs
 19 requirement into Apalachicola River at all times,
 20 and any additional basin inflow above 5,000 cfs
 21 is stored in the reservoirs until the system is
 22 full. Correct?
 23 A. **Right.**
 24 Q. Okay. Now, as of the time of your deposition in
 25 May of this year, you had not conducted any

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1 **much of the summer period in 2011 and 2012.**
 2 Q. And, sir, we'll get to those demonstratives; but
 3 it's correct though, isn't it, in your testimony
 4 submitted to this court you continued to describe
 5 the minimum such as the 5,000 cfs minimum as a
 6 target. Correct?
 7 A. **Yes.**
 8 Q. Now, I would like to look at some of the
 9 statements that you made about how the RIOP
 10 actually works. So --
 11 MS. WINE: And we can take that down,
 12 Mr. Walton.
 13 BY MS. WINE:
 14 Q. In your February 29 expert report, which we can
 15 pull up -- it's at tab 1, the first tab in your
 16 binder.
 17 A. **Okay.**
 18 Q. And I'm going to go to pages 20 and 21 in that
 19 report. This is GX-860. I'm going to focus on
 20 the section that starts at the bottom of 20
 21 titled Drought Operations.
 22 A. **Right.**
 23 Q. And, sir, in your expert report you said that for
 24 the entire period that the Corps is in drought
 25 operation, the Apalachicola River will receive

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1 empirical evaluation of the actual state line
 2 flows to back up your claim that the Corps
 3 discharges only 5,000 cfs during drought periods
 4 or low periods or during the winter refilling
 5 season. Correct?
 6 A. **As of the time of my second report, is that what**
 7 **you said?**
 8 Q. As of the time of your deposition in May of this
 9 year.
 10 A. **Oh, the deposition in May.**
 11 **That is correct. I have not.**
 12 Q. So, in other words, you had not compared observed
 13 flows on the one hand with the flows that you
 14 predicted would occur under the RIOP. Correct?
 15 A. **Give me just a moment to check this report.**
 16 Q. I'm talking about -- well, you can look at your
 17 report, certainly.
 18 A. **Well, that's what you're asking me about.**
 19 Q. Absolutely.
 20 I think I can show you some excerpts from
 21 your deposition, if it would be helpful, where
 22 you were asked if you had done any of this --
 23 A. **No, that's fine. I just wanted to double-check**
 24 **for myself here based on what you're asking me.**
 25 **But I think you're correct.**

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1 Q. Okay.

2 **A. Okay. No problem.**

3 Q. So as of the time of your deposition, your

4 assumption that the Corps would target 5,000 cfs

5 during drought operations was just a hypothesis.

6 Correct?

7 **A. Well, it was based upon my reading of and my**

8 **assessment of what I had seen in the DEIS and on**

9 **the reading of the operations -- the operational**

10 **systems for the -- for the basin -- for the ACF**

11 **Basin.**

12 Q. And do you recall that at your deposition you

13 were presented with multiple examples where the

14 state line releases exceeded the RIOP's minimum

15 requirements, and you admitted that you had not

16 studied the empirical data and did not know what

17 was causing those additional releases?

18 **A. I don't believe I said that I did not know what**

19 **was causing those releases. I believe that I,**

20 **somewhere in that multitude of questioning,**

21 **suggested that some of those were related to**

22 **discretionary type releases and/or could be**

23 **related to flash rainfall events. I believe I**

24 **said that in my deposition.**

25 Q. You don't recall saying, I don't know exactly how

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1 the Corps is generating these flows above 5,000.

2 I don't know why they are doing that or what the

3 cause of that is?

4 **A. I may have said that at one time. But I believe**

5 **that somewhere in that deposition -- are you**

6 **talking about just the first deposition or the**

7 **entire deposition?**

8 Q. Well, I think what I'm reading from is from day

9 one of your deposition.

10 **A. I may have said that on day one of my deposition.**

11 Q. Okay. In any event, you claim now to have

12 analyzed these instances of flow above 5,000 at

13 the state line. Correct?

14 **A. I have analyzed a great deal of data since that**

15 **first day of deposition one.**

16 Q. Okay. And if we look at your prefiled direct --

17 MS. WINE: On page 4, Mr. Walton.

18 BY MS. WINE:

19 Q. -- the first sentence of the first bullet on

20 page 4 in bold, you now say that the state line

21 releases are very close to 5,000 cfs during low

22 flow and drought conditions. Correct?

23 **A. Yes, I do.**

24 Q. And later, if we were to go to paragraph 28, you

25 say that they are at or very close to 5,000 cfs.

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1 Correct?

2 **A. On page where?**

3 Q. It's paragraph 28 on page 15.

4 **A. Okay.**

5 Q. Right at the top there. You say, as shown in

6 Bedient demos 5 and 6 --

7 **A. Yes.**

8 Q. -- the Corps' releases --

9 **A. I see it.**

10 Q. -- were at or very close to 5,000?

11 **A. Yes. I see it.**

12 Q. Sir, let's look at demo 6 from your prefiled

13 direct testimony, which is right on the page

14 before, page 14.

15 **A. Okay.**

16 Q. In this demo you're showing a relatively flat

17 line from May through December 2012, which

18 appears on this demo to be right around 5,000

19 cfs. Correct?

20 **A. Yes. I would say that -- and this is for 2012.**

21 **Yes, it appears very, very close to the 5,000**

22 **mark.**

23 Q. And drought operations began in May of 2012 and

24 continued through the end of February of 2013.

25 Didn't they?

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1 **A. They did.**

2 Q. Okay. And so this is when the 5,000 minimum

3 release was in effect. Correct?

4 **A. This was when the 5,000 was in effect, yes.**

5 Q. Okay. Now, were you here for Dr. Shanahan's

6 testimony?

7 It was a couple weeks ago now, and I don't

8 recall if you were here.

9 **A. I was not.**

10 Q. Okay. Well, Dr. Shanahan discussed a

11 demonstrative that he prepared using the same

12 data that you used to create demo 6.

13 MS. WINE: And let's put that up.

14 BY MS. WINE:

15 Q. It's in your binder. You should have a separate

16 cluster of demonstrative exhibits.

17 **A. Oh, yes.**

18 Q. It might be in the front flap of your binder.

19 **A. They are.**

20 Q. And we're going to start with Bedient cross

21 demo 1.

22 **A. Okay.**

23 Q. Now --

24 MS. WINE: Jon, can we put that on the

25 screen, please.

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1 BY MS. WINE:
 2 **Q.** While we're getting it up, what Dr. Shanahan
 3 did was he took your data from demo 6 in your
 4 prefiled direct; and he just increased the
 5 resolution by adjusting the Y axis. And then he
 6 also broke it down by week whereas your demo 6
 7 was by month.
 8 **A. So let's -- let me confirm that. He adjusted the**
 9 **axis that used to be all the way up to 35,000**
 10 **cfs?**
 11 **Q.** Correct.
 12 **A. He adjusted it to range from 4900 to about 6,000**
 13 **or about a thousand. Correct?**
 14 **Q.** That's correct.
 15 **A. All right.**
 16 **Q.** Now, Dr. Bedient, there aren't any instances on
 17 this chart, Bedient cross demo 1, where the Corps
 18 releases were exactly at 5,000 cfs, as you
 19 contend. Correct?
 20 **A. That is -- well, that contention was back on day**
 21 **one of my deposition back in May; and it's from**
 22 **my first report.**
 23 **Q.** Sir, I think you say that in paragraph 28 of your
 24 prefiled direct testimony submitted to this
 25 court. And you can look back at that. You say
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1 that the Corps' recorded releases from Woodruff
 2 Dam are at or very close to 5,000 cfs.
 3 **A. At or very close is what I said. Right?**
 4 **Q.** Sure.
 5 **A. Yes.**
 6 **Q.** So all I'm asking here is none of them are at.
 7 Correct?
 8 **A. Okay. Yes.**
 9 **Q.** We'll break this down and make it very simple.
 10 **A. I'll agree that we did not exactly hit the**
 11 **five-zero-zero-zero mark.**
 12 **Q.** Okay.
 13 **A. But if you will look across that dataset, you**
 14 **will see that it ranges from a low of 5050 -- and**
 15 **then there are, of course, some rainfall events**
 16 **in the middle that adjust these flows up to**
 17 **6,000. And then it hovers around the 5100 mark.**
 18 **And, remember, the Army Corps of Engineers**
 19 **here is trying to hit a minimum of 5,000. They**
 20 **don't want it to drop below 5,000 at all. So in**
 21 **order to do that and in order to operate a large**
 22 **reservoir gate operation, as they do, they**
 23 **probably built in a safety factor here to make**
 24 **sure that they stay above 5,000 -- at or above.**
 25 **And I agree with you; they didn't exactly hit**
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1 **5,000.**
 2 **Q.** Yes. Your language is at or very close to 5,000.
 3 And what we see here for this time period is a
 4 range from 5050 to over 6,000 cfs. Correct?
 5 **A. Correct.**
 6 **Q.** And the 5050 -- we'll get to that later.
 7 You just mentioned a safety factor. The
 8 5050, that is a safety factor that's prescribed
 9 under the rules. Correct?
 10 **A. It's -- it's contained within the -- within the**
 11 **ResSim computer model that's used to operate, you**
 12 **know, and basically run analyses for this system.**
 13 **Q.** Okay. Now, you haven't presented in your
 14 prefiled testimony or in any of your expert
 15 reports the differences between actual flows
 16 observed at the Chattahoochee Gage, on the one
 17 hand, and minimum flows under the RIOP, on the
 18 other hand. Correct?
 19 **A. Ask that question one more time? I'm sorry.**
 20 **Q.** Sure. I'm wondering if you presented anywhere,
 21 whether in your testimony here today or in your
 22 expert reports, something -- an analysis that
 23 shows the differences between actual flows
 24 observed at the Chattahoochee Gage, on the one
 25 hand, and minimum flows under the RIOP, on the
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1 other hand?
 2 **A. Well, are you asking me about minimum flows under**
 3 **the RIOP that the Corps of Engineers is**
 4 **attempting to meet on a day-to-day basis? Is**
 5 **that what you're asking?**
 6 **Q.** I'm asking if you looked at what are the minimum
 7 flows supposed to be according to the RIOP at a
 8 particular time, and if you plotted that as
 9 against the actual observed flows at the
 10 Chattahoochee Gage?
 11 **A. It's done -- I suppose one could say that on this**
 12 **demo 1, the minimum is 5,000. And you have got a**
 13 **plot of what the flows were. So there's a plot.**
 14 **Q.** But this demo, which we took from the data that
 15 you used in your demo 6 in the prefiled direct,
 16 doesn't actually use the actual observed flows at
 17 Chattahoochee Gage. It uses provisional data,
 18 which we'll get to, but that you argue is the
 19 right thing to look at. Correct?
 20 **A. I mean, yeah. There are two sets of data here.**
 21 **There is provisional data, the type of data, if**
 22 **you will, that the Army Corps of Engineers is**
 23 **relying upon on a daily basis to make their**
 24 **decisions. And then there's this other set of**
 25 **USGS data that I have been shown in my deposition**
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1 **and other places.**
 2 **Q.** Right. We'll --
 3 **A. That is data that has been adjusted after a**
 4 **period of time by the USGS.**
 5 **Q.** And we'll get to that, to the provisional data,
 6 in a moment; but let me just, to help you out --
 7 because I think Dr. Shanahan put together a table
 8 that's getting at what I was asking you about.
 9 So if you can go to table 4 in Dr. Shanahan's
 10 prefiled testimony, you will find that in your
 11 binder at tab 33. And table 4 is found on
 12 page 32 of Dr. Shanahan's testimony.
 13 Now, sir, do you recall that you reviewed a
 14 very similar version of this table at your
 15 deposition?
 16 **A. That could well be. There were lots of tables.**
 17 **Yes, I recall something like this.**
 18 **Q.** And you see that Dr. Shanahan in this table
 19 calculated the differences between actual
 20 observed flows at the Chattahoochee Gage and
 21 minimum flows under the RIOP for the entire 2012
 22 to 2013 drought operations period. Correct?
 23 **A. He's created -- yes, I see that. And he's**
 24 **created it in such a way that the last column**
 25 **over there with the flow per day is showing up as**

