CLAYTOR PROJECT NO. 739

APPLICATION FOR NEW LICENSE

STUDY PLANS UPDATE MEETING

CLAYTOR PROJECT NO. 739

MAY 16, 2007

DAY ONE

INDEX PAGE

The following STUDY PLANS UPDATE MEETING came on to be heard on this the 16th day of May, 2007 at the AEP Pulaski Service Center, Pulaski, Virginia.

Introduction

TERESA ROGERS: There are agendas over here if you need a copy of the agenda. I will warn you now, we pretty much have to stick with the times on the agenda because some people may be only wanting to come for like one portion so they publicize the agenda and all the information I send out.

They may not come until 2:30 for fish entrainment and impingement and if we skip ahead they=ll miss it. So, you may want to bring a book with you tomorrow because we have had that happen where we finish in like 15 minutes and there=s no questions and we have to wait for the next one, or bring work with you and you can like work during the breaks.

There is water over here and some snacks if you would like a snack. Also, the bathrooms are right outside the door here in the back. My name Is Teresa Rogers. I think everybody has been here before. I=ll go ahead and start.

Let=s start with the introductions first before I give you

all the background. We=ll start over here. I will let you know this meeting is being transcribed. Melissa is transcribing it so as we get into questions or presentations make sure you tell, you state your name so she can get it for the record.

We=ll start here and we=ll go around the room.

MIKE MCLEOD: Mike Mcleod, I=m with DEQ out of the Roanoke Regional Office.

DOUG ROYER: Doug Royer, Normandeau Associates. I=m involved in impingement and entrainment.

KERRY BLEDSOE: I=m Kerry Bledsoe from the West Virginia Division of Natural Resources.

MARK HUTCHINS: Mark Hutchins, Normandeau Associates water quality.

SARAH ALLEN: Sarah Allen, Normandeau Associates, working on Habitat analysis.

MARY RHOADES: I=m Mary Rhoades, resident at the lake and with Friends of Claytor Lake.

LARRY BANDELIN: Larry Bandelin, lake resident working on recreation and --

JOHN COPELAND: John Copeland, I=m a fisheries

biologist from Blacksburg with the Department of Game and Inland Fisheries.

BILL KITTRELL: Bill Kittrell, I=m with the Fisheries Division of the Virginia Department of Game and Inland Fisheries.

DAVE FALCINELLI: Dave Falcinelli, Kleinschmidt Associates working with sediment and erosion studies.

CHRIS GIBBONS: I=m Chris Gibbons, I=m with Baird & Associates.

ALEX BRUNTON: Alex Brunton, Baird & Associates, working on the erosion study.

MARK RIEDEL: Mark Riedel, also with Baird & Associates on the sedimentation study.

JON MAGALSKI: Jon Magalski with AEP environmental services.

CHUCK DIETZ: Chuck Dietz, DCR civil engineer.

TERRY NOBLE: Terry Noble, Army Corps of Engineers.

JOHN SMITH: FERC, project coordinator and biologist.

DARLA JENNINGS: Darla Jennings, executive director for the Friends of Claytor Lake.

KEVIN BYRD: Kevin Byrd, New River Valley Planning District Commission.

WAYNE ALEXANDER: Wayne Alexander with APCO real estate asset management.

TERESA ROGERS: You want to introduce yourself, Laura?

LAURA BULLARD: Laura Bullard, land owner and member of the local Friends of Claytor Lake Board.

TERESA ROGERS: I would like to begin with just a review of where we are to date because we have been working on this for quite a while but we still, of course, have a lot of work left to do.

We did have some prefiling stakeholder meetings in August and October of 2005. Appalachian submitted the preapplication document and the notice of intent in January of 2006. The scoping meetings were held in April of 2006 and that=s when we followed up with the proposed study plan filed with the Commission on June 14, 2006.

We had initial study plan meetings, which were public, in July 2006. Then during August, there was a week in August where

we got together with the different work groups for each one of the studies and discussed revisions to the study plans and that=s when the stakeholders file their comments on the proposed study plans and we submitted a revised study plan to the commission in October 2006.

The stakeholders filed their comments on the revised study plan and then FERC followed up with their study plan determination in November.

In January we kind of had a kickoff meeting of the studies where the consultants that were hired came in and gave a presentation on what they would be doing on the studies and gave an opportunity to answer questions.

That=s where we come today. This is a study update meeting. Over on the table there is a process plan, a copy. I bring these to every single meeting because it is very important. These are the official filing deadlines for relicensing, so it=s very important, you know, like when the stakeholders have comments due and that type of thing.

In these meetings I also try to remind people like when the next comment period is so that you=re aware. This information is

also on our website whenever you need to look it up.

The approved studies for Claytor relicensing included aquatic resources assessment, cultural resources, debris, erosion, fish entrainment and impingement, instream flow needs and reservoir elevation, native and exotic aquatic vegetation, navigation systems, recreation angler use, sedimentation, water quality, wetlands and riparian, debris, littoral and bald eagle habitat.

The purpose of today=s meeting is just to give you an update on where we are in the process. This won=t be on your process plan we just kind of do it every six months to keep people informed. The consultants will discuss a process to date on each study and answer any questions that you might have and then that will be reviewing the upcoming dates on the ILP process.

As far as agenda, we=re going to do the update on the relicensing process right now. At 10:00 we=ll have the aerial mapping and bathymetry update. Brady Todd is not going to be here but he is going to call in and I=ve got the presentation so we=ll just kind of go through it together.

At 10:45 we=ll do a sedimentation and erosion and then we=ll break for lunch. Lunch is on your own. We=ll meet back here

at 1:00. We will go over water quality study update, followed by the debris study, fish entrainment and impingement, habitat and aquatic vegetation and then at the end we=ll have an opportunity to kind of wrap things up and just have open discussion if it=s necessary.

Tomorrow I=ll just give kind of an overview of the previous day=s meeting and then we=ll have cultural resources, instream flow needs study update and then we=ll have a little bit earlier lunch tomorrow at 11:30. After lunch we=ll have aquatic resources, recreation and angler use, navigation, followed by shoreline management workgroup update.

Right now we are in the first season of studies. Consultants are out in the field right now performing their work. We=ll be having workgroup meetings at this time as we need them. If something comes up in a study that we think may need to be modified or we need consultation from the workgroup I=ll have a meeting. Some of the consultation may be by email if it doesn=t really need a meeting.

By November 17 we will have to file our initial study report and then we=ll follow that up with an initial study report meeting. So, you=ll have the initial study report prior to the meeting

so you can kind of familiarize yourself with it before we meet.

I say by because it won=t be on these exact dates. I=ll put something out ahead of time but it will be around those dates. I think December 2 is a Sunday so I=ve got to work with the calendar a little better.

The next step we will file an initial study plan meeting summary and a study plan modifications if they=re necessary by December 17 and then the participants and stakeholders will be filing your comments on the meeting summary by January 16.

Then we=ll file our response to the comments and FERC will issue their study plan determination. I love this picture, I use it on every single presentation. We took it when we were out on the boat one day and these ducks followed us down the entire lake. You all probably know them if you=ve been on the lake, they follow everybody.

We do have the Claytor hydro website and I=m trying to keep it updated with new meeting information and that type of thing. I also use the email a lot to put information out to people. So if you want to be on the email listing make sure you tell me and I=ll put you on there.

I do have some extra copies of the revised study plan that went to FERC. I have them available with me today and also FERC=s determination letter if anybody needs a copy. All of the filings are on our website, they can be downloaded.

Any questions so far?

I always do this. We=re not supposed to start til 10:00. Let me go ahead and I=ll start preparing for that. If you need a snack or a drink go ahead. Usually I=m used to more questions.

Anybody have any questions so far on where we are in the process?

How to file comments with FERC?

FERC has a website, FERC.gov. You can electronically file your comments with them. You will need to have the project number, which is 739 and then the sub docket number is 018. So you need to have both of those numbers on there, 739 and 018 is the sub docket number.

MARK HUTCHINS: It=s not really a formal comment period; right?

TERESA ROGERS: No. Right now it=s not. Next time we have a formal comment period will be after the initial study update

report is filed with the FERC. That will be the next time you actually -- if you send comments in now they=re going to look at them and say what=s this for.

MARK HUTCHINS**:** Teresa, you said that you were filing an initial study report on November 17?

TERESA ROGERS: By November 17, yes.

MARK HUTCHINS: Our schedule for producing draft reports doesn=t jive with that, so is this something that -- are you going to be responsible for it or -- without study results?

TERESA ROGERS: I will probably be asking the consultants to submit a report probably the beginning of October to me on where everything stands to date. It=s not going to be a lot of conclusion type things at that point, because the study of course isn=t over and you probably haven=t gotten to the conclusion part yet.

But it=s mostly just, you know, where we are in the process type thing. I=ll send you out something. I=ll probably want it by the beginning of October to give us plenty of time to get things together and that type of thing.

Any other questions?

All right, well you can just talk amongst yourselves.

[Recess.]

TERESA ROGERS: Let=s go ahead and get started again. Brady, go ahead and start.

Aerial Mapping and Bathymetry Update

BRADY TODD: My name is Brady Todd and I=m the AEP supervisor for surveying and mapping. I=m a registered surveyor in both Ohio and Virginia. I=ve got over 32 years with AEP.

Our project responsibilities were to provide aerial mapping to the project limits required and provide bathymetric mapping of the lake. The aerial surveys were performed by Henderson Aerial Surveys of Grove City, Ohio. They=re a division of Kucera International in Cleveland.

Henderson utilized state of the art technology to capture the photos and the data required for this project. A combination of aerial photography and LIDAR technologies were imposed.

This is a standard aerial photo. Since I haven=t received the photos from this project yet some of what I will use in this presentation will be for our Smith Mountain relicensing project.

This is a standard aerial photo from that project. You can see the shoreline and the lake in it. Orthophotos are rectified scalable images. They are used for planning and feature analysis. They are used in geographical information systems. Additional orthophotos are going to be incorporated into AEP=s GIS for this project. This slide is a picture of Spinnaker Run on Smith Mountain Lake. This is a rectified scale for the photo. These were shot with a digital camera. You can see how clear everything is in the photo. You get a good depiction of the shoreline, all the houses, docks. It=s great for analysis for the studies that we=re doing.

