MORGAN FALLS HYDRO

INTEGRATED LICENSING PROCESS

STUDY RESULTS MEETING

April 18, 2006

8:45 a.m.

J.K. Davis Conference Center
Georgia Power Company
241 Ralph McGill Boulevard, N.E.
Atlanta, Georgia

Linda E. Cheek, CCR-A-752

LIST OF ATTENDEES

Facilitator:

Tom Sullivan - Gomez & Sullivan Engineers

David M. Moore, Esq. - Troutman Sanders
Hallie Meushaw, Esq. - Troutman Sanders

George Martin - Georgia Power Company - Project Manager - Hydro Relicensing

Larry Wall - Georgia Power Company
Greg Boortz - Georgia Power Company
Tom Broadwell - Georgia Power Company
Michael Abney - Georgia Power Company
Scott Hendricks - Georgia Power Company
Nancy DeShazo - Georgia Power Company
Mike Nichols - Georgia Power Company
Eldon Watts - Georgia Power Company

Chris Martin - Georgia Department of Natural Resources

Alexandra Adams - Upper Chattahoochee Riverkeeper
Betsy Nicholas - Upper Chattahoochee Riverkeeper

Jim Long - National Park Service

George McMahon - Arcadis/Atlanta Regional Commission
Pat Stevens - Atlanta Regional Commission
Jim Santo - Atlanta Regional Commission

Alice Lawrence - U.S. Fish & Wildlife Service

Gregory Hogue - Department of the Interior
Joyce Stanley - Department of the Interior

Lee Emery - FERC
Janet Hutzel - FERC
Elizabeth Molloy - FERC

Winnie Simpson, Esq. - Independent Consultant
L.G. Byrnes - Independent Consultant

Steve Layman - GeoSyntec Consultants
Christin Krachon - GeoSyntec Consultants
Michael Monteleone - GeoSyntec Consultants

Jim Scarbrough - Gwinnett County Public Utilities

Sally Mills - City of Atlanta

Lewis Jones, Esq. - King & Spalding

Fred Cox - Southern Company, Hydro Services
Courtenay O'Mara - Southern Company, Hydro Services
Joel Galt - South Company, Hydro Services

Nolton Johnson - Georgia Environmental Protection Division - Water Resources Branch

(Reporter disclosure made pursuant to Article 8.B. of the Rules and Regulations of the Board of Court Reporting of the Judicial Council of Georgia.)

MR. MARTIN: Good morning. My name is George Martin, and I want to welcome you-all to our second day of Morgan Falls ILP Relicensing Study Results Meetings. We had a pretty good session yesterday. We went over terrestrial resources including wetlands, wildlife, botanical, terrestrial as well as fisheries.

And today on your agenda you can see that we are going to go through water resources and geology and soils. And I want to welcome you and appreciate your time and effort for coming. I want to remind everyone as well we are passing around the sign-in sheet; if you have not signed in, please do so. We are going to keep this in the record as well.

And if you would, get a name tag and/or a tent card. And the first time that you speak identify yourself and your organization for our court reporter. With that I want to go to our next slide and bring us up to speed as we did yesterday briefly on where we are with the Morgan Falls ILP timeline.

We started back in January of 2004 with a Filing of the Notice of Intent to relicense with our pre-application document which you-all have, I'm sure, close and near and dear to your heart in your office. And I'm not going to go through all the bullets. As we introduce ourselves you can refresh your memory where we started and where we are today at our study results meetings. And much like I did yesterday at the end of the resource areas or at the end of the day, we will look towards our next steps in the process.

And with that, why don't we just start right here with Winnie.

WINNIE SIMPSON: Am I introducing myself?

GEORGE MARTIN: Yes, ma'am.

WINNIE SIMPSON: I'm Winnie Simpson, and I'm an independent consultant to Georgia Power on the Morgan Falls project.

STEVE LAYMAN: I'm Steve Layman with GeoSyntec Consultants, and we have been supporting Georgia Power on the environmental sites.

CRISTIN KRACHON: I'm Cristin Krachon. I'm also with GeoSyntec Consultants.

FRED COX: Fred Cox, Southern Company Hydro Services.

COURTENAY O'MARA: Courtenay O'Mara, Southern Company Hydro Services.

PAT STEVENS: I'm Pat Stevens with the Atlanta Regional Commission.

GEORGE McMAHON: George McMahon, Arcadis, consultant to the Atlanta Regional Commission.

ALICE LAWRENCE: Alice Lawrence, U.S. Fish and Wildlife Service.

CHRIS MARTIN: Chris Martin, Georgia Department of Natural Resources.

JIM SCARBROUGH: Jim Scarbrough with Gwinnett County.

HALLIE MEUSHAW: Hallie Meushaw, Troutman Sanders.

SALLY MILLS: Sally Mills, City of Atlanta.

LEWIS JONES: Lewis Jones, King & Spalding representing Atlanta Regional Commission.

JOEL GALT: I'm Joel Galt. Southern Company Hydro Services.

LARRY WALL: Larry Wall, Georgia Power Company Land Department.

ELDON WATTS: Eldon Watts, Morgan Falls plant mechanic.

SCOTT HENDRICKS: Scott Hendricks, Georgia Power.

JIM LONG: Jim Long with National Park

Service.

DAVID MOORE: I'm David Moore, Troutman Sanders representing Georgia Power.

MIKE NICHOLS: I'm Mike Nichols, Georgia Power Environmental Affairs.

NANCY DeSHAZO: Nancy DeShazo, Environmental Affairs Georgia Power.

L.G. BYRNES: L.G. Byrnes, independent consultant.

JOYCE STANLEY: Joyce Stanley, U.S. Department of the Interior.

GREGORY HOGUE: Gregory Hogue, Department of the Interior.

JIM SANTO: Jim Santo with the Atlanta Regional Commission.

NOLTON JOHNSON: Nolton Johnson, Georgia Environmental Protection Division, the Water Resources Branch.

ELIZABETH MOLLOY: Elizabeth Molloy, FERC.

LEE EMERY: Lee Emery, FERC.

JANET HUTZEL: Janet Hutzel, FERC.

ALEX ADAMS: Alex Adams, Upper Chattahoochee Riverkeeper.

BETSY NICHOLAS: Betsy Nicholas, Upper Chattanooga Riverkeeper.

GREG BOORTZ: Greg Boortz, Georgia Power Land Management.

MICHAEL ABNEY: Michael Abney, fisheries biologist, Georgia Power.

TOM BROADWELL: Tom Broadwell, Georgia Power Environmental Affairs.

TOM SULLIVAN: I'm Tom Sullivan with Gomez and Sullivan. I have been asked to facilitate your ILP meeting this morning. I'm just going to review the agenda quickly, talk a little bit about where we are in the process similar to what I did yesterday but for the benefit of those that are here for the first time today. And then we are going to jump into the technical presentations.

In terms of the agenda for today we are going to ask FERC to spend a few minutes just giving us some insights into the purpose of today's meeting within the context of the ILP process for Morgan Falls. We are then going to talk about the water resources report this morning and we are going to talk about the geology and soils report immediately after the water resources report. Now, that's scheduled for this afternoon, but it may be this morning or it may be this afternoon. We'll finish up with George giving us some closing remarks in terms of again where we are in the process and what the next steps are.

Just a little change for today in terms of the way the presentations are going to go. Today's two presentations are longer, they are each about 30 minutes presentations, I think, Steve, right?

STEVE LAYMAN: Yes, sir.

TOM SULLIVAN: What we'll do is, I have left it to Steve's discretion and the presenter's discretion to kind of put in logical break points for questions as we go, and so that people can remember their questions, we don't have to carry questions for 30 minutes.

There is a couple of things that I would like, though, from the group relative to that. The presenters possibility may tell you that that's something that's going to be a little farther in the presentation. And if they do, if you could just be a little patient with that and you'll probably get the answer to your question, and, if not, we'll come back to it.

If the questions start to go too fast and furious and I think it's going to take away from what the presentation is, I'll kind of remind the group about that, too. But the group yesterday was very good that way, so I don't think that's going to be any type of an issue at all.

With that, Janet, do you want to just give a few words as to from FERC's perspective what today's meeting is about.

JANET HUTZEL: Sure. I'm Janet Hutzel, FERC. Today's meetings are initially to be -- to discuss the study results, and if you have any questions and if there is any gaps that you believe in the studies, to discuss any need for future studies.

TOM SULLIVAN: Does anybody have any questions for FERC about today's meeting? Just a couple of logistical things about today's meetings. We are actually kind of keeping notes two ways. Linda is our court reporter, she is keeping a transcript of today's meeting that will be an official transcript that will be filed with FERC. To help Linda out, if you could, when you first talk, as George mentioned, please mention your name and your affiliation. And actually it wouldn't hurt if you did that more than the first time, too, there is a lot more people in the room today and I think that would be very helpful.

Winnie is going to keep what we termed

yesterday areas of agreement and action items. And those will be kind of my notes for today in terms of the things that I will go over with you at the end of the meeting to make sure that we are all on the same page.

Now, yesterday it really didn't work out that way and the nature of yesterday's discussion really didn't lend itself to that, so we basically came up with three bullets at the end of the meeting that we all could agree on, and that was kind of a summary, if you will, of yesterday's meeting. Georgia Power will be preparing --

WINNIE SIMPSON: Excuse me, Tom, I see Betsy's face going, what was that? Would you mind repeating what we said yesterday in the meeting.

TOM SULLIVAN: Not at all.

BETSY NICHOLAS: No, I was holding back a sneeze.

WINNIE SIMPSON: Just trying to be sensitive and make sure everybody that gets there.

TOM SULLIVAN: Can you get that in the summary of today's meetings, Betsy was holding back a sneeze. You just threw me right off my game, you know that.

WINNIE SIMPSON: That's okay, we have to

stay loose here.

TOM SULLIVAN: In terms of where we are in the process right now, George mentioned the steps that have led up to this, and basically you started a process in January of 2004. You are at kind of the end of the study process. You know, we are going to be reviewing the study reports today. You'll hear me ask questions about comments on the study reports. You'll here me ask questions about whether there are requests for additional studies or not.

You will be quickly moving in this process to the preliminary license proposal, and you have a series of meetings scheduled for July to really kind of get after that part of it. And Georgia Power is on schedule to have their preliminary license proposal filed with FERC in October and a license application filed in February of next year.

So, just -- I say that and a lot of that, some of that is a repeat of what George has said or what he'll say at the end, but I want to give you a context as to what today's meeting is about. We are coming to the end of kind of the study phase. There are some steps but from there you are moving on to license proposals. Lee.

LEE EMERY: Probably want to make yourself familiar to the new crowd today who don't know who you are or where you're from or what you have done. So a brief sentence or two.

TOM SULLIVAN: I was trying to avoid boring the people that were here from yesterday. Just -- and that's fair enough because there are people who don't know who I am.

I am a water resources engineer by training. I have had the fortune, misfortune, misguidedness, whatever you indicate it to be of working in FERC licensing pretty much my entire career, for the last 25 years. I started doing -- started the work as a modeler. I have done hydrology and hydraulics modeling, water quality modeling, instream flow modeling, worked into becoming a FERC project manager at that point and am a practice leader in my firm for doing that. The last ten years I have spent more of my time on assignments like this, where I have either facilitated or in some cases mediated FERC licensing,

So, a lot of the topics that you have talked about, a lot of the operations, you know, I have had some exposure to them in the past and so they are not all new to me. But that's really where I come from. As I said, my job today is to facilitate your meeting, which is simply to make sure that everybody is heard, that the meeting goals are achieved for the meeting. And yesterday I think we did. Although yesterday went very quickly, I think we did okay doing that yesterday.

So, before we move on to the technical presentations are there any questions for me or any questions for anybody in the room relative to what we are about today? Okay. Very good. With that, I think we are ready to talk about the water resources report.

STEVE LAYMAN: The water resources study for the Morgan Falls project was a joint effort really led by Georgia Power's environmental lab, Mike Nichols, Tom Broadwell, Michael Abney were all involved to a high degree. Southern Company Hydro Services, Fred Cox, Courtenay O'Mara, and GeoSyntec supported that effort.

So a lot of what you see today in this presentation represents the combined efforts of these individuals, and I'd like them to feel free to get involved in our discussion and conversation and clarification as we move forward, especially into the temperature monitoring portion of the presentation.

Our objectives for the water resources

study were to characterize the water use availability and water quality within the project area. To characterize the effects of the Morgan Falls impoundment on summer water temperatures relative to stock trout. Develop information for evaluating the effects of continued project operations on water quality and water quantity. And characterizing the benefits of Morgan Falls operation for protecting drinking water uses and downstream water quality and quantity.

The study area, looking familiar now, included the Morgan Falls impoundment represented in this area, the circle, the lower reaches of Big Creek and Willeo Creek for the purposes of temperature monitoring. Those are the two large tributaries that enter the Morgan Falls impoundment. And the downstream Chattahoochee River to Peachtree Creek was of special interest.

In addition, we have looked at USGS gauging data, temperature data and flows throughout this portion of the basin between Buford Dam and Peachtree Creek and the City of Atlanta. Georgia Environmental Protection Division classifies this whole segment from Buford Dam down to Peachtree Creek for the purposes of drinking water and recreation.

And the Wildlife Resources Division classifies the reach as secondary trout waters. And along with that designation comes criteria regarding temperature and dissolved oxygen.

Our methods consisted of quarterly monitoring of the Morgan Falls impoundment in 2005 for water quality. Vertical profiles were measured in the impoundment and water chemistry analyses were conducted for 23 different parameters. These data were augmented with quarterly data that were collected also in 2003 and 2004. Continuous water temperature monitoring was conducted at 14 locations in the impoundment area in May to October 2005. And we'll talk about this in some detail later.

The stations were selected to bracket the effects of tributaries that flow into the impoundment, these shallow flats that we talked a little bit about yesterday that are adjacent to the main channel within the impoundment and also natural warming that occurs downstream. These data are augmented with some continuous temperature monitoring data from 2003 and 2004.

All of these data have been compiled into an access database with about 226,000 temperature data points. 231,000. And then we used this information to analyze the monitoring trends and data and existing information on water quantity and quality.

This is just a first look at some stations you are going see later on a map. These are the 14 stations used for continuous water temperature monitoring. And once you start to become familiar with the designations of some of these stations. The stations designated by an M are along the main channel of the Chattahoochee River. M1 is upstream of the Morgan Falls impoundment. M2 through M7 proceed downstream through the impoundment. And M8 is in the Morgan Falls tailrace. These stations were positioned to bracket the effects of tributaries coming in.

For example, M2 was upstream of Big Creek. M3 was downstream of Big Creek. Also to bracket the influence of these shallow flats that drain toward the main channel. For example, M6 was upstream of the Sullivan Creek embayment. And M7 was downstream of the Sullivan Creek embayment.

We also had stations on tributaries coming into the project area, and these are designated with a T, T1 through 3, Big Creek, as it enters Morgan Falls. And then we had two stations on the Willeo

Creek tributary system including Willeo Creek itself and a lake in a subdivision next to Willeo Creek that's representative of the large numbers of such lakes that are in residential subdivisions in metropolitan Atlanta. And then we had temperature monitors in two areas that we'll call flats or tributary embayments within the Morgan Falls impoundment.

So, throughout this presentation you'll see some mention of these stations. Remember, M is for main channel; T, tributary; F is a shallow flat.

So, in 2005 we had monitors at all 14 of those locations, and in 2003 and 2004 there were monitors just at the upstream end of the project in the Chattahoochee River, in the Morgan Falls tailrace and in Big Creek. So for those three stations we had multiple years of continuous temperature information.

Key sources of existing information. There is a lot of Water Resources information for the Chattahoochee River in metropolitan Atlanta and we drew upon that including the Metropolitan North Georgia Watershed Planning District, water withdrawal information, wastewater discharges, watershed conditions. Water quality data compiled by Environmental Protection Division. Water resource investigations by the USGS. There are a number of those in the ACF basin dealing with fecal coliform to such things as the background stream temperatures expected in Georgia; and we looked at some of that.

And then the Chattahoochee River flow and temperature data that's been continuously recorded in a number of USGS locations both on the mainstem river and in tributaries in this segment between Buford Dam and the City of Atlanta. This information is summarized in the report, and a lot of it is descriptive information, we are not going to talk about all of this here. But if you have questions about it, certainly we'll entertain those.

We are going to focus mainly on the study results of the water quality monitoring in the impoundment and then talk a little bit about the Chattahoochee River temperature trends overall between Buford Dam and City of Atlanta, and then talk more specifically, kind of burrow in to our project area and look at the continuous water temperature monitoring data.

Georgia Power, as I mentioned, conducted quarterly monitoring in 2005 bringing three years of total water quality data for the impoundment. This monitoring was conducted at four locations, the upstream end of the impoundment, the Chattahoochee River flowing into this area.

And let me just say that this yellow line represents that 2000-foot zone that we saw yesterday with the wildlife and botanical resources, kind of the project area. This just gives you a point of reference of the area we are talking about.

So, you have got the upstream location. You have got a location toward the middle reach of the impoundment. A location up this embayment area which we are calling the Sullivan Creek embayment and then right upstream of the dam near the powerhouse area. These four locations were monitored in the impoundment.

In addition, Georgia Power monitored dissolved oxygen in 2003 and 2004. Some of that was summarized in the PAD and that was a two locations, one upstream in the Chattahoochee River and in the tailrace location. This is an overall summary of our water quality data.