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1 **Q.** Sir, the demo that you're referring to is using
 2 provisional data and not the actual reading from
 3 the Chattahoochee Gage. Correct?
 4 **A. Well, let's back up.**
 5 **Q.** What we're looking at here in table 4 is the
 6 actual readings from the USGS gage, not
 7 provisional data.
 8 **A. So it's apples and oranges. Okay.**
 9 **Q.** Correct.
 10 **A. That's fine.**
 11 **Q.** And we'll get into the provisional data issue.
 12 But Dr. Shanahan felt it was appropriate to
 13 look at the actual USGS gage reading. Okay?
 14 **A. That's fine.**
 15 **Q.** Now, these state line releases above the 5,000
 16 cfs minimum are not consistent with your
 17 assertion that during drought operation, the
 18 Apalachicola River will receive only 5,000 cfs
 19 crossing the state line. Correct?
 20 **A. Well, again, that was an assertion that was made**
 21 **early on in my deposition back in day one of, I**
 22 **guess, the May time period. And since that time,**
 23 **and especially for 2012 when I have gone back and**
 24 **looked carefully at this data, there are a whole**
 25 **period of -- you can just see it from my demo**

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1 **an average for that whole month, yes.**
 2 **Q.** All right. The average difference between what
 3 was observed at the gage versus what you would
 4 expect if it were just a minimum release under
 5 the RIOP. Correct?
 6 **A. Yes.**
 7 **Q.** Okay. And do you see -- if we just focus on May
 8 of 2012 through December of 2012 for the moment.
 9 **A. Yes.**
 10 **Q.** So the last few months of -- last half of 2012.
 11 **A. Right.**
 12 **Q.** And if you just look down that column on the
 13 right-hand side, you can see that on average the
 14 releases ranged from 212 to 525 cfs per day above
 15 the minimum release. Correct?
 16 **A. Yes. I see -- let me check something here.**
 17 **I think the table is wrong.**
 18 **Q.** Okay. I think your counsel can ask you about
 19 that. I don't think we believe that the table is
 20 wrong.
 21 **A. Well, if you just look at my exhibit demo**
 22 **number cross 1 --**
 23 **Q.** Yes?
 24 **A. -- for the month of June 2012, you got an average**
 25 **difference there of 525 cfs.**

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1 **cross 1 where there are at least half a dozen**
 2 **spikes in there all through July and August and**
 3 **into September that are clearly related to flash**
 4 **rainfall events coming through the system.**
 5 **So I went back and confirmed that, indeed.**
 6 **And these flash events are not subject to**
 7 **control by the Army Corps of Engineers, and**
 8 **they're not subject to control by the RIOP**
 9 **because these are occurring below the reservoirs**
 10 **below Bainbridge on the Flint River. And so**
 11 **this is a pass-through that comes on through**
 12 **the reservoir. And because it's a pass-through**
 13 **reservoir at Lake Seminole, they're just going to**
 14 **move on through and then be recorded as increased**
 15 **flows.**
 16 **Q.** Sir, in your February 29 report you talked about
 17 flash precipitation events like this. And you
 18 said that the 5,000 cfs minimum or target, as you
 19 called it, would remain -- I think you said this
 20 is true even if basin inflow experiences
 21 short-term increases above 5,000 cfs such as
 22 during a flash precipitation event.
 23 Do you recall saying that?
 24 **A. I did. And some of these are -- some of these**
 25 **are bigger events. Some of these are day-long**

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1 **events with 3 inches of rain, as we went back and**
 2 **carefully looked at the rainfall events. So**
 3 **hydrology is a very dynamic science.**
 4 **And, in fact, in this regard, if you look at**
 5 **that figure in demo cross 1 up in the top left,**
 6 **it really is quite close to 5,000 much of the**
 7 **time. And there are just these times where there**
 8 **are rainfall events that come through that**
 9 **elevate it.**
 10 **Q.** So, sir, these statements in your expert report
 11 are no longer correct. Right?
 12 **A.** **They -- I didn't say that. They are shooting for**
 13 **values near 5,000. And in what we just read from**
 14 **my prefiled testimony, I said at or near 5,000.**
 15 **So I corrected that statement already.**
 16 **Q.** Okay. Now, sir, let's focus on -- let's go back
 17 to table 4 from Dr. Shanahan that was tab 33,
 18 page 32, I think.
 19 MS. WINE: Mr. Walton?
 20 **A.** **Okay. And now, you're asking me to use some sort**
 21 **of different dataset -- different dataset for --**
 22 **from Dr. Shanahan's table.**
 23 **Q.** I'm asking you to look at Dr. Shanahan's table.
 24 We'll get into the differences in the datasets.
 25 **A.** **Well, the difference --**

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1 **Q.** I understand. We'll get to the provisional data.
 2 He used the gage data from the USGS, okay.
 3 And we're going to go look at table 4 again.
 4 **A.** **Okay. I'm there.**
 5 **Q.** I'm waiting to get it up on the screen.
 6 We looked at the last six months of 2012
 7 before. And what I want focus you on now is the
 8 winter refilling season. So that would be
 9 December 2012 through February of 2013.
 10 MS. WINE: Mr. Walton, I believe that's
 11 on page 32 of this exhibit.
 12 BY MS. WINE:
 13 **Q.** So now, focusing on this -- it's labeled winter
 14 refilling season. Do you see that?
 15 **A.** **Yes, I do.**
 16 **Q.** So, sir, not only are we now still in drought
 17 operations; but we're also in the winter
 18 refilling season, which is another time that you
 19 say the 5,000 cfs will not be exceeded. Correct?
 20 **A.** **That's a stated policy in the RIOP. And, of**
 21 **course, we all know that what happened during**
 22 **this particular period of time -- and I have got**
 23 **to get --**
 24 **Q.** Sir, I just asked you if those were -- if that is
 25 another reason that you assert that the Corps

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1 would not go above 5,000 cfs for releases?
 2 That's what you stated. Correct?
 3 **A.** **Well, it's -- it is their policy. However, they**
 4 **are also operating these reservoirs, as I said**
 5 **earlier, to meet seven different project purposes**
 6 **within the basin. One of those project purposes**
 7 **is flood control.**
 8 **Q.** Okay. And, sir --
 9 **A.** **And, clearly, what's happening here in this time**
 10 **frame, especially in -- as we get into February**
 11 **and January, for that matter, there were large**
 12 **floods and large storms that moved through the**
 13 **system and refilled -- it refilled conservation**
 14 **storage in some of the reservoirs; and it started**
 15 **to then impact flood storage. And when you get**
 16 **into the flood zone, by definition the reservoirs**
 17 **have to be operated in such a way that they --**
 18 **they release that floodwater downstream. They**
 19 **store a certain amount, and they release a**
 20 **certain amount. So there are rules according to**
 21 **that.**
 22 **And you can see that in my demonstrative**
 23 **No. 7.**
 24 **Q.** Sir, you know that the composite conservation
 25 flood storage did not fill all the way back up

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1 until after February of 2013. Right?
 2 **A.** **I do know that. Right.**
 3 **Q.** Okay. So this was not an issue where the
 4 reservoirs had filled all the way back up.
 5 Correct?
 6 **A.** **They had not filled all the way back up; that is**
 7 **correct.**
 8 **Q.** Okay.
 9 **A.** **But there were obviously massive rainfalls within**
 10 **the basin that were driving these flows.**
 11 **Q.** Sir, you stated that until those reservoirs were
 12 filled up, the Corps does not exit drought
 13 operations; and it's still under the 5,000
 14 minimum release. Correct?
 15 **A.** **Yes. But we can't just look at --**
 16 **Q.** Sir, I just asked you if that was correct under
 17 the rules?
 18 **A.** **That is according to the rules, yes. But --**
 19 **Q.** And you can see here --
 20 **A.** **Can I finish my question?**
 21 **Q.** I just asked you if that was connect, sir.
 22 **A.** **Can I finish my question?**
 23 **Q.** I would just like you to answer my question.
 24 **A.** **I said yes.**
 25 **Q.** You will have the opportunity --

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1 **A. I said yes. However, clearly when you're going**
 2 **from 400 to 3800 to 32,000, something else very**
 3 **different is happening in the basin. And that**
 4 **something else, during this particular time of**
 5 **the year, was a major rainfall and a major flood**
 6 **moving across the basin. Once that moves**
 7 **anywhere upstream of Lake Seminole, it's going to**
 8 **come right on through Lake Seminole. And that's**
 9 **how it operates.**
 10 **Q.** Sir, are you saying that your statement that the
 11 Corps will remain in drought operations and will
 12 retain the 5,000 minimum release until the
 13 reservoirs are filled back up and it exits
 14 drought operations, that that statement is not
 15 correct?
 16 **A. No. It's a correct statement. But in this**
 17 **particular situation where you have this level of**
 18 **flow coming through the system, it's obviously**
 19 **flow related.**
 20 **Q.** Right. And the Corps released a lot more in each
 21 of these months. Correct?
 22 **A. I don't know whether they released a lot more. I**
 23 **haven't studied the reservoir operations from**
 24 **flood control standpoint. But I do know that**
 25 **there had to have been a lot of water moving**

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1 **Yes, I did say that.**
 2 **Q.** Okay. And that wrong data is the official USGS
 3 streamflow data recorded at the Chattahoochee
 4 Gage on the Apalachicola River. Correct?
 5 **A. It is the official data that is adjusted after**
 6 **some period of time by the USGS. However, it is**
 7 **not the data on which the Army Corps of Engineers**
 8 **makes its day-to-day decisions to operate this**
 9 **basin. That starts with provisional data from**
 10 **the USGS. And then by the end of the day, it is**
 11 **adjusted by the Army Corps themselves; and it**
 12 **then becomes the Army Corps of Engineers release**
 13 **data.**
 14 **And they have to use that because they're**
 15 **standing there at the dam, at the gates, watching**
 16 **the outflow. And they're making day-to-day**
 17 **decisions. So they can't wait for the data to**
 18 **come back after it's been adjusted by the USGS.**
 19 **Q.** So what you're saying in essence is that even
 20 though the Corps did release above the 5,000 cfs
 21 minimum, they didn't intend to do that?
 22 **A. They're basing -- they're basing their releases**
 23 **on their information that they have on a daily**
 24 **basis as shown in my demonstratives 5 and 6,**
 25 **which, as you will notice there, targets just**

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1 **through Lake Seminole to generate a differential**
 2 **of 32,000.**
 3 MS. WINE: Your Honor, I'm about to
 4 switch topics. Would this be a good time to
 5 switch topics, or would you like me to keep
 6 going?
 7 I'm happy to keep going if you're not
 8 ready.
 9 SPECIAL MASTER LANCASTER: Let's go a
 10 little longer.
 11 MS. WINE: This is good. We're going to
 12 get into provisional data, which I know
 13 Dr. Bedient wants to talk about.
 14 BY MS. WINE:
 15 **Q.** So as we discussed, you contend that in table 4
 16 and other analyses that Dr. Shanahan did, he has
 17 relied on the, quote, wrong data. Correct?
 18 **A. He has -- well, data is data. Now, there are**
 19 **three different datasets here. So we can talk**
 20 **about those to the level that you would like to.**
 21 **Q.** I just want to know if you recall saying in your
 22 prefiled direct testimony at paragraph 161 that
 23 he relied on the wrong data. Do you recall
 24 saying that?
 25 **A. Oh, you mean for his analysis?**

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1 **above 5,000. That's what they're making their**
 2 **decisions based on.**
 3 **Q.** So if they released more than the 5,000 cfs
 4 minimum, they didn't intend to do that?
 5 They were doing it based on provisional data
 6 that was presented to them that may have been
 7 telling them something different?
 8 **A. Well, first of all, they -- there's a minimum of**
 9 **5,000. That's a minimum. They're releasing just**
 10 **above 5,000 because, again, there's quite a bit**
 11 **of variability in that data, as you have shown**
 12 **me, actually, in Bedient cross demonstrative**
 13 **No. 1. There is quite a bit of up and down in**
 14 **the data. They don't want any of those down dips**
 15 **to drop below 5,000 because they're trying to hit**
 16 **that minimum.**
 17 **Q.** Okay. Let's look at this provisional data.
 18 First of all, you had to get the data from
 19 Georgia EPD. Correct?
 20 **A. I -- let's see. Which -- you're calling this**
 21 **provisional data. Are you talking about the**
 22 **Corps data or the USGS data?**
 23 **Q.** Well, tell me what you looked at and what you
 24 relied upon.
 25 **A. I looked at this Corps release data.**

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- 1 Q. Okay. And the Corps release data itself comes
- 2 from the USGS provisional data. Correct?
- 3 A. **It comes from -- it's actually posted up on the**
- 4 **U.S. Army Corps website. It is something that**
- 5 **they compute themselves. The Army Corps of**
- 6 **Engineers does it themselves at the end of each**
- 7 **day. And that's what they make -- base their**
- 8 **decisions upon as they operate on a day-to-day**
- 9 **basis.**
- 10 Q. And they're getting it from the USGS provisional
- 11 data?
- 12 A. **I think it starts there, and then they do some**
- 13 **adjustments to it by the end of the day based**
- 14 **upon what happens to be going on in the basin.**
- 15 Q. And you had to get this provisional data from
- 16 Georgia EPD. Correct?
- 17 A. **I did.**
- 18 Q. And that's because the provisional data doesn't
- 19 exist anymore on any public source? No public
- 20 website; you can't find it on the USGS website or
- 21 on the Corps website. Correct?
- 22 A. **I don't know that you can't find it on the Corps**
- 23 **website. I mean, I have seen it up on the Army**
- 24 **Corps website back to maybe 2007.**
- 25 Q. Okay. But you got it from Georgia EPD?