LIDAR, which is light detection and ranging, is a laser system that pretty basically scans the ground as the plane passes over, as you can see by the red lines in this display here. It gives us high resolution topographic data, it helps reduce the cost of the overall project, it has the ability to penetrate tree canopy and vegetation where you can=t see in a photo this data supplements that and allows you to get more ground information.

There=s a minimal need for ground control and there is time savings with this method.

This is an image of a point cloud. This is millions of

points that are returned from a LIDAR system. It=s been run through a software package that color enhanced the image and green in this depicts the foliage areas in that particular area.

One of the things they can do with LIDAR imaging is they put it through a software program and can do terrain modeling. This is a sample of a terrain model developed from LIDAR information.

This is a contour map. This is ultimately what we are getting as product from the aerial mapping sequence. This is a contour map showing Smith Mountain Lake Dam. You can see the dam facilities, the power lines going in and out of the area, the contours around the lake and around the downstream outlet of the dam. The dash lines in this picture are the under water contours in the lake and downstream of the dam.

This image indicates where we did the aerial mapping coverage. The dark line around the lake is the project boundary line. Inside of that line we will have contour mapping at both the bottom of the lake and the surrounding ground features. We also have the orthophotos of that area.

The yellow line, the larger area is the drainage area

going downstream as far as Glen Lyn. That area was flown for photographs only. Those photographs are being used by the consultants in their research.

Mapping control for the project was a combination of ground targets, which were placed throughout the mapping zone. Some of you may have seen these targets placed along the highways and in different areas around the lake. We also used airborne GPS system. This system uses GPS on the ground and in the air and allows us to put less ground targets out for the flights.

The hydrographic surveys were performed by Ocean Surveys, Incorporated, Old Saybrook, Connecticut. They employed a multibeam sonar technology system and a CHIRP system sub-bottom profiler.

This snapshot, couple of snapshots of the vessel that they used for the hydrographic survey. Some of you may have seen this vessel on the lake. Multibeam sonar. The multibeam sonar system that they used employees 240 degree -- I=m sorry, a 240 half degree beam ray.

What that does, if you go back to the image that we have of the plane flying over and all the multiple beams coming out of

that, this does a similar item only it=s doing it under water. It covers a swath that is 3.46 times the water depth, so if they=re in 100 feet of water they=re actually scanning 346 feet of bottom from side to side as the boat passes through the lake.

It=s the highest resolution multibeam system available and we=re able to tilt the head of the multibeam system in order to capture the edge of water along the shoreline.

The two images here are samples from multibeam surveys. The top image is a pipe trench off the sea floor. So you can see the relief, you can tell exactly where that pipe trench is.

As a result of the high definition that we get from the multibeam system this is a contoured section of Smith Mountain Lake where the old Route 122 bridge crossed the Roanoke River. In the image you can see the bridge still exists today and you can see the old river channel that is underwater.

The sub-bottom profiler, the top image on the left, that is a picture of the unit itself in water over the side by the boat. The image top right is both a paper readout and a digital readout of the information being gathered by the sub-bottom profiler. The bottom two images are samples of what they get with the imaging.

If you look at the bottom right image there is a thin line at the top of the display, that would be silt on the bottom of a lake and then the darker areas would be the rock or original bottom areas. That is all analyzed and determined based on other information that they gather simultaneously with the sub-bottom profiler.

The sub-bottom profiler objectives were to determine the original bottom of the lake, determine sediment thickness and the data was collected simultaneously with the multibeam data.

Onboard the boat they used Hypack software and RTK/GPS. RTK/GPS is real time GPS, so on the monitors that are in this slide you can see images that are detecting where they are on the lake. The Helsman has the capability of seeing on a map that is on that display where it is in real time and also allows them to see the coverage they=re getting with the multibeam so that they don=t miss any spots in the lake.

The final products expected from this project, we will incorporate both bathymetric and aerial mapping into one composite contour map. Data and mapping will be used for comparison of the existing condition of the lake and the original design, comparison of the current volume tables with the established historic volume table,

baseline mapping for future design, analysis and mapping.

Generation of the cross sections and map detail used to determine the nature and extent of silting. It will be used to determine the condition of adjacent areas, determine the current volume at the lakes, determine the presence of any unusual land or lake bottom features and, as I said before, the information obtained from the survey will be incorporated into AEP=s geographical information system of the area.

If anyone has any questions I will be happy to try to answer them.

TERESA ROGERS: Anyone have any questions. Go ahead, Mary.

MARY RHOADES: This is Mary Rhoades. Was this ever done before and how many years ago?

BRADY TODD: I don=t believe, to my knowledge, that we have any surveys to this extent in our historical records. Not of the lake bottom for sure.

TERESA ROGERS: Could you give us an idea of when the information will be available?

BRADY TODD: The schedule as it stands right now, the

lake bottom contouring information from OSI is due in my office by the end of May and then that information will be given to the aerial company. Their final product, which will incorporate the bottom of the lake information and all the service information, is due by September 1. Currently everything is on schedule.

BILL KITTRELL: Bill Kittrell. Will this information be used for the sedimentation and erosion plan or will they be -- I=m sure you=ll give us an update. Will you be collecting your own information or how will that be reconciled?

ALEX BRUNTON: This is used in the sedimentation and erosion studies so as soon as Brady gets it he will make it available to us for our modeling and analysis.

BILL KITTRELL: And you all feel very comfortable with the methodology --

ALEX BRUNTON: Absolutely. It=s by far the best that we=ve ever had.

TERESA ROGERS: We=ll be also using this information with the navigation system workgroup to look at areas that shoaling and that type of thing. They=ll be available for that as well.

JOHN COPELAND: John Copeland. Is this the guy that

-- we found a box, a gray box with some transducer equipment in it at the upper end of Claytor Lake.

TERESA ROGERS: Brady, did you get my email asking about the box that was one of the consultants. It=s not Baird=s.

BRADY TODD: It=s not Baird=s?

TERESA ROGERS: No.

MARK RIEDEL: Well, if it=s really valuable, yes, it is.

TERESA ROGERS: It might be.

JOHN COPELAND: If the price is right we can get it back to you.

BRADY TODD: I have contacted the consultant and I have not heard back from them yet as to whether it=s a piece of their equipment. I would appreciate it if you would hang onto it just in case.

TERESA ROGERS: I think John has it with him today so I=ll take it off his hands until we can locate the owner.

BRADY TODD: As soon as I hear from them, Teresa, I=ll let you know if that belongs to OSI or not.

SARAH ALLEN: Brady, this is Sarah Allen. Is the topo two foot contours?

BRADY TODD: The finished product will be two foot contours, yes.

SARAH ALLEN: And is that going to be a composite of the photo and the LIDAR data or is it strictly LIDAR based.

BRADY TODD: No, it=s a composite between the photo and the LIDAR data. What we are doing on this project and what we did on Smith Mountain was we used the LIDAR to supplement the photographic information. It=s being primarily developed from the photo.

TERESA ROGERS: I guess by the next time we meet, that will be in November, we can actually bring some of the Claytor information with us; correct?

BRADY TODD: Correct.

TERESA ROGERS: So I can show you part of the product. Any other questions? Okay. Thank you, Brady.

BRADY TODD: Okay. Thank you.

TERESA ROGERS: Some of these photos are really hard to see on the screen. It shows up much better on my computer. We=ve got about half an hour, if anybody wants to see the actual photos up close feel free to come up here.

MARK RIEDEL: I can show one of the ones that we used for bathymetric, I can zoomed in really close.

TERESA ROGERS: Okay. It does show a whole lot. I was amazed at how much it picked up underwater and on the shoreline. You=ll see every single dock that=s out there. It will be on the mapping.

BILL KITTRELL: What kind of availability will there be for this information once relicensing is done? In other words, I can envision the public wanting to have access to some of that information.

TERESA ROGERS: I don=t know at this point. That came up at Smith Mountain and I haven=t gotten an answer so I=ll find out. I=m not really sure.

BILL KITTRELL: I can envision an underwater structure map, you know, for fishermen, things like that.

TERESA ROGERS: Fishermen. It=s going to show everything. I=ll find out. I haven=t gotten an answer for Smith Mountain yet either.

SARAH ALLEN: I just realized Brady didn=t mention docks, isn=t he planning on mapping docks?

TERESA ROGERS: They will be on the mapping, yeah. When they=re doing their aerials and everything else it just picks it up automatically, so it=s on those.

SARAH ALLEN: But that=s going to be a discreet layer isn=t it so we can --

TERESA ROGERS: The mapping that I have seen shows all the contours and the structures. I=ll see if --

SARAH ALLEN: I think I recall from the last time that that was going to be a specific study, knowing the areas of docks and --

TERESA ROGERS: Yeah, it=s part of this. You=ll be able to see all structures.

LAURA BULLARD: Teresa, I appreciate this whole group process where we can come together and be kept abreast of what=s going on. I guess I=m having some concern about the fact that you all will do your initial study report before we come together again; is that correct?

TERESA ROGERS: Uh-huh. And that will give you an opportunity to actually read through the information and you=ll -- instead of just getting it cold in a meeting you=ll have an opportunity

to look at that and then we=ll come together and you can ask specific questions. I think that=s why it=s kind of structured that way. But there will be an opportunity to respond to those initial reports and that type of thing.

LAURA BULLARD: I guess and maybe I=m trying to take more ownership than I deserve as just a land owner, but it seems that, you know, we=re being given this information and then we don=t really know what the outcome is until you all have massaged it into a report.

TERESA ROGERS: Right. And that report will come later, probably, I=m guessing on this, the actual study report is March. Does that sound about right, consultants?

About March of next year and you=ll get to see those study reports. The way we=ve handled it in the past is we=ll have a draft report for you to look over and offer comments before we actual finalize the actual report on the study.

This update initial study report will be just where we are to date, so there won=t be a lot of conclusions and that type of thing at that point. It=s just still kind of early, by November.

LAURA BULLARD: Will we be able to see what the

consultants have reported or will it be what AEP does with it first. You know, you all get it, do what you want with it and then we get that or do we get to hear what the consultants found before you --

TERESA ROGERS: I=m trying to remember how we did it at Smith Mountain.

MARK RIEDEL: This phase that we=re in it=s a discovery phase and so the purpose is not to find a specific problem. The idea is that during the scoping phases of the ILP process people raised issues and said we would like certain studies done because there might be things that we are unaware of.

So, this is really a discovery phase. So when the reports come out they get sent to AEP to make sure there=s no private information or anything like that, FERC gets them and then for the study update we present basically an update report, we go through and present it, got feedback on it and we get feedback through the whole process.