The Morgan Falls impoundment is an artificially cool water reservoir. What I mean by that is it's driven by the temperature releases from Buford Dam, you know, it's hypolimnetic releases coming down the river that supports the trout fishery. It also has an influence on the Morgan Falls impoundment.

In fact, if you look at the average temperature data that Georgia Power collected, this reservoir is colder on average than any of the other impoundments in Georgia that Georgia Power monitors including lakes Burton, Rabun and Seed in north Georgia. So, on an average basis with these data this is a cold reservoir overall.

The main channel of the impoundment does not vertically stratify. It's relatively shallow, relatively well mixed, and I believe the greatest difference we ever saw in temperature from the surface to the bottom in the main channel was about point four degrees centigrade.

However, Sullivan Creek embayment, that area that was located up beside that does stratify seasonally in spring and summer. And so you will see a pronounced difference in dissolved oxygen and temperature between the surface and the bottom at that location. The impoundment overall reflects relatively high turbidity from urban storm water runoff.

All the field data and water chemistry analyses met the applicable water quality criteria except for fecal coliform. We don't have 30-day samples of fecal coliform but for monthly values we had five quarterly samples that showed densities higher than EPA's review guideline for monthly data. So, fecal coliform is elevated through that impoundment.

The project waters typically meet Georgia DO criteria for secondary trout waters based not only on the quarterly data but also the continuous data upstream and downstream of the impoundment. The upstream data for 2004 represented by the blue points, and this is in the river upstream of the project boundary, and the black points represent dissolved oxygen in the tailrace of the Morgan Falls powerhouse.

The average DO upstream of the project in 2004 was 8 milligrams per liter and it was 8.7 milligrams per liter downstream. You'll see that in the blue areas there were some instances where DO upstream fell below 5 milligrams per liter, and I believe that's due to sediment possibly on the temperature monitor. We are not sure. But in the downstream of the project the DO never fell below 6.

Incidentally, for secondary trout waters the dissolved oxygen standard is an average of

6 milligrams per liter daily average and an instantaneous of 5 milligrams per liter.

Next let's shift to looking at the overall trends in Chattahoochee River temperatures going from Buford Dam down to Peachtree Creek. And the interest in the temperature is largely focused on summer water temperatures as they relate to the survival of trout downstream of Morgan Falls. That's been a concern and observation that over the past couple decades the maximum temperatures downstream of the project have been increasing.

So, we wanted to examine that trend in the context of this river system. We began by looking at water temperature data collected by USGS, a number of occasions along the river. And I do want to mention this is a naturally warm water river, and when Buford Dam was completed in 1958 it created the situation where hypolimnetic releases from Lake Lanier have now made it a cold water river.

Some of the downstream warming trends I want to summarize, we'll talk a little bit in detail and I'm just going to sit down and get comfortable with my notes and we can get into this data a little bit.

But Lake Lanier's the sole source of cold water, and because these releases are out of equilibrium with the environment for Georgia in the Piedmont, the temperature of the river rises downstream. And in distances far enough downstream the river starts to return to what's the normal background temperature for Georgia.

So temperature rise across the Morgan Falls impoundment, because that's our specific focus in our study, occurs primarily due to heat transfer at the air/water interface just due to the warmer climate in part and then to natural warm water tributary inflow to the river. These tributaries are still a warm water system.

Summer water temperatures are much higher in tributaries than in Buford Dam releases. These are USGS data from the Chattahoochee River at Buford Dam for the most of May through October in 2005. And you'll see that the temperature -- this is the temperature of the river compared to eight tributaries to the river between Buford Dam and the City of Atlanta. And you'll see that in the summer the temperatures of Buford releases are a good 10 to 15 degrees Celsius cooler than the natural warm water tributaries coming into the system.

So, the Chattahoochee River temperature

rises as the water flows downstream. And what we show on this plot are actual versus predicted monthly average temperatures for the river in June, July and August of 2005. The bottom series of plots shows actual temperatures measured at five locations, Buford Dam, starting at Lake Lanier and going downstream to Norcross, Roswell, the Morgan Falls tailrace area and Atlanta.

And these three different colors are the different months. I'll highlight June just to show the trend. And then the top series of plots shows what the predicted temperatures would be for the Chattahoochee River without hypolimnetic releases. And these data were developed based on USGS information on background stream temperatures. So you would normally expect without a Lake Lanier upstream that the temperatures would be in this range and warming also in a downstream but not as much. And so the comparison there for the predicted in June, you see this contrast and, in fact, as the actual temperature of the river does rise going downstream. And with all things being equal, influences on heat gain you would expect this rise to -- the rate of rise to decrease as it approaches the natural stream temperature.

It's interesting, though, and it's been noted before that you see a higher slope of rise across the Morgan Falls impoundment where you might be expecting that rise to be lessening. And we wanted to examine more closely what was the cause of that rise across the Morgan Falls impoundment. The temperature rise caused by warm water tributaries is higher per river mile across Morgan Falls.

In this plot we want to tease out the contribution of the tributaries to the total temperature rise. So, what you see here is the temperature rise at the same five stations from Buford Dam, Norcross, Roswell, Morgan Falls to Atlanta in June, July and August.

And I'm going to highlight just one of the months to try to make this a little easier to look at. That's the total temperature rise going downstream. And here you see the steep rise across the Morgan Falls impoundment. This is the temperature rise due to tributary inflow, and this was determined using temperature data from the tributary gauges applied to the drainage areas of those gauges and looking at the accretion of tributary flow moving downstream.

So, that's the relative contribution of

tributary inflow in that month of July. And then knowing that you can separate all the other influences into this group, other sources. Which is principally heat exchange at the air/water interface. But the point of this plot is that you see the steeper rise in tributary inflow across Morgan Falls. And, in fact, if you look at all three months you would see it's steeper for all three. And that's because there is a larger area of tributaries that's draining to the Morgan Falls impoundment than any the upstream segment.

So, there is that steep rise. And Big Creek is the largest tributary between Buford Dam and Morgan Falls Dam and it flows into the impoundment.

And here is a view of the watershed area between Buford Dam and Morgan Falls Dam, approximately here. And you can see the tributaries to the Chattahoochee River here coming downstream toward the project, but once you get to the project you get the largest tributary entering Morgan Falls. And it represents 103 square miles or almost a third of the local drainage area between Buford Dam and Morgan Falls Dam. So, it's a much larger volume of warm water that enters this segment of the river.

The actual ratio of drainage area in

square miles to river mile is 18.75 for Morgan Falls, that's 18.75 square miles for every river mile through the impoundment versus 4.9 for the upstream segment. That alone explains a lot of the temperature rise across Morgan Falls. The temperature rise per unit surface area is lower across Morgan Falls than in the upstream river segment. And I'm going to tell you that's expected.

What we did is, we looked at the other sources of temperature rise and instead of plotting it on the basis of river mile we looked at -- we plotted it in terms of cumulative water surface area downstream. Because Morgan Falls is an impoundment, it's wider, it's got more surface area. And what you can see is that pretty much the rate of temperature rise decreases across the Morgan Falls impoundment in all three months, as you would expect. As the temperature more closely approaches equilibrium with the environment, the rate of increase is going to decrease. So we don't find that to be a surprising trend.

In fact, if there has been a lot of change in temperature downstream these data, at least these average data would suggest that most of that temperature change is due to changes in tributary inflow as opposed to changes in the Morgan Falls impoundment. And that's because the Morgan Falls impoundment has been about the same area since 1960, surface area. And as you'll see in the geology and soils report later today and in some of the resource areas we discussed yesterday, the overall configuration of the impoundment has remained about the same.

But there has been a noteworthy change in the tributary areas upstream of the project over the last several decades due to rapid urbanization and associated storm water runoff. So, at this level narrowing into the project, it looks like tributary inflow is a big part of the temperature rise across Morgan Falls.

And I don't know if that's a breaking point to ask questions about some of those data.

TOM SULLIVAN: Might be a good place, Steve, particularly on the last presentation about the temperature. Does anybody have any questions about the temperature trends?

ALICE LAWRENCE: I just had one, just clarification.

TOM SULLIVAN: Alice

ALICE LAWRENCE: The slide that you showed for the 2004 data that had the dissolved oxygen and it had -- you know, you were pointing out kind of the anomalies there, it had a tailrace DO and upstream DO. Is that upstream DO the station that's at the top of the FERC boundary?

STEVE LAYMAN: I'm going to let Tom Broadwell answer that question.

TOM BROADWELL: Yeah. I'm Tom Broadwell with Georgia Power.

That station was at the USGS Roswell gauge.

ALICE LAWRENCE: Okay.

JIM LONG: Which is just a little bit north of the impoundment, right? That is north of Island Ford, right?

STEVE LAYMAN: Yeah. Half a mile, mile. Something like that.

CRISTIN KRACHON: It's about a river mile.

STEVE LAYMAN: A river mile.

JIM LONG: Hey, Steve, this is Jim.

How did the USGS do that predicted temperature? I mean...

STEVE LAYMAN: I'll let Fred Cox talk about that.

FRED COX: They put out a publication, and we reference it in the report. They looked at a lot of temperature data from gauges all over Georgia. And if you look at it through the year, it kind of fits the same sort of pattern and they figured out an equation, statewide equation. You plug in drainage area, latitude and altitude and you can fit that curve to it. So, that's the curve where we were looking at what the temperature approximately would be without Buford.

JIM LONG: Okay. Yes, so -- okay.

TOM SULLIVAN: Any additional questions at this point? Steve, go ahead, proceed.

STEVE LAYMAN: We are going to shift to looking at the continuous temperature monitoring data focused in the impoundment area. And again, the interest is in relation to the influence of summer water temperature on trout downstream. And rain events are of particular interest, so we kind of singled those out in analyzing the data in these next slides.

And I'm going to pause on this slide a little bit to talk about the locations of the monitoring stations, and we are going to pass out a handout that contains several of the next slides that maybe you can see better at your spot. Yes, nearly all of those slides -- well, that information represents the resource report but one of the plots -- and I'll tell you which one -- is not in the study report, but it's -- the information is there, we just removed some of the lines so you could see it a little more clearly so you'll have it here as well.

We had 14 stations, as I mentioned, M1 through M8 proceed downstream on the main channel of the impoundment. And they bracket the influence of tributaries. So, like, for example, M2 is upstream of Big Creek. Big Creek comes in here, the City of Roswell. And T1 was located on Big Creek. And M3 is located downstream. And just a general observation that we are going to return to, is that you'll see the upstream half of the reservoir is pretty narrow. You don't get really any of these shallow wide areas of these flats in this upstream half of the impoundment.

You do have Big Creek coming in here. By the time you get down to this middle reach around where the Chattahoochee National Center in this area. And this is where Willeo and Azalea Drive come together, you start to pick up these shallow flats adjacent to the main channel.

And we have temperature monitors in this one to represent how warm those flats get. F1 and then there was also this monitor up in F2 in Sullivan Creek embayment. Sullivan Creek embayment also includes an area out here that's very shallow in a flat area. The tributaries on Willeo Creek are on T2 and T3, these stations are representing Willeo Creek inflow to this location.

But I guess my main point is that you start to pick up the shallow flats in this lower half of the impoundment, and this will be important as we move forward.

Okay. So we had temperature monitoring data now from 2003, 2004, 2005 and we wanted to begin to look at overall trends and events of interest with respect to warm water. So the appendixes in the water resources report give you this detailed information. I'm going to give you a little overview of what it shows how we used it to narrow in on specific events to look at in greater detail.

This is a two-week period of monitoring for the project area. The top plot shows temperature monitoring data for three locations. We picked three to start with to stay simple so we could see when we were reaching a critical temperature either at the upstream location, M1; at M3, which was right below

Big Creek; or at M8, which is the tailrace station.

The middle plot shows the hydrology of the system. The blue line on the top goes with the scale on the right. That is the elevation of the Morgan Falls impoundment. And the other lines on this plot go with the scale on the left. Those are the hydrographs or the flow recorded at Buford Dam in green. The Roswell gauge in gold. Morgan Falls in red. And Big Creek is the heavy blue line at the bottom.

And the bottom shows the meteorological data that we have for this period including daily rainfall at four different locations in metropolitan Atlanta, Norcross, Alpharetta, the Morgan Falls Dam and Atlanta. And then we also show the air temperature that was occurring through that period. So, we wanted to inspect these data overall to pick out events of interest.

Well, how did we identify an area of concern? Well, the Wildlife Resources Division has identified that when temperatures reach about 23 degrees C, they are starting to approach thermal tolerance limits for trout in the downstream reach. It's starting to become of concern. So, we dropped a line across 23 C on the temperature plot in the top.

So, we scanned these types of plots through the whole period of monitoring to pick out areas where the temperature started to approach or even exceed that threshold as you go downstream to the impoundment.

So, in this example we associated this weekend rainfall event. You can see the rainfall occurring here on June 1st, this is a Saturday, the days of the week are listed on this top plot. They all line up on the same scale, by the way. And the rain event occurred here, and you can see the temperature rise, it peaked above this 23 C and then the temperature dropped. So, we said let's pull that one out. That's a weekend rain event, let's look at it in more detail.

Everybody follow that kind of progression looking at the data?

There are a few points I want to make about it. On the operational characteristics you can see the Buford Dam peaking releases are represented by the green hydrograph and they typically peaked from anywhere from 5,000 to 10,000 cfs or more, and those peaks drive the flow and the temperature in the river.

When you look at the temperature patterns above you'll see that they fluctuate daily and they track the Buford release. There is about a 12-hour lag time between the time releases come out of Buford Dam and reach the project area. We have taken that into account. By the time you get down to Roswell gauge the peaks from Buford have become more attenuated, as you can see by the smoother flow pattern at Roswell. By the time they go through Morgan Falls you can see further attenuation. The peaks are smaller. The minimum flows are higher. And you can see that pattern as well.

And for those of you interested in the project operations there is a wealth of information in these plots showing the relationship of Buford Dam releases in the gauges downstream. So, doing this we identified 11 rainfall events for detailed water temperature data evaluation. That means now we are going to look at -- we are going to bring all the temperature locations on the plot and look at patterns through the impoundment.

We identified rain events during every month in the record June through September, not in every year but through the three years at least one in each month. Six of our events led to temperature maxima approaching or exceeding 23 C in the Morgan Falls impoundment.

The average rainfall amounts for the weekday and weekend events that we looked at were in the order of .6 to 3.8 inches, and we had a number of protracted rain events where it rained for extended period of time where it might have rained anywhere from 7 to 16 inches over, you know, a seven to ten-day period.

And there is a table in the report that summarizes these various rain events. We had six in 2005. We had four in the 2004 temperature data. And we had one in the 2003. You know, we also looked at dry events as well. Because if there is an influence on the temperature due to shallow flats, we wanted to look and see if they influenced an increase in temperature when the river falls during the dry periods as well as during rain events.

So, that's a summary of the events that we looked at in detail. And I'm going to show you some of these events and walk through one of them in a fair amount of detail with this plot.

TOM SULLIVAN: Steve.

LEE EMERY: Most people may know, but they may not, upstream Buford doesn't operate on the weekends, you have a minimum flow. And so, you saw a level place in there and certainly that would be important when looking at temperatures.

STEVE LAYMAN: That's right, that's a good point, and we'll look at that, we'll see that on this upcoming plot. But Buford's pattern of operation is they follow peak power demands and that means operating typically on weekdays. And on the weekends they generally either pass the minimum flow or they'll release short pulses of peaking flows, probably depending on how wet it has been and that sort of thing. Okay.

So, this is actually the rain event that was on that first plot, we have pulled it out and we are looking in detail at it. We are going to separate out in the top plot the main channel stations, all the M designated temperature stations and we are going to put on the middle plot all the tributaries and flats, the T and the F designated stations.

And in the bottom we are going to show the hydrology, the hydrographs at these various gauges on the river, the elevation of the Morgan Falls impoundment.

CRISTIN KRACHON: This is in your handouts. Fourth page.

STEVE LAYMAN: We went ahead and dropped

the precipitation air temperature. We knew a rain event occurred leading into this event --

TOM SULLIVAN: Just a moment. I think there probably is confusion about what you have in your handout. You are showing three plots here, you have two June plots in your handout?

STEVE LAYMAN: This one you do not have, I'm going to get to --

CRISTIN KRACHON: It's page 5, just the top plot, just the temperature plot. There is three plots on the slide and just the top one is shown in your handouts.

STEVE LAYMAN: Right now we are just sort of going to look at the overall, just the kinds of general features that are important to evaluating the temperature change. You can see that following the rain event, you see that Buford Dam is no longer releasing. There is a flat line for Buford releases, it's the green line. And that's the point that Lee was making.

So, in anticipation of the rainfall Buford Dam stopped generating, and I mean they are releasing a minimum flow and so there is less cold water coming from Buford Dam. At the same time you see a rise in the flow at the Big Creek gauge which is the dark blue line. And you start to see a rise in flow at the Roswell gauge on the river upstream of Morgan Falls. And now this represents more of the warm water tributary inflow occurring upstream of the impoundment. It's not the cold releases from Buford Dam.

So, as these warm water flows increase you see the temperature going up through the impoundment in stations M1 through M8. And at sometime later early in the week the temperatures peak out at 23. You see that the water level of the impoundment falls late in this period. There is no water coming in from Buford, yet Morgan Falls is releasing flow. So its level starts to fall. This event ends when the Buford starts peaking again.

You can see the Buford Dam peaking release here, and then you see the temperature just dropped precipitously about 10 degrees C in a matter of four to six hours when it finally arrives and you're back to the more normal colder pattern of flow.