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- 1 packet to Bedient cross demo 3.
- 2 A. **Okay. I see it.**
- 3 Q. And this is something that we just pulled from
- 4 the USGS website. It says, provisional data
- 5 statement. Do you see that, sir?
- 6 A. **Yes.**
- 7 Q. And if you look at the first few paragraphs
- 8 there, do you see that the USGS is saying that
- 9 the provisional data may be inaccurate?
- 10 A. **Yes, I see that.**
- 11 Q. And that it's subject to significant revisions?
- 12 A. **Yes.**
- 13 Q. And, sir, if you turn to the next page in your
- 14 demonstrative packet to Bedient cross demo 4,
- 15 there is a provisional data disclaimer from the
- 16 USGS. Do you see that?
- 17 A. **Oh, yes.**
- 18 Q. And it says that the US -- it's in the paragraph
- 19 starting, realtime data, which is the second
- 20 paragraph.
- 21 A. **Right.**
- 22 Q. It says that the provisional data, which they
- 23 have bolded here, may be subject to significant
- 24 change and is not citable. Do you see that?
- 25 A. **Yes, I see it.**

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- 1 A. **I believe so. Just because we were working**
- 2 **closely with them for data transfer.**
- 3 Q. And it's no longer on the USGS website?
- 4 A. **The data for the Chattahoochee Gage?**
- 5 Q. Provisional data, correct.
- 6 A. **That I don't know.**
- 7 Q. Okay.
- 8 A. **That I don't know.**
- 9 Q. You weren't able to independently verify the
- 10 provisional data that you got from Georgia EPD;
- 11 were you?
- 12 A. **I relied upon it. That is the official data used**
- 13 **by the Army Corps of Engineers to operate the**
- 14 **system. I assumed that if it came from Georgia**
- 15 **EPD, they have a vested interest in that data.**
- 16 **They download it each and every day as I -- or at**
- 17 **least once a week, as I understand it.**
- 18 Q. You just took it at face value?
- 19 A. **I did.**
- 20 Q. Okay. Now, are you aware of the various
- 21 disclaimers that the USGS has issued with regard
- 22 to this provisional data?
- 23 A. **There are all sorts of caveats that come along**
- 24 **with USGS data.**
- 25 Q. Okay. If you could turn in your demonstrative

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- 1 Q. And it goes on to list another -- a number of
- 2 other warnings about the data.
- 3 Now, sir, you didn't cite these disclaimers
- 4 in your prefiled direct testimony. Correct?
- 5 A. **No, I did not. But then, again, this is data --**
- 6 **and because I run realtime flood warning systems,**
- 7 **and I rely upon provisional data all the time.**
- 8 **This is data that comes in on a day-to-day basis.**
- 9 **And decisions are being made on a day-to-day**
- 10 **basis in this system.**
- 11 **And if the Army Corps of Engineers were to**
- 12 **wait for the USGS to finish their adjustments to**
- 13 **data, which can take weeks or months, then we're**
- 14 **going to have a real problem operating the system**
- 15 **on a realtime basis.**
- 16 Q. Sir, all I asked was whether you referenced these
- 17 disclaimers in your prefiled direct testimony?
- 18 A. **No, I did not.**
- 19 Q. Okay. Now, sir, you're aware from Dr. Zeng's
- 20 examination that in any event, we identified a
- 21 series of errors in this provisional data that
- 22 Georgia EPD provided to you. Correct?
- 23 A. **Yes, I have seen that.**
- 24 Q. And do you recall we presented him with a
- 25 demonstrative identifying some of those errors?

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1 **A. I have seen those.**
 2 **Q.** Okay. And we don't have to walk through them
 3 all. They were shown with Dr. Zeng. But they
 4 are in your packet at Bedient cross demo 5. And
 5 it shows a number of missing records from that
 6 data?
 7 **A. It does. And that's fairly typical for**
 8 **provisional data.**
 9 **However, for 2011 and 2012 it seemed to**
 10 **provide a fairly -- a fairly complete dataset.**
 11 **Q.** Can you explain how these errors occurred, sir?
 12 **A. Oh, there's a variety of ways that -- I have got**
 13 **a lot of familiarity with USGS gages because I**
 14 **have helped put them in. You can get power**
 15 **failures. You can get maintenance issues. You**
 16 **can get clogging. You can get destruction of the**
 17 **gage for some period of time. There are all**
 18 **sorts of reasons that they go down.**
 19 **Q.** So are you aware of whether there are any other
 20 errors in that provisional data dataset that you
 21 were provided that we didn't happen to find?
 22 **A. No.**
 23 **Q.** How would you know whether that dataset is
 24 accurate or not?
 25 **A. Again, I relied upon EPD, who was in**
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1 **A. No, it's not -- there is no paragraph 50 on page**
 2 **70.**
 3 **Q.** All right.
 4 **A. That's wrong.**
 5 **Q.** Hang on.
 6 I'm sorry. Page 27.
 7 **A. Okay.**
 8 **Q.** I have got a little typo here.
 9 **A. No problem. No problem.**
 10 **Q.** Sorry about that. Thanks for correcting me.
 11 **A. No problem.**
 12 **Q.** Here we go.
 13 **A. Okay.**
 14 **Q.** Do you see that reference to GX-949 at the end of
 15 paragraph 50?
 16 **A. Yes, I see it.**
 17 **Q.** Right at the bottom there.
 18 So I don't imagine you know offhand what
 19 GX-949 is based on that moniker?
 20 **A. No, I don't.**
 21 **Q.** Okay. So we were trying to figure it out
 22 ourselves, so what we have done is a spreadsheet.
 23 It's just a slip sheet in your tab that we're
 24 going to pull up a portion of GX-949 to see if
 25 you can help us understand where this data came
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1 **communication with the Army Corps, to provide**
 2 **that to me; and I just relied upon that dataset.**
 3 **Q.** Now, sir, in addition to that provisional data
 4 that Georgia EPD provided to you, you also cite
 5 another dataset that I want to ask you about.
 6 **A. Sure.**
 7 **Q.** So if you turn to your prefiled direct testimony
 8 on page 70 --
 9 **A. Okay.**
 10 **Q.** -- you will see that you have a demonstrative
 11 there. It's labeled demo 13.
 12 **A. Yes.**
 13 **Q.** And I just want to ask you. The -- in
 14 paragraph 50 the source cited is GX-949.
 15 Correct?
 16 **A. It is --**
 17 **Q.** Do you see right there in paragraph 50 it says,
 18 Bedient demo 13 is a true and accurate copy of
 19 the results of my analysis of RIOP flow
 20 thresholds and basin inflow for 2007. And it
 21 says --
 22 **A. Excuse me. What page are we on?**
 23 **Q.** We're on page 70, I believe.
 24 Let me just make sure that's the right page.
 25 It's paragraph 50, for sure.
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1 from.
 2 And, actually, we have got a demo. These
 3 guys are way ahead of me.
 4 Let's turn to cross demo 6-1.
 5 **A. All right.**
 6 **Q.** So this is just a picture -- we put it on the
 7 screen, too -- of just a portion of the GX-949
 8 data worksheet.
 9 **A. Yes.**
 10 **Q.** And I'll represent to you that you have a bunch
 11 of worksheets in this file?
 12 **A. Right.**
 13 **Q.** But we pulled out this one that says data. And
 14 it looks like it identifies Woodruff Outflow
 15 Data. Do you see that?
 16 **A. Yes.**
 17 **Q.** Sir, do you -- based on looking at this, do you
 18 know what GX-949 is?
 19 **A. I don't; but I suspect -- well, I know that this**
 20 **came to us from the Georgia EPD.**
 21 **Q.** It looks like the provisional data that Georgia
 22 EPD provided you. Correct?
 23 **A. But I don't know that for a fact. And this was**
 24 **also the same plot that was in my very first**
 25 **expert report dated in February.**
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1 Q. Okay. Sir, if we turn to the next demo, this is
 2 a screen shot. It's demo 6-2 from GX-143, which
 3 is the provisional data that Georgia EPD provided
 4 to you.
 5 A. Okay.
 6 Q. Can you see they look the same, sir or relatively
 7 the same?
 8 A. Yes, they do.
 9 Q. Okay. And now, sir, if you could turn to the
 10 next one, which is Bedient cross demo 7-1. We
 11 have put these two spreadsheets side by side.
 12 They both look like they contain provisional
 13 data. And what we have done here is just shown a
 14 number of days where the numbers seem to match
 15 up, as one might expect. Do you see that?
 16 A. I see that.
 17 Q. Okay. Now, if you turn to the next demo, which
 18 is 7-2.
 19 A. Right.
 20 Q. Here, we found a number of instances where the
 21 numbers in these two spreadsheets don't match up.
 22 If you look at basically June 25 through June 30,
 23 do you see that?
 24 A. Yes, I do. They're close, but they don't match
 25 up. You're right.

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1 Q. And, sir, if you turn now to Bedient cross demo
 2 8, which is next in the packet.
 3 A. Okay.
 4 Q. We went through, and we cataloged all the
 5 differences that we could find between these two
 6 provisional datasets in GX-949 and GX-143. And
 7 it goes on for several pages. There's about 250
 8 instances where they're different.
 9 A. Okay.
 10 Q. Okay. And you will see that some of them are
 11 substantial. They go up to several thousand cfs
 12 difference, and one of them goes all the way up
 13 to 17,000 cfs difference.
 14 Sir, do you know what accounts for the
 15 differences in these two provisional datasets?
 16 A. Not as I sit here. I could -- I can speculate
 17 that one might be from Army Corps adjustment, and
 18 one might be from USGS provisional. But I do not
 19 know.
 20 Q. Do you know which is correct?
 21 A. I do not as I sit here.
 22 MS. WINE: Do you want break yet?
 23 New topic.
 24 SPECIAL MASTER LANCASTER: We'll take a
 25 10-minute recess.

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1 MS. WINE: Perfect.
 2 THE WITNESS: Thank you, your Honor. I
 3 appreciate it.
 4 (Time Noted: 2:40 p.m.)
 5 (Recess Called)
 6 (Time Noted: 2:50 p.m.)
 7 BY MS. WINE:
 8 Q. Sir, I would like to switch topics now and talk
 9 about some of the modeling work.
 10 A. Okay.
 11 Q. Okay. To support your theory that any reduction
 12 in Georgia's consumption would not result in
 13 increased state line flows during droughts or
 14 low flow periods you performed modeling work.
 15 Correct?
 16 A. I did.
 17 Q. And if we pull up your prefiled direct at
 18 page 33, paragraph 68 what you did was you
 19 simulated predictive state line flows under
 20 various consumption scenarios; is that correct?
 21 A. That is correct.
 22 Q. And you used the ResSim model to do this?
 23 A. I did.
 24 Q. And the ResSim model that you ran treated the
 25 minimum flow as a target. Correct?