Basically the whole purpose of that is to make sure that the study is being conducted according to the original study plan and that there haven=t been deviations and if there have been deviations, either in schedule or scope, those have to be worked out with the

FERC since the study documents are now official licensing documents.

So, the point is to say this is what was done, you know, we=ve done what the study plan said we were supposed to do and these are the findings thus far. At that point the FERC will come back and say, okay, you=re doing things properly continue or it will say you=re not going to make the time line or you=re forgetting this objective, you know, you=re getting a lot of scope. But really it=s a chance to, you know, how is the study progressing, you know, are we doing what we were supposed to do as was outlined in the scoping phases and scoping between you folks and the FERC.

ALEX BRUNTON: From my point of view, with the previous studies the reports that we=ve submitted haven=t been, quote, massaged by AEP, our findings have been passed on to the --

LAURA BULLARD: That was what I was hoping to hear. That was my concern. I mean, no offense to anybody but I just wondered if they would be censored in any direction or not. Okay. Thank you.

TERESA ROGERS: Do you have anything to add on process as far as an initial study report and initial study meeting?

JOHN SMITH: Not really. I think they accurately described how it works. I mean, you may see AEP or Appalachian Power interpret things differently when they get ready to do their preliminary licensing proposal or draft application. I mean at that stage they=ve got to come in and say what they think about all this and what they=re proposing or what they=re not proposing.

So, I mean it=s perfectly normal, I don=t know about massaging, if that=s the right word, but interpretations you might see some of that at the very end.

TERESA ROGERS: And it seems like we=ve been doing this forever but we=re still very early in the data collection process and some studies will still be ongoing at that time and we won=t even have the study completed by November just because of the nature of the study.

So it=s more of an update, you know, where we are in the process at that point, but there will come a time where an actual study report will be issued for that study.

LARRY BANDELIN: Larry Bandelin. The actual environmental document is your document; correct? You are the -- you issue the EA?

JOHN SMITH: Yeah. EA or the EIS but I was talking about, you know, if they file it after all the studies are done.

LARRY BANDELIN: So you would be the final arbiter on any questions that arose between consultant input versus AEP output? EA is your document; correct?

JOHN SMITH: Right.

BILL KITTRELL: But it will be very important, I think, you know, that January >08 comments on the meeting summary will be due from the participants. That is our chance as participants to comment on this first year study.

TERESA ROGERS**:** Right.

BILL KITTRELL**:** They in turn are submitted -- or Appalachian Power, you know, submits those comments and so forth to FERC and that=s when a determination is made on whether there is going to be a second field season on some of these studies or additional studies if necessary. So, it=s going to be a very important time for all of us I think to comment.

TERESA ROGERS: In that meeting summary comments go directly to the FERC; correct?

JOHN SMITH: Yeah.

TERESA ROGERS: That=s an official comment filing.

JOHN SMITH: You kind of would, and maybe it=s wishful thinking but FERC would like everyone to take ownership in what the studies say. I mean, that=s why we have all these workgroups and encourage all this discussion. How that plays out remains to be seen. That would be what we would like to happen.

LAURA BULLARD: Laura Bullard. I appreciate that and that=s why I was getting the feeling that we=re here at the front end but then we don=t get to hear the results before you all file the report that we comment on.

TERESA ROGERS: That=s where we are now, another project I=m working on, the reports are out and we=re going through the study results and what they mean and people are commenting to us on the reports. We=re trying to work out the comments in the workgroup meetings and that type of thing.

Any other questions or comments. We=ve got about 20 minutes --

JOHN SMITH: I should know this but I don=t because it=s not my project, but the other projects where you had the examples of Smith Mountain, when is that going to be filed with the

preliminary application? Do you know roughly?

TERESA ROGERS: That=s a rather large --

UNIDENTIFIED SPEAKER: November 2.

JOHN SMITH: Of this year?

UNIDENTIFIED SPEAKER: Right.

JOHN SMITH: So that=s something you guys can look at too once it=s filed to see how --

TERESA ROGERS: That=s the PLP in November and then application --

JOHN SMITH: Now if things were determinant on that project that would be on the record.

TERESA ROGERS: Oh, yeah. There are other projects out there now --

JOHN SMITH: Right.

TERESA ROGERS: Anything else? But I will add, it is very important when you make your comments to always go back to the study criteria on the study criteria. It is very important to refer back to those and project nexus and that type of thing.

Okay. If anybody wants to see these up close just let me know.

[Recess.]

TERESA ROGERS: I think we=re ready to start again.

Sedimentation and Erosion Study Update

MARK RIEDEL: My name is Mark Riedel. I=ve seen most of you before. I work with Baird & Associates and I=m the project manager on the sedimentation study. I=ll just give you an update on where we=re at with things.

I=ll go through the objectives, the relicensing relevance statement, the project tasks. I=ve got these different bullets in here, a box, if it=s a square box that means that=s something we haven=t started yet. If it=s this little arrow that means it=s a task that we=re currently working on. If you see a check that means we=ve completed that task or that aspect of the project.

The project schedule, you can see where we are in terms of that. The objectives, first, update the surface area and storage volume curves for the Claytor Project, determine areas of sediment accumulation by comparing updated bathymetric maps to pre project mapping where available, determine the rate of sediment accumulation during the term of existing license and project accumulation during the term of the new license or estimate.

Objective 4, here=s a big one. Determine impacts of the Claytor project operations on downstream sediment dynamics including assessment of how altered sediment dynamics affect downstream channel morphology, identification of what impacts such physical changes have on beneficial uses and characterize continuation in sediment impacts from the Claytor Dam to Route 460 bridge at Glen Lyn.

Objective 5, identifying extent of problems associated with the accumulation of sediments within the reservoir and downstream of the dam, including impacts on recreation, fisheries and aesthetics, identify sources of sediment discharging into the reservoir and then investigate methods to prevent or reduce reservoir sedimentation impacts.

As we go through and talk about these there is obviously some synergy and some overlap with other studies. Sources of sediment discharging into the reservoir, I=m working closely with Dr. Brunton on the erosion study because he=s doing all the shoreline erosion and obviously shoreline erosion can be a potential source of sediment.

Looking at the effects of the project on other beneficial

uses, that sort of thing, obviously that=s why the other studies are going to be very important in coordinating with those folks.

So, where are we? This is where we are. This shows the entire watershed area for Claytor Lake and all the lands that feed into Claytor Lake. You can see Claytor Lake there as well. This is important when we start looking at watershed -- sediment sources to the water -- to Claytor.

Here=s Claytor Lake itself and we=ll be doing some work there. Then for the river server, the downstream portion, here=s Claytor Dam and it=s this section of river up to Glen Lyn. The reason I show this is that one of the things we=re going to be doing as we=re doing the downstream work, one of the most important things we=ll be identifying are geologic controls.

There are a lot of faults in this region, there=s a lot of changes in bedrock type, there=s a lot of things that have potentially strong impacts on what we expect to see, both within the lake but also the flow system down river and it=s important to address those, kind of the natural template, if you will.

The relicensing relevance statement: sedimentation within the project reservoir and downstream river can have significant

impact on recreational uses.

Shoreline development and project generation. Identification of where sediment accumulation may be most pronounced we=ll provide information relative to the development of potential control measures if needed.

The project tasks that we came up with were designed to directly follow the objectives in the sedimentation study plan. So when we complete the tasks we=ll have everything we need to satisfy the objectives.

They were developed during scoping and study plan drafting phases of the Claytor integrated licensing process last year and so some of the working group meetings folks were giving us input, guidance, in developing the study plans and the tasks that would support them.

So what have we=ve done? We=ve conducted a general literature review, we=ve gone out and pulled in all the literature we can get for Claytor Lake, looking at sources of information for general reservoir sedimentation within the Appalachians, obtaining digital and physical data for development of the sedimentation study. Here our your notes, there=s

an arrow on the bathymetric survey. That means we=re in the process of getting that. This is what Brady talked about before me. Most of these other ones we=ve done the work we need to do.

We pulled in all the state and federal water quality studies, all the TMDL=s, the geology, geologic maps, soil reports. We=ve actually been very fortunate, we found a wealth of geologic information. There=s been a lot of studies that have been done to inventory coal reserves and that sort of thing. That has produced some great data.

Land use information, climatic data and all appurtenant reservoir management studies and reports. So, now I=m going to go through objective by objective and talk about the tasks and where we=re at. Objective 1, updating the surface area and storage volume curves. We reviewed the existing curves and as soon as the bathymetric data comes in we can start on these other tasks, develop the new area of volume data, develop the new curves, determine changes in area in volume.

Basically what this looks like is we=ll have the existing curves and we get high res bathymetric data, which this is a sample, I=ve got a better image later that I=ll show you and then we can develop new curves that show the change in storage capacity

and surface area of projects with data.

Objective 2; determine the areas of sediment accumulation. We=ve done the literature review. We=ll be comparing pre project and current storage volume curves, comparing pre project and current bathymetric mapping, converting the pre project to digital. Corps of Engineers I believe are going to be doing that and that=s wonderful.

Then we=ll be able to determine at what elevation within the project we=ve seen losses in storage. Now this is the type of data that I mentioned I would show an image of.

This is the high res bathymetric mapping product that was developed by OSI, the same firm using the exact same methodologies that they are using on Claytor. This is somewhere else. But what you can see is when we take these data we generate a bathymetric model, we overlay it with a color photograph and we can actually see all sorts of things.

We can see old bridges where there used to be bridge crossings. Up here you can see an old road bed that people drove to get down to the bottom of the river. You can see the old river channel. From these things you can get all sorts of information. You can figure out where is there sedimentation, where is there not

sedimentation by knowing the relative size of these types of features, how wide a road is going to be, how high the channel banks are going to be as you come up and you start to see the channel disappear because it=s buried under sediment, it gives you a sense that, okay, these banks are on the order of two to three feet high so in this area we know we have at least two to three feet of sediment.

It=s a way to verify the chirp data and some of the other data that we=re getting, just a way to visually inspect them.

We take those data and we generate what we call shoaling maps. In this figure we have a map of a reservoir and what we have done is over the operational pool limit, in this case it=s a two foot range, we=ve mapped that zone as white. So over that operational pool limit at the lower limit any area that=s white would be exposed to sediment.

We also took the historical record low water elevation for this area and we delineated that as this blue line. You see this blue line. You can see it better over here. So during the historical low, which would be during the maximum or the record drought during the period of operation, here you see the blue line is here so all this area between the blue and the white that would be exposed to sediment.