A couple of things I want to point out in the middle. These shallow flats, this yellow line is one of the flats. And this is something we had to examine carefully in the temperature database. When the impoundment level dropped this shallow area was left exposed.

So, this temperature monitor which we called Tidbits, these are tidbit monitoring devices, it came out of the water. So now, this tracking air temperature here, does not reflect water temperature coming in. So, we flagged in the database these instances where we believe that the data indicated that the monitor was coming out of the water.

It also occurred in this instance at station M4 along the main channel and we actually repositioned this station later on. That M4-A that you see on the map is kind of get a better location for that monitor so it wouldn't get exposed in shallower reservoir elevations. So, that's a characteristic of some of these data.

And you can see the tributary temperatures here are T1, the blue line is Big Creek. It also is coming up above 23 during this rain event. And also T2 which is on Willeo Creek also peaks up above at about 24 degrees or higher during the rain event.

Okay. So, what does this all mean? That's what we want to try to tease apart here. So, I'm going to get back a little bit to the locations of the stations relative to the tributary drainage that accumulates downstream through the impoundment.

And also the volume of the shallow flats and embayments downstream through the impoundment.

This table is a summary of table 13 in the report, it's a little simplified but this gets across the main points. Those are that 97 percent of the tributary area draining to the impoundment comes in between stations M1 that's upstream and M5 in the middle of the impoundment. And you can look at your map that's in the handout to see where M5 is located. It's downstream toward the middle below Willeo Creek.

So, these first five stations you see this accumulation of tributary flow, you really pick up a lot after M2 when Big Creek comes in. These arrows show where tributaries enter between the mainstem -- the main channel stations. Big Creek comes in between M2 and M3. Willeo Creek between T2 and T3. And there are other smaller drainage areas coming in but none nearly as large as those two. By the time you get to station M5, 97 percent of the drainage area has accumulated at that point to tributary inflow.

In contrast and as you'll remember from the map, the upstream part of the reservoir is very narrow. You don't start to pick up many of the shallow flats along the side channel until you get down toward the middle. Around station M4 and M5 you pick up those flats that are near the Chattahoochee Nature Center and Azalea Road, Willeo Road.

And then further downstream you start to pick up additional flats, and most of those flats come in -- 72.6 percent of the flats come in downstream of station M5. So, their temperature, if their water warms up and drains to the main channel of the impoundment, it's going to be reflected in the temperatures of these main channel stations. Some tributary flats occur upstream of M5, about 27 percent. Most occurs downstream of M5.

Does everybody follow that? So, now I'm going to pull up the same temperature plot you saw earlier but I'm just going to highlight the main channel stations. M1 through M8. And you can see a little better here what's going on. You can see that as the temperature is rising -- and we are going to call this a warm-water event because it's getting up close to 23 and above throughout this period.

The temperature rises progressively from M1 to M2 to M3. M4 is out of the water in this one, so it's not helping us. But there is a big jump from M3 to M5 which lies underneath the yellow line. And so M5, M6, M7, M8 all lie on top of one another.

So, most of the change in temperature that's occurred during this event when we are peaking out is between the stations in the upstream end of the impoundment where you are seeing the greatest accumulation of tributary flow.

This next plot we are going to drop some of these lines. Let's focus on the M5 and to M8 because it's hard to see. You can't really see M5 underneath M8, so this last plot drops everything except M1 upstream of the project. M5 and M8 -- and you can see that there is very little distinction between M5 and M8 during this particular rain event. And so, therefore, it looks like nearly all the temperature increases occurred upstream of the majority of the shallow flats in the impoundment.

So, this particular event, warm-water event appears to be driven by tributary inflow upstream of the project as opposed to warm water coming just strictly out of shallow flats in the main channel. Let's look -- and you don't have these in the detailed handout, these are in the report and they are discussed. I'm going to show you a few of the other events and how some of these trends continue on.

This particular weekend rainfall didn't

reach the 23-degree threshold. But we saw some interesting patterns here to point out. It did not result in temperature maxima as high as 23. I think they ranged like between 20 and 21 for the downstream M8 location. But nevertheless, you see a similar pattern of temperature increase after the rainfall event progressively through the impoundment. You'll see that the tributary temperatures are very warm.

T1 which is Big Creek is tracking at 23 and above. T2 on Willeo Creek is at about 24. And T3 which is the Jackson Lake which drains to Willeo Creek is very high. It's maxima of 25 to 29 throughout this rain event.

So, that's the temperature of warm water flow that's coming in to the system in a rainfall event. It didn't get as warm. Well, there are a couple of reasons; one, there is not quite as much tributary flow coming in upstream. This peak along Big Creek, its flow doesn't get up quite as high. And there is not quite as much reflected in the tributary flow at Roswell.

But one of the important distinctions is that Buford Dam continued to generate small pulses or short peaks through the weekend and that helped to keep the temperature lower during this event. In the previous event they were only releasing minimum flows and the temperature went up more. In this event they are releasing pulses, smaller short peaks and it seems to be helping moderate the temperature.

LEE EMERY: Lee Emery, FERC. Was that purposeful, that release by Buford, do you know or just accidentally sort of occurring?

STEVE LAYMAN: I don't know. Fred, do you have any --

FRED COX: I'm sorry. What was the question?

LEE EMERY: Whether that peak area, some operation pulsing during the weekend was purposeful because of the rainfall event or was it just arbitrarily doing something?

FRED COX: Normally -- do you know how much rain they had on this weekend? Normal operation is --

CRISTIN KRACHON: Not much.

FRED COX: -- a little bit, a small amount of peaking on the weekend at Buford because there is not enough water in the system for Morgan Falls to meet its minimal flow releases all weekend. So that's kind of a normal weekend pattern. And obviously there wasn't a lot of rain where they said we better cut it off.

LEE EMERY: Okay. Thank you.

STEVE LAYMAN: It was probably a slightly less amount of rain.

CRISTIN KRACHON: Two, two and a half inches.

FRED COX: And, yeah, and if they look, start seeing lots of local inflow where you might get flooding downstream, then they'll cut off. The amount of rainfall --

STEVE LAYMAN: Table 12 in the report lists the rainfall for each event and the maxima --

CRISTIN KRACHON: The average rain at the four stations was 1.2 inches; it wasn't big. And the maximum was 2.4.

STEVE LAYMAN: Yeah, Chris.

CHRIS MARTIN: Chris Martin, Department of Natural Resources. Those turbines at Buford were refurbished and they were having fits with them all last year. Have you talked to them about the release pattern? And sometimes there were testing turbines, sometimes they were down because turbines were being repaired.

They had fits all last year with those turbines. And you can't -- I wouldn't call it a typical generating year for them because of that. They had some off line. Their house turbine was off line some because it was, you know, they were being repaired.

So, you might want to -- I don't know if you have talked to them about it but there were periods where there were big generations and you would think it was because of water elevation in the reservoir and it was due to testing.

FRED COX: Yeah. You see that some during the week. But these weekends, if you look at that pattern there, you look at Friday and you have got a pretty good release. You go up to Monday and Tuesday, they are showing a pretty good release, then you show small releases on the weekend.

CHRIS MARTIN: That's a typical pattern, I agree, but there are abnormal releases.

FRED COX: Oh, yeah, there were Releases --

CHRIS MARTIN: And it wasn't due to SEPA asking for power, wasn't due to elevation in the reservoir maintenance. It was due to testing of their turbines or a lack of a pattern would have been because of turbine was down.

STEVE LAYMAN: Chris, we found that --

well, the turbines came back on line in December of 2004. We found in 2005 was a lot more typical than the preceding year. And it seemed like on most weekends that we looked at that they did release some small pulses in 2005, and it may be because it was a wet year.

CHRIS MARTIN: You mean on the weekends?

STEVE LAYMAN: Yeah, on weekends.

CHRIS MARTIN: Yeah, that's been a typical pattern. What I'm saying is that Buford as a hydro facility has not been typical for probably the last three years because of turbines off line due to refurbishment. And also, they have had turbines going on and on-line because they have been having problems with the work that was done in their, you know, I don't know what, they're fine-tuning, balancing, I don't know what the problem is. But I know that, you know, through Buford trout hatchery I hear when they are having problems and also working on the river got to be real entertaining because they'd say, you know, well, we are going to do this generation and go out there, and they are full bore flat out wide open because they are testing the turbine.

So, you need to talk to them and find out if their patterns when you saw anomalies in the patterns, what -- why did you see that. And it was probably because of their repairs on the turbines or testing or whatever. So...

FRED COX: If you look at the 2004 for, you know, 2004, 2003, a lot of times you'll only see one large turbine was operating.

CHRIS MARTIN: That's when they had some of them off line.

FRED COX: In late 2004 they had them both refurbished back on-line. So, 2005 they had both turbines available. They may have done some testing here and there, you know, as they had some problems. But it's relatively a more normal year than '04 and '03 and through there.

STEVE LAYMAN: Okay. Let's look at another rain event. We are not looking at all the rain events from the plot, we are just picking out several of them to give you an idea. This is a protracted rain event in August of 2005. You can see that Buford did continue generating on this weekend and it looks like they couldn't wait to get rid of more water when they could. It rained for a long period of time leading up to this event. I think this was early August.

And you can see there were two what we'll call warm water events during this protracted period where the temperature exceeded 23 C. Certainly in the downstream half of the impoundment and even the inflow at this point is getting pretty darn close to 23 C indicating the overwhelming influence of the tributary inflow upstream of the project.

You'll notice some unusual patterns on the tributary -- excuse me.

TOM SULLIVAN: Why don't we take a break for a minute while Steve gets -- it's quarter of 10:00, let's reconvene at 10:00 o'clock.

(Recess from 9:42 a.m. until 10:00 a.m.)

TOM SULLIVAN: All right, folks, we are going to renew our conversation if we can get our seats. With that, Steve, if you want to take us through the rest of the presentation.

FRED COX: This is Fred Cox. Before Steve continues on I wanted to address Chris' observation a little bit earlier about the operation of Buford. And if you look in the appendices, like appendix A, you have got the whole year for 2005, and some of the other appendices should show the 2003 and 2004 flows on the river. And in 2003, 2004 they were working on turbines, they were upgrading the turbines.

So, when you look at the Buford peaking you'll see it only going up 5, 6,000 cfs with one turbine plus the small housing minimum flow unit. Then in the late December of 2004 they finally got both turbines upgraded and where they could run them. And if you start looking at 2005, you'll see where they'll go up to ten and even 12,000 cfs to run both of those large turbines and the small housing minimum flow unit. And that's a more typical operation of Buford.

But there is a lot of different things that drive what goes on at Buford. On a week-by-week basis the Corps will make an evaluation of how much water they have available to release. That's a function of the inflow, what the level of the reservoir is, what the water needs are (inaudible). So they'll decide on a volume of water, and then working with that volume of water SEPA will make a request for how they want it generated.

They might want it all at two-unit operation, they might want it spread out during the day at one unit operation. And also on the weekends, this is driven more by water supply in Atlanta. A lot of times you'll see some short releases at

Buford.

And if you look through the whole year 2005, you'll see the whole range of what represents typical operations at Buford within all of the other constraints of the whole system. You'll see periods where you got five days about the same generation at two units, then small generations on the weekends.

You'll see periods where they cut off because of the large rainfall and then the reservoir is over full, and so then after the local runoff is gone they'll generate for long periods of time. And you'll see times some of it may have been due to turbine testing, some of it may have been due to SEPA demands where they are only running one unit pass the water for that day.

So, 2005 you have got a wide range of operations that pretty much covers typical operations at Buford.

CHRIS MARTIN: And my point to you is that, you know, for purposes of your study you don't care why they are releasing, you are just looking at how much and how long and all that. But they were having a lot of problems with their turbines last year. So, it is a much more typical year but it has anomalies as well, you know, rather than a SEPA request or water level management is basically run the turbines to test them or whatever.

FRED COX: But they are still operating -- when they do those turbine tests, they operate within the constraints of how much water do we have available. And what does SEPA really want. So they try to accommodate those two needs as much as possible.

So, my point is if you look at the whole area you see a whole range of operations at Buford and that's really kind of a -- if you look at other years when they had two units available, you'll see the same, pretty much, range of operations.

CHRIS MARTIN: Do they release water at your request? At Georgia Power's or Morgan Falls' request?

FRED COX: They will make weekend releases at the request of the ARC for water supply. They are not doing --

CHRIS MARTIN: I was just curious in the reservoir level management, if there is times when you need water and do you two communicate?

FRED COX: Typically what's happening is the Corps is monitoring, you know, with the USGS gauge at our head water. On the weekends they are monitoring what's going on in our reservoir.

So, based on what's going on there and what they know about the volume of our reservoir they can decide how much they need to release so that we don't run out of water and have to cut it off downstream. So they'll make those releases.

Sometimes they'll be -- Eldon may can address this some. You know, there may be some discussion going back and forth on Morgan Falls and Corps but usually the Corps is keeping a pretty close eye on it.

TOM SULLIVAN: Steve.

STEVE LAYMAN: Back to the data. Where we left off was this protracted rain event in 2005. And I'll point out that Buford was generating peaks up to 11,000 or even 12,000 during this period, yet the warm water inflow produced this steady rise in temperature through the project area during two events. There are basically two warm-water events that peaked above 23 C during this protracted rainfall. Temperature also increased in shallow flats and tributaries, and then these -- each of these individual events concluded when Buford peaks arrived. Here is this Buford peak and you can see it declined, steep decline by about 10 degrees C or more following its arrival at the project site.

This is a weekday rain event and it functions very similar to a weekend rain event because in this instance Buford has stopped generating probably in anticipation of local inflow to prevent flooding. Yet, you see the steady rise in temperature through the project impoundment.

The tributary temperatures are running warm. Big Creek, Willeo Creek are above the 23. That small lake, Jackson Lake is way up there. And then when the Buford peak shown here arrives at the site, you see the decrease in temperature.

This is an expansion of the plot from that same event. We have dropped out a couple of the stations here. We are showing M1, M3, M5, M8. We'll drop a few more but most of the temperature increases that occurred occurred between stations M1, the upstream station, and M3 which is the orange station buried in there, corresponds with 79 percent of the local tributary inflow. That includes Big Creek flowing into the project. And as you'll recall in one of our earlier rain events, monitor M4 was out of the water. But it's in the water on this one and we can see what it's showing because it records the addition of that upper shallow flat in the impoundment. So, let's drop out a few of these lines and focus on M3 and M4.

When you go from M3 which is the orange line, to M4 you pick up that first 25 percent of the shallow flats up there near the Chattahoochee Nature Center in that area. And you can see here just by adding that area of the flats, you don't see any effect on increasing the temperature of the main channel impoundment.

So most of this temperature rise again is driven by tributary inflow upstream of the project as opposed to warm water draining out of these shallow flats in the impoundment. And it makes intuitive sense in that these shallow flats are shallow, they don't have a lot of volume. There is a lot of volume of flow coming out of Big Creek tributaries going up to Buford Dam.

FRED COX: There is no -- (inaudible)

STEVE LAYMAN: Oh, yeah, there are no tributaries, there are only about 3 percent of the tributary drainage area coming in between these two stations. Well, we thought it was important to also look at a dry weekend where you don't see a temperature -- a warm-water event, and you can see here that the temperature pattern tracks Buford releases, goes up and down on a daily basis.

On this particular weekend as you enter the weekend, and I'm sorry if I'm going too fast and all. This is Friday, you see the normal Friday peak. As you get to Saturday and Sunday you see shorter peaks coming out of Buford. And you see the temperature overall start to go up just a little bit.

It's interesting here that you see that the impoundment level has dropped in several instances. Yet, you don't see the water temperature of the main channel stations getting up higher than 19 degrees C. So, it indicates that when there is water draining out of the flats during this period of time and look at some of the high temperatures you see in the tributaries. That's -- and in the flats -- well, it's an indication that those areas in the flats draining the main channel are not having a sizable influence on the main channel temperature. That's the point.

I got caught up here on these stations because some of these are coming out of the water. You can see these signatures like station F1, the yellow one here, has come out of the water, and we have tried to point out those instances in which some of these stations have come out. It's hard to avoid that in shallow locations.

We also have some data of representative events in 2004. We had fewer data stations in 2004, we just had M1 upstream of the project, we had M8 at the tailrace and we had T1 representing Big Creek.

But you see a similar pattern, the Buford peaks aren't as high in 2004, this might be related to the turbine upgrades. But in anticipation of the rainfall event they stopped generating, you see increased flow coming out of Big Creek, that heavy blue line here. Some -- that represents local inflow. And you'll see this temperature rise through the impoundment, it actually peaks a little above 23 C. And then when the Buford peaks finally resume that temperature falls off again and drops. This is a recurring pattern that we see in these data.

We also have a weekend rain event in August of 2003. Again, you see a similar progression of increase of temperature through the impoundment. This one doesn't peak as high as 23 C. And then when the Buford peaks resume out here you see that temperature fall back off to a normal pattern.

So, I'm going summarize what we have seen here and try to walk you through some of the examples. The Buford releases drive river flow and water temperature through the project area. The summer weekend and weekday rainfall events of 2 inches or more can produce warm-water events in the impoundment. And the steady rise in temperatures that you see through the impoundment correspond with increasing warm water tributary inflow.

The warm water from the shallow flats contributes little or no additional warming following rain events from these data. The temperature maxima are higher during off peak generation from Buford Dam.