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1 A. It did. It basically did that during drought and
 2 low flow type conditions. Of course, the RIOP is
 3 actually just built into the model.
 4 Q. And that's because ResSim is unable to account
 5 for any discretion the Corps has to release
 6 greater than the 5,000 cfs minimum. Correct?
 7 A. Yes. When you're in that drought condition, it
 8 targets -- I think the number is 5050.
 9 Q. Right. And the ResSim users' manual explicitly
 10 warns users about ResSim's limitations in this
 11 regard. Correct?
 12 A. It does.
 13 Q. Okay. And if we just quickly turn to tab 10, we
 14 have got an excerpt of the users' manual, JX-46?
 15 A. Right.
 16 Q. And right where that caution sign is, correct,
 17 there's where it's talking about how ResSim
 18 cannot be programmed to account for basically the
 19 greater than sign that we see on the RIOP table.
 20 Correct?
 21 A. Yes. I have seen the warning, yes.
 22 Q. Okay. And as you have alluded to, when a 5,000
 23 minimum rule is in effect, ResSim assumes that
 24 the state line flow will be the 5,000 plus a
 25 safety factor of 50 cfs for exactly 5050 cfs.

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1 Correct?

2 **A. That's correct. That's how it works.**

3 **Q.** Now, let's take a look at some of the ResSim

4 modeling results that you produced in support of

5 your expert report. And if you could turn to

6 Bedient cross demo 9 in your packet.

7 **A. Okay.**

8 **Q.** Now, what we have done here is you had an Excel

9 worksheet in your production, the -- sort of the

10 definition of it is at the top of Bedient cross

11 demo 9. And in this worksheet you included the

12 results from a scenario that you modeled in

13 ResSim where Georgia reduces both its M & I and

14 Ag consumption by 30 percent. Correct?

15 **A. Right.**

16 **Q.** Okay. And the worksheet indicates what the state

17 line flows would be under this scenario for every

18 day between January 1 of 1975 and December 31 of

19 2011. We only have an excerpt here, but do you

20 recall that your worksheet went all the way back

21 to 1975?

22 **A. Yes. So you're just showing me an excerpt**

23 **from --**

24 **Q.** From that worksheet.

25 **A. -- 2011 and --**

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1 **Q.** Correct.

2 **A. -- forward?**

3 **Q.** What we have done here is excerpted August 1,

4 2011, to December 27, 2011.

5 **A. Yes.**

6 **Q.** Do you see that?

7 **A. I see it; right.**

8 **Q.** And based on this 30 percent reduction scenario,

9 for every single day in this time period you have

10 that the state line flows would remain at exactly

11 5050 cfs. Correct?

12 **A. Correct. Right.**

13 **Q.** Okay. Now, let's look at how these modeled

14 results compare with the flows that were actually

15 observed at the Chattahoochee Gage on the

16 Apalachicola River. Okay?

17 So if you could turn now to cross demo 10.

18 **A. Okey-dokey.**

19 **Q.** What we have done here is actually plotted the

20 observed state line flows for the same time

21 periods in blue. Do you see that?

22 **A. Yes.**

23 **Q.** And do you see that the observed flows during

24 this period were always higher than 5,000 cfs,

25 sometimes substantially so?

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1 **A. Yes. A lot of time they hovered around the 5050**

2 **mark; and then there were some -- there were some**

3 **increases in there as well.**

4 **Q.** There are several times that they go above 5600

5 cfs. Correct?

6 **A. Yes. Right.**

7 **Q.** And cumulatively, if we add up these differences

8 for this time period, the observed state line

9 flows exceeded your ResSim model flows by nearly

10 63,000 cfs?

11 **A. For this specific period, yes. I'll agree.**

12 **Q.** Okay. Now, in other words, ResSim predicted that

13 if there were a 30 percent reduction in

14 consumption, the state line flows would have been

15 63,000 cfs lower during this period than they

16 actually were without any reductions in

17 consumption. Correct?

18 **A. Well, again, during this particular period, I**

19 **think, in 2011 there were some -- I think it was**

20 **either rainfall related or there were some other**

21 **issues that were causing this -- this movement**

22 **away from the 5,000, as we have seen also in**

23 **2012.**

24 **Q.** Right. But, sir, your ResSim model predicted a

25 substantially lower flow during this time period

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1 than the actual observed flows show?

2 **A. For that particular period it did. However, we**

3 **have run the ResSim model over a longer period of**

4 **time to get a -- to get a kind of a better**

5 **representation of how the model works. We ran it**

6 **from 2008 through 2011, and not -- not with**

7 **consumption caps, but just to see how the model**

8 **would compare against measured data. And we did**

9 **that, you know, fairly recently as part of this**

10 **prefiled. And that's indicated in my**

11 **demonstrative 17.**

12 **Q.** Now, sir, 2011 was a drought year. Correct?

13 **A. 2011 was not a drought year.**

14 **Q.** 2011 was not a drought year?

15 **A. It was not a -- they had not moved into drought**

16 **operations.**

17 **Q.** Okay. Was it a year of low flows?

18 **A. Oh, yes. Absolutely. Yes.**

19 **Q.** Now, sir, in addition to the limitation of ResSim

20 and that it's not able to program the greater

21 than sign on the greater than or equal to 5,000

22 cfs, your ResSim modeling also relied on the

23 Corps' unimpaired flow numbers, their UIF's.

24 Correct?

25 **A. It did.**

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1 Q. And you took those Army Corps UIF's at face
 2 value; didn't you?
 3 A. **We did.**
 4 Q. You didn't evaluate the quality of those UIF's?
 5 A. **No. This was the same UIF's used by the State of**
 6 **Georgia. They had been reviewed by them. And**
 7 **the Army Corps of Engineers uses these UIF's to**
 8 **make all of their runs with ResSim for the ACF**
 9 **Basin.**
 10 Q. And as you just said, the UIF's are actually
 11 dependent on consumptive use data provided by
 12 Georgia. Correct?
 13 A. **No. The UIF's are based upon -- yes. I mean,**
 14 **they have to go back and subtract those out; so I**
 15 **guess that's true.**
 16 Q. Right. They get the consumptive use data from
 17 Georgia?
 18 A. **Yes, they do.**
 19 Q. All right. Now, I know you were here when
 20 Dr. Zeng testified. Were you also here when
 21 Mr. Masters testified?
 22 A. **I was not, no.**
 23 Q. Okay. Well, they were both asked questions --
 24 but obviously you will only remember Dr. Zeng --
 25 about some of the errors in the Corps' UIF's. Do

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1 **Neither one of them, neither one of the authors**
 2 **had a problem with the approach. We went -- I**
 3 **mean -- and, again, the Army Corps of Engineers**
 4 **in this particular basin both operates the basin,**
 5 **manages the basin. And they ought to be the ones**
 6 **that best understand how that model works and how**
 7 **those UIF's need to be determined.**
 8 Q. And you know that Georgia Tech concluded that the
 9 UIF dataset included both random and systematic
 10 errors. Correct?
 11 A. **Right. For their express purpose that they**
 12 **were -- that they were doing the analysis.**
 13 Q. We'll get to the purpose, sir. I promise.
 14 But for now, I just want to test your
 15 recollection about that UIF report.
 16 And it found that those systematic errors
 17 affect both the long-term and daily flow
 18 calculations. Correct?
 19 A. **Correct.**
 20 Q. And that many of the errors are related to
 21 agricultural demand, including groundwater
 22 pumping. Correct?
 23 A. **I believe that was correct.**
 24 Q. And that many of the errors related to the fact
 25 that evaporation from farm ponds and other

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1 you recall that questioning?
 2 A. **Yes. I'm familiar with that line of questioning.**
 3 **I am.**
 4 Q. And you're aware of the criticisms that GWRI or
 5 Georgia Tech will sometimes refer to it as levied
 6 in its UIF assessment report?
 7 You were aware of that before you filed your
 8 prefiled direct testimony. Correct?
 9 A. **I'm aware of it, yes.**
 10 Q. And were you aware of it before you submitted
 11 your expert reports?
 12 A. **I don't know. It seems like I saw the document**
 13 **early on. But one of the -- there are criticisms**
 14 **there. However, the two gentlemen that authored**
 15 **that report also clearly stated that for the**
 16 **express purpose that ResSim is used in this basin**
 17 **for -- especially for comparative analysis on**
 18 **consumptive use, the UIF's are perfectly**
 19 **acceptable.**
 20 Q. We'll get into that; but, sir, you did not alert
 21 the Court to any of the Georgia Tech critiques of
 22 the UIF dataset. Did you?
 23 A. **No. Once -- once they basically said that for**
 24 **the express application that we're using the**
 25 **model for, they had no particular problem.**

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1 impoundments was not accounted for. Correct?
 2 A. **Well, they made that -- they made that statement.**
 3 **But, again, Army Corps of Engineers and others,**
 4 **including the State of Georgia, feel that the**
 5 **whole issue of small pond impoundment and the**
 6 **evaluation of evaporation by itself without**
 7 **consideration of size of pond and infiltration**
 8 **is -- is a very difficult and complex thing to**
 9 **compute and certainly highly inaccurate.**
 10 Q. Sir, do you recall that Georgia Tech said that
 11 the error from that issue alone can be up to 1200
 12 cfs. Correct?
 13 A. **I recall that.**
 14 Q. And that the systematic errors in the dataset
 15 create a false assurance regarding the amount of
 16 water available during periods of drought?
 17 A. **Right. Yes.**
 18 Q. Okay. And, sir, if we could, you will find the
 19 UIF report at tab 21 of your binder. And I want
 20 to turn to the page marked with a little Roman
 21 numeral iv -- I think it's actually the fourth
 22 page of the document. This is Exhibit FX-534.
 23 A. **Okay.**
 24 Q. Sir, are you at the page that says Executive
 25 Summary?

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1 **A. Yes, I am.**
 2 **Q.** Okay. If you look at the fourth paragraph that
 3 begins, the assessment demonstrates, do you see
 4 that?
 5 **A. Yes, I do.**
 6 **Q.** Okay. If you could just read the last
 7 sentence --
 8 **A. The last sentence about systematic errors?**
 9 **Q.** Of that paragraph, sorry, that begins systematic
 10 errors may affect. Do you see that?
 11 **A. Yes.**
 12 **Q.** Can you just read that to yourself, sir.
 13 **A. Oh, okay. I have read it.**
 14 **Q.** And, sir, do you see there that Georgia Tech is
 15 saying that the UIF's can lead to inaccurate
 16 estimates of reservoir drawdowns and releases?
 17 **A. I see it.**
 18 **Q.** And that they can lead to unrealistic
 19 representations of environmental flow regimes?
 20 **A. Right.**
 21 **Q.** And, sir, Georgia Tech said that the UIF's must
 22 be improved before they can support valid water
 23 management assessments. Correct?
 24 **A. Well, they recommended their improvement. But,**
 25 **once again -- that they be improved. But, once**

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1 **A. Yes, I see that.**
 2 **Q.** Okay. And, sir, you also know that the U.S. Fish
 3 and Wildlife Service has warned about using the
 4 Corps' UIF dataset. Correct?
 5 **A. I have heard that as well.**
 6 **Q.** Sir, if you could turn to tab 13 in your binder.
 7 **A. Okay.**
 8 **Q.** This is a February 5, 2013, letter from the U.S.
 9 Fish and Wildlife Service. It's FX-530.
 10 And if you could, just look under the heading
 11 Inappropriate use of the unimpaired flow dataset.
 12 Do you see in that second sentence that begins,
 13 although the Service is saying that the UIF
 14 dataset was not intended to accurately identify
 15 historic daily discharge or be a predictive
 16 model?
 17 **A. Right. But as you read the rest of that**
 18 **sentence, which is actually quite important, it**
 19 **says the advantage of its use in comparative**
 20 **analysis is that the errors and biases within the**
 21 **UIF are uniformly applied to all alternatives,**
 22 **thereby enabling analysts to hone in on**
 23 **differences caused by various reservoir**
 24 **management strategies.**
 25 **And that's exactly what the authors of this**

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1 **again, they also went on to say that for the**
 2 **purposes that the UIF's are being used by the**
 3 **Army Corps of Engineers and by the State of**
 4 **Georgia for this application especially,**
 5 **comparing consumptive use scenarios, it's --**
 6 **they're perfectly acceptable.**
 7 **Q.** Sir, can you stick to the executive summary and
 8 look at the second to last full paragraph on that
 9 same page that begins, the overarching study.
 10 **A. Yes.**
 11 **Q.** Do you see that?
 12 **A. Yes.**
 13 **Q.** The next sentence that begins, such improvements,
 14 can you read that and the next two sentences to
 15 yourself.
 16 **A. I see it.**
 17 **Q.** And, sir, do you see there that Georgia Tech is
 18 warning that the problems with the UIF's are
 19 particularly critical with daily time steps. Do
 20 you see that?
 21 **A. Yes.**
 22 **Q.** And that they concluded that these errors
 23 undermine the results of ResSim and other river
 24 basin simulation models operating on daily time
 25 steps. Correct?