So this is a shoaling map. You asked about what do the

stakeholders get to review and what do they get to comment. We generated this figure, we had it in a report and people didn=t like the way it was. They said there are areas where they=re showing us sedimentation and we want those things highlighted. So they were in the report but they wanted those brought to the forefront.

So we got the feedback and we sat down and identified the locations of these places and the things that they wanted explicitly named so we named them and we included photos, because we also go out and we do fieldwork and we look at these sites and we make sure that everything is matching.

So in this case on Little Indian Creek this is what the shoaling looks like at the lower pool limit from our boat survey. So we added these in at the stakeholders= request because they wanted these things up front so that it was easier to see.

Then something else we generate is this is a map that just shows the volumetric change in the storage capacity as a function of depth across. You=ve got the upper pool limit getting down to what we would call a depositional zone.

So here the bars represent the change in volume between each elevation, the black line represents accumulative volume metric change. So in this area, which is at the upper pool

limit, we=re seeing shoreline erosion. So the volume is increased. There has been shoreline erosion.

That material that=s been eroded has formed the littoral area or the shelf so we=ve seen a big decrease in volume below, getting into this depositional zone, below the lower pool limit. Then continued sedimentation coming from watershed sources, fluvial sources and for the total change in volume. These are the types of products that we=re going to be developing. Objective three; determine sediment accumulation rates during existing and new license terms.

Existing rates are being calculated from the results of objectives 2 and 6. So we see how things have changed. But looking at the future rates means that somehow we have to predict or simulate what=s going to happen in the future and so we will be developing a hydrodynamic reservoir sedimentation model. All that means is -- hydrodynamic just means the water is flowing.

It=s a fully three dimensional model. I=ll show you some examples of what the output looked like. The model will be calibrated and validated to current flows, to currents and flows within the reservoir from field measurements. Dr. Brunton will talk about that.

The simulations that we=ll be looking at will be actually pre sediment. That=s for the watershed so we can ignore that. I don=t think this was there pre settlement. We=ll be looking at the existing conditions and we=ll also be looking at future scenarios under different land use and climatic situations.

So we can look at climatic extremes and we can look at different types of development patterns that we would anticipate coming in the future. Since we don=t know what=s going to happen in the future this kind of provides us a window. If there is a worse case scenario, the weather is really bad and there=s a lot of development it could be this or, you know, that sort of thing.

The calibration and validation is going to be to measure currents within the reservoirs using acoustic Doppler current profilers. Reservoir level and discharge data that we have gotten from Teresa and then watershed inputs, which are objective six.

So what these models look like -- this is just a still image but, for example, we have a series of cross sections cut just to show temperature profiles and velocity vectors, which are the arrows. This runs for the entire reservoir and so we get currents, we get sheer stress and so from that we can get patterns of erosion and deposition.

So, for example, this is -- here we have a tidal effect, so the water levels are going up and down but that=s much like the up and down that we see going in the reservoir that=s used for hydro power generation.

Areas where we have green the currents are scouring sediments. In the areas where we=re getting red we=re seeing depositional patterns. That=s what the model allows us to do, again for the whole project. So running it under these different scenarios we can generate maps like those shoaling maps that will show under these different scenarios these are what we expect sedimentation patterns to be.

Now I went through that pretty quick, are there any questions at all or just keep rolling? I=ve either lost everybody or it=s extremely boring or both.

Objective four; determine the flow modification impacts on downstream sediment and dynamics, including assessment of how altered sediment dynamics effect the downstream channel morphology. So we=ve done all of our fieldwork planning, we=re getting ready to do our field reconnaissance work so this is going to be below Claytor. This is from Claytor to the Highway 460 bridge at Glen Lyn.

Identify how physical changes impact the beneficial uses. We=re working on this right now. We=ve done the literature review pulling results from other studies, getting stuff from DEQ, fisheries, other stakeholders.

Then characterizing continuation in sediment impacts from Claytor Dam to the bridge. We=ll be developing mapping from the field survey data that we gather, so obviously we haven=t started any of this yet because we need the fieldwork results, reconstructing our sediment flux, profiles along the river transect.

So at cross sections along the river we=ll see sediment transport dynamics, size distributions, morphological characteristics and then this is being done concurrently with the erosion study which will be addressing the erosion side and the objectives for that.

Then constructing river morphologic profiles along the river transect. So this will include things like we=ve now crossed the fault or we=re in an area where we have head control from the bedrock outcrop, so we=re pulling all that information. What type of river profile. You know, what kind of river are we seeing here.

Objective five; identifying the extent of problems associated with accumulation of sediments within the reservoir and downstream, including impacts on recreations, fisheries and

aesthetics. Obviously again we=re doing the literature review, local media sources are one of the things that we really rely on. We=re getting results from similar relicensing projects, incorporating results from the other Claytor studies.

Our studies, I say our but the sediment and erosion studies are physical studies. I=m a physical scientist. So we=re focusing on the physical side of this, where there is going to be sedimentation, where it might potentially be posing an issue. For the biological side that=s going to be going on specifically in the other studies and then summarize results that we obtained from the state.

Objective six; identify the sources of sediments discharging near the reservoir. What we will be doing is developing a watershed sedimentation model. That one slide that showed the large watershed area for all of Claytor Lake. We=re going to be modeling hydrologic processes, fluvial processes, soil erosion processes across the entire watershed.

It will be calibrated to observe data and then we=ll look at future development scenarios. So a lot of times you see in mountains, we have agricultural land, that=s often land that develops first or is sold to developers, along major highway routes. There are different predictor variable that we use to anticipate or provide our

best estimate to where we expect to see development and disturbance from construction activities.

We=ll feed that into the model. We=ve already done our analysis of impervious surfaces. We=re pulling effects of climate change and climate variability and very importantly obviously are the effects of upstream projects.

We put in all the parameters for those dams. There are measured outflow rates, storage volume curves, so the model can predict how much sediment is going fall in those dams or be trapped in those dams before it comes downstream.

Characterizing erosion from the shoreline and upland sources. The actual shoreline erosion itself will be in the erosion study. Developing watershed sediment budget. Ultimately identifying hot spots of erosion and sediment yield within the project area.

So what does that mean? Well, first I=ll show you the calibration of the watershed. We have a long term climatic gage at Allisonia. We have a matching USGS gauge on Big Reed Island Creek. It=s a fairly large watershed for calibration. It=s larger than we would normally use, it wraps all the way around way up there pretty much all the way to its confluence with the New River.

But we=ve got the important matching records for climate and USGS gaging data. Also very importantly we have representative train and land cover within this watershed are quite representative of what we see throughout the larger watershed itself. So the model will be calibrated to these data for the observed period of record from those stations.

When the model is calibrated we run it for the entire watershed for the different types of scenarios and when we end up generating our maps that show by sub watershed the amounts of sediment yield that these watersheds are producing, delivered to a stream and we can also see how much sediment is moving through each sediment stream and making it to the project.

We can generate a map that identifies, okay, what are our hottest source areas within the watershed and that=s what this model allows us to do. We can then run the development scenarios, we can change the land cover characteristics, etcetera and generate additional maps that show similar things.

In the future we would expect, you know, to see maybe these green watersheds turn red or something like that.

LAURA BULLARD: Mark, may I ask, are these based on current land use?

MARK RIEDEL: Yes.

LAURA BULLARD: You have a standard --

MARK RIEDEL: Actually we developed a suite of model runs. We develop -- we calibrate to the current land use conditions and the land use over the period of the calibration record, we then for the entire watershed we develop a pre settlement map that shows, okay, our best guess at what the pre sediment sediment yield would be is this.

There=s a lot of data in the Appalachians that have all kinds of numbers about sediment yield, so we can see them and make sure we=re getting representative values. We run that. We then run the current situation for the entire watershed. We can look at the differences between the current condition and pre sediment and that will give us an estimate of how much our activities, our land disturbing activities, primarily agriculture, long term agriculture, original forest clearing, you know, what the original forest clearing was well before the dam was built, but, you know, what our land disturbing activities that were there, the effect it had on sediment yield and then forecasting it into the future.

LAURA BULLARD: So you assign yields to certain land use, agricultural versus --

MARK RIEDEL: No. No, we don=t assign yields. The model is a physically based model and so it takes the climatic records for the region and it runs through storm events with different storm intensities and it deposits that rainfall onto either the forced canopy or a highway or whatever land cover happens to be there.

We get all the land cover data from our GIS database so we have land cover across the entire region and then it tracks water, if there is forced canopy, if there is adequate infiltration rates it=s going to infiltrate.

If there is exposed soil it will go into doing erosion computations. Say, okay, the water has this much energy the soil has this level of erodibility, this level of self adhesion while the particles erode. If it erodes it predicts how much and then it predicts the transport capacity of the over land flow.

If there is water running over land what is the transport capacity, what size particles can it move, delivers it to a stream and so it=s a physically based model. So once -- it doesn=t take much to calibrate it because it is a physically based model. But we do calibrate it to the observed data.

BILL KITTRELL: How much fieldwork do you do going out and actually checking for hot spots and doing some

groundtruthing of the current land use layers that you=re using and that sort of thing? You=re using Big Reed Island Creek as a calibration for the watershed; right?

MARK RIEDEL: Uh-huh.

BILL KITTRELL: And that=s expanded on the entire water, which is huge, but how much fieldwork do you actually go out and look for those hot spots, look for changes in maybe updated land use patterns that maybe the GIS layers don=t have? I don=t know.

MARK RIEDEL: Well, there=s a certain -- we have a week of fieldwork scheduled and what the fieldwork consists of is we take aerial photographs or we take printouts from the GIS. What we have is 1992 language data and 2001 language data to feed in the model, we don=t have current conditions so any changes between 2001 and current we don=t have, so the model gets calibrated up to 2001.

We take those data, go out in the field and then we also use the farm service aerial imagery that was just shot this past September and we can see clearly what kind of land cover is there. We do spot checks and we know that realistically you=re going to see some things are off.

Typically where we see the land cover off is you might

see something labeled as being like a fodder crop and it=s actually pasture. That=s the most common one. You=ll often see those being about eight to ten percent off where it would be mislabeled one or the other. You know, it=s either been labeled as fodder where it=s actually pasture or vice versa. From a sediment yield perspective that doesn=t have that big of an impact.