What I mean by that, off peak is when they are releasing just the minimum flow on the weekends when we saw the temperatures get up to 23 and above in the impoundment. When they release daily pulses through the weekend it helps moderate that temperature rise, so the peaks don't get as high.

And then these warm-water events conclude when the Buford peaking releases arrive at the site and the water temperatures fall as much as 10 degrees Celsius in about four hours.

Now, we feel like with the data that we have that we have seen fairly representative events with Buford Dam operations that were adequate to test the influence of tributary inflow versus shallow flats. And we believe our data that we have collected and presented in this report show that it's tributary inflow that drive the warm-water events through the Morgan Falls impoundment.

Okay. To wrap up this whole section on water quality, Morgan Falls is an artificially cool water reservoir affected by Buford Dam releases. The impoundment meets applicable water quality criteria with the possible exception of fecal coliform. The steeper river temperature rise across Morgan Falls is expected, it occurs due to the greater contribution of tributary drainage area to that segment and due to the greater surface area because it is an impoundment.

11 rainfall events that we examined over three years of data indicate that storm water runoff from the upstream watershed is the predominant factor producing warm-water events potentially detrimental to trout downstream. Any additional heat gain across Morgan Falls in recent years appears to be primarily due to changes in temperature of tributary inflows because the surface area of the impoundment has not changed since 1960.

And in the presentation you'll see this afternoon on geology and soils, we'll get into more specifics about what that temporal change has been at the impoundment both the shoreline and sedimentation.

And then others have observed including the Environmental Protection Division and WRD that urban storm water runoff does contribute substantially to warm-water events in the Chattahoochee River. And we believe that's what's driving these temperature increases that are seen across Morgan Falls. That concludes this presentation.

TOM SULLIVAN: Okay. Questions or comments on Steve's presentation on water quality and temperature? Lee.

LEE EMERY: Lee Emery, FERC. Steve, just curious, any other data on Big Creek and whether the temperature that we see there is typical? Has it gone up over the years, that temperature, or is that typically reflected what it's been like for many years?

STEVE LAYMAN: The temperature monitoring that's been done on Big Creek by USGS I believe is fairly recent. It might be just the 2005, 2004 time frame. Fred, do you know?

FRED COX: It's just in the last few years. You know, we think that any temperature increases that you may have seen in the tributaries are due largely to urbanization, you know, where you lose riparian vegetative cover.

LEE EMERY: I understand that, I just didn't know if we had any data going back further.

FRED COX: And a lot of this development has occurred, you know, over the last 20 to 30 years.

LEE EMERY: Right. Okay

STEVE LAYMAN: This plot shows these eight tributaries, this -- I know this doesn't answer the question of multiple years but it kind of gives you the relation to the other tributaries coming into the Chattahoochee. Big Creek is the yellow, so it's tracking a little warmer.

Certainly there has been a lot of development in recent years up that watershed. There is north Point Mall and a lot of development in Alpharetta. So, it's changed quite a bit in character in recent decades.

CRISTIN KRACHON: I don't have the exact entries but I know a lot of those gauges have been stream gauges all along, but temperature has been added on-line more recently.

LEE EMERY: Right.

TOM SULLIVAN: Other questions for Steve?

Jim.

JIM LONG: I was just going to comment, I recall there was a Big Creek watershed study that was what, like, 2001 or something? I don't remember if there were temperature data there, but I think they had some predictions for where the urbanization was going. And it was certainly going to increase a lot.

STEVE LAYMAN: No, I don't know that they had continuous data that we used, they might have had some on some smaller tributaries, I believe that's possible. And they may have used this same station for some of their data. I don't know.

JIM LONG: Well, I guess my comment there is if it's urbanization that's increasing the temperature, I think that urbanization is expected to increase. I would imagine we can see further increases in temperature from there if those two are correlated.

TOM SULLIVAN: Other questions or comments on the study? Are there any additional study requests on this subject area? Okay. At this point -- Steve, presentation was excellent. I mean it took a complicated report and broke it down in a way, at least for me, that I could understand it better.

At this point if there are no, you know, additional questions or comments on this study or any requests for additional studies, I think we are probably ready to move on to the next thing in the agenda. But before I do I just want to make sure is everybody all set with this study?

Okay. Do you need a minute to get focused?

STEVE LAYMAN: I need a minute just to get --

TOM SULLIVAN: If you can just hang tight for a second and get organized and be patient, we'll get organized for the geology and soils report.

(Recess from 10:25 a.m. until 10:32 a.m.)

TOM SULLIVAN: All right, folks, if we can get seated we are going to get started with the geology and soils report. And Steve is going to take us through the geology and soils report, too, so -- they tell me lunch is going to be here about 11:15, that's doesn't need to drive our report.

I think this conversation probably takes a little bit of time also like the one we just had. So, what we'll do is we'll work through it, if we find a logical breaking point, we'll break for lunch and then we'll go from there. Very good.

STEVE LAYMAN: I'm going to probably sit down again for most of this talk, but before I start I wanted to point out that again this study was conducted jointly by Southern Company Hydro Services, Georgia Power's Environmental Laboratory and GeoSyntec. And what you are going to see in this presentation are a lot of aerial photographs show temporal change, and then are going to finish up with the dredging feasibility evaluation. That portion of the presentation is going to be presented by Mike Monteleone to my right with GeoSyntec's Consultants.

Our study objectives were to characterize the distribution sources and rate of sedimentation in the Morgan Falls impoundment. To evaluate whether sedimentation is reached or is approaching equilibrium in the impoundment. You'll remember from the pre-application document that we presented some volume estimates that suggested that. So we looked at that further. Evaluate the impact of future sedimentation on usable storage capacity and re-regulation of Buford Dam flows.

Characterize surface sediment quality in the project area based on review of existing data. And evaluate the feasibility and estimated costs of dredging, transporting and disposing of sediment.

The study area again included the Morgan Falls impoundment in this area, the Morgan Falls tailrace extending downstream of the existing boat ramp for the purposes of the shoreline reconnaissance survey and the mainstem Chattahoochee River and tributaries upstream and downstream of the project. That for the sediment quality data that exists that we'll talk about.

The methods consisted of reviewing existing information. Shoreline reconnaissance survey of the impoundment and the tailrace area. An analysis of temporal change in the shorelines of the Morgan Falls impoundment using aerial photography from a number of years dating from 2004 back as early as 1938. And then deriving unit costs of dredging by evaluating three scenarios that bracket a range of dredging options.

Some of the key sources of existing information were identified in the PAD and the study plan and are listed here. The Corps estimated the reservoir volume of Morgan Falls in 1976 and 2001, and they in fact produced a very detailed topographic map with the 2001 data that appears on the wall behind me. So that's one of the appendices of the report and there it is in all its glory.

Cross-sectional profiles of the impoundment were available from 1954. So, those were used to estimate the 1960 volume that's been previously reported to check that. Metropolitan Atlanta Area Water Resources Management Study that was completed in 1981 provides a lot of useful information.

The USGS and EPA maintain sediment quality data from the upper Chattahoochee River basin, and we have looked at those data. The Corps dredging permit application submitted by the Atlanta Sand and Supply Company in 1996 for proposed dredging of 150 acres of Morgan Falls. We have looked at that information. That proposal was abandoned, that has not occurred.

The Corps prepared an EIS in 1992 concerning sand and gravel dredging throughout the Chattahoochee River National Recreation Area. And then we looked at other scientific literature, management plans and technical reports.

Our study results are going to focus on these three or four key areas. Shoreline reconnaissance survey and temporal change. Sediment deposition, sediment quality, and the dredging feasibility evaluation. I'll do these first three, and then Mike Monteleone will do the dredging feasibility evaluation. And we'll see where we are when lunch arrives and all that and the time that it takes, whether we want to pause or anything like that.

First, let's talk about the shoreline reconnaissance survey and temporal change. And this slide just gives you an indication that we have aerial photos from 1938 through 2004 that reveal some interesting features of the impoundment and the amount of change that's occurred over time, and we'll examine that in detail.

For the shoreline reconnaissance survey we looked at 27 shoreline sites and evaluated them using the visual assessment protocol that's in the study plan. And the familiar yellow line around the impoundment which is the 2000-foot zone extending out from the project boundary, we looked throughout the impoundment at numerous sites and then down into the tailrace and downstream beyond the boat ramp when the river starts to return to its normal character.

This aerial photography is from 2004. You can see the widespread residential development and the golf course here and Huntcliff subdivision. This is Georgia Highway 400 and this is Georgia Highway 9, Roswell Road, leading up into Roswell. And Sandy

Springs is down here.

The survey protocol used some bank stability and vegetative protection metrics that were adapted from Georgia DNR protocols. In addition -- those are listed here.

In addition, we looked at the potential sources of active shoreline erosion, kind of did a little inventory at each site. We looked at the riparian vegetative buffer zone with impervious surfaces, surrounding land uses and recorded additional observations. This was done at all 27 of those sites. And these forms can be found in the appendix of the geology and soils report.

What we found, just a quick summary in terms of the shoreline stability and vegetative protection. If you take all 27 sites and the metrics that we used, the stability was ranked from unstable to stable on that continuum, and vegetative protection was ranked from less to 50 percent up to greater than 90. Most of the sites fell out in this upper right quadrant which we'll call the moderately stable to stable to well vegetated site.

There were about five sites that were poorly vegetated and two of these sites were both unstable and poorly vegetated. And we'll look at some pictures of what these areas are like. We inventoried potential sources of erosion. A few sites exhibited active shoreline erosion problems, and those that did tended to have multiple sources or potential sources of erosion occurring.

But these data are provided in the report, and I'm going to show you some photographs and some active erosion potential. These are some of the representative shoreline sites in the impoundment. These were not rated as having active shoreline erosion problems.

Starting here, this is the Island Ford shoreline upstream of Georgia Highway 400. This is a shoreline with multiple unit residential dwellings along the shore. This obviously is the Ace Sand Company operation at the City of Roswell. This is the Chattahoochee Nature Center boardwalk along the impoundment, the wetland boardwalk.

This is a view into the shallow flat that station F1 was located on from the water temperature monitoring across from Willeo Creek where it comes in on the east side of the impoundment. And this is the shoreline along Gold Branch unit.

There are several pages of these photographs in the geology and soils report, so I'm not trying to shortchange any one site, you'll find others there. Tailrace area site 26 from the powerhouse down to the boat ramp is represented by these two sites. And then as the river starts to narrow and resume a more natural pattern looking downstream you see that in this photo of site 27.

These are the sites that were judged to have the most potential for active shoreline erosion in the project area; this is all of them in the impoundment area. And they tended to be, with the exception of perhaps this one at the stables across from the Azalea Park, most of the others tended to be where there was -- where there were parks and a lot human activity.

This little park called Willeo Park is used for putting canoes in and such and a lot of people -- well, a lot of people, I don't know about that but there are people who feed geese here, they throw out feed, and that shoreline is bare in large part due to that type of activity.

This is Azalea Park, the largest recreational facility on the impoundment that you'll hear more about tomorrow. This is also part of Azalea Park.

LEE EMERY: Excuse me. Lee Emery. What

is that stuff on the Azalea Park area? Is that some kind of --

STEVE LAYMAN: It's an armored sort of

MICHAEL MONTELEONE: It's like an armor format erosion matting.

LARRY WALL: Actually they took small bags and filled them with sand and concrete and stacked them in there. And they set up as they --

LEE EMERY: I couldn't tell from the picture whether it's a perforated plate.

MICHAEL MONTELEONE: No, it's a concrete blanket.

LEE EMERY: All right. Thank you.

STEVE LAYMAN: This is the Don White Memorial Park upstream underneath the 400 bridge, and you can see the parking lot and it drains through off the surface here and there is some erosion potential associated with that bank. This area, this shoreline is located just downstream of the mouth of Big Creek and there is sediment deposition along this shoreline down beneath Roswell Road bridge.

And I think during the wetlands and you'll see in later photographs that some of this sediment is deposited around an island downstream of Roswell Road bridge.

Shifting gears a little bit to the temporal change that you can see in the project area. This is the first complete set of aerial photos that we have or that we found of the whole impoundment after 1960 after the elevation of the reservoir was increased. And I should mention that we obtained our aerial photography, some of it from the National Parks Service, some through the UGA Map Library and some through some other commercial sources, I believe.

And you can see here that most of the area is rural, forested. The City of Roswell is here, and in 1966 it was probably on the order of 5,000 population. I think that's what it was in the 1970 census, or close to it. Not a lot of development.

In the next picture we'll jump to 2004 and you can see the degree of change. 1966. And you can see in 1966 part of the golf course here next to Huntcliff. Maybe a few of the homes going in at this subdivision.

And then in 2004 it's pretty full bore residential around it. This golf course has been expanded. You have what was a landfill down here that's now a recreation area, golf course. And you'll notice from these two photos that there is not a whole lot of change that's occurred around the actual edge of the impoundment.

If you look at the shape of the flats, they are there in 1966. You see a lot of these braided islands along the channel, they are still there. This F1 flat is there. The flats up around the Chattahoochee Nature Center, Azalea Road, they are there. We have got some probably recent clearing along the shoreline at Huntcliff and some less vegetated areas up where this riverside park is located now.

And then when you go to 2004 you still see the same shoreline configuration. You see these braided islands. You see a greater development of vegetation through this middle reach. It's matured over time and it's been protected through MRPA, and certainly the land units of the park service, that of the natural -- of the river area, national recreation area that has been created.

There is possibly some evidence from these photos of sediment accumulation along some of these berms and islands and maybe this band. It gets difficult to judge in some instances what the reservoir elevations were from these photos. But some of the data we'll show you later gets beneath the surfaces to what the cross-sectional profiles of the impoundment looks like.

The geology and soils report also does a comparison, pair wise comparison of 1972 versus 2004. So in '72 represents a time just before MRPA was even enacted and before the Chattahoochee River National Recreation Area was created, and we have compared that with 2004 aerial photography. And again, this gets a little bit better at the -- really, the overall lack of major change in the structure of the shoreline in the locations of berms and braided islands and flats and that sort of thing in the impoundment.

And granted, there may be some additional accumulation here and along these areas. It's difficult to know the water elevation difference between these two. This is moving up the impoundment toward the middle reach. This is the Chattahoochee Nature Center in this area, Willeo Road, Azalea Drive, and this is the area where I believe the whooping cranes may have been observed. I know the sandhill cranes were. I think the whooping cranes might have been there.

Again, you see the flat where F1 was located for the temperature monitoring. It's still present. There is some glare going on here I believe that would explain that from the aerial photography. And you see that perhaps in the '70s the vegetation wasn't as fully developed in this reach as it is in 2004. Both of these photos are from February so they should have similar vegetative development. But you can see more mature vegetation along these berms.

It's interesting in 1972 there was a dredging operation at the present-day site of Azalea Park. You can see it better maybe in the report, closer examination. This is the area where Georgia Highway 9 or Roswell Road crosses the upper -- getting close to the upper end of the impoundment. Big Creek is right here. It flows in. You can see a plume apparently associated with it flowing behind. This is in 1972.

And in 2004 you can see that plume has kind of come out around the other side of the island, and the back side is presumably filled in with sediment, is now wetland vegetation back there. This area has a little more vegetative development along it now than it did in the past. And you can see this shoreline has more vegetation along it than it did in the past in the riparian zone.

So, the general trend we observed is that the vegetation along the shoreline looks to be more developed and actually improved from 1972 to 2004. This is the very upper end of the project. This is Georgia Highway 400. This is the Chattahoochee is coming in and flowing downstream. The Island Ford area, 1972 is on the left and 2004 is on the right again.

And you really don't see -- well, of course you don't see any difference here because the park has acquired and preserved this unit. You do see, however, more residential development over on this side. There is a swimming pool located right here incidentally, that was there in 1972 and fortunately for them they are still there but they are very close to the bank of the river.

We did find some older aerial photographs of the dam of 1938 and 1960. This 1960 one is, I believe it's in February, it's after they have done clearing to raise the level of the impoundment. They haven't yet raised the actual level of the impoundment. In fact, this might be a draw down for that clearing.

But let's start on the left. In 1938 you can see a peninsula of upland coming out in front of the powerhouse which present day is a sediment bar, it appears, out from the surface. But it was actually cleared in 1960 and was inundated when the reservoir level rose.

Another interesting feature is this shallow flat. What is a shallow flat today at Sullivan Creek embayment was upland floodplain in 1938 and 1960. And then when the reservoir level was raised 6 feet in elevation, it became inundated and is now part of that shallow flat. So, that flat is shallow and no doubt sediment is accumulated there. But it's always been a pretty shallow feature of the impoundment relative to other areas.

Similarly, on this outside bend of the river you can see that it was vegetated before the impoundment was raised. It was cleared and now it is inundated. About 575 acres of forested areas were cleared in raising the elevation of the dam in 1960, 6 feet. And a lot of that presumably is where those shallow flats now exist.

Shifting to sediment deposition -- and I'm going to try to do the best I can with this. A lot of this information was developed by Southern Company Hydro Services, so jump in and clarify and correct me where I go wrong.

This is the 2001 Corps survey of the

impoundment. And this is what appears on the back wall here, and it's in the appendix. This topography uses 1-foot contours and it's very detailed. This particular area that you're looking at is that lower part of that Sullivan Creek embayment that we were just looking at in the 1960 and 1938 photos.

Let me go back to those briefly. This area here. I did want to point out one other thing about this Sullivan Creek embayment. That's where F2, the temperature monitor was. It was an impounded area back before the dam was raised, so it's kind of its own little lake going on back there early on.