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1 **document from Georgia Tech also said. And, as a**
 2 **matter of fact, we have taken this model for the**
 3 **period of time 2008 to 2011 and run a careful**
 4 **analysis against measured values. And the ResSim**
 5 **model actually matched beautifully with a**
 6 **correlation essentially of .96 which says that**
 7 **the model, indeed, with its current UIF's in**
 8 **place is an accurate tool.**
 9 **It's the tool relied upon by the Army Corps**
 10 **of Engineers for operating this basin. It's also**
 11 **the tool recommended by the Hydrologic**
 12 **Engineering Center Army Corps of Engineers**
 13 **research group. They assessed the model for**
 14 **three years before they selected it and applied**
 15 **it to the basin. So it's a fine tool.**
 16 **Q.** Sir, do you agree that the Service says that
 17 ResSim in the -- excuse me. That the service
 18 said that the UIF dataset should not be used as a
 19 predictive model?
 20 **A. I see that. And we actually ran a test between**
 21 **'08 and '11 and found it to be an excellent**
 22 **predictive tool.**
 23 **Q.** Right. You used it as a predictive model.
 24 That's what you said in your prefiled direct
 25 testimony. Correct?

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1 **A. Yes.**
 2 **Q.** Okay. Now, you also used the Corps' dataset --
 3 the UIF dataset and ResSim to identify historic
 4 daily discharges at the state line and predict
 5 what those daily discharges would have been under
 6 various conservation scenarios. Correct?
 7 **A. Yes.**
 8 **Q.** Okay. And if you would, sir, just briefly turn
 9 to your prefiled testimony. And I'm looking at
 10 your demo 24, which is a page 41 of your
 11 testimony.
 12 **A. Okay. I see it.**
 13 **Q.** Sir, I just to want look at that briefly. Do you
 14 see at the bottom right you cite a source there,
 15 which is GX-911. Do you see that?
 16 **A. Yes.**
 17 **Q.** And now, if you could turn to your demonstrative
 18 packet, sir --
 19 **A. Okay.**
 20 **Q.** -- to demo 16.
 21 **A. All right.**
 22 **Q.** Which is, I think, the very last one.
 23 **A. Okay. I'm there.**
 24 **Q.** Sir, what we did here was we took a screen shot
 25 of GX-911, which was cited in this demo in your

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1 prefiled direct testimony.
 2 **A. Okay.**
 3 **Q.** And, sir, do you see here that you are putting a
 4 baseline and then 1,000 cfs cap scenarios on a
 5 daily basis in this spreadsheet?
 6 **A. Yes.**
 7 **Q.** And you did that by running ResSim. Correct?
 8 **A. I believe so, yes.**
 9 **Q.** And so you were using ResSim precisely in the
 10 manner that Georgia Tech and the U.S. Fish and
 11 Wildlife Service warned you against as a
 12 predictive tool and with daily time steps.
 13 Correct?
 14 **A. Well, we're doing a comparative analysis here**
 15 **between -- if you're talking about my demo,**
 16 **demonstrative 24, is that what we're referring**
 17 **to?**
 18 **Q.** It is.
 19 Well, I'm looking at --
 20 **A. On page 41?**
 21 **Q.** -- what you have here as support, which is
 22 GX-911, on demo 16.
 23 **A. Okay. So we're actually running a scenario**
 24 **comparison between the baseline 2011, which is**
 25 **the 2011 sort of condition in the basin, which is**

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1 **a serious drought year, and we're comparing that**
 2 **against, I guess, Dr. Sunding's proposal --**
 3 **proposed cap of a thousand cfs. And so we're**
 4 **doing a -- a direct, if you will, scenario**
 5 **comparison just like the Fish and Wildlife**
 6 **Service said was completely appropriate. And**
 7 **those are the results we got.**
 8 **Q.** Sir, you're running a predictive models, and
 9 you're using daily time steps; is that correct?
 10 **A. That's correct.**
 11 **Q.** Okay. Now, sir, are you also aware that Georgia
 12 Tech warned about the use of the UIF's for
 13 comparative analyses?
 14 **A. Everything that I have seen from Georgia Tech,**
 15 **from both of the main lead authors there, were**
 16 **that for running sort of a -- this model in a**
 17 **planning mode, meaning sort of a comparison of**
 18 **consumptive use caps or whatever, or increases**
 19 **into the future -- and, of course, this is the**
 20 **exact same model that was run by the Army Corps**
 21 **of Engineers in consideration of Georgia's 2013**
 22 **and 2015 request for sort of future uses.**
 23 **Everything I have seen, they said it's**
 24 **perfectly -- this model is perfectly fine. Yes,**
 25 **it's subject to a few issues and a few problems**

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1 **that they solved for their specific application;**
 2 **but in general, the model is perfectly fine for**
 3 **comparative analysis.**
 4 **Q.** Sir, could you turn back for a moment to tab 21,
 5 which is Georgia Tech's UIF --
 6 **A. Sure.**
 7 **Q.** -- unimpaired flow, analysis.
 8 **A. Sure.**
 9 **Q.** And if you could, sir, please turn to page 124.
 10 **A. Okay.**
 11 **Q.** The numbers are in the box on the bottom of the
 12 page --
 13 **A. Thanks.**
 14 **Q.** -- yes, in the light gray.
 15 **A. In the light gray. So I have to get three layers**
 16 **of glasses.**
 17 **All right. 124, you said?**
 18 **Q.** Correct.
 19 **A. Okay.**
 20 **Q.** The heading on that page says, Unimpaired flow
 21 uncertainty implications for --
 22 **A. Yes.**
 23 **Q.** -- FWMP?
 24 **A. Yes.**
 25 **Q.** And, sir, if you look at the paragraph that

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1 begins, since unimpaired flows, do you see that?

2 **A. Right.**

3 **Q.** It's in the second paragraph under the (i), (ii),

4 (iii), and (iv). Can you just read that to

5 yourself, sir.

6 **A. I see that.**

7 **Q.** And, sir, do you see there that Georgia Tech is

8 actually warning that use of the unimpaired flows

9 and all of their uncertainty can actually be

10 passed on in modeling and impact even when you're

11 doing a relative comparison of various water

12 management alternatives. Correct?

13 **A. I see that. However, again, I have already**

14 **stated the model has been run in a predictive**

15 **mode against the period 2008 to 2011 and found to**

16 **be highly accurate. And, therefore, while this**

17 **might apply to sort of specific applications that**

18 **Georgia Tech had in mind, for this ACF Basin and**

19 **what we're doing here in the modeling, I think**

20 **it's the preferred tool.**

21 **Q.** Sir, are you aware of the ACFS Stakeholders

22 Group?

23 **A. I am.**

24 **Q.** And have you reviewed the document they produced

25 called the Sustainable Water Management Plan?

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1 **A. I have seen the cover, and I think I have**

2 **probably read the executive summary.**

3 **Q.** It's at tab 22, if you want to refer to it.

4 **A. Okay.**

5 **Q.** You know that after reviewing Georgia Tech's

6 criticism of the UIF's, the ACF Stakeholders

7 Group decided to use the UIF's and ResSim

8 modeling anyway. Correct?

9 **A. Yes, I do know that.**

10 **Q.** And they acknowledged the errors and omissions in

11 the UIF dataset. Correct?

12 **A. Yes.**

13 **Q.** Do you recall they called it an artificial

14 dataset?

15 **A. Wouldn't surprise me.**

16 **Q.** And they said that it needed to be improved as

17 soon as possible?

18 **A. It would not surprise me.**

19 **Q.** Okay. And if we could turn to page 128 in

20 tab 22, I think it's at the very end of that

21 document.

22 **A. Okay. All right.**

23 **Q.** Or almost the very end.

24 **A. Almost the very end of your --**

25 **Q.** Yes. Page 128 in tab 22.

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1 **A. Okay. Now, I'm with you.**

2 **Q.** Which for the record is FX-883.

3 **A. Right.**

4 **Q.** And, sir, if you look in the third paragraph that

5 begins, although questions have been raised.

6 **A. Right.**

7 **Q.** If you could read that, sir, just to -- the first

8 two sentences there, to yourself.

9 **A. Okay.**

10 **Q.** And you will see that they cited time and funding

11 constraints for why they couldn't fix the errors

12 in the UIF --

13 **A. Yes.**

14 **Q.** -- dataset?

15 They agreed to go forward anyway, but

16 recognized that they could not truly assess the

17 environmental impacts and benefits associated

18 with various water management alternatives.

19 Correct?

20 **A. Let me just check something here.**

21 **Yes. I see that. But, once again, the model**

22 **has been tested; and it has been proven already**

23 **for the years 2008 to 2011 to be accurate with**

24 **the UIF's that are contained therein.**

25 **Q.** Sir, did you do anything to attempt to refine or

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1 improve the Corps' UIF's before conducting your

2 own ResSim modeling?

3 **A. No, I did not.**

4 **Q.** Still not enough time and money to do that?

5 **A. Well, we tested the model from 2008 to 2011. And**

6 **that is actually one way of evaluating the**

7 **accuracy or the relative accuracy of UIF's.**

8 **Q.** But you --

9 **A. Since the model produced a correlation, kind of a**

10 **coefficient of about .96 over that time period,**

11 **that implies to me that the model is perfectly**

12 **acceptable for this application.**

13 **Q.** And you know that Georgia Tech suggested some

14 very specific improvements to the UIF dataset.

15 Correct?

16 **A. Under their specific sort of set of objectives**

17 **they did, yes.**

18 **Q.** And if you could just turn back to that one more

19 time, tab 21.

20 **A. Sure.**

21 **Q.** Page, I believe, 193.

22 **A. Okay. 193?**

23 **Q.** Correct. 193.