Generally you don=t see, you know, land being categorized as being urban and it=s forest land. We just don=t see that. There=s such a huge difference in reflectance, especially with the 2001. The 2001 data developed by MRLC are incredible compared to 1992. Even the 1992 data are pretty darn good but the 2001 data are incredible.

But we spend a week. We go out and take all the sheets with us. There=s aerial photos. We identify random sites. We go around and we validate those uses. As far as what we do for construction activity and hot spots and that sort of thing we=ll review the erosion control ordinances that are in play, we=ll talk with the counties, the SWCD=s.

We already have all the ordinances, we pull all of those for the State of Virginia and then we go up and we see, okay, what=s actually being implemented on the ground. Are they being

implemented, if they=re being implemented are they being implemented correctly and that sort of thing.

Then we take that into account when we run our development scenarios. We=ll run our development scenarios we say, okay, let=s assume everybody does a really, really good job and we have 100 percent compliance, you know, compared to what we actually observed. Maybe we saw yeah, they=re implementing them but they=re not being done correctly so that=s 50 percent effective or something like that.

Does that answer your question?

BILL KITTRELL: Yeah. How do you calibrate with Big Reed Island Creek, explain how you would calibrate it.

MARK RIEDEL: Sure. We run the model for the period of record using observed data, the observed climatic data and we -- it=s actually entered in the processor, you start just doing the water balance. You start doing annual water balances and once we get the annual water balances calibrated we then start looking at monthly yields, separating out the base flow from over land flow.

There=s some standard methods. We=ve done enough modeling in the Appalachians that it doesn=t take that much to calibrate it typically for us. We=ve got a number of large watershed

models that we developed. The parameters for the different types of land uses are fairly consistent, you know.

You reach a point of no return to where the best data you can get from the USGS is mean daily flow. The model doesn=t necessarily put out mean daily flow. So, you know, you=ll get, you know -- you might get a really, really high peak reported one day but if it occurred at 11:59 at night, there=s the slight just, you know, if you=re off just a little bit in your routing it might show up the next day.

So you can see that a real extreme peak might not match but it=s not that the water is not there that=s being predicted it=s how it=s being reported by the USGS and how it=s being given in the model. But you get down to that point that=s the best you can do.

KERRY BLEDSOE: Are the metrics that you use to set these categories are those standardized? I guess I=m wondering what the --

MARK RIEDEL: Oh, you mean these colors?

KERRY BLEDSOE: Yeah. What tons per hector if that=s the sediment yield metric you=re using? What=s the average and what would be extreme for example? Is that standard?

MARK RIEDEL: No, this is -- the way we colored this map was to make it so that it is easily usable as a local planning tool. So it identifies your hot spots compared to the average for the region. Anything below average would be considered, especially the dark green this would be background so this would be like forest, undisturbed forest.

Average is just average across the entire area. What that does is, okay, if we=ve got limited resources, limited funding and we want to know where we need to focus we=ll focus on the red ones first, those are the low hanging fruit. We can get the biggest bang for the buck on those red ones.

Now the types of yields you=re asking about, sediment yield enforced in the Appalachians is typically in the order of .01 to .1 tons per hector per year. Those are the, you know, generally published values. As you get into larger and larger watersheds it=s hard to say because then you start getting mixed land uses, you start getting more of a land use legacy.

But once you start getting agriculture and development you=re often well over one ton hector per year. You can easily get up to, you know, ten to 15. During construction, I mean, you know, construction is not there the entire time and Virginia law is if you have

a site that any trip soil erosion ordinances you=ve got some days of seeding.

But at any given day in the Appalachians there=s a 30 to 40 percent chance of precip.

KERRY BLEDSOE: So these are set for the Appalachian regions.

MARK RIEDEL: Yeah.

KERRY BLEDSOE: So if you=re in the Midwest all those values might shift?

MARK RIEDEL: This is just relative to itself.

KERRY BLEDSOE: But you can apply a number of tons per hector to that because we are in an area of a lot of known data?

MARK RIEDEL: Well, the model actually puts out tons per hector per year.

KERRY BLEDSOE: Okay.

MARK RIEDEL: The model puts out numerical values but nobody wants --

LARRY BANDELIN: But from the very low extreme you can apply at least a range of sediment?

MARK RIEDEL: Oh, absolutely.

LARRY BANDELIN: You need that to know the

capability of how much filling you=re going to get; right.

MARK RIEDEL: Right. When the report comes out -- the graphs are just for display purposes. The reports include all the tabular values of, you know, X tons per hector per year per sub watersheds. All the data are included in the report but nobody wants to look at a table full of data, but they are included on the DVD=s, in the, you know, in the project archives. They are submitted as part of the study.

ALEX BRUNTON: I don=t remember this particular project but was it a plus or minus one and two standard deviations where the offsets were like low and very low categories?

MARK RIEDEL: Yeah. This is statistically based. The average is the median and then we often use either the standard deviations or the quantiles. So that=s a statistical distribution.

Objective seven; investigate methods to prevent or reduce reservoir sedimentation impacts, eval existing sediment control measures, identify potential measures that may be adopted to reduce future sedimentation and preserve watershed resources.

Specifically looking at trying to preserve the soil resources, practicing good soil conservation, making sure that=s being done, aquatic systems and ultimately, from Appalachia=s

perspective, reservoir longevity. That=s really one of the biggest concerns.

BILL KITTRELL: How specific are these recommendations going to be? It sounds pretty general, evaluate existing sediment control and identify potential measures, that sounds very generalized. How specific are those recommendations going to be?

MARK RIEDEL: What we do -- generally what we do is we say okay, if we take the existing situation and we say, okay, this is under the existing situation and we observed, I=m just throwing a number out, 50 percent compliance, what if, you know, people get onboard, the community gets onboard, they support erosion control officers and stop shooting at them or whatever is going on and they can bump it up to 80 percent.

How do these colors change. If they can bump it up to 90 percent how do these colors change. We=ll make recommendations about how that can be done but we=re not going to say landowner X, Y or Z, I mean, that=s really beyond the scope of the study. But, you know, a lot of times you can make a lot of headway just by making sure the existing ordinances are being enforced, implemented properly --

BILL KITTRELL: You can have your compliance off some in some counties.

MARK RIEDEL: Yeah. And then also make a decision whether or not you want to ratchet them up. The state are just the minimum recommended but if folks living around the lake or whatever say, hey, you know what, we want more than the minimum, we want more than a two year design on that because the lake is more important to us than that.

We want a five year vent or a ten year vent. So we want stricter erosion control. That=s one of the things that we=ve seen on other projects is people are like, holy cow we=re only doing a two year we need to ratchet that up. It=s like well, that=s a community decision not a state decision.

LARRY BANDELIN: Mark, you mentioned cow which is good because it reminded me of a map I was looking at last night of a grazed area in the watershed pretty close to where I live. You can actually see the paths of these going up and down these very steep erodible soils. You mentioned earlier that foraged crops and grazed areas are producing approximately the same amount of sedimentation --

MARK RIEDEL: General. That=s a generalization.

LARRY BANDELIN: Is that from data here in the Blue Ridge or Appalachians?

MARK RIEDEL: I don=t have anything specifically from this valley, in this region but in the southern Appalachians and North Carolina you get further north, west of here into West Virginia and kind of the northern, north central Appalachians, particularly some farming studies that have been done, it varies a lot from landowner to landowner or from parcel to parcel. But, you know, if you=re a foraged crop there=s still enough time there where you going to have bare soil during a rainy season and you often get enough --

LARRY BANDELIN: When you talk forage crop are you talking things like alfalfa or corn?

MARK RIEDEL: Fodder for animals. So alfalfa, you know, for --

LARRY BANDELIN: Which is a cover crop in itself where corn is not.

MARK RIEDEL: Corn is a --

LARRY BANDELIN: From my observation of this watershed I think that the most abusive -- I=ll rephrase that, probable input of sedimentation is probably from grazing, cattle disturbance of the soil.

MARK RIEDEL: We=ll see what it tells us.

LARRY BANDELIN: You can handle that kind of information?

MARK RIEDEL: Oh, absolutely.

TERESA ROGERS: I guess I just want to make one clarification, you won=t actually be designing BMT=s or anything as part of this study?

LARRY BANDELIN: No. No. BMT=s have existed for 50 years --

MARK RIEDEL: Okay, so I covered that slide. Okay, the important stuff, reporting. We had a pre project meeting in January. We=re here today for the May study update meeting. There will be a study update meeting with the interim study reports in November. The draft final report is going to be coming out sometime in January 2008. The final report with feedback, etcetera somewhere in April, May 2008.

There will be bound copies, you know, hard copies that you can take home and page through and scribble on them or whatever you want to do, digital copies and all project data, model files, results, read me files explaining what=s there, how it was done, methodologies, all the references used absolutely everything on

DVD=s because these things end up being huge and there=s no way to get them on CD=s.

Tables to your heart=s content. Sit there with a magnifying glass and look at all the 8.5's. The schedule where are we at, basically anything that=s blue is stuff that we=ve done. We=re getting into May. I haven=t colored May=s blue yet. As soon as we get the bathymetric data we can knock this out, same thing down here, but for the most part we=re doing pretty good.

Well, let me go through these, go through the tasks or the objectives, the updated bathymetric curves, looking at existing sedimentation, looking at the changes in sedimentation within the project, so this is within the reservoir, downstream impacts, that would be objective four.

JOHN COPELAND: Question.

MARK RIEDEL: Yeah.

JOHN COPELAND: So you did some fieldwork downstream in March and April?

MARK RIEDEL: We have done preplanning. This was all fieldwork preplanning. The sites that we=re going to be using, the methods that we=re going to be using. Using mobilization is what we call it. But, no, we haven=t actually been out. We=ve scouted sites,

we=ve determined the type of boats we need, we=ve thought over intake out points, all that sort of stuff.

Summarizing the sedimentation impacts, identifying watershed sedimentation sources, looking at mitigation measures. For example, we=ve already pulled in a lot of the state ordinances and standard methods that are available. This is all like the lit review and all that sort of thing.

We=ve had our pre study meeting, we=ve had, this is our main meeting here. This is actually -- yeah this would be November. We have a November meeting in here somewhere. This was in case we have a working group meeting interim. That I believe is that.

LARRY BANDELIN: Is it within your purview to look at wave induced erosion or is that somebody else doing that?

MARK RIEDEL: Up front.

KEVIN BYRD: Kevin Byrd. What data are you going to use to assess the future land use?