LEE EMERY: Lee Emery. Is there a dam or something holding back that, creating that impoundment for Sullivan Creek?

STEVE LAYMAN: I don't know that we know.

COURTENAY O'MARA: It looks like there is some sort of controlled structure but we don't know that far back. There is no documentation.

STEVE LAYMAN: Anyway, this is the quality of information that was used by the Corps to derive the 2001 volume estimate, and we did some work with it to see if we could replicate their estimate. We also used this data to overlay with the 1954 cross-sections that you are going to see later in checking the accuracy of some of the 1954 cross-sections.

So, looking at sediment deposition we went back and did a thorough review and analysis of the data that were used to develop the volume estimates for 2001, 1976 and 1954. These three points were shown in the pre-application document. The 1954 point was called 1960 and they were based on 1954 data to try to project what the volume would be once the reservoir elevation was raised in 1960.

And there is a detailed discussion in the report on how we looked at the volumes and checked them and looked at the accuracy. The 2001 volume was based on aerial photography and hydrographic surveys, actual transects through the areas of the impoundment to get a good topography map, the one behind us.

Georgia Power used some auto CAD tools to replicate their volume estimate and came up with a very close estimate of what the Corps found. And accuracy was estimated of this volume estimate at about 14 -- plus or minus 14 percent. So that our conclusion was that it was a reasonably good estimate, a very good estimate for state of the art, in fact, for estimating storage volume of an impoundment with hydrographic survey and aerial photography information.

The 1976 volume was based on the use of similar methods, both aerial photography and hydrographic survey. Georgia Power worked with the Corps, contacted the Corps to try to get the topographic map they used for this, did not have success in finding that. But they did use the same type of methods as 2001.

So, we believe that the accuracy estimated of this volume was between plus or minus 10 to 14 percent and it also was a very good estimate of the storage volume. The 1954 volume of the impoundment was based on some surveyed cross-sections of the mainstem, of Willeo Creek and what is referred to as the north embayment area, a total of 51 cross-sections. And there is a map of these cross-sections in the geology and soils report, and a lot of these cross-sections are in the appendices.

I'm not going to try to explain the detail of the methods that were used. But using the 2001 data and digital terrain elevation modeling and auto CAD tools and things that Courtenay can tell you a lot more about, the 2001 topographic map helped them to kind of verify the 1954 volumes and the error associated with them by cutting transections the same locations.

And if you have questions about that we'll get into those. These are some of those transect located, the cross-sections that were used to develop the 1954 estimate.

And these are cross-sections in the pink, they were found in the files and we could use those in our analysis. Some of them apparently are no longer available for whatever reason. They were not found in the files, perhaps they were used for another purpose since 1954 and didn't make their way back in.

But one of the interesting points is the 1954 volume did not include transects above Roswell Road bridge up here and it didn't include transects in Sullivan Creek. So it may be an underestimate, it probably is an underestimate of the 1954 storage volume. I believe by looking at the 2001 data you estimate maybe a 20 percent underestimate of the 1950, 1960 storage volume.

So, we are back to this plot. Georgia Power has confirmed the accuracy of the same data points that were presented in the PAD with the provision that these two points for 1960 may actually have been about 20 percent higher, which would indicate a steeper decline in storage volume between 1960 and 1976 than indicated on this plot.

And you can see that the rate of deposition has declined dramatically from 1976 to 2001, supporting an interpretation that this impoundment is approaching or is close to or at equilibrium with respect to the deposition of sediment into and the transport of sediment out of the Morgan Falls impoundment.

We looked at reservoir trap efficiency relationships and they also support an interpretation of a sediment equilibrium state that we are seeing today in the impoundment.

Trap efficiency is the percentage of sediment that enters a reservoir that is retained within the reservoir. And we looked at two common methods used by the Corps and others to estimate trap efficiency including Brune's curve relationship which is based on a ratio of reservoir capacity to mean annual flow. And the Churchill model which is a ratio or is based on a ratio of reservoir retention time to mean velocity.

So, generally as a reservoir traps sediment, the storage capacity decreases which in turn decreases the trap efficiency. As you lose cross-sectional area of the reservoir due to sedimentation the velocity increases. You have the same flow coming through that area of the impoundment but because it's less cross-sectional area the velocity necessarily has got to increase and that transports sediment downstream.

So, as a reservoir reaches equilibrium, the incoming sediment equals the outgoing sediment. And we believe these data show that Morgan Falls is approaching that sort of equilibrium state. We then took the reservoir -- well, okay, we estimated the reservoir volume into the past using the trap efficiency models and current sediment loading rates projected for the Chattahoochee River.

Let me say something first about current sediment loading. We derived this information through the Metropolitan North Georgia Watershed Planning District Watershed Management Plan and applied that information to Buford Dam and to tributaries downstream and estimated that approximate sediment load coming into Morgan Falls of about 50-acre feet per year. And then we used the trap efficiency models to project backward in time to 1954 to see what those models would predict that the reservoir volume would be.

As a point of reference we have put on here the usable storage and total storage estimates from 1954, 1976 and 2001 that were on the earlier graph. These three lines represent predictions made by the Brune curve and the Churchill curve, and generally they show a pretty flat slope that mirrors, if you will, the slope that we see from actual data of the volume of the impoundment. And our analysis supports that -- or these data seem to support this idea that the impoundment is reaching a sediment equilibrium state.

It's interesting to note, though, but if you go back to 1954 we underestimate the actual volume of the reservoir, and that would indicate or suggest that sediment loading rates were much higher back in this time period than they are presently. And we considered that and the Corps had looked at it in the Metropolitan Area Water Resources Management Study. And they estimated back in 1978 to 1980 that the sediment loading rate to Morgan Falls was actually 171-acre feet per year.

So, back in that time frame much higher sediment loads coming in to Morgan Falls. Why would that be? Our review of that study and of other information suggests that the factors contributing to possibly higher loading rates would have been Buford Dam. It came on-line in 1958. It was new to the system. It introduced peaking and it caused severe erosion the first two and a half miles downstream of the project. And that's fairly well documented in that study.

Also, erosion from upstream agricultural land use practices and at that time a general lack of erosion and sedimentation control practices along waterways before the early '70s. That was a common situation. So that could explain in part a higher sedimentation rate between 1954 and 1976.

If you look into the future what do these trap efficiency relationships predict? Well, they predict that looking out to 2040 that reservoir volume of the Morgan Falls impoundment might be anywhere from about 2300 to 2450-acre feet for the Brune curve and that 2450 is the current volume. And the Churchill curve predicts slightly less storage volume at that time. So, not a lot of change going out to 2040 from present conditions. And that assumes the current loading rate of 50-acre feet per year.

However, management initiatives underway in part through the Metropolitan North Georgia

Watershed Planning District predict that future sediment loading rates may decline or will decline in the future based on storm water management practices in metropolitan Atlanta. So, we don't believe that these data suggest that there will be much more loss of reservoir storage of Morgan Falls into the future that would be detrimental to the reregulation capability of Morgan Falls.

We also then looked at sediment distribution within the impoundment and what has changed. And certainly you don't see this from the aerial photos. You see the shoreline looks good but you don't see what's underneath the surface.

So Southern Company Hydro Services looked in detail at the 1954 cross-sections and then overlaid on top of those 2001 cross-sections from the digital topographic map in the same location. The 1954 cross-section is the brown in this particular example, and the 2001 cross-section is in this lime green color.

These two lines, the horizontal lines, I think that represents the water surface elevation before the impoundment was raised, increased in height. And this is the current full pond elevation. These cross-sections are also provided in one of the appendices and summarized in tables in the report.

So, you have got the brown is 1954, the lime color is 2001. And what they found was that at most of the cross-sections they lost on average about 30 percent of the cross-sectional area that was available in 1954. So there definitely has been sediment accumulation in the impoundment.

And that's a typical cross section. This one was located in the main channel downstream of the Sullivan Creek embayment in that lower end of the impoundment a short distance upstream of the dam.

Before we -- would this be a good point to ask questions about some of that information?

TOM SULLIVAN: Is the next part is the dredging part?

STEVE LAYMAN: The next part we do sediment quality, but we can do this or plow ahead.

TOM SULLIVAN: Why don't we see if there is any questions now about erosion or about sedimentation rate. Sir.

GEORGE McMAHON: I'm George McMahon with Arcadis. Do you include -- as usable storage, are you talking all the way down to the bottom or down to some storage level?

COURTENAY O'MARA: It's 858 all the way to the bottom, and 858 that lower line drawn on all the cross-sections, that's actually the top of that concrete --

GEORGE McMAHON: So, there is --

COURTENAY O'MARA: So there is a 8-foot difference between it and full -- (inaudible)

ELIZABETH MOLLOY: But that is your dead storage level?

COURTENAY O'MARA: 858 and below is dead, 858, 868 would be the usable.

FRED COX: From a practical point of view, though, we try never to draw that reservoir all the way down to 858. So, what we call usable, I mean it's usable but we try not to use all of it.

PAT STEVENS: That was my kind of impression was what engineers use the term usable storage in ways that the people that live around or recreate or have nature centers on that reservoir would never use the term the same way.

LEE EMERY: Right.

PAT STEVENS: And so, I just don't want to give anybody the impression that you can pull that reservoir down to 10 to 8 feet every week because everybody would get run out of town and there would be tremendous environmental impacts of doing that.

So, I just would say when you look at that amount of acre feet as usable storage, that's not what I would call practical usable storage.

ELIZABETH MOLLOY: It's usable in that that is as low down as the facility could draw? Correct?

COURTENAY O'MARA: Correct.

ELIZABETH MOLLOY: I mean it is a physical impossibility without modification to draw any lower than that. Not that you want to draw that low but --

COURTENAY O'MARA: You could.

FRED COX: Actually, you could draw below 858. One reason why we never do that, we have got minimum flow requirements that support the water supply for the City of Atlanta in part and below 858 -- you know, above 858 you can open spillway gates to pass flow or you can use the turbines.

Below 858 you can only use the turbines. And if you got below 858 and for some reason lost outside power, you couldn't run the turbines and suddenly you have shut off all the water until it rises above the spillway crest.

ELIZABETH MOLLOY: Which would be a bit of time.

FRED COX: Yeah.

GEORGE McMAHON: The 2200-acre feet is all the way to the bottom.

COURTENAY O'MARA: 2200 in 2001. 2250 is 858 and below. Or I'm sorry. 858 to 866.

GEORGE McMAHON: It's not all the way, okay. That's what I was wondering.

COURTENAY O'MARA: 200 from the left.

FRED COX: And we have got -- there is some graphs in the water resources report showing how much the reservoir fluctuates as a percentage of time. And you can see that it, you know, most of the time it's within about 4 feet of fluctuation as opposed to 8 feet.

STEVE LAYMAN: So, it would be half.

FRED COX: Well, you probably have three quarters of your storage in that four feet too.

TOM SULLIVAN: Other questions? Jim.

JIM LONG: I'm really confused about the sedimentation curve. It was like slide 28, 29, somewhere in there. Yeah, those.

STEVE LAYMAN: That one?

JIM LONG: Yeah. You started with 2001 values, assumed a sediment load of 50-acre feet a year and then projected backwards to see if you could estimate reservoir volume? Was that right?

FRED COX: Yes.

JIM LONG: So, if it was a good fit those curves would be very close to the data points that were estimated in 1954? Is that right? I mean if you got a really good estimate then those curves would -- green would connect to green, those two green dots would be connected; is that right?

STEVE LAYMAN: That's right in part. In fact, and we feel like the fit is best, it's pretty close fit between 1976 and 2001, but it's not a very good fit between 1954 and 1976. And we believe that's related in part to a higher sediment loading rate in the past than is presently occurring. And I'll let Fred --

FRED COX: Unfortunately we didn't have in '76 the total storage, the green point, but it would be, you know, somewhere up in here, you know, judging by the spacing there. But if you look at the usable storage and if you imagine a line drawn through there, for this period in time, you know, you have similar slopes to what we are predicting into the past.

But you have got to remember that we are using current sediment loads. We didn't have any good data on what the sediment loads were as you get into the past, any quantitative data.

As Steve mentioned, there was some qualitative things that we looked at. We did know that the Corps had estimated that in that Metropolitan Atlanta Water Resources Study 171-acre feet per year entering the reservoir. Well, we are using 50.

JIM LONG: Right.

FRED COX: And also, we know there was other things going on prior to the mid-'70s that where you could have had a whole lot higher, you know, sedimentation rates.

JIM LONG: So these curves are all based on a single estimate of sediment load? It doesn't allow you to vary the sedimentation load like if it was greater than --

FRED COX: Right.

JIM LONG: I guess I'm also looking at it, like, could you just fit a curve. And I know you guys did before, but I don't know if there was an actual equation associated with that curve. But wouldn't the slope of that curve give you the sedimentation rate? Like, if you put a power curve to that.

FRED COX: You know, if you go back to the original curve, Steve --

JIM LONG: Yeah, like two more back, yeah, like that.

FRED COX: Right.

JIM LONG: Is there an equation with that curve?

FRED COX: We had originally concluded that based on this that the sedimentation rate through here, the accumulation of sediment in the reservoir had gotten really low, maybe even reached equilibrium. There were questions about how accurate were these volume estimates. You know, so you only have three of them. How accurate were they? So that was the first thing we looked at. And we have determined that we think they were about as accurate as you can get.

Then the second part of it was we looked at, okay, what are the mechanics of how sediment deposits in a reservoir and understanding those mechanics and something about the sediment loads, would it predict something similar to this.

And at least for this period here it does. And, you know, but the only real good estimate we have got on sediment loads is, you know, from the current data.

JIM LONG: Yeah. But then if you only look at those two points you have two data points, not three. I mean two is always a straight line. But I guess what I'm wondering is that curve right there, is there an equation with that curve? Because the slope of that equation would be volume acre feet per year. That would be an estimate; instead of having to rely on a guess of 50, you would have an estimate.

FRED COX: Well, if you just took these two points, you have got -- on usable storage, you have lost 200-acre feet in 25 years. So, if you want to project that out into the future 30 years or something.

JIM LONG: I can't do that math that quick. What is 200-acre feet over -- well, it's less than an acre foot a year. Ten, which is a whole lot less than 50, right?

FRED COX: Well, it's, you know, it's -- yeah, it's a whole lot less than was going on back here.

JIM LONG: But it's also a whole lot less than 50, which is what you based your current rate on, right?

FRED COX: No, no, no, no. 50 is the

total amount of sediment coming into the reservoir

JIM LONG: Coming in. Okay. So that would be ten accumulating?

FRED COX: Right. Now if you go forward to this one we are assuming 50 coming in.

JIM LONG: 50 coming in. Okay.

FRED COX: These curves represent how -- what's accumulated.

ELIZABETH MOLLOY: So, it's less than 50 is accumulating as it's coming in, you're sending more of it down.

FRED COX: And these curves are showing that based on, you know, science of how reservoirs accumulate sediment through trap efficiencies, it looks very similar to what we see with actual volume measurements.

ELIZABETH MOLLOY: Does that clear it up any for you?

JIM LONG: I think so. I'm working on it.

FRED COX: You know, I wish I had -- you know, if we would have had some kind of estimate of seven loads in the river for every year going into the past, we could have applied it to these trap efficiency methods. And as we speculate you may have had a lot more sediment load coming down the river, then these curves would have gone up.

JIM LONG: So, if 50 is coming down and the reservoir has been trapping ten, so that's what, like a 20 percent trapping efficiency? One out of five?

FRED COX: Actually I think it's less than ten, you have got what -- yeah. I'd have to go back and calculate that. You can look at the efficiency, it depends on which curve you're looking at. And the smaller it gets in relation to the inflow the less it traps every year.

JIM LONG: Right. Right. So I guess I'm also wondering, you know, on my rough calculations I have just done, is 20 percent typical? I mean where do reservoirs start? Do they start trapping 80 percent and then go down to less than 1 percent?

FRED COX: If you look at -- apply these methods to Lake Lanier.

JIM LONG: Yeah.

FRED COX: Depending on which one you're looking at, it might tell you you are trapping 96 to 100 percent of the sediment coming in.

JIM LONG: Right.

FRED COX: Whereas down here, you know, this particular one you are saying zero percent trap efficiency, whereas these others, you know, you may have 5 to 10 percent trap efficiency.

COURTENAY O'MARA: The trap efficiency is constantly decreasing as the reservoir fills. So, at any point in time a year later you might have a smaller trap efficiency.

JIM LONG: Right. And that's where I guess I'm trying to understand your curves. So, that first Brune curve is saying the trap efficiency for Morgan Falls was zero?

I hope I'm not being overly ignorant.

FRED COX: Let me draw a little graph here.

JIM LONG: Do I get credit for this course?

FRED COX: Yes. If I have got trap efficiency on this axis, say you have got 100 percent up here, zero percent here.

JIM LONG: Right.

FRED COX: On this axis I have got a ratio of the, basically the volume of a reservoir, the volume of the annual inflow. If the volume of the reservoir is small compared to the inflow, which is the case at Morgan Falls, you are down on this end of the scale. If it's high like at Lanier, you are up on this end of the scale.

JIM LONG: Okay.

FRED COX: And what they have got -- let's see, there is a curve that looks something like this.

JIM LONG: So as the volume to inflow is smaller, the trap efficiency, no matter how long it's been there, is smaller?

FRED COX: Right. And that's because with a smaller reservoir you have got higher velocities running through it.

JIM LONG: Okay. Right.

FRED COX: You know, like Lake Lanier is a big sediment pond.