24 **A. Okay.**

25 **Q.** And you see under the section Recommendations

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1 they first suggest some recommendations to fix
 2 the monthly UIF's. And then as you go onto the
 3 next page, they say, thereafter, there can be an
 4 attempt made to try to fix the daily UIF's. Do
 5 you see that?
 6 **A. Oh, yes. Oh, yes.**
 7 **Q.** And did you know that Georgia Tech concluded that
 8 even if the UIF's were revised per their
 9 suggestions, it would still be challenging in a
 10 couple instances. And those are -- if you look
 11 at the bottom paragraph on page 193, there's a
 12 sentence right in the middle that says, the two
 13 challenging improvements relate to the effect of.
 14 Do you see that sentence?
 15 **A. At the bottom of 193?**
 16 **Q.** Yes. In the last full paragraph on that page.
 17 And there is a sentence in the middle there or
 18 about a third of the way down --
 19 **A. Yes.**
 20 **With the exception of two errors, yes.**
 21 **Q.** Correct.
 22 Could you just read that to the end of the
 23 paragraph.
 24 **A. Right. I see it.**
 25 **Q.** All right. So Georgia Tech says that the two
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1 challenges that would remain are, one,
 2 human-induced groundwater changes.
 3 **A. Yes.**
 4 **Q.** And then the small and medium-sized impoundments,
 5 the farm ponds. These are the same two issues we
 6 talked about earlier. Correct?
 7 **A. They are.**
 8 **Q.** And do you see that in light of these persistent
 9 challenges, Georgia Tech concluded that the way
 10 to deal with it is to run rainfall runoff models.
 11 Correct?
 12 **A. Yes.**
 13 **Q.** And they said that rainfall runoff models could
 14 be developed to provide a realistic assessment of
 15 the collective groundwater and impoundment
 16 impacts. Do you see that?
 17 **A. Yes. If -- if you had, again, the time and the**
 18 **money to do that.**
 19 **Q.** Well, sir, are you familiar with the work that
 20 Dr. Lettenmaier and Dr. Hornberger did in this
 21 case?
 22 **A. I am.**
 23 **Q.** And you know that they ran rainfall runoff models
 24 for precisely this purpose?
 25 **A. Well, I don't know about precisely this purpose.**
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1 **They ran rainfall runoff models in order to**
 2 **compare against measured flows in order to back**
 3 **out, if you will, consumptive use values.**
 4 **Q.** Right. So they ran these models --
 5 Dr. Hornberger used the P R M S or PRMS model.
 6 Correct?
 7 **A. Yes.**
 8 **Q.** And Dr. Lettenmaier used the VIC model?
 9 **A. Yes, I'm aware of that.**
 10 **Q.** Okay. And that was a way for the two of them to
 11 deal with the challenges noted here by Georgia
 12 Tech. Correct?
 13 **A. Well, but also Dr. Hornberger himself ran the**
 14 **ResSim model as well. So he ran a -- I mean, he**
 15 **ran the ResSim models and with a -- you know,**
 16 **with his own calculations on unimpaired flow.**
 17 **But he did run his own with the ResSim model.**
 18 **Q.** He did a variety of modeling. He realized some
 19 of the challenges with ResSim. And one of the
 20 things he did was to run a rainfall runoff model.
 21 Correct?
 22 **A. Yes.**
 23 **Q.** All right. Now, sir, before we leave this topic,
 24 just coming back to farm ponds for a moment, have
 25 you seen the assessment that Georgia EPD did of
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1 the consumptive use impact of evaporation from
 2 farm ponds?
 3 **A. I have not seen it in detail, no.**
 4 **Q.** All right. You recall Dr. Zeng testified that
 5 such an assessment existed. Correct?
 6 **A. I think I remember that, yes.**
 7 **Q.** And it was withheld from Florida as privileged?
 8 **A. Say it again?**
 9 **Q.** It was withheld from Florida as privileged?
 10 **A. Oh, that -- I did not remember that.**
 11 **Q.** Okay. But you haven't seen it?
 12 **A. No.**
 13 **Q.** Okay, sir. I want to switch topics one more
 14 time.
 15 Sir, in addition to theorizing that any water
 16 saved by reductions in Georgia's consumption
 17 would not flow down to Florida, you also suggest
 18 that any cuts in consumptive use by Georgia would
 19 not be meaningful in any event because Georgia's
 20 water use represents a relatively small
 21 percentage of streamflow entering Florida.
 22 Correct?
 23 **A. Well, it's -- you're talking about at the state**
 24 **line; and you're talking about mostly under**
 25 **drought conditions. The situation is that**
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1 **basically the offset kind of kicks into place.**
 2 **If you have consumptive use coming -- let's say,**
 3 **you know, increased flows coming down the Flint,**
 4 **and the offset sort of kicks into place, and the**
 5 **reservoirs were then used to store an equivalent**
 6 **amount of that flow on the Chattahoochee side.**
 7 **That's how they operate the system.**
 8 **Q.** Sir, if you could turn to your prefiled direct
 9 testimony at page 44.
 10 **A. Okay.**
 11 **Q.** Paragraph 94.
 12 **A. Yes.**
 13 **Q.** Actually, just above that, while you're getting
 14 there --
 15 **A. Sure.**
 16 **Q.** -- there is a main heading in the middle of that
 17 page. Do you see that it says --
 18 **A. Yes.**
 19 **Q.** -- Georgia's water use will not have a
 20 significant impact on state line flows?
 21 **A. Right.**
 22 **Q.** And then at paragraph 94 you say, Georgia's water
 23 use represents a relatively small percentage of
 24 streamflow entering Florida?
 25 **A. Yes.**

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1 relationship between Georgia's average monthly
 2 consumptive use for the months of May through
 3 September with average state line flows during
 4 those same months. Correct?
 5 **A. Right.**
 6 **Q.** And as you point out, water is in its greatest
 7 demand from May to September. Correct?
 8 **A. Oh, yes.**
 9 **Q.** And Georgia's consumptive use is highest during
 10 the months of July and August. Correct?
 11 **A. That's correct.**
 12 **Q.** The caption below your demo 28 has the years 1980
 13 to 2013. Do you see that?
 14 **A. Yes.**
 15 **Q.** And this indicates that the demo is plotting
 16 Georgia's consumptive use data and state line
 17 flow data for all of the years between 1980 and
 18 2013?
 19 **A. Yes.**
 20 **Q.** In other words, demo 28 is including average
 21 monthly consumptive uses and state line flow data
 22 during all years in that time period, including
 23 normal and wet years. Correct?
 24 **A. It is. It's the whole -- it's the whole**
 25 **sequence, yes.**

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1 **Q.** Now, to support your assertion that cuts in
 2 consumptive use would not be meaningful, you
 3 compared Georgia's consumptive use values with
 4 state line flows measured at the Chattahoochee
 5 Gage. Correct?
 6 **A. Right.**
 7 **Q.** And if we could turn to your prefiled direct
 8 testimony to page 46, demo 28.
 9 **A. Okay.**
 10 **Q.** Are you there?
 11 **A. Yes.**
 12 **Q.** And just so we're all clear, when you refer to
 13 consumptive use throughout your testimony and in
 14 this demo, you're using the term in the same way
 15 that Dr. Zeng uses it, meaning the total amount
 16 of surface water reduction or streamflow
 17 depletion resulting from Georgia's water use.
 18 Correct?
 19 **A. Yes. The sum of M & I and Ag use. And it was**
 20 **basically provided to me from the State of**
 21 **Georgia and other experts, yes.**
 22 **Q.** Right. You actually relied on the consumptive
 23 use data that Georgia provided to you?
 24 **A. I did, yes.**
 25 **Q.** Okay. Now, in demo 28 you focus on the

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1 **Q.** So I would like to turn your attention back to
 2 your demonstrative packet.
 3 **A. Okay.**
 4 **Q.** And if you could find Bedient cross demo 11.
 5 **A. All right. No. 11. I'm there.**
 6 **Q.** Now, what we have done here is focus on 2011,
 7 which I think you agreed with me earlier that it
 8 was at least a dry year, if not quite yet
 9 declared a drought year?
 10 **A. Yes, it was definitely a low flow year.**
 11 **Q.** Okay. And do you see that, like your demo 28,
 12 what we did in Bedient cross demo 11 is to
 13 compare state line flows in Georgia's consumptive
 14 use on an average monthly basis?
 15 **A. Yes.**
 16 **Q.** Okay. But this Bedient cross demo 11 is only
 17 looking at 2011?
 18 **A. Correct.**
 19 **Q.** Okay. Now, do you see that during the summer
 20 months of this year, Georgia's consumptive use
 21 came much closer to approaching average monthly
 22 state line flows than in your demo 28?
 23 **A. Yes. I mean, you're plotting something**
 24 **completely different here.**
 25 **Yes, it's a true and accurate plot. I don't**

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1 **disagree with it at all.**

2 **Q.** And do you see that the average monthly

3 streamflow depletion value for August 2011 was

4 1,777 cfs?

5 **A. Yes. Close to 1800, yes.**

6 **Q.** And that the average monthly state line flow for

7 that month was 5,484 cfs?

8 **A. Yes.**

9 **Q.** And I'll represent that if you divide those

10 numbers, it comes out to 32 percent. Does that

11 sound right?

12 **A. Sure. I'll buy that.**

13 **Q.** Do you recall that in your written testimony, you

14 say that even when water is in its highest

15 demand, Georgia's consumptive water use still

16 represents a small percentage of water as

17 compared to the amount of streamflow that crosses

18 the state line?

19 **A. Well, that's a general statement. When I made**

20 **that statement, I wasn't necessarily talking**

21 **about 2011.**

22 **And, you know, if you plot 2011, yes, that's**

23 **kind of a worst case. And, actually, 2011 is the**

24 **year that we selected to do all of our baseline**

25 **runs against because of its -- because of the**

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1 **extreme nature of that year.**

2 **Q.** Sir, if you could, just turn to your prefiled

3 direct testimony at page 46 --

4 **A. Okay.**

5 **Q.** -- paragraph 97.

6 **A. All right.**

7 **Q.** And you will see at the end of that paragraph,

8 sir, the statement that I just stated for

9 the Court when you said Georgia's total

10 consumptive -- sorry. Even when water is in its

11 greatest demand, Georgia's total consumptive

12 water use still represents a, quote, small

13 percentage of water as compared to the amount of

14 streamflow that crosses the state line.

15 Do you see that, sir?

16 **A. Yes.**

17 **Q.** Okay. 32 percent is not a, quote, small

18 percentage; is it?

19 **A. Not for that one particular data point that you**

20 **have selected. But this statement is with**

21 **respect to this general graph that's on page 46.**

22 **Q.** Now, sir, if you turn to cross demo 12, which is

23 the next page.

24 **A. All right.**

25 **Q.** You will see what we have done here is that we

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1 have plotted the ratio of average monthly

2 consumptive use for 2011 versus observed state

3 line flow at the Chattahoochee Gage for the same

4 year. Do you see that?

5 **A. Sure.**

6 **Q.** And we were just talking about the ratio of

7 August, which is 32 percent. Do you see that in

8 July and August, the months when you acknowledge

9 that Georgia's consumptive use is at its highest

10 percentage of Georgia's consumptive use as

11 compared to state line flow, is 27 percent and

12 then 32 percent respectively?

13 **A. Sure. But, again, during all of this time period**

14 **in 2011, the -- you know, there's a lot of**

15 **augmentation going on at this time. And so the**

16 **system is being operated to shoot for or to at**

17 **least hit the minimum of 5,000. And all other**

18 **water, to the extent possible, is going back to**

19 **refill those reservoirs.**

20 **Q.** So, sir, at least for this time period your

21 statement that Georgia's total consumptive water

22 use still represents a small percentage of water

23 as compared to the amount of streamflow that

24 crosses the straight line -- state line is not

25 true. Correct?

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1 **A. Well, that statement, again, was made in a**

2 **general sense for average years. This is**

3 **obviously an extreme year. And it is a high**

4 **percentage, I'll absolutely agree with.**

5 **Q.** So we don't need to belabor it with the Court,

6 but if you look at the next two demos in your

7 packet, 13 and 14 --

8 **A. Sure.**

9 **Q.** -- you have done the same thing for 2012, sir.

10 Would you agree that, once again, the ratios are

11 much higher than what you present in the demo in

12 your direct testimony?

13 **A. The ratios are higher. And, of course, 2012 is**

14 **the back-to-back drought that came right after**

15 **2011. And, yet, you will also notice that with**

16 **respect to the way that the Corps is operating**

17 **the system, they are meeting the minimum 5,000**

18 **cfs as required under the RIOP.**

19 **Q.** And, sir, you realize that these charts are all

20 using Georgia's consumptive use numbers.

21 Correct?

22 **A. Yes.**

23 **Q.** And that Florida at least believes that Georgia

24 has underestimated its consumptive use. Correct?

25 **A. I'm aware of that, yes.**

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1 Q. Pretty substantially, according to Florida's
 2 experts. Correct?
 3 A. Yes.
 4 Q. And I know you won't agree with that, but would
 5 you at least agree that to the extent Georgia's
 6 consumptive use values are underestimated,
 7 Georgia's consumptive use will represent an even
 8 larger percentage of the state line flows than is
 9 shown on these cross demonstratives?
 10 A. Well, I think based on everything that I have
 11 looked at -- and, again, I have to rely upon
 12 consumptive use being provided to me; but based
 13 on the analyses and the discussions that I have
 14 had with team members, I would think that -- that
 15 those are pretty accurate numbers coming from the
 16 State of Georgia. And I --
 17 Q. Sir --
 18 A. -- think they're more accurate than what's being
 19 provided and being estimated by Florida experts.
 20 Q. I appreciate that. I didn't ask you if you
 21 agreed that they weren't accurate. I just asked
 22 if you would at least agree that to the extent
 23 those consumptive use values are underestimated,
 24 Georgia's consumptive use would represent an even
 25 larger percentage of these state line flows.

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1 the state line. And we did this detailed
 2 analysis for the whole year. And the results
 3 were that for 307 days out of that year Florida
 4 would receive no additional state line flow, and
 5 for only 49 total days during the year would they
 6 receive the full benefit of that flow. And that
 7 would typically not be during the low flow months
 8 of the summer.
 9 Q. And what do you attribute -- that 307 days when
 10 Florida would receive no additional state line
 11 flow, what do you attribute that to?
 12 A. That basically -- I attribute that to, first of
 13 all, they're in drought operations in 2012. And
 14 this is a scenario where they have -- they're
 15 following the RIOP; and they have gone into
 16 drought operations. They're augmenting flows.
 17 They're meeting the 5,000 minimum, and that's it.
 18 In other words, they're augmenting the flows.
 19 And other excess flows that come through are put
 20 back into storage in the reservoirs.
 21 Q. Now, on cross-examination you talked a little bit
 22 about your modeling. Did you model the impact of
 23 both increases in Georgia's consumptive use on
 24 state line flows and decreases in Georgia's
 25 consumptive use on state line flows?