MARK RIEDEL: We=ve done a number of land use projection studies in the Appalachians. I used to do a lot of research with SAMAB, Southern Appalachian Man and Biosphere Reserve Program, and there=s a number of land use development studies for

the entire southern Appalachians, including all of Virginia and West Virginia.

Also I used to work for the forestry service. We have a number of projection models that have been developed. That=s what we use as our basis. We then look at development patterns within the watershed so when we=re out doing fieldwork we look, you know, transportation corridors, truck routes.

If the road is a truck route the development is going to be very different than if it=s not a designated truck route. That sort of thing. Existing land use. It=s a lot easier to develop ag land than forest land.

KEVIN BYRD: Will you all be open to looking at local plans? The reason I ask is that we=re working on a comprehensive plan for Pulaski County currently and there are significant changes with infrastructure that they are discussing, which may impact south of the lake area.

MARK RIEDEL: Yeah, absolutely. If you can send that to us, you know. Now the land cover, the land use that -- we=re only doing that for the Claytor Lake watershed. We=re not doing anything down river. Down river is just hydraulic survey and fluvial process.

KEVIN BYRD: That=s see what I can do to be able to

provide you with it at this time. It will be the Pulaski County area.

MARK RIEDEL: Okay. Yeah. Anybody else?

BILL KITTRELL: Getting into the New River Planning District work they=re doing, I know they saw a presentation last week I think about trying to incorporate marine infrastructure and other types of low impact development practices, are those kinds of recommendations that if you all get involved in in terms of what the Planning District is trying to assess or is that a little too specific for --

MARK RIEDEL: Yeah, that=s a little more specific than what we would, you know, than what we would get at. I guess those things are certainly pertinent but we=re not, you know, we=re really looking at such a large scale of the watershed scale and we=re looking at, okay, what are really the major sources going on.

We do account for the fact that, okay, this area will likely become developed and so what would we expect to see with changes in the runoff of sediment yield during development, soil, bare soil situation, what=s the worst case. This is how bad it could be.

If you have a big rain event bare soil they hadn=t seeded yet, there=s no mulch, this would be the worst case scenario.

BILL KITTRELL: Well, inputs, you know, into the river upstream obviously, you know, agriculture is going to be a primary despondent, but when you get down to the scale that the landowners around the lake are concerned about, you know, that is a much smaller scale when you=re talking about impacts of the homeowners from, you know, how much is developed.

Also, when it gets back to a shoreline management plan and how much development should take place when take work quality, aesthetics, when you take these other important issues. I guess that=s something to think about when we get into at shoreline management planning too.

MARK RIEDEL: We do very directly address the changing nature of landscaping. You know, if you=re in a forestry situation in the Appalachians it=s typically rare to even see over land flow that generates soil erosion.

The larger sources of sediment are going to be from slumping, mass wasting, hill sloped creek, which can actually be a fairly significant source of sediment, but you=re not going to see erosion from over land flow because generally speaking you just don=t have it. If there is such a capacity we would have it in half the rainfall in this region, so 50 percent of your rainfall right there is gone

before it gets to the soil.

But then as you start to get into agriculture, agriculture tends to be a chronic source. Depending on the type of agriculture, you know, you=re going to see different magnitudes of increased sediment yield and we=ll talk about that report. If you then start to get into a development scenario, development is an acute source because you tend to have a very intensive disturbance of the soil often there and we=ll talk about that.

It will be a big impact but it=s usually short lived. So the question is what are the tradeoffs, what are important. Once the development is done and you=ve developed an area to, I wouldn=t say it=s permanent, but to a stable, you know, long term future use, be it residential, commercial or whatever, sediment yields from soil erosion is typically not much of an issue anymore, assuming they doing a good job at the site.

Most of your erosion becomes fluvial sources. You=ve got all the runoff from impervious surfaces, you then have erosion of your drainage network and then slumping and, you know, failure of stream lines. So the sources are very dynamic through time depending on where you are within that development or that land cover change regime and we will address that in the report.

MARY RHOADES: Mary Rhoades. If you have time, I think you said you finished reviewing all the information on sedimentation up to this point; right? So I=m just kind of curious if you can tell us in a small amount of time what you found, how good are the data? From what I understand there=s probably not much out there.

MARK RIEDEL: Well, what we reviewed are sources of information that give us background information to help us look at sediment yield. So things like rainfall runoff studies, if there have been development studies. There=s some experimental watersheds that aren=t far from this region. They have looked at these sorts of things. So we pull in results from their research. We pull in studies that have been done by the state, we pull in studies that have been done by parks and --

MARY RHOADES: Well, I mean specifically for Claytor Lake, not even considering the watershed, just the lake itself, you don=t have solid data from the past about sediment issues; right?

MARK RIEDEL: No, that=s what=s being developed --

MARY RHOADES: That=s what=s being --

MARK RIEDEL: Right.

ALEX BRUNTON: Not until we have the bathymetric.

LARRY BANDELIN: This is a statement for all of the consultants, when we, the local conservation people are trying to impact things locally it=s most important to have consultants put information, even general information into their reports because the further you are away from the site and the more you=re paid the more valuable your input is.

A local person=s statement, even though it may be exactly the same as yours, carries less weight than yours would, particularly if you are paid and come from a long distance. It would be better if you would come from Afghanistan and they paid you an incredible amount.

MARK RIEDEL: I=m very happy to be here. Yes, I will tell you what we have learned today.

LARRY BANDELIN: I was a little bit tongue and cheek in that. Adding what seems to you to be general statements of improvement or condition is very valuable at the local level because you are getting paid to do it, even though we know those things before you write them, but to have it there to say look, Baird said this or Normandeau said this or this consultant said that is very important to us.

MARK RIEDEL: I can tell you, the feedback we=ve

gotten on other reports that we=ve done, the CD=s in particular have just embraced them, they=ve been thrilled. My experience living in, I lived in rural southern Appalachians for five years and it=s a lonely job to be, to work our conservation district or be an erosion control officer. They=re underfunded. If one exists they=re underfunded, there=s not enough of them.

SARAH ALLEN: I think Larry is suggesting we get paid more.

MARK RIEDEL: You can take --

LARRY BANDELIN: Or move further away, either one.

MARK RIEDEL: With that I=ll pass it on to Dr. Brunton and he=ll tell you all about the erosion side effects.

Sedimentation and Erosion Study Update

ALEX BRUNTON: Good morning, my name is Alex Brunton. I=m heading up the erosion study. Obviously my study is very closely to Dr. Riedel=s sedimentation study. So we work very closely together on these projects. We share a lot of information and there is a quite obvious overlap between us which is why we need to work so closely together.

MARK RIEDEL: Too closely sometimes.

ALEX BRUNTON: Too closely sometimes. We fight like

an old married couple sometimes. I would just like to go through the preps of the study, the objectives, relicensing relevance and then update something on the project tasks that we=ve been looking at to date and where we are on them.

So, the purpose of the erosion study is to determine the effects of project operations on the shoreline and also river sediments in the Claytor project area and also in the New River downstream from the dam. So, just a quick shot of our study area and then straight into the objectives.

Our first objective is to identify the effects of project operations on erosion from the shoreline of the reservoir and also of the river banks downstream as far as the highway 460 road bridge.

What this entails is part of task two, which is identify the existing shoreline conditions and also the existing protection measures on the reservoir and to develop GIS mapping layers of these.

Objective three; we then need to say something about the degree of susceptibility of the areas along the reservoir and downstream to bank erosion.

Objective four; identify the areas subjected to accelerated bank erosion. That=s accelerated bank erosion is a little

bit of a loaded term because that implies that we need to determine some form of statements about what constitutes a natural rate of bank erosion.

That=s a little difficult on a manmade reservoir, because of course no reservoir no erosion is essentially the natural background rate. So we have to consider what we think is a natural rate of erosion and that may be erosion due to the natural climatic conditions in the region and then we determine accelerated erosion as a result of things like boat traffic or variations in projects, operations.

So when we=re talking about accelerated shoreline erosion what we=re really talking about is trying to identify the different component factors in the causes of shoreline erosion. Part of this really involves assessing the effects.

Objective five is wind; looking at recreation boat traffic and how the waves from these different sources impacts our shoreline erosion.

In Objective six; it=s to then look at the measures that we can implement to reduce erosion around the reservoir and also downstream to the perhaps operational modifications, physical structures, differences in vegetative cover.

Objective seven; is to determine the effectiveness of the existing erosion control measured under the Claytor reservoir guidelines. We want to identify the conditions into which different biological measures, rip rap, bulk heads are considered adequate or appropriate for controlling erosion and wear, also where no additional protection is needed.

We like to look at erosion control measures in attempt to determining their effectiveness, cost, longevity and also compatibility with the sort of natural eco system. So this is where we really are giving advice that can be taken as direct input to a shoreline management planning activity and can also be used by local people to implement effective shoreline erosion control measures on their properties.

I should perhaps just add that this isn=t at the individual property level, this in the form of general guidelines such as one would see in a shoreline management plan. LAURA BULLARD: Could I ask quickly, there are existing guidelines; correct?

ALEX BRUNTON: Yes.

LAURA BULLARD: So you all will be commenting on those?

ALEX BRUNTON: Yes.

LAURA BULLARD: But also then recommending additional if those are not sufficient?

ALEX BRUNTON: Yes. Object 8; is to assess the need for an annual drawn down in order to allow for construction of shoreline stabilization, which is obviously highly dependant on the recommended shoreline protection measures that we see.

So what=s the relevance of all of this, the relicensing. Well, erosion of the shoreline due to project operations. Obviously an issue if it results in property damage. There=s also an issue related to erosion in terms of accumulation of sediment and debris within the project reservoir.

We need to determine if project operations are having an impact and how they=re having an impact on erosion around the shoreline and also in the river downstream. Then we can go on to determine the potential benefits or perhaps the effects of any proposed changes of project operations.

So I=ve actually grouped together our methods because they apply across our objectives. So, up until now we=ve been conducting a literature review and collecting any existing or background data that exists on the project and we=re just initiating the fieldwork component of the erosion study and I=ll talk to that in

some more detail.

I=m starting to construct our GIS inventory and mapping system. Then as the project goes on we=ll be getting into the numerical modeling of wind waves, hydrodynamics and shoreline erosion.

LAURA BULLARD: By the hydrodynamics are you including the elevation of the reservoir?

ALEX BRUNTON: Yes.