JIM LONG: Exactly.

FRED COX: They base this on, you know, they have taken some measurements in a number of different reservoirs.

JIM LONG: Sure. Okay.

FRED COX: And so, we have got two Brune curves there. One of them is this curve that kind of fits through the median of the data points.

JIM LONG: So, that's what these curves are?

FRED COX: We used the information from this to develop this.

JIM LONG: Okay.

FRED COX: There is another curve that would be some envelope curves. Where we are now on the median curve on this ratio here, you are so low that you are saying you have got zero trap efficiency. If I go to this upper envelope curve it's saying I have got a little bit of trap efficiency. That's why there is two curves. So if you start at a volume at a given point in time, I get this ratio, you go in and read the trap efficiency.

JIM LONG: Oh, okay. Okay.

FRED COX: Then you take the sediment total load coming into the reservoir and you estimate how much settled out. Okay. Now, I have a smaller volume, so for the next year -- I have got a smaller volume, smaller ratio, so I calculate a new lower trap efficiency. I see how much I have accreded and I keep -- and I'm moving down this curve till I get to a point where I'm not -- I can't trap anymore.

JIM LONG: So, time has nothing to do with those curves, it's all about the volume of the actual reservoir in relation to what comes into it?

FRED COX: Right. Yeah. Well, time --

JIM LONG: Which does change over time but that scale right there really has nothing to do with that curve?

FRED COX: I just used this to calculate this curve.

JIM LONG: Okay, that helps. I got that, that makes sense.

JIM SCARBROUGH: You think about retention time the more that stays in there -- (inaudible)

JIM LONG: I just inherently thought somewhere in that equation time was plugged into it, and it's not. It's just that you get various data points at certain time intervals.

TOM SULLIVAN: It's the volume change in the reservoir.

JIM LONG: It's the volume change. Okay. That helps.

TOM SULLIVAN: Strikes me the take-home message, you know, setting aside the math for a second, the take-home method is that we know three points in time what the storage was. We have estimates of what the trap efficiency of the reservoir is in addition to what the inflow volumes are.

JIM LONG: We have an estimate of the inflow in one point in time?

TOM SULLIVAN: Right, in the trap

efficiency. So I mean, it gives you a little bit of an idea of what you may see in the future in terms of trap efficiency. But those three points are pretty telling, that graph over time where the rate flattens out is pretty telling on the graph.

FRED COX: Right. The take-home is a two-part one. You know, when we presented the volume measurements in the PAD questions arose, okay, how accurate were those volume measurements. So, that was the first thing we did, we went back, we looked at what the accuracy of the methods used and we determined that we think they are pretty accurate.

JIM LONG: Right.

FRED COX: Then the second part was does the theory of how sediment settles out of the reservoir using these trap efficiency curves match what we have seen; and yes, we think it does.

JIM LONG: Okay. Okay. So the predictions in the future though can change somewhat depending on how much sediment load there actually is?

FRED COX: Right. And in that metro north Georgia water management plan that we got the current estimate for sediment loads, they actually are predicting out into the future that the sediment load will decrease because of you increase soil and erosion control practices.

JIM LONG: Right. Well, let me ask this question. That volume to inflow relationship, if inflow -- and if that's sediment inflow, that decreases, your trapping efficiency will go up; is that right?

FRED COX: No. No. No. That volume to inflow ratio is the storage volume of the reservoir to the water inflow volume.

JIM LONG: Water inflow. Okay. Okay.

FRED COX: You could think of it as kind of an average of velocity, the lower the inflow volume -- average annual inflow volume is relatively constant. As the volume of the reservoir decreases the velocities increase through the reservoir and it's harder to settle out.

JIM LONG: Right. The sediment goes through farther because it gets entrained.

ALICE LAWRENCE: So, that assumes constant inflow --

JIM LONG: Sediment stays suspended longer.

ALICE LAWRENCE: -- and a constant sediment load for the future; is that right?

COURTENAY O'MARA: The average annual inflow and the 50-acre feet per year, right.

FRED COX: Right.

JIM LONG: I have one more -- I haven't looked at the other study about what the sediment inflows are likely to be, but I do get the impression that the Big Creek watershed is going to be a major contributor to sediment. And I'm wondering if that sediment load is expected to be higher in the future?

Because I guess with all, you know, with all the predictions I have read is that that watershed is going to be more urbanized which should increase sediment.

STEVE LAYMAN: Well, I'll just comment that they have done a recent watershed study in Big Creek and the goal of that would be to have a watershed protection plan to implement best management practices into the future. So, I would think, not knowing the details of that plan, I would think they would be projecting to at least control or reduce that in the future.

JIM LONG: Right. That would be the goal. Is that based on current project? If we do nothing we are going to have a lot of sediment. So, the goal is to decrease that amount of sediment because the urbanization will increase?

FRED COX: The data where we came up with 50-acre feet per year, it wasn't broken down into Big Creek and, you know, the different creeks, it was just kind of this area of the Chattahoochee. So --

JIM LONG: Right.

FRED COX: But they were projecting for that area of the Chattahoochee that it would decrease into the future.

JIM LONG: Okay.

TOM SULLIVAN: Other questions on the erosion or sedimentation part of the presentation?

JIM SCARBROUGH: I'd like to say one thing. If you -- my recollection is if you study sedimentation then the streams have sort of a natural appetite. If you cut off too much then it will start taking it out of the banks.

TOM SULLIVAN: That's exactly right.

JIM SCARBROUGH: So sort of has something to do with, you know, what the nature of the stream bed is and what's going on in the watershed. But I mean, to me the conclusion from looking at all this is that Morgan Falls is pretty much at equilibrium or near equilibrium and what goes in, goes out.

STEVE LAYMAN: That's what we believe the data show.

TOM SULLIVAN: Steve, just a logistics question before we jump into sediment quality. About how long is that and --

STEVE LAYMAN: Not very long. A couple slides.

TOM SULLIVAN: If it's all right with everybody, we'll push through this and then we'll break for lunch before we do the dredging. Does that work okay? Okay.

STEVE LAYMAN: We looked at existing sediment quality data in the upper Chattahoochee River from a number of sites upstream and downstream of the project.

We looked at surface sediment data from nine sites that was collected from 1974 to 1993. And these data are were collected by USGS as part of the National Water Quality Assessment Program in the ACF basin, and also data collected and maintained in EPA's STORET system, a lot of it for municipal water intakes upstream and downstream of the project.

Six of these sites were located upstream of the project, and in this figure these represent the sediment sampling location also as opposed to USGS gauges. So along the main channel upstream and in tributaries, Big Creek, Willeo Creek and three downstream, the main channel and the tributary Soap Creek and Peachtree Creek.

We also have subsurface sediment quality data from the Morgan Falls impoundment from 1989 and these data were from the Atlanta Sand and Supply Company permit for the proposed commercial dredging operation. Those sites are shown in the inset here in the bottom right in red. And it's important to note that these samples in contrast to those above were not collected at the surface. They were collected 16-1/2 to 28 feet below the bottom of the impoundment because they were considering a dredging operation and the quality of that material.

The sediment data are provided in the geology and soils report both in summary fashion in tables associated with the main text and in a detailed appendix E which provides all of the data that we reviewed from these nine sites in the watershed upstream and also in the impoundment. I'm not going to go into these data, attempt to go into these data in detail here but we'll provide some summary statements about what they show.

The surface sediment quality sampling in the river and tributaries upstream and downstream of the Morgan Falls project indicated the presence of trace metals and organic compounds consistent with urban and suburban watersheds in the ACF basin.

USGS had done a study throughout the basin associating sediment quality with different land uses, and they were consistent with what was found in urban and suburban watersheds. There was a low degree of enrichment, about two to four times above background for many of these constituents in the project area. And so, the values found near Morgan Falls were similar to other test sites in the basin including metropolitan Atlanta and downstream in Columbus.

Let's look upstream of Morgan Falls in particular. The data indicate measurable concentrations of some metals such as copper, lead and mercury upstream of Morgan Falls. Typically these values are lower than the median values for the ACF basin and lower than the values found downstream of Atlanta in the main channel or in mainstem impoundments downstream of the City of Atlanta.

Pesticides were detected at low levels upstream of Morgan Falls in the suburban watersheds. But there were higher levels found downstream of the project. Polycyclic aromatic hydrocarbons or PAHs were detected at low levels only in tributaries downstream of the Morgan Falls project.

What were the data like from the impoundment in the subsurface samples? Those studies found the presence of several metals and three organic compounds below the bottom surface of the Morgan Falls impoundment. At the time that this work was conducted with the analytical methods used in the late '80s the consultant doing that work concluded that the concentrations did not represent appreciable contamination compared to available background data. In fact, I believe permits were issued for that dredging to take place but that proposal was abandoned.

We also examined sediment quality trends for the upper Chattahoochee based on a publication by USGS, Frick et al, 1998, which includes these data that we used from USGS. They found that the highest concentrations of trace elements and metals in particular in organic compounds were found in the mainstem river and reservoirs downstream of Atlanta as opposed to upstream in the project area. The USGS attributed this enrichment to storm water runoff from urban and suburban watersheds.

EPA recently completed a screening review of national data that included these same USGS and EPA data, they did not identify the upper Chattahoochee above Atlanta as an area of potential concern relative to human effects or environmental effects. And our project is located in this upper Chattahoochee portion.

Existing water quality data from the impoundment and fish testing data collected by Georgia DNR do not indicate potential threats to aquatic communities in the project area. The water quality parameters meet -- as we indicated earlier, they meet applicable criteria. And the fish testing data that the state conducts does detect mercury in large mouth bass.

There is a fish consumption guideline for mercury upstream of the project. But the segment is not listed as not supporting uses because of that designation and mercury is very widespread in aquatic systems.

The Corps EIS on dredging in 1992 looked at commercial dredging operations throughout the Chattahoochee River National Recreation Area. They did not identify sediment quality as a significant issue at that time.

And that concludes the sediment quality

portion.

TOM SULLIVAN: Questions or comments on the sediment quality portion? Lee.

LEE EMERY: Lee Emery, FERC. I had a question that may be related. Earlier you showed the Ace Sand & Gravel Mining Company, is that still in operation today?

STEVE LAYMAN: It has been in operation recently. We are told that it's not operating currently for dredging, active dredging, that it's more of a stockpiling area. And that when its lease runs out with City of Roswell, that it's probably going to move from that.

LEE EMERY: They were dredging the sand from the bottom of the river in the Roswell area, is that what was happening?

STEVE LAYMAN: Yes. But there are piles there that look like river material that's somehow --

CHRIS MARTIN: They are dredging. City of Roswell signs a yearly contract with them, and they may or may not sign it again. But I saw them dredging a month ago.

MICHAEL MONTELEONE: And we contacted them as a part of the next piece that we'll talk about, just to get some idea but the amount of dredging is very limited, it's not a big operation.

LEE EMERY: Okay.

LARRY WALL: Larry Wall with the land department. In conversations with Joe Glover with the City of Roswell Parks and Recreation, Joe told us that they in fact did not expect the dredging to go on passed this year, that it was being done simply as a convenience to the City of Roswell to help that upper end be cleaned out of sediment for recreational purposes. And the family that has been doing that under contract to the city had told them that they no longer desired to continue that process. So, it was a very minor operation.

TOM SULLIVAN: Any other questions on the sediment quality presentation? If not, I would suggest that we break for lunch, it's 11:40. I think the dredging piece is probably going to take a little bit of time. Why don't we break until 12:30. If you could all be back and we'll start promptly at 12:30, we'll go through the dredging piece. Thank you.

(Lunch recess at 11:40 a.m. until 12:30 p.m.)

TOM SULLIVAN: All right. Folks, we are going to go through the dredging feasibility evaluation as I think that's the last part of the presentation on the geology and soils. And, Mike, you are going to take us through that?

MICHAEL MONTELEONE: Yes, sir.

TOM SULLIVAN: Very good.

MICHAEL MONTELEONE: Well, welcome back. Let me turn on the mike.

TOM SULLIVAN: Mike, before you start -- and the microphone reminded me -- when we do questions, you know, after we get through the presentation, if you don't have a microphone, and you won't except for Michael, please speak up because some of the conversations the last time did get a little hard to hear even here and I imagine in the back of the room they were harder. So...

MICHAEL MONTELEONE: Well, welcome back. My name is Mike Monteleone with GeoSyntec Consultants. I worked with Steve and the team here on this particular element of the dredging feasibility evaluation. So, we'd like to go ahead and just kind of launch right into that. Wanted to just set up our study objectives. This is really the study plan objectives, two main broad objectives that were outlined in the study plan.

First one was to develop a unit cost model for evaluating the feasibility and estimating the cost of dredging and disposing of sediments from the Morgan Falls impoundment. The second item was to identify feasibility considerations and constraints associated with dredging alternatives.

Like to take a minute and talk a little bit about this unit cost model. Really the goal was to develop a tool, that was one of the objectives. I'll call it a tool that could be used to evaluate any number of scenarios depending on the volume of material that you would be looking at dredging within a given impoundment, in this case the Morgan Falls impoundment specifically. In identifying the feasibility considerations and constraints there were a number of them. The first of which were, if we were to dredge in this particular area what would you do with the materials from the dredge operations. Okay?

Just to kind of -- for those that have not done dredging operations, it's relatively straightforward but you need to bring the materials out, we need to dewater them somehow and they need to be transferred. Question is, where do you put them while you are dewatering and where do you put them when you are done with them.

Ideally you'd like to gain some capacity back in the impoundment area that you have taken them from, so off site is an option. The question is where do you take them off site and how do you get them there. So, those were some logistical constraints. I'm going to talk about those in a little bit more detail.

In terms of a laydown dewatering area, as you can tell from the map that's been shown previously -- and I'll talk about that in my next slide -- we are kind of constrained. We have got residential areas around the project area. We have got a number of parks around the reservoir area. So we are kind of physically constrained within the impoundment area itself. So that provided several challenges for a staging area.

Permitting, obviously we are looking at a number of permits that would be required for such an operation. Those were considered in detail in this particular element of the plan that we developed. Last item is just material handling, the dredging piece itself really it falls into two basic operations. You can think of it as a mechanical dry dredge, if you will, so that's kind of the conventional excavation, loading in the trucks. Or a more wet dredge methodology, hydraulic, if you will.

For this particular application it's just not feasible to dewater the entire reservoir and go from a purely dry perspective. So a hydraulic application is what we looked at going forward.

The picture, the photograph here which we referenced from Ellicott, a division of Baltimore Dredges. This is an example of one type of hydraulic dredge that you might see in this type of application. For those that have either worked with the Corps or have been involved in the Corps of Engineers dredging project, you know that some of their hydraulic dredges are very large and just awesome spectacles to see. I have been behind several of them.

And we are not looking at something like that, obviously, the size and the strengths, the draft that you have available, would not be adequate. But this is more typical for what you would see diesel operated, something that floats and is able to pump from a cutter head that's a suction cutter head and it gives you a slurry of water and sediment to deposition to your staging area.

Talk a little bit about the study area. Again, just for reference, you have seen this map a bunch this morning since I have been here, probably more yesterday. Morgan Falls Dam for reference.

This is the area that's owned and operated by Georgia Power, they use that for maintenance and support of the dam. Really from Morgan Falls Dam to Highway 9 or Roswell Road was really the area that we were considering relative to the study area for excavation. We had talked a little bit right before break about Ace Sand and Gravel, that's right up in here, their land-based operation. We talked to those folks a number of times in developing our analysis. A very small operation. They dredge periodically. I think we have got the run down on their schedule.

Material, what do they do with their material. That was one of the other considerations, is there an applicable commercial use. They do have some limited commercial use but it's real limited in small quantities.

You know, they don't dredge a whole lot out of that area right now and the piles that you saw that Steve showed you in his picture prior to this were very small piles. And I'll put that in relation, if you look at this square, okay, this is just for relative purposes, it is to scale to the map. This is about 3,000 foot by 3,000 foot on the side.

And if you could imagine that square three-foot deep, so about up to your waist, and assume that to be sediment, that would be about a million cubic yards of sediment. So, you can kind of put that in perspective to the land masses within the area.

So, as we talk a little bit about land-based staging areas and dewatering, this kind of gives you some idea aerially of the types of land space you need to kind of manage and deal with these sediments that you would be looking at from this particular scenario.

We did a field reconnaissance through here looking for where could we set up logically from a topography perspective, from an access road perspective, from a river perspective. You know, you want to be able to be in a position where you are relatively close, i.e. within, let's say, a half a mile or so of your dredge. Pumping much further than that it gets a little bit more difficult in the booster pumps and things like that.

So, really the three areas that we saw based on field recon -- and these are not anything that we are saying is going to be done, I'm just saying from a technical perspective for the purposes of the study there were three.

There was an area down here, land base staging area 1 that had some area that was available, it was near the shore. There is a small road that connects out into here that can allow for truck traffic in and out. Maybe about 6 to 8 acres worth of area.

This area here which is actually a park as you saw in the previous photograph, this was actually bare at one time. It's wooded now but that's an area there for topographic relief in proximity Timber Ridge Road could provide some technical access relative to putting a stages area there.

This area here which we all know is a flat area, mudflat area and a wetland area but from a pure area perspective it's almost 23 acres, ideally suited relative to geographic location along the river. Big and wide, and so that was really the third one.

Land-based staging area, what are we talking about? You would need to go in and clear these areas, so timbering of any forested areas that would be there. You would need to put up soil erosion and sediment control features down gradient of the piles.