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1 Correct?
 2 A. I'll agree with that.
 3 Q. All right. Thank you.
 4 MS. WINE: I have no further questions.
 5 SPECIAL MASTER LANCASTER: Redirect?
 6 MS. ALLON: Yes. Thank you, your Honor.
 7 REDIRECT EXAMINATION
 8 BY MS. ALLON:
 9 Q. Dr. Bedient, I want to start by talking about
 10 your opinion that reducing Georgia's water use
 11 would not typically lead to increases in state
 12 line flows during dry and drought conditions. So
 13 if you could turn to page 29 of your direct
 14 testimony. And I specifically want to look at
 15 paragraph 56.
 16 Does paragraph 56 report the results of an
 17 analysis that you did in support of that
 18 conclusion?
 19 A. Yes.
 20 Q. Okay. And could you describe the analysis that
 21 you did?
 22 A. Sure. We basically -- for the year 2012 we
 23 essentially did a counting. We counted up how
 24 many days Florida would be expected to receive
 25 either additional water or no additional water at

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1 A. Yes. I looked at both.
 2 Q. Okay. And which model did you use?
 3 A. I used the HEC ResSim model that was provided.
 4 And, again, it's basically the Army Corps of
 5 Engineers' model with input data in there from
 6 the State of Georgia.
 7 Q. And before we get into the results of your
 8 modeling, I just want to briefly discuss, because
 9 it came up cross-examination, the issue of the
 10 UIF's.
 11 MS. ALLON: Your Honor, may I hand up a
 12 demonstrative?
 13 SPECIAL MASTER LANCASTER: Please.
 14 BY MS. ALLON:
 15 Q. Now, during cross-examination you mentioned that
 16 you had seen some testimony from the authors of
 17 the GWRI report that discussed when those authors
 18 themselves thought the UIF -- the use of UIF's
 19 was appropriate. And if you look at the
 20 demonstrative that I just handed out, is this the
 21 testimony that you were referring to?
 22 A. Yes, it is.
 23 Q. And could you just describe -- you don't have to
 24 read through it; but could you describe at a
 25 general level what your understanding of that

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1 testimony is.

2 **A. Yes. This is essentially what I was referring**

3 **to. Both Dr. Kistenmacher and Dr. Georgakakos**

4 **from Georgia Tech are referring to their report;**

5 **and they're basically saying that for comparison**

6 **scenarios, in other words, if that's where you're**

7 **running these scenarios to compare, for example,**

8 **consumptive use caps or increases in whatever,**

9 **you were doing that type of analysis, the**

10 **magnitude and the results of these issues that**

11 **they came up with really are no longer an issue.**

12 **Q.** And did you do anything yourself to test the

13 ability of the ResSim model to accurately

14 reproduce reservoir operations in the ACF Basin?

15 **A. Yes, I did.**

16 **Q.** And what did you do?

17 **A. Basically ran the model -- I mean, put it through**

18 **a severe test between 2008 and 2011. So that**

19 **basically includes a really serious drought year**

20 **of 2011. And it runs with the RIOP rules in**

21 **place. And so we ran that model over that period**

22 **of time and found the comparison to measured**

23 **flows coming out of Woodruff Dam to be excellent.**

24 **Q.** Now, with respect to the modeling that you did

25 using ResSim, can you just provides the Court

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1 with a general overview of how you isolated the

2 impact of consumptive use.

3 **A. Yes. You're basically asking me kind of how I**

4 **ran the model?**

5 **Q.** Right.

6 **A. So the ResSim model is this complex beast that**

7 **has rivers, the Flint, the Chattahoochee, and**

8 **reservoirs contained therein. And so all of**

9 **those rules that the reservoirs are operated**

10 **under, all those rules are contained within the**

11 **computer model. And then what we do is we get**

12 **rid of all the human influences to generate the**

13 **unimpaired flows.**

14 **So unimpaired flows are sort of like Mother**

15 **Nature's flows from the original days back 100**

16 **years ago. All right. That's the unimpaired**

17 **flow. So that is sort of how you start the**

18 **model. Then you start putting in consumptive**

19 **uses. And you put in all sorts of withdrawals**

20 **and all of that. So the human influences are**

21 **added back into the model.**

22 **So if I want to look at consumptive use**

23 **changes, let's say by 30 percent, I would take a**

24 **baseline run. And the baseline run we used was**

25 **the year 2011. And then I would simply cut**

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4002

1 **consumptive use -- I would cap it or cut it by 30**

2 **percent, put that in, make those two runs, and**

3 **then compare the results at the state line.**

4 **So that's what we did. And we did that 19**

5 **different times with 19 different scenarios.**

6 **Q.** And I want to talk about both sets of modeling

7 that you did, decreases in consumptive use and

8 increases in consumptive use.

9 **A. Both, yes.**

10 **Q.** Let's start with decreases.

11 **A. Okay.**

12 **Q.** With respect to decreases in Georgia's

13 consumptive use, what were the specific

14 consumption cap scenarios that you modeled?

15 **A. We basically looked at 5 percent deltas all the**

16 **way up to 30 percent. So we looked at 30**

17 **percent. We looked at 1992 levels, which is**

18 **about sort of a 40 percent decrease. And we also**

19 **ran Dr. Sunding's analysis of 1000 cfs.**

20 **Q.** And at a high level, what did your modeling show

21 about the impact of decreases in Georgia's

22 consumptive use on state line flows into Florida?

23 **A. And, again, we're running this under the 2011**

24 **baseline. And when we did that, we essentially**

25 **found no material differences whatsoever at the**

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4003

1 **state line during the -- during the drought --**

2 **serious summer months for any of those runs. No**

3 **difference.**

4 **Q.** Let's take a look at page 38 of your direct

5 testimony. And I would like to focus on

6 demonstrative 21.

7 **A. Okay.**

8 **Q.** And does the demonstrative 21 show the results of

9 one of your ResSim model runs about the impact of

10 consumption caps on state line flows?

11 **A. Yes. That's a fairly typical plot of all of**

12 **these. We're plotting two different colors here,**

13 **blue and orange, the blue being the baseline run.**

14 **And the flow is plotted as a -- just a function**

15 **of time through the year, January to December.**

16 **So the blue is the baseline original run.**

17 **And then when we cut, the orange represents what**

18 **additional flows might or might not come across**

19 **state line.**

20 **Q.** Okay. And --

21 **A. You will notice in the month of January and in**

22 **the month of May, there are additional flows**

23 **coming through to Florida. And, actually, a**

24 **little bit in July. But across the board for the**

25 **bulk of that time through the summer it's just a**

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4004

1 **flat line, and they're the same.**

2 **Q.** What was the specific consumption cap that you

3 were modeling in demonstrative 21?

4 **A. This one is a 30 percent cap on both M & I and on**

5 **agricultural use.**

6 **Q.** And what was your conclusion about reservoir

7 operations from the results of this modeling?

8 **A. Well, the conclusion is that the -- you know, the**

9 **reservoirs that are in the system -- and there**

10 **are these -- there are these five big reservoirs**

11 **with three big storage reservoirs in place. They**

12 **tend to smooth or dampen out any changes or any**

13 **alterations that might take place in the system.**

14 **And that's what they're designed to do.**

15 **Q.** Now, Dr. Bedient, I think you had said that

16 you -- when you had looked at caps, you went all

17 the way up to a 40 percent reduction in

18 consumptive use; is that right?

19 **A. Yes.**

20 **Q.** And if you look at page 40, demonstrative 23 --

21 **A. Right.**

22 **Q.** -- in your direct testimony, does that show the

23 results of your analysis with respect to the

24 impact of a 40 percent reduction in consumptive

25 use?

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1 **A. Yes. This is essentially taking it all the way**

2 **back to the 1992 level of consumptive use, a 40**

3 **percent difference or cap. And when -- again,**

4 **you see very similar results here to what we got**

5 **with the 30 percent.**

6 **Q.** And what are those results?

7 **A. And those results basically say no material**

8 **difference of flows at the state line. A few**

9 **little differences, but mostly in the wetter**

10 **months, not in the dry months.**

11 **Q.** Now, let's talk about the modeling you did of

12 increases in Georgia's consumptive use. What

13 scenario did you look at for that modeling?

14 **A. There, we -- we ran the 2040 into the future use,**

15 **I believe.**

16 **Q.** So you looked at projected increases in Georgia's

17 consumptive use. Is that right?

18 **A. That's correct.**

19 **Q.** And what did your modeling show with respect to

20 the impact of increases in Georgia's consumptive

21 use on state line flows into Florida?

22 **A. And, again, going all the way to 2040 with the**

23 **projected uses, we see no material differences**

24 **especially, again, in the summer months.**

25 **Q.** Dr. Bedient, how does it make sense that

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1 Georgia's consumptive use, whether we're talking

2 about increases or decreases, is not having a

3 significant impact on state line flows into

4 Florida during the dry times and drought years?

5 **A. It's all related to two things, the reservoirs**

6 **and the way in which the Army Corps of Engineers**

7 **operates those reservoirs. They have the RIOP**

8 **rule. They basically are acting as a smoothing**

9 **mechanism or a dampening mechanism for any**

10 **changes that might migrate through the system.**

11 **Q.** I want to move on to a different topic, and I

12 want to talk about your analysis of the

13 relationship between precipitation and streamflow

14 in the ACF Basin. Have you analyzed that issue?

15 **A. I have.**

16 **Q.** Now, let's take a look at page 56 of your direct

17 testimony, specifically demonstrative 34.

18 **A. Okay.**

19 **Q.** And does this show the results of your analysis

20 of the relationship between streamflow and

21 precipitation?

22 **A. It does.**

23 **And I apologize; it's a fairly complex graph,**

24 **but I can -- I can explain it, I think, in simple**

25 **terms.**

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4007

1 **There are two things being shown here. The**

2 **red is rainfall. And it's been converted over**

3 **into cubic feet per second, but essentially it's**

4 **inches of rainfall that's been converted. And**

5 **you will notice how the rain starts over there in**

6 **1929 on the graph. It was actually a fairly high**

7 **year, and then it bounces up and down quite a**

8 **bit. There is a low year in 1954, another kind**

9 **of low year in the '60's. And then you come**

10 **across, and you will notice that over there in**

11 **the 1999 and forward time frame, you see three**

12 **sort of double-year droughts; '99 and 2000, '06**

13 **and '07, and then '11 and '12. And then you will**

14 **also notice that the flows -- and these are flows**

15 **at the Chattahoochee Gage at the state line --**

16 **the flows also show a marked reduction. And,**

17 **again, these are in units of tens of thousands of**

18 **cfs average annual flows. But they show a marked**

19 **reduction, especially post-1999. So there's this**

20 **correlation that appears to show up.**

21 MS. ALLON: Your Honor, may I hand up

22 one more demonstrative?