LAURA BULLARD: Because I noticed under your objective five there was no mention of -- though you said it out loud on the screen itself there was nothing that you said anything about reservoir level. You are looking at waves --

ALEX BRUNTON: Yes.

LAURA BULLARD: But not reservoir levels?

ALEX BRUNTON: Well, that=s included in the project operations.

LAURA BULLARD: Thank you.

BILL KITTRELL: The project operations as in fluctuating reservoir levels directly related to power production is part of those study objectives; correct?

ALEX BRUNTON: Yes.

BILL KITTRELL: Although it wasn=t listed on the objectives?

ALEX BRUNTON: That=s included in all of that assessing the project operation, impact --

BILL KITTRELL: But you are partitioning out that effect --

ALEX BRUNTON: Absolutely.

BILL KITTRELL: In addition to boat traffic, wave action --

ALEX BRUNTON: I=ll talk to that --

BILL KITTRELL: In general --

ALEX BRUNTON: Yeah, I will talk to that in terms of the methodology that we=re applying.

So, in terms of shoreline erosion and I=m grouping together objectives one through four here, what we=re doing is really investigating the erosion processes that are taking place around the lake and then the performance of the existing shoreline protection. Then we=ll develop our recommendations for remediation if necessary.

We have extensive experience investigating shoreline of impounded areas, both in the Appalachian mountains and also in the great lakes and overseas. So, we=re bringing that experience too to play on this particular project.

These are just some quick photos of sorts of erosion that are very typical on reservoir impoundments in terms of -- here we have some failed rip rap in front of somebody=s property here. We can see that they=re having ongoing recession behind this failed shore protection.

Here we have bedrock that=s eroding at the base. We have some very typical failure mechanisms on the face of this and then low where the sediment deposited. I=ll go into a little more detail about these processes in a minute.

So in terms of our fieldwork we have a GPS enabled field PC that has a GIS built into it. We=re working directly in the shoreline GIS database while we=re out in the field and we have developed a system that takes very detailed notes on erosion processes, shore protection types as we go around the shoreline and we tend to break the shoreline up into discreet segments.

So where we see, for example, one segment may be a strip of eroding bank and then we go into perhaps some form of retaining wall and that will be another discreet segment in the shoreline GIS database. From that we then assemble this into a numerical analysis.

So, just a slide showing typical shoreline profile

development in a reservoir. What we=ll generally start with is just the natural side slope of the reservoir and over the zone of water level fluctuation we typically see a recession of the shore face until it develops this typical S-curve profile, which generally makes sense if we think about all the wave and water fluctuation action at the base of the slope.

That=s where most of the energy to do work in terms of erosion is occurring and that=s the level at which the shoreline will retreat and then any material above will be removed from the system or deposited on the foreshore of the system.

Just to show a local example, although not Claytor, we do have this very typical S profile developing. In terms of shore protection we=re very interested in the type and condition of different approaches to shoreline erosion around the reservoir and this includes newer erosion control measures as opposed to all the measures that may have failed.

We assess not only the type but also the condition and the stability of the structure as well. This isn=t a full structural survey for each landowner to go on it=s a general assessment of shoreline, shore protection condition around the reservoir.

Objective two; we identify the existing shoreline

conditions and also the protection measures. We develop our GIS mapping layers using the field survey results and this plays into the model scenarios that I=ll talk about later.

Different shore protection types. The end product of this and what you can expect to see is, first of all, a set of very detailed shore protection maps. From these you can identify the different extents of shore protection, location and so on and this can be a very valid baseline approach for future development studies and also for ongoing through time you can look at changes in shore protection.

From this we also present all sorts of just basic numerical analysis of what=s out there. So very useful local planning information as well as physical information for us. Then we can also look at historic changes in shore protection, should there have been a previous survey, which I don=t think there is on Claytor.

TERESA ROGERS: No.

ALEX BRUNTON: Then also looking not just at the extent, you don=t have to see the individual numbers, but here we have all different shore protection types and the condition of these structures. You can see that obviously these blue areas show good condition, working shore protection and you can see the different types of shore protection around this particular example of failed or in

good condition and so forth and that plays into our recommendations for future shoreline management planning.

In terms of the river erosion survey, Dr. Riedel and I will be conducting the survey together. While Mark is looking at things from a sedimentation point of view I=ll be looking at the erosion side of things just so we get that consistency of observation down to the system.

Some of the data collected, obviously catchment morphology, land use, channel dimensions, cross sectional form and then detailed accounts of river bank types, materials, the types of erosion mechanisms that are taking place, riparian characteristics, bed and bank grain size and also, if we note it as we=re going down, perhaps any potential for future enhancement in maintenance activities on the river.

This all again gets fed into baseline GIS, of which there is an example here. It contains photographs and different reaches and also you can pull up analysis of different variations in substrate size and how that relates to things like tributary inputs and then you can also look at looking at left bank, right bank, upstream, downstream views, down through the rivers.

So a very detailed information system that will be

available for people at the end.

Objective five; we=re starting to get into more detailed numerical modeling tasks where we=re looking at the relative effects of wind waves, recreation and boat waves and also the water level fluctuations. I have a slide to talk to that. This includes basic background literature review.

Obviously our field data collection plays in very importantly into this and then some detailed numerical modeling. In terms of wave measurement, we are going to have wave gages out in the summer to measure -- the wave gages don=t tell whether they are wind waves or boat waves they just measure waves.

So we=re going to have five wave gages out there and they allow for sort of a hindcasting so when we take our historic winds data what we=re doing is we=re coordinating our existing wind data and wave data that are coincident with our observations and using that to calibrate our wind wave model so we can draw a hindcast. Yes, sir.

LARRY BANDELIN: As you know we=re looking at the lake from aerial photograph is a very, it looks like a snake.

ALEX BRUNTON: Yes.

LARRY BANDELIN: And with the catches for waves very

much different in certain areas of the lake than in other areas of the lake, it seems to be that five gages seems to be, unless they are deployed in the areas of high fetch, it seems to be a very small number of gages to --

ALEX BRUNTON: It=s very large compared to other studies and that=s why we have five out is to actually make sure they are in different regions of different fetch so that we try to get some representation of the different conditions on the lake.

I mean, if it was a completely -- lake then we would probably just have one gage. So that=s why we have five out. In terms of the wave modeling, this is some typical output from another project looking at wave and here we can see that we=ve taken our lake bathymetry and our wind input and we generate different model scenarios.

This is one particular example, on this lake where you can see that we=re looking at a fairly high wind condition and you can see the effects of this long fetch, how we=re getting high wave energy around these headlands here, and we do that for the complete compass and different wind conditions.

We can then -- this is actually the typical wind rose analysis we do where we look at, we look at sort of historic data and

assemble wind roses and we also from the model assemble wave roses as well. So we get a very complete climatic summary data of the region.

LAURA BULLARD: Will you be capturing any information about boat waves? Will you be able to do that, because in some areas in small coves where there=s a lot of boat activity it looks like there=s a lot more erosion so I was just wondering.

ALEX BRUNTON: Yes, we do. It is possible to separate out, when you get the wave data you can really see the impacts of boat waves and how they stand out from the background wind wave activity. What we will do is separate out -- essentially what we like to do is from Memorial Day to Labor Day you obviously have a lot more boat traffic on the lake with recreation and so forth, what we typically like to do is to be able to characterize that. I=ll talk a little bit more about that when we look at influence of boat waves.

LARRY BANDELIN: Is time recorded at the same time wave height is recorded?

ALEX BRUNTON: Yes.

LARRY BANDELIN: So we can look at 10:00 on a Wednesday versus 10:00 on a Sunday?

ALEX BRUNTON: Absolutely. So along with the waves

we need information about the currents that are moving through the lake. This plays into the sedimentation study and the hydrodynamic modeling and also into the shoreline erosion modeling that we=re going to do. So, we have a series of acoustic Doppler current profilers that we=re deploying into the lake.

In fact, we have one out there at the moment that=s just offshore from Bullet=s Farm actually and that=s recording over the month of May and then we=ll have an array of five ADCP=s out from mid June to mid July that will be again in different areas of the lake measuring different current velocities.

This is in terms of direction and magnitude and time and it=s throughout the water in a particular, at a particular point. Then while these data are valuable in themselves they are also used to calibrate the hydrodynamic sedimentation model and also to look at cross shore currents for the shoreline erosion modeling as well.

That=s just a typical acoustic Doppler current profiler, so if you happen to drag one up with an anchor or it washes up on your shore then please give it back to us. Just a sample of the data, it=s not from Claytor but you can see that the variations in currents through depths with different depths as time moves through. We can also look at the directionality of this flow as well.

All of this data, you know, we have a lot of experience in crunching this data down from its raw form into something that=s very usable for people who don=t have a PhD in hydrodynamics. So we do make the summary data available.

Just we were out there last month so we threw in a string of temperature profilers as well just to be coincident with some of the work that we=re doing and we happened to download these so you can see that we=re getting a very detailed record of temperature as well that=s coincident with our current stuff. That=s additional to -- it=s sort of above and beyond the remnants of the project. It=s just we happened to be out there anyway so why not.

In terms of the hydrodynamic modeling, we=re interested in the model that Dr. Riedel talked about, we=ll look at in the erosion study as well to determine the typical alongshore currents. Obviously this is a very important part of the components of shoreline erosion and then we=ll also be using it as part of the sediment study as we=ve already discussed.

So just typical hydrodynamic model. You can see that this is for a lake up in Canada. We=re looking at flow around the lake from wind generated waves and also from tributary inputs and currents. This plays into the shoreline modeling. This is just a

screen shot it=s not a particularly exciting screen shot. This is of the cosmos model which is out all of the shoreline erosion.

Here you can see that we have a shoreline face that=s undergoing some sort of recession and then we have a four shore where we=re getting deposition. In terms of the overall processes that are going on, this is a little difficult to see, but we do get -- we=re transforming waives from offshore into the near shore so we get wave energy dissipated in the near shore area and then we may have breaking waves, depending on the shore profile and then the model will account for bank recession, down cutting of the four shore face and also deposition and any bar movement that may take place up and down the four shore and initial face.

So, we=re going to be doing this model and we=re going to pick four areas around the lake for the representative of different erosion conditions around the lake that hopefully apply to a much wider range of conditions around the lake. Obviously this sort of model is very computationally expensive to set up and run.

My colleague Chris Gibbons is here today as our cosmos modeler who will attest to the fact that it=s a very time consuming process, which is why we pick the four different conditions around the lake and model those. It=s not possible to

model the entire lake with this level of protest representation.