So, in other words, I'm taking these piles and I'm putting them in piles allowing them to naturally dewater via gravity. The idea is to turn those piles, if you will, to kind of liberate the water and allow it to drain a little bit more efficiently.

Each area would also by necessity need a kind of a floating turbidity curtain out in front of it to kind of cordon off those sediments from getting back into the river where you have just dredged.

So, in general those are all the elements that would be required to be installed, if you will, or put into any given land-based staging area that we have got on the table.

Let's talk a little bit about the methods of the feasibility study. We are not looking at any particular dredging area within the Morgan Falls project. In other words, I haven't said, you know, put a channel here and take this out. What we have done is to develop a tool. It's a matter of volume and the study plan speaks to that. Obviously, with smaller volume projects, you know, your fixed base costs are going to be disproportionately higher than they would be on a much higher volume-type scenario for applications.

So, we are looking at what we termed a

small, a medium and a large scenario to allow us to build our tool. And to put that in perspective, the small scenario was approximately 12,000 cubic yards. Or equivalently that would be about a 2-1/2 foot depth of excavation over about, you know, an 8-acre area, let's say. The medium was, again, about 330,000 cubic yards and that would be over an 82-acre area about 2-1/2 acres deep. Two and a half feet over 82 acres.

The large would be 420 acres with 2-1/2 foot depth. So, that's the large one and that's about 1.69 million cubic yards. So, that gives us a -- we felt that that gave us a broad enough range in terms of volumes to help us support the cost analysis I'm going to talk about in a few minutes and develop the tool that we could use for any other future projects.

Talk a little bit about the site reconnaissance that we used to try to determine topography, traffic patterns and access roads for potential land-based staging areas and where they might be. We have already talked a little bit about dredging methods, hydraulic versus mechanical.

In developing our detailed cost estimate for each alternative we used a bottom up type approach. I mean really can't drill down to very detailed levels of cost estimating, understanding labor unit rates and expenses that would go into it and built our cost, our unit cost up from those estimates.

We worked on local vendor and supply quotations and estimates. As I said, we did talk a little bit to Ace Sand and Gravel, got some information from them. We have talked to local trucking companies. We have talked to local excavation dredging folks, to help validate our own numbers that we have internally from dredging projects that we have performed at GeoSyntec.

Commercial estimating reference documents. RS Means is a commercially availability document that you can purchase and take a look at relative to costs in terms of labor and expenses for various and sundry earthwork and dredging. We used that in areas where we either wanted to check ourselves or where we thought we didn't have quit enough data. So, we didn't rely on that solely, we tried to build up with local labor and vendor quotations and information in our own experience to help validate the costs.

The last piece is time, we haven't talked about time. These projects small, medium or large take time. They take time to permit. They take time to implement. So we developed a detailed construction schedule for each one of these options, small, medium and large, and then included that in as well into the estimate because time is money.

The synthesis of this work is really the unit cost model or the tool. It's all-inclusive. The unit cost effectively rolls up your design, your construction permitting, management and oversight costs. What we have done there is develop these unit rate calculations and then we have developed a graphic representation that I'll present shortly.

What are some of the key assumptions in doing any type of analysis like this? There are key assumptions that are involved. We have talked a little bit about some of these. The small, medium and large scenarios are listed at the top with the volumes that we just described. The maximum rate of dewatered sediments that we felt could be reasonably transported off the site was about 1300 cubic yards per day.

As I go down to this particular assumption that was assuming that I can load and move a truck out of any one of those land-based staging areas in a six-minute turn time. For those that have driven in those areas, you know that the roads are heavily congested so that does present some potential concerns. We'll talk about that a little bit later. That's reasonable for construction purposes. That's six minutes loading and going out which means that there is also a truck coming back in. So, there is one out; one in.

We talked about the staging within one half mile of the dredging operation. That's an assumption. We did not include the cost for purchase or lease. I already described the fact that those particular areas that were technically viable for land-based storage areas are not areas that Georgia Power owns or has access to per se. So we did not have any costs associated with the purchase or negotiation of those leases.

If we come down to this item here, Steve already did a great job of talking about sediment quality. The data that we have has suggested that the material did not have environmental contamination or debris and it probably would not be precluded from disposal. Here we just say landfill but really was a C and D landfill, construction and demolition debris landfill, is what we assumed.

We actually have contacted the folks at

Waste Management to talk to them about the nearest C and D landfill. And we do a lot of work for Waste Management and talked to them at depth about unit price and what their requirements would be to take material.

We also told them a little bit about the data and what we had. And they thought the data and material we had would be fine to do take into that facility. The nearest facility is the Chadwick C and D landfill, and I'll talk a little bit about the truck route in a minute.

Last two bullets I wanted to draw your attention to were that there were no costs or efforts in this estimate included for repair or replacement of public use roads. I'll explain a little bit more detail. I have got a graph as to why that's important, but you can imagine these are going to be big trucks, they are going to be going over roads. And for those who do highway design you know the trucks are the ones that drive the (inaudible) for those who design the roads. And when you get a lot of them going for a long period of time they really break up roads and beat them down pretty heavily.

Also, there were no costs included for future maintenance or dredging. You know, we have talked a little bit about the fact that it's kind of an equilibrium state, if you will. But when you are doing this type of dredging type project there is some amount of sediment accretion that would occur in these areas. So, that's not been accounted for to go back and redevelop those areas.

So, let's talk a little bit about the dredging feasibility evaluation at this point and the study results. Let's talk a little bit about project duration. This does include design, permitting, construction. Put this in terms of months for small, medium and large.

Small, we have estimated 18 months for construction total. Medium, 54. And large is 114 months. Of that the actual in-field dredging construction, that's the actual in-the-field dredging material for this particular small option would be about a month and a half to move about 12,000 cubic yards. Medium, about 15 months for about 330,000 cubic yards; and the large about 36 months or three years in the field dredging for about 1.69 million cubic yards.

This is the large scenario schedule. All the detailed schedules are presented in the plan that we have presented in the geology and soils report.

You'll notice that the larger component of this time factor here, this bar in particular, is really the design and the permitting stage.

The complexity of the work and permits that would be required, we are looking something in the neighborhood of a total of about 18 total permits, roughly nine federal, four state and five local. So, the permitting effort would be significant to put this together. So, I think the schedule reflects that.

Let's talk a little bit about proposed truck route. Where are we going to take this material? Again to bring your attention, this would be LBSA, land-based staging area one, two and three. Okay. That's what we are talking about. This is Roswell Road. Azalea. This would take us back up to Arnold Mill and then up to Chadwick landfill which is right here. That's the nearest C and D landfill that would be within our, quote, unquote, project area at this point in time.

Live Oak obviously is closed. Bolton is not really an option. And the next municipal solid waste landfill would be either R and B landfill up in Commerce or Pine Bluff landfill which is up in Ballground. So this is really the nearest post that we could come up to relative to disposal for consideration in the analysis.

You could see that as you are running trucks along here they'll be going through a lot of heavy residential, heavy trafficked areas. Those of you who know the area know there is a fair bit of congestion through there.

To put it in perspective, I particularly like this graph because it kind of illustrates the point. The small option is down here. Each truck is 1,000 loads. That means I have loaded it and it's gone out the door.

To put it in perspective for the large option, that's 1.69 million cubic yards or 130,000 loads. There would also be obviously a truck coming back. So, that's about 250,000 or so truck trips that would be coming in and out of your area, if you think of it in those terms. This is kind of typical of a tandem truck that would be -- is projected that could be used for sediment hauling transports.

There are also others that would be available, but that's kind of indicative of the type of truck traffic and the type of equipment we considered in the analysis.

Let's talk a little bit about the dredging scenario costs. Focus your attention on the top bar here which includes transportation and disposal. Small, medium and large, the volumes we have just discussed. The approximate cost that we have estimated, anywhere from 1.8 million for the small, to upwards of $140 million for the large.

Your unit rate cost, which again is all rolled up, these are all rolled up unit rates. No intangible costs. In other words, the costs I described before about road maintenance and some of those other intangibles are not included. But that's an all rolled-up cost for managing and disposing of the materials. Excluding transport and disposal.

Obviously if you take the delta between, for example, the small and the large or look at the large and the large here, there is almost $100 million that's looked at relative to transportation and disposal. So that's not an insignificant component of the project should that be required.

If you think about it, when you're looking at 1.7 million cubic yards it's not feasible to really relocate that all within the project boundary and make that work. That becomes technically very, very challenging to nonexistent.

One thing we did do too for the medium option to allow us to generate a few more data points, we kind of looked at the sensitivity of disposal of the 330,000 cubic yards, either dispose of all of it, half of those materials or none of those materials and where would we kind of put it within the project boundaries. So, we developed those costs as well.

The end result is the unit cost model. So, all that discussion we have just had about land-based staging areas, hydraulic methods all roll up into this graph, okay? And it's meant to be a tool that can be used for future study work that may be done for this project.

If you were to come in here -- and I have got an example, the next slide I'd like to show. If you were to come in here and say, you know, I'm looking at a project and you say, well, we are looking to dredge over, you know, project A in this particular area and it's about so many cubic yards, you can come into the graph, and let's say it's 1.2 million cubic yards, come up on the graph and say, well, I'm going to -- I want to bracket my costs, what's the cost if I have to excavate and dispose of all that material off site. And here is a number and here is your cost per cubic yard. What's the cost if I were able to keep it all on site. You could come down and bracket your range of costs.

You'll note in the graph that both of these have a similar shape. And the reason for that which is actually talked about in the study plan document itself, is that for smaller dredge operations your upfront startup costs, if you will, your fixed costs to get things established are disproportionately higher to the overall cost of the materials you are dredging, taking out on per volume basis.

So, that's why you see this sharp decline in this knee. And at some point you get to a point where this knee in the curve, those fixed costs just kind of background themselves out and they are just there through the project and it just levels itself out at that point. So that's why smaller jobs, you look at them and say, why does it cost that much. There is a lot of upfront preparation work and mobilization that has to go into that, and that's true for any of these options. So, the intent of this graph is to be able to use that for that particular purpose, volumes versus dollars per cubic yard.

Any dredging project has scenario specific challenges to the implementation and execution. I have listed some of the challenges that we have talked about already. Environmental permitting. Access to and use of land-based staging areas via lease or purchase. Right now the areas we have shown as potential candidates would involve Fulton County, National Park Service, City of Roswell and others.

Potential adverse, environmental impacts such as important to habitats, recreational use, cultural resources. I talked a little bit about time. In that large scenario you would be looking at a dredge being out on the impoundment for almost three years. And obviously it's used now and those activities would be disrupted, you would have a relatively large dredge, diesel-type dredge out on the impoundment that would be out there for that entire period of time along with the staging areas and the traffic, etcetera. Noise and visual aesthetic impacts. Obviously, the viewing perspective of this would be impacted during this work activity going on.

We talked already about traffic impacts to both City of Roswell and/or City of Sandy Springs and local residents. Again, high end, 250,000 truck trips coming in and out of that area. That's a lot. Damage to public roads, we have already discussed it would really have a tendency to beat up a lot of those roads very significantly.

Potential need for maintenance and dredging depending on the scale, future, if you will, to kind of reestablish should you need it. And then the potential for public opposition to this type of intrusion into this area.

To kind of summarize the dredging feasibility evaluation. We looked at three basic scenarios ranging from 12 to 1.69 million cubic yards. We evaluated land-based staging areas, identified the potential for three and technical feasibility of those. Azalea Drive, Willeo Road and Roswell Road.

We project the project duration is anywhere from a year and a half on the small end to upwards of almost a decade for the large scenario at 1.7 million cubic yards. Estimates anywhere from 1.86 million to in excess of 140 million. And potentially significant constraints to dredging operation in metropolitan Atlanta within the CRNRA.

So, that's just a brief summary, and I think what I'd like to do is stop at this point and kind of throw the floor open for any other -- any questions or discussion about the feasibility analysis. Sure.

GEORGE McMAHON: I'm George McMahon with Arcadis. The dredging time, did that include the -- did that also include disposal of the material, dewatering and all that?

MICHAEL MONTELEONE: Yes, it did. The schedule that was built factored in allowing the water -- allowing the material to dewater. And we made an estimate based on the soil data that we had for the material. There was some material samples that Steve had presented earlier.

We looked at grain size, distribution and the character of material. The upper material tended to be a little bit more sediment like, if you will, but the bottom was more sandy, coarse grain. So we developed a dewatering time for that, calculated what we thought the throughput would be at a given staging area and then factored that in relative to the overall projected time into the equation as well as the trucking time as well.

GEORGE McMAHON: And the dredging is the assumption was portable hydraulic dredges?

MICHAEL MONTELEONE: Correct. Floating.

GEORGE McMAHON: How large?

MICHAEL MONTELEONE: That particular unit I think it had capability --

GEORGE McMAHON: Just pipeline size, 6 inches?

MICHAEL MONTELEONE: Yes. I was looking at, like, an 8-inch pipeline.

GEORGE McMAHON: And did you look at having more?

MICHAEL MONTELEONE: Yes. In fact, looking at the large scale you'd probably be looking at we assume maybe two operations could be on the go. You would probably need all three of those land-based staging areas in effect at some point in time. For a small scenario you could probably do with the one and probably one land-based staging area and that would work out well.

GEORGE McMAHON: And did you look at any mechanical dredging alternatives?

MICHAEL MONTELEONE: I did not include that into here. You know, I think mainly given the fact that it would be logistically really difficult to kind of either draw the levels down low enough and build enough access to get, you know, track hoes and that kind of clam shells or other types of equipment --

GEORGE McMAHON: I mean mechanical dredge, floating mechanical dredge.

MICHAEL MONTELEONE: Floating mechanical. Right now what we really looked at was just the hydraulic end of it, thinking that would be the best way to get at an access to the material, slurry the material and putting it into a staging area for dewatering.

Otherwise, what you could do, we did talk about looking at, let's say, a, like an environmental example, if you will, off a barge, putting it in the barge and barging it over and transferring it over; but thought for a project this size that might be kind of inefficient.

GEORGE McMAHON: For the smaller and even the medium, it's possible that you could move the disposal areas that you eliminate -- would be pretty big -- might be, you know, might reduce the time requirements too.

MICHAEL MONTELEONE: Right. Could be considered. Could be considered. I don't think, though, with that it would impact your overall cost structure a whole lot when you're looking at it.

GEORGE McMAHON: Sounds like the trucking was the --

MICHAEL MONTELEONE: Yeah. I think the proposal that we had looked at before that I think Ace had on the table was basically a hydraulic dredge operation as well. And I think that for this type of operation it probably made sense.

I did a dredging project over near Stone Mountain and we actually used a combination of hydraulic dredging and mechanical dredging to facilitate that. But for different reasons. Smaller project, (inaudible) access. But it was very, very difficult. Very difficult.

TOM SULLIVAN: Other questions for Mike?

BETSY NICHOLAS: Betsy Nicholas, Upper Chattahoochee Riverkeeper. I'm curious, this is asking you, Steve, a little bit more for Ace, but if you can just sort of give me a sense. Obviously, when they were looking at this their thought in going into that would be making profit. They obviously also didn't go through with the project. But I'm wondering if there is some sort of balance there between if there was some commercial outlet for this -- I mean if you could tap into some of how they were planning on using it in a proposal, would that make the finances different and could you explain a little bit about that?

MICHAEL MONTELEONE: Yeah. We did talk -- one of the things that we did talk to them about was trying to understand the economics. They were -- the information was good from them but obviously it was also limited to a certain degree as to how much they wanted to come forward with. But what they did tell us was they also had a nearby area -- it's now closed. I don't know if you have got the study map here.

JIM SANTO: Jim Santo with Atlanta Regional Commission. It was the golf course off of Morgan Falls Road it used to be the landfill, and they used it to fill in the landfill, the stuff they wouldn't sell off.

MICHAEL MONTELEONE: That's correct, now it's a golf course. And so what that did was in terms of their fixed cost operations it was a lot cheaper. They had a nearby area so their overall costs went down. Once that option went away, they haven't really shown a whole lot more interest in going back after that again because of the things we are wrestling with here, where you are staging. How do you deal with it and how you move it off. So, that cost would obviously go up for them.

The commercial value, we talked to them at length about that and, you know, for the volume, for the medium and the large, those volumes of materials that you are talking about, they are significant enough that they are selling them in almost like buckets or pails, if you will. I mean it's like a thousand cubic yard-type sales or even less.

They do have some limited application. They are mainly residential people may want them to mix in with their sand in creeks, some top soil out of them. They might have other applications in a park and rec application.

But the use that they are finding right now has been relatively limited or hasn't been a huge application for that. So, that has been their perspective on it. So, that's why their quantity has been very low, their operations very small and they have not really gone back to pursue that proposal since then.

PAT STEVENS: I'm a little confused. Atlanta Sand and Gravel was the group that got all the permits in '96 to do this project. Ace Sand and Gravel is the old guys that are shutting down?

MICHAEL MONTELEONE: Right.

PAT STEVENS: You are talking about the

Atlanta Sand and Gravel permitted project that went away? I'm a little confused about what you are talking about.

MICHAEL MONTELEONE: No. In relation to Ace Sand, I'm sorry, it's Ace Sand and Gravel is out there now. And the question was?

PAT STEVENS: That's right.

MICHAEL MONTELEONE: What does Ace have for commercial viability relative to the material they dredge. That's who I was speaking to. I'm sorry if I confused you on that

PAT STEVENS: Atlanta Gravel is a larger operation.