23 May I hand up one more demonstrative?

24 SPECIAL MASTER LANCASTER: Please.

25 BY MS. ALLON:

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1 **Q.** Now, Dr. Bedient, this is a demonstrative that
 2 the Court has seen before. Florida's counsel
 3 actually used it in their opening statement.
 4 Have you seen this before?
 5 **A.** I have.
 6 **Q.** Okay. And can you describe what it shows.
 7 **A.** **It's basically showing the -- and I choose to**
 8 **look at annual streamflow; it's easier to see,**
 9 **but you can also look at June to September**
 10 **streamflow. And what you're seeing is a**
 11 **comparison between droughts of '54 and '55**
 12 **compared to today, 2011 and 2012.**
 13 **And the -- the effort here is to show that --**
 14 **or the statement up here is that fewer inches of**
 15 **precipitation and higher temperatures in the past**
 16 **lead to -- or were considerably higher and**
 17 **produced sort of worst droughts in the future.**
 18 **Q.** Okay. And do you agree with that conclusion?
 19 **A.** **No, I don't. I think there are a lot of other**
 20 **issues going on here.**
 21 **Q.** Okay. Can you describe what you mean by that?
 22 **A.** **Well, in particular two things have changed**
 23 **dramatically in the basin between '54 and '55.**
 24 **And that was shown on my earlier exhibit that we**
 25 **just looked at.**

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1 **In 1954, that was basically just a**
 2 **single-year drought. And all the -- all the**
 3 **earlier droughts were sort of single-year type**
 4 **drought occurrences.**
 5 **Secondly, in 2011 and 2012 the reservoirs**
 6 **were in place; the RIOP was in place. So they**
 7 **were hitting or shooting to hit that minimum**
 8 **5,000, which explains why you see the June to**
 9 **September streamflow in there around 5500.**
 10 **Lastly, and more importantly than anything,**
 11 **the high annual streamflow during 1954 is kind of**
 12 **a false and misleading number because the end of**
 13 **1953 had one of the largest rains on record. And**
 14 **it happened in the very end of the year, and then**
 15 **flows just carried over into 1954 generating a**
 16 **higher value, much higher than -- you will notice**
 17 **'55; the value there is 11,000. And you will**
 18 **notice it's 3,000 higher. And that's just not --**
 19 **and I investigated that.**
 20 **Q.** Okay. And let's look at page 85 of your direct
 21 testimony.
 22 **A.** Okay.
 23 **Q.** And specifically at demonstrative 50.
 24 **A.** All right.
 25 **Q.** And can you describe what demonstrative 50 shows.

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4010

1 **A.** **That shows what I was just talking about for 1954**
 2 **and '53. You will notice in January of 1954, the**
 3 **rainfall starts to really, really go down. And**
 4 **you will notice the flows also in '54 track down,**
 5 **but they start very high. They start at 40,000.**
 6 **And the reason they start really high at 40,000**
 7 **is because look at that ginormous rain spike that**
 8 **comes in at the very, very end of 1953. It just**
 9 **carries over.**
 10 **This is a slow-moving, slow-responding basin.**
 11 **And those flows just carry over into '54 and**
 12 **register at the state line.**
 13 **Q.** Now, Dr. Bedient, based on your review of the
 14 precipitation data and streamflow data, what
 15 have you concluded about the relationship
 16 between precipitation and streamflow in the ACF
 17 Basin?
 18 **A.** **Well, I think it's just common sense that higher**
 19 **rain, higher runoff, higher streamflow; lower**
 20 **rain, especially significantly lower rain, lower**
 21 **flow -- lower streamflow, lower flows measured at**
 22 **the gage.**
 23 **Q.** Thank you.
 24 MS. ALLON: Your Honor, nothing further.
 25 EXAMINATION

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4011

1 BY MS. WINE:
 2 **Q.** Sir, I just want to pick up where we left off
 3 with your counsel asking you about your analysis
 4 of rainfall.
 5 **A.** Sure.
 6 **Q.** You're not a climatologist. Correct?
 7 **A.** I'm not a climatologist.
 8 **Q.** And you're not a hydroclimatologist?
 9 **A.** I'm not one of those, no.
 10 **Q.** And were you here when Dr. Hornberger testified
 11 about this chart that you were just asked about
 12 comparing '54 to '11 and '55 to 2012?
 13 **A.** No, I wasn't here.
 14 **Q.** And were you -- so you weren't here to hear him
 15 say he compared 2010 to 1953, and that they were
 16 the same?
 17 **A.** No.
 18 **Q.** And did you hear him talk about looking at the
 19 effect of any kind of carryover analysis?
 20 **A.** No, I did not.
 21 **Q.** Sir, when you looked at the relationship between
 22 rainfall and streamflow for purposes of your
 23 expert report and your prefiled direct testimony,
 24 did you rely on gridded climate datasets?
 25 **A.** No. I relied on the data that basically came

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1 **from the National Weather Service out of the EPD**
 2 **offices.**
 3 **Q.** And, sir, are you aware that NOAA has now
 4 published on its website and said elsewhere that
 5 the gridded datasets are the state-of-the-art
 6 datasets that are to be used these days?
 7 **A. I am familiar with that.**
 8 **Q.** Okay. And you haven't looked at the gridded
 9 datasets or done any analysis to see what the
 10 relationship would be -- between rainfall and
 11 streamflow would be if you used those datasets.
 12 Correct?
 13 **A. Well, I haven't done a detailed analysis; but I**
 14 **have looked at some of Dr. Hornberger's annual**
 15 **rainfall totals. And I have compared those back**
 16 **against our annual rainfall totals. And they**
 17 **compare very, very well. They're very close.**
 18 **Q.** Sir, have you looked at any of Dr. Lettenmaier's
 19 analyses?
 20 **A. I have.**
 21 **Q.** And have you looked at his analysis of the
 22 relationship between rainfall and streamflow?
 23 **A. I have.**
 24 **Q.** And he uses gridded climate datasets; does he
 25 not?

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1 **A. He does.**
 2 **Q.** And he comes up with very different conclusions
 3 than you do. Correct?
 4 **A. He does.**
 5 **Q.** Now, sir, I just want to make sure I'm clear on
 6 one thing. Going back to your ResSim modeling
 7 and your use of the UIF dataset, your counsel
 8 handed out this sheet that has some excerpts from
 9 testimony. Correct?
 10 **A. Yes.**
 11 **Q.** And I just want to make sure I heard correctly.
 12 Are you now conceding that your ResSim modeling
 13 work is of no utility if we want to know what
 14 absolute flows are at a particular time period?
 15 **A. No, I haven't said that. In fact, I said just**
 16 **the opposite. The time period from '08 to '11 we**
 17 **compared and got a very, very good result. So I**
 18 **think it's an accurate tool.**
 19 **Q.** So you're purporting to state what the absolute
 20 flows are on particular days?
 21 **A. No. Over a period of time if you do a long-term**
 22 **analysis and see how well that model works, not**
 23 **necessarily day-to-day, but across a three-year**
 24 **period, it works very well. And that's the**
 25 **system, by design, is a -- is a multi-month,**

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1 **multi-year type analysis.**
 2 **Q.** So your modeling cannot give us absolute flow
 3 numbers going back in time or in the future if we
 4 want to look at a particular time period.
 5 Correct?
 6 **A. At a particular day it's more difficult. For a**
 7 **particular time period, we can do a better job.**
 8 **Q.** Okay. Thank you.
 9 **A. Thank you.**
 10 SPECIAL MASTER LANCASTER: Any redirect?
 11 MS. ALLON: Yes, your Honor, very brief.
 12 REDIRECT EXAMINATION
 13 BY MS. ALLON:
 14 **Q.** Dr. Bedient, counsel for Florida asked you if you
 15 were a climatologist or a hydroclimatologist, I
 16 think. Do you have expertise in studying
 17 rainfall and streamflow data?
 18 **A. Yes. Extensive. I do.**
 19 **Q.** About how long have you been studying and
 20 analyzing that data for?
 21 **A. I have been looking at rainfall and runoff for 40**
 22 **years in Texas, where we get really, really big**
 23 **storms, and all over the country, for that**
 24 **matter, as well. I have done it for a long time.**
 25 **Q.** And do you have experience in applying that

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1 knowledge in the real world?
 2 **A. I do. I have developed and operate realtime**
 3 **flood warning systems that work off of radar**
 4 **rainfall and high-tech rainfall. So I'm quite**
 5 **familiar with rainfall databases.**
 6 MS. ALLON: Nothing further, your Honor.
 7 Thank you.
 8 MS. WINE: Nothing further.
 9 SPECIAL MASTER LANCASTER: Doctor, you
 10 were here when Dr. Panday testified?
 11 THE WITNESS: I was.
 12 SPECIAL MASTER LANCASTER: I want you to
 13 think very carefully before you answer this
 14 question.
 15 THE WITNESS: I will, sir.
 16 SPECIAL MASTER LANCASTER: It's pouring
 17 rain out there. It's very cold. And it's
 18 getting dark.
 19 Do you remember what Dr. Panday said
 20 when I asked him questions?
 21 THE WITNESS: You asked him that
 22 question?
 23 SPECIAL MASTER LANCASTER: No, no. I
 24 asked him questions.
 25 THE WITNESS: Oh, yes. Yes.

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1 SPECIAL MASTER LANCASTER: And he said
 2 you, meaning me, know more about this than I
 3 do.
 4 THE WITNESS: And I agree with him.
 5 SPECIAL MASTER LANCASTER: So we should
 6 quit?
 7 THE WITNESS: That's the best news I
 8 have heard all day, sir.
 9 SPECIAL MASTER LANCASTER: Well, let me
 10 ask you a couple questions.
 11 Are you familiar with Battle Bend?
 12 THE WITNESS: I have heard about it from
 13 you up on the stand asking the questions; but
 14 I have not -- I have not researched it.
 15 SPECIAL MASTER LANCASTER: Well, if --
 16 Battle Bend is south of -- of Bainbridge and
 17 north of Sumatra.
 18 THE WITNESS: Right.
 19 SPECIAL MASTER LANCASTER: If the United
 20 States Supreme Court were to order the
 21 disengagement of Battle Bend, what would the
 22 result be?
 23 THE WITNESS: I haven't studied that
 24 problem. I don't know.
 25 SPECIAL MASTER LANCASTER: Well, let's
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1 suppose that the Supreme Court ordered a
 2 canal to be created between the Tennessee
 3 River and the Chattahoochee. What would the
 4 result be?
 5 THE WITNESS: I haven't studied that
 6 either.
 7 SPECIAL MASTER LANCASTER: There are, by
 8 my count, some 300 sloughs. What if the
 9 Supreme Court ordered them all cut off? What
 10 would the result be?
 11 THE WITNESS: I haven't run that
 12 analysis either.
 13 SPECIAL MASTER LANCASTER: You're making
 14 great progress.
 15 Well, let me ask you one last question.
 16 Oysters are male and then become female. Do
 17 you know how that happens?
 18 THE WITNESS: I used to think I was an
 19 ecologist, but I'm not. And I have not
 20 studied that problem.
 21 And I don't like to eats oysters either,
 22 so I don't know.
 23 SPECIAL MASTER LANCASTER: Let me ask
 24 you this question. If we get a drenching,
 25 drenching, drenching rain, what's the effect
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1 going to be on groundwater and streamflow?
 2 THE WITNESS: The groundwater levels,
 3 just like Dr. Panday indicated, will
 4 definitely come up; and the streamflow will
 5 increase. That's just the way a hydrologic
 6 system works.
 7 SPECIAL MASTER LANCASTER: Now, you're
 8 not a climatologist?
 9 THE WITNESS: No. That's rainfall
 10 runoff. That's hydrology.
 11 SPECIAL MASTER LANCASTER: And that's
 12 common sense?
 13 THE WITNESS: Yes, sir.
 14 SPECIAL MASTER LANCASTER: Further
 15 cross?
 16 MS. ALLON: Nothing else, you Honor.
 17 MS. WINE: Nothing further, your Honor.
 18 SPECIAL MASTER LANCASTER: Okay.
 19 THE WITNESS: Thank you, sir.
 20 SPECIAL MASTER LANCASTER: Thank you.
 21 Yes, sir?
 22 MR. PRIMIS: Your Honor, Georgia's next
 23 witness is going to be called by video
 24 designation. I don't believe we can finish
 25 it today given the length. So I propose we
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1 start with Mr. Leitman's video designations
 2 tomorrow.
 3 SPECIAL MASTER LANCASTER: Thank you for
 4 that.
 5 Anything else?
 6 MS. WINE: No, your Honor.
 7 SPECIAL MASTER LANCASTER: All right.
 8 We'll be in recess until tomorrow morning.
 9 MR. PRIMIS: Thank you, your Honor.
 10 MS. ALLON: Thank you, your Honor.
 11 (Time Noted: 3:57 p.m.)
 12 (Proceeding adjourned to Wednesday,
 13 November 29, 2016, at 9:00 a.m.)
 14 (End of day)
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CERTIFICATE

I, Claudette G. Mason, a Notary Public
in and for the State of Maine, hereby certify
that the foregoing pages are a correct
transcript of my stenographic notes of the
Proceedings.

I further certify that I am a
disinterested person in the event or outcome
of the above-named cause of action.

IN WITNESS WHEREOF, I subscribe my hand
this 13th day of December, 2016.

/s/ Claudette G. Mason
Claudette G. Mason, RMR, CRR
Court Reporter

My Commission Expires
June 9, 2019.

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