That choice of model locations will depend on the wind characteristics we see around the lake. Obviously you get different shoreline erosion characteristics or you get different sort of wind wave energy climates. It also depends on land use, where we see threats from existing erosion. This we generally determine throughout the fieldwork phase of the project.

What can you expect in terms of output from this. Well, here=s an example where we have, actually in this case an estimated historic profile. If we have historic profile for the shoreline then that=s great. We can also synthetically produce a historic profile in terms of extrapolating from different slopes and shorelines and then we=ll run it for the historic wind wave and boat wave data that we have and again we can synthesize boat wave data into the historic wind wave data.

The reason we do that is obviously we want to account for the historic effects of boat waves when we=re trying to calibrate the model. We can actually calibrate the model very closely into our observed shoreline recession rates.

That=s quite interesting in itself but it doesn=t really tell us much that we didn=t already know. What we can then do is we

can add and remove boat wake influence from these model scenarios and we can say, well, okay, if we didn=t have any boats on the lake historically then how much less shoreline erosion would we observe.

So we can partition out the natural wind wakes from the boat wakes and in some cases it can be surprisingly high the amount of boat wake influence. Then again, we can start to look at things like changes in operational levels.

We can forecast how say if we increase the lake level two feet or drop it two feet or go to a different regime of water level fluctuation we can look at how that would effect our changes in the shoreline, profile the section and from that we can make recommendations as to how we should proceed from a management point of view.

Any questions on that so far?

So as I talked about before, we=ll be looking at four representative sites and site selection is on the wind, climate, wave energy, population, development, shoreline geology and any specific needs that people want to raise and bring to our attention that we can take into account.

Tasks six through eight; we=re really looking at the

measures that we can then look at to reduce shoreline erosion. The effectiveness of shoreline erosion control measures and also looking at this annual draw down issue in terms of construction and shoreline stabilization.

We can hook it up from model scenario analysis but also looking back at our fieldwork and looking at any accompanying literature on that subject.

So to the deliverables, again it=s the full swing, DVD=s, the whole works in terms of the literature review, GIS and mapping, the model results, the boat wake predictions and also the consensual management alternatives that we generate from this and of course the reports.

In terms of our time line, we=re essentially are just getting into the fieldwork phase of our project in terms of -- we=ve planned out deployment and we=ll be out in two weeks time looking at the shoreline survey and then going down to the banks of the New River.

So we=re right in the middle of our busy phase of the fieldwork part of the project and then once this is complete we=ll be moving into the modeling and then into looking at erosion control and so forth.

So, we=re very much on target at the moment and I think with that any questions?

BILL KITTRELL: I=ve got one. When you do your modeling are you going to -- how in your partitioning out operational effects on shoreline erosion, can you hindcast, based on changes in operations?

In other words, you know, if there have been fairly stable water levels over a certain amount of time what that would have done if the operation fluctuates the reservoir level, you know, one to two foot deep per week and this has been going on for a number of years, how far back can you hindcast and how do you change -- or input operational changes into that model?

ALEX BRUNTON: We hindcast over the entire project life and the model is calibrated based on the historic water level fluctuations. Then when we do the scenario modeling we can look at stable areas versus fluctuating areas versus areas where levels are rock versus riparians levels are down.

So we can actually -- we can split out --

BILL KITTRELL: I assume Appalachian Power has historical reservoir levels?

ALEX BRUNTON: Yes.

BILL KITTRELL: During the entire life of the project or no?

TERESA ROGERS: No. We have it electronically with >95. Are you thinking about like when we were depending on the year?

BILL KITTRELL: Right.

TERESA ROGERS: That was in the -- when did --

BILL KITTRELL: Early >90's. What I=m wondering is, yeah, if you can go back and look prior to that period because there would have been probably more dramatic reservoir fluctuations going on on a daily and weekly and --

ALEX BRUNTON: We=ll have to synthesize the data so that way we don=t -- where we have gaps in the existing data so. But it will be done as a representative. We want to represent as closely as we can the conditions that have been experienced over the project. So otherwise our model calibration will be off.

TERESA ROGERS: I=ll get with operations too and pick there brain back in those days and we usually do typically. We may have some hard copy data still in the archives. I can pick some dates and look back and see if there is anything. But basically our data back then was charts and paper and hourly numbers, it wasn=t

electronic until >95 or so.

BILL KITTRELL: It would be nice to be able to pull off, you know, wind wave, boat wakes and so forth and see if you can peel away the layers and look at maybe operational changes and influences on sedimentation, erosional rates on the reservoir --

ALEX BRUNTON: That=s what we try to do to the best of our abilities. Often what we can do is we can synthesize in water level data that reflects gage observations as well upstream and downstream so we try and capture the drought areas plus the high end areas as well.

So there are ways and means of jamming that into the analysis where we don=t have that direct observations. We will get accounting for that to the best of our ability.

LAURA BULLARD: Will we be notified of the four selected sites?

ALEX BRUNTON: Well, we=ll present the analysis of the four selected sites at the November meeting, but we=ll select them to be as representative as we can of the conditions on the lake.

LARRY BANDELIN: Can you gather data on the prevailing winds in the area to help set your wave, five wave monitoring stations? It looks here the most, from my understanding,

it looks like southwest and west, mainly southwestern winds are the most rugged. We occasionally we get storms and you get a back northeast wind. The majority of our time we=ll get southwest winds here, is that something that you can put into wherever you=re putting your wave monitoring devices?

ALEX BRUNTON: We don=t gather the wind data but we --

LARRY BANDELIN: I know that, you use the historic wind --

ALEX BRUNTON: Yes. We use the closest available climate stations and if necessary we can apply transforms to make that more relevant to the local conditions. But as it is we try to use the most local station. We look at it very closely to see how representative we think it is of the conditions here.

KERRY BLEDSOE: What model are you using to assess the erosion of the river channels and river banks?

ALEX BRUNTON: We=re not modeling erosion as to river banks. That=s an observational --

KERRY BLEDSOE: Are you putting in change or are you measuring the physical --

ALEX BRUNTON: We=re not measuring rates we=re

observing the morphologic evidence of erosion.

KERRY BLEDSOE: Oh, I see. You=re just -- all right.

ALEX BRUNTON: Yeah. It=s a baseline survey.

TERESA ROGERS: We=ll go ahead and break for lunch and be back at 1:00.

[Luncheon recess.]

TERESA ROGERS: We=re going to go ahead and start this afternoon with the water quality report.

Water Quality Study Update

JOHN SMITH: I=m going to be presenting the update on the water quality report. What we=ve done today is we have put together, compiled existing data and put it in a database. We=ve also done some review and evaluation of the data primarily to assess it=s adequacy when combined with data that we will be collecting this summer for meeting the project needs.

So, basically what I will be just talking about is we=ve compiled existing pertinent water quality data. We=ve created a database in an electronic form which should give any potential user a convenient format for using the data.

As I said, we=ve attempted to do a bit of evaluation of the data to assess it=s efficiency for meeting project needs and I will

be presenting some of that data and my interpretation of what it=s telling us.

We found four primary sources of data. I should say we did not attempt to collect every bit of data that=s out there. We tried to collect that data that is most applicable to the project and in particular the data that might be influenced in one way or another by the operations of the hydro station.

DEQ obviously is a major source of water quality data. I would say that we collected the past 15 years worth of data and in our analysis we kind of emphasized the most recent data thinking that the most recent data was probably the most representative of current conditions.

So DEQ has many sample stations on the New River and Claytor Lake for looking at primarily to solve dissolved oxygen temperature. We also pull together the sediment and fish data but we aren=t really doing much with that, other than putting it in the database.

DGIF has recently started a fairly comprehensive temperature monitoring program, both upstream and downstream of Claytor Lake, collecting continuous temperature data so that=s been included here.

We found one comprehensive Master=s thesis from Virginia Tech. Kilpatrick, I think it=s >03, where he actually did a full year=s worth of water quality monitoring data in Claytor Lake. It=s the most complete set of data that we have found. So I put that on the database and I will focus on that to some extent. There are 11 sampling stations within the lake.

Then the Friends of Claytor Lake and Ferrum College have been collecting a variety of water quality parameters for 12 years now. I am focusing on those parameters that relate a lake trophic state, total phosphorus, chlorophyll A and secchi depth. They have 12 sampling locations within the lake also.

This map, you obviously can=t see from where you are but basically it shows the various sampling locations that we=ve collected data from within the project area, from Allisonia down to Glen Lyn and in particular there are -- it shows sampling locations as well as who has used those locations for collecting data.

This figure is, which you can=t see I guess, well you can see the colors and that=s really why I put a black background on it because the colors are what=s important. It=s a very busy figure and I don=t expect you to -- the detail is not important in terms of axis labeling.

What it=s attempting to show, I mean, we struggle all the time with how to present lake water quality data because we have so many variables. We have location, we have depth and we have parameter and we have time. It becomes very cumbersome to figure out a way to present all that information in a convenient format.

This is a relatively convenient format although to really make use of it you would need to look at it in a report where you can see what all the labels are, but each one of these graphs, each box is a different sample location within Claytor Lake and it=s oriented from the dam in the upper left to the headwaters in the upper right.

On the X -- on the Y axis we have depth and on the X axis is time. What we plotted -- then we plot whatever water quality parameter we=re measuring for each sample time and then we contour the data so that we generate lines of equal, in this case it=s temperature. So, each line represents the same temperature.

What I really wanted to show here is just a couple of things. When lines are vertical it means the lake is not stratified, it=s essentially mixing top to bottom and the temperature is the same top to bottom. When lines are not vertical and at times horizontal it means that if you go from the top to the bottom you have a significant change in temperature.

The only thing I wanted to show here is that in the deeper portions of the lake -- well, in the whole lake the lake is essentially well mixed for probably three or four months out of the year, from January into April. It=s mixing top to bottom. Temperatures are essentially the same top to bottom.

In the other seasons there=s a certain amount of stratification, not a lot in May and December but is strongly stratified in the June to November period. When you get into depths shallower than say five meters there isn=t a lot of stratification. There may be some temporary stratification on a daily basis but by in large it=s the same temperature top to bottom or perhaps a difference of maybe one or two degrees center.

In this plot we have the same format but here we have dissolved oxygen instead of temperature. In here there are similar conclusions. During the winter period the lake is largely the same, has the same dissolved oxygen concentration