JIM SANTO: Atlanta Sand. And that's the one that was down near Morgan Falls Road.

LARRY WALL: I think that's the one that Betsy was actually referring to as far as what you were thinking about, the commercial viability was the Atlanta Sand operation that never came to fruition. And that was for a couple of -- not only the reason that Mike just alluded to as far as the -- not having the place to put the spoils that they could not market, but there were a couple of other issues that were -- prevented them, the company from going forward with the proposal.

MICHAEL MONTELEONE: I should say one of the items to speak to your question about how -- really the question is, how do you manage that cost relative to disposal, is really where you are going. Commercial viability is one. The other is disposal, obviously.

And you know there are potentials that there could be somebody out there like, for example, if there was another fifth runway being build from doing a lot of earth work projects in town now, getting soil is very difficult because fifth runway gets it all. So there is a lot of in-fighting for just about anything you can get to impact. Should you do something and have -- that's sort of an opportunity type of thing should the project go and you have the opportunity, great.

But from a feasibility perspective I can't bank on that and factor that into that type of analysis. But that could be something that -- but you would need that type of project to really try to have a revenue stream to be able to get that material off to.

TOM SULLIVAN: Other questions for Mike?

CHRIS MARTIN: Could you plug a lifetime of not how long it would take to dredge it, how long it would take to fill back to where you started?

MICHAEL MONTELEONE: Turn that question over to Steve in terms of the sediment and filling up again.

FRED COX: His large scenario is about 1.6 million cubic yards. That's basically dredging back to 1960 volume when they raised the reservoir 6 feet. So, you know, if you did a really big one like that and given current sedimentation rates, it would be a long time before you got back to where you are now.

If you get on a real small scenario, maybe you are just opening up a little bit of area, even though the reservoir may actually be at equilibrium right now, I can see sediment kind of moving around and filling in a little channel. So, it kind of depends on what kind of project you might be looking at.

MICHAEL MONTELEONE: I mean to add on to that as a point of comparison for that other project I did over in Stone Mountain, we dredged out about 3,000 yards there and with, you know, we knew the accretion would be such that it could be within a year. And sure enough, within about a year to a year and a half most of that had come back into that particular area. So, it was the smaller scenarios, it could be one to two years. It wouldn't surprise me.

LARRY WALL: And that is apparently the frequency that the Ace Sand operation because they are just dredging the same spot that --

MICHAEL MONTELEONE: Correct

LARRY WALL: When they clean it out, the other materials around it just fill that void back in.

MICHAEL MONTELEONE: Right. I hope that answers your question.

CHRIS MARTIN: Yes.

TOM SULLIVAN: Other questions for Mike?

CHRIS MARTIN: Are there no other financial benefits to dredging other than just doing it? I mean, increased operational flexibility? Increased recreational benefits? Are there none other that were -- that you saw that would offset the cost of the project?

FRED COX: You know, looking at, say, operational flexibility and let's just look at power, from that project you couldn't pay for the dredging. There is just no way. Certainly there is some benefit to water supply in the Atlanta region to having some more volume. Pat may be able to address that some more. But I suspect that that would not be economical either.

Back in 1981 Metropolitan Atlanta Water Resources Study, that was done looking at how to supply Atlanta, water to them in the future, and they had three major options, you know, one of them was build a rereg dam downstream of Buford. One of them was to dredge Morgan Falls out and find storage there. And a third one was just do more reregulation at Buford.

Well, that was the one that finally was adopted because the others just weren't feasible. So, and I don't -- I don't see that, that feasibility -- I don't know that there is anything that's changed that at this point in time. Pat, do you have --

PAT STEVENS: Pat Stevens, ARC. I think that's pretty accurate.

COURTENAY O'MARA: I was going to add -- this is Courtenay O'Mara. I don't know if you remember in scoping way back when back --

CHRIS MARTIN: What was that?

COURTENAY O'MARA: That was at the very first meeting where we discussed, we were talking about the time that we would gain from going from our

2001 volume back to our 1960 volume, and it was a gain of six hours. Which doesn't get rid of Buford peaking on the weekend. It doesn't help significantly in terms of water supply.

PAT STEVENS: Morgan Falls. That small amount of storage in Morgan Falls is real important for water supply and water quality downstream to keep the river at the level on a short-term daily, less-than-daily basis. But when you are talking about water supply for metro Atlanta you got to have a lake the size of Lanier. So, I mean it's helpful to moderate the river; at this point it doesn't help our intakes upstream. You just have to have a big lake.

TOM SULLIVAN: Other questions? Okay. We have reached that point where we have done all studies. Any additional comments on the study as it was done, the geology and soils study? Or any additional study requests? Hearing none, we are going to move on to the next part of agenda if everybody is all right with that. All right.

We have two things left on today's agenda. One is basically kind of my summary of the meeting which is going to be very similar to yesterday's summary, and then the other one is George is going to kind of fill us in on dates moving forward.

Again, we had talked about areas of agreement and action items, and I don't really see us having anything like that today either when you get right down to it. I mean I think summary is very similar, there were technical presentations, there were a series of technical questions that were answered. And there were no additional information requests would be the summary for today's meeting.

Chris, you had one thing that you raised this morning which was the business about looking at whether or not this was a typical year for Buford releases. I think Fred addressed that question maybe when we came back, so I wouldn't list that as an action item unless you --

CHRIS MARTIN: (Shakes head negatively.)

TOM SULLIVAN: Is everybody all right with that as a summary? Okay. I'm going take your silence as agreement. All right.

But that does bring me to one more thing before George gets up and gives a summary. Out of these meetings and where we are in the process is we are trying to figure out are we through the study process, are we getting ready to move on to the preliminary license proposal which is the next step.

And George is going to go through -- there is a series of potential paper steps. But there really hasn't been a lot of discussion or feedback and I'm not necessarily looking for that. But I want to make sure everybody understands where we are in the process. I mean these are the study report meetings and this is the place to have those comments, if you have them. And I just -- does everybody understand that and everybody understand where we are at process wise? Betsy.

BETSY NICHOLAS: Betsy Nicholas. I have sort of a question I guess to all the Georgia Power folks about that just more basic level. On any of these studies is there going to be continuing information gathering going forward, or is this cutoff? Are any of these going to continue on, you know, water quality sampling or anything like that or is this completely the end?

MIKE NICHOLS: Mike Nichols, Georgia Power. We have an ongoing program to monitor water quality that will continue. It will not continue as part of this process but it's part of an overall monitoring program of our facilities.

GEORGE MARTIN: Betsy, specifically to the scope of studies for the relicensing process, these are now complete.

BETSY NICHOLAS: Okay.

TOM SULLIVAN: Jim.

JIM LONG: I just kind of throw this in here, that the Park Service has conducted a couple of other studies particularly related to the Big Creek watershed, and based on some of those results we may request additional studies on that. So I'll throw that out there.

LEE EMERY: What kind of studies are they?

JIM LONG: We had a genetic study on Shoal bass and a sedimentation study on the mouth of Big Creek. And we'll submit those to FERC.

LEE EMERY: Any idea what time frame you are talking about the studies coming in, Jim?

JIM LONG: The sedimentation study is completed and we need to submit that. The genetic study we got a draft final report in draft.

JANET HUTZEL: This is Janet Hutzel with FERC. There is a time frame by which you have to submit and it is very quickly coming up. Let me see if I have got my regulations with me.

ALICE LAWRENCE: Same for the service. We also did a study for upper riverkeepers but we are waiting for those results.

LEE EMERY: Any idea on your time frame?

ALICE LAWRENCE: I e-mailed the guy on Friday.

JANET HUTZEL: If you want to request modifications or additional studies, the regulations allow basically 30 days after the -- within 30 days of the applicant's meeting summary.

ELIZABETH MOLLOY: Which is 40 days --

JANET HUTZEL: 45 days.

JIM LONG: Is that from yesterday or from tomorrow?

JANET HUTZEL: 15 days following when the applicant files their meeting summary. And you were going to file it on the 30th?

GEORGE MARTIN: That's correct.

JANET HUTZEL: So, 30 days after Georgia Power files their meeting summary.

JIM LONG: 30 days after the 30th of April.

JANET HUTZEL: Right. You have within 30 days to submit.

JIM LONG: Is that 30 calendar days or 30 workdays?

LEE EMERY: 30 calendar days.

WINNIE SIMPSON: Here is the dates, Jim.

GEORGE MARTIN: Go by this instead of, if you will.

JIM LONG: April 30th. I have 30 days after that to file for an additional study

JANET HUTZEL: May 30th meeting summary disagreements, comments, that would also include for additional studies. And you have to address the original criteria and you also have to address criteria on 5.15(e) 1 through 4.

JIM LONG: Okay.

JANET HUTZEL: And I think in your white book it's on page A-26.

JIM LONG: A-26.

JANET HUTZEL: You have the one that was issued July 23, 2003?

WINNIE SIMPSON: Is it E or F, Janet?

TOM SULLIVAN: George.

GEORGE MARTIN: I'd like to add to this discussion we were anticipating getting here, I want to give a copy of this to FERC as well, and I want to introduce this to everybody and we are going to pass this out. These are the ILP rule criteria for additional studies at this point in the process. And I'm going to just pass them around. You-all can all have one. They reference the rule and we thought we would get to this point and as part of my summary, not at all to side step or interfere with what FERC is saying, but we went to the rule and --

JANET HUTZEL: This is different. Which version did you have? Mine has E.

WINNIE SIMPSON: That's the final one. George, you have the final rule, don't you?

GEORGE MARTIN: We are here after the studies are complete.

TOM SULLIVAN: Just so I make sure I have it straight, and I think I do. Because we are going a lot back and forth on a lot of references. I think Georgia Power has -- you have compiled what the criteria are and that's the piece of paper that's going around; is that correct?

GEORGE MARTIN: Uh-huh (nods head affirmatively).

TOM SULLIVAN: And Jim and Alice, I guess a question for you folks. I mean it sounds like this may result in additional information requests but you don't know yet one way or the other whether they do or not? The studies that you have conducted, the two studies the Park Service has conducted and the study the Fish and Wildlife Service has conducted, you don't know whether or not these will result in additional information requests at this point?

ALICE LAWRENCE: Right. I don't have the results right now and --

BETSY NICHOLAS: The one fish and wildlife and UCR are working on, we don't even have any results. So...

TOM SULLIVAN: So you don't know one way or the other. I understand. Fair enough. And, Jim, how about you folks, do you know whether or not they'll result in additional information requests at this time?

JIM LONG: I think so. The one we did was a genetic study looking at the impacts of operations on a remnant population of Shoal bass that are isolated in Big Creek. So we -- I anticipate looking at ways to reconnect that population. So...

TOM SULLIVAN: Okay.

JIM LONG: There is some information linked to that which is unavailable.

TOM SULLIVAN: So, you are not quite sure what form it's going to take yet, but also will look at a reconnection, if you will, of the Shoal bass population in Big Creek to the mainstem?

JIM LONG: Right.

ELIZABETH MOLLOY: And just to be clear,

at section 1.15 and, it's E and F because this has been the final report on studies, a proposal for new information according to sort of the second to last sentence F, proposal for new information gathering or studies is subject to paragraph E of this section, which has the criteria, except as the proponent must demonstrate extraordinary circumstances warranting an approval.

So it's a higher than --

JIM LONG: Right. Right.

ELIZABETH MOLLOY: But then you also do need to go through the five things here.

JIM LONG: Yeah. Yeah.

ELIZABETH MOLLOY: Just want to make sure you know that.

TOM SULLIVAN: Any other questions or comments about kind of where we are in the process at all? Okay. You want to go through the dates?

GEORGE MARTIN: Sure. Much like we did yesterday, we have a few folks that attended today that weren't with us yesterday, we wanted to end the day with some next steps; and before I get into this I have been remiss at not pointing out that we do have a few hard copies of the studies that you may want to pick up. I don't have enough for everybody, we didn't plan that way, and they have always been available upon request. But we did print out a few of the resource study reports. If you want to pick one up, you-all stop by and get one on your way out.

But to our next steps, of course this week we will conclude our study results meetings tomorrow. And tomorrow we are going to go through our recreation and land use resources as well as our cultural resources, both historic hydro and historic properties.

By April 30th Georgia Power will file the meeting summary that was mentioned earlier, and as Tom has summarized yesterday and as he has just summarized today, alluding to what that summary will be. Of course, the court reporting will be a part of that meeting summary word for word verbatim as well as the PowerPoint presentations and any handouts that have been given during the presentations today in this last handout for additional study requests. Those will all be a part of the meeting summary.

The next step is by May the 30th. Stakeholders may file meeting summary disagreements. So our court reporter has to be real careful she typed everything right, and/or comments or other requests that you want to put forward.

By June the 29th we will respond to any comments or requests or disagreements.

And then the next meetings that have been added to the process plan and schedule as an enhancement are our July 24th, 25th and 26th licensing proposal development meetings. That's the next opportunity that we all have to get together. Those may be the 24th, and 25th and 26th or they may be some subset or less days than that. By July the 29th FERC will resolve any study results meetings disagreements.

October the 2nd we'll file our preliminary licensing proposal. December 31st, comments are due on that preliminary licensing proposal by all. And then by February the 28th of 2007 we will file our license application and the ball will be in FERC's court with two years remain on the existing license before the expiration of the existing license.

Liz.

ELIZABETH MOLLOY: With regard to your meeting coming up in July, will you be sending something out to people beforehand to sort of look at?

GEORGE MARTIN: We anticipate digesting everything that has gone on during these three days of study results meetings. Reviewing the transcript, reflecting upon what was discussed, what was agreed upon, what was not agreed upon, what may be in the future. And then we will move ahead with the development of a straw man, if you will, to discuss with the stakeholders with regard to enhancements for the continued project operation over the next license term.

And we have already given the dates out earlier. I think that probably went out a month or so ago. We alluded to the July time frame in October of last year and we nailed it about a month ago I believe.

ELIZABETH MOLLOY: So, a straw man thing would be presented there or ahead of time or -- I mean I'm just trying to get a sense of will people be able to mull before coming to the meeting.

GEORGE MARTIN: I don't quite know yet, honestly, I don't know. We are going to have to develop a licensing proposal and it does depend a lot upon this discussion here. And we will certainly take everything into consideration. If we need some clarifications with folks, we'll certainly do that. And we'll have a straw man as a goal for the July meetings if not somewhat sooner.

ALICE LAWRENCE: Those will probably be here at this facility?

GEORGE MARTIN: Yes. As a matter of fact, they are in this room, July 24th, 25th and 26th. And I think Tom is going to get to the logistics of tomorrow's meeting but I won't take that away from him, let him end the day. If that's all you-all have for me. Yeah, Chris.

CHRIS MARTIN: If an additional or mudflat study proposal is accepted by FERC and Georgia Power's requested to pursue that, how does that affect from -- I mean the date for --

ELIZABETH MOLLOY: You see that last date? You see that last date right there? That doesn't change at all. That absolutely has to be, cannot --

LEE EMERY: Even if --

CHRIS MARTIN: So, it would be ongoing?

ELIZABETH MOLLOY: We are really cranky on that.

CHRIS MARTIN: I was just wondering FERC making their disagreement, resolving those and take those other two meetings --

LEE EMERY: We have a couple of years to issue the license, so if that study is ongoing it might be ongoing while we are still processing.

ELIZABETH MOLLOY: The application is due by statute no later than two years prior to the expiration, they cannot miss that date. So, everything has to proceed to a proposal be filed by then.

CHRIS MARTIN: But there is a two-year period that modifications and negotiations or whatever can be --

ELIZABETH MOLLOY: Our target is to aim to issue a license prior to that two-year. It would be -- and in the event and in cases where we have issued it prior to a two-year expiration, we postdate it. It's effective the next day.

So we -- our goal is to issue a license before that expiration date because we don't like annual license and so that will be what we will be aiming for. That we'll be proceeding on that schedule to have a license issued before the expiration. So as things -- if something comes in, you know, that's where we have to come in, earlier the better. But our process will be proceeding with a target of issuing a license prior to expiration.

TOM SULLIVAN: Final thing that we have for today is just logistics for tomorrow. Assuming nobody else has any questions or comments. So, before I do that, does anybody else have anything? Okay.

Tomorrow we start again at 8:30 but not in this room. We are in the cafeteria banquet room tomorrow, which I believe they have to go through the cafeteria to actually get to that room. Is that right, George?

GEORGE MARTIN: It is the room that we had our scoping meetings in, it's go through the cafeteria and just continue walking around to the left and you'll see some of us, we'll help you get in there.

TOM SULLIVAN: We are going to start at 8:30 tomorrow. We have recreation and land use in the morning and cultural resources in the afternoon. A very similar format to today's format.

LARRY WALL: Tom, excuse me, they both take place in the morning, I believe.

TOM SULLIVAN: Okay.

LARRY WALL: Am I right?

GEORGE MARTIN: That's correct.

WINNIE SIMPSON: And only pie charts tomorrow, Greg has promised. Pie charts and bar charts.

TOM SULLIVAN: Very good. If there is

nothing further, I think we are done for today. Thank you all very much and we'll see you in the morning.

(Meeting concluded at 1:30 p.m.)

C E R T I F I C A T E

STATE OF GEORGIA:
COUNTY OF FULTON:

I hereby certify that the foregoing proceedings were taken down, as stated in the caption, and reduced to typewriting under my direction, and that the foregoing pages 1 through 161 represent a true, complete, and correct transcript of said proceedings.

This, the 23rd day of April, 2003.

LINDA E. CHEEK, CCR-A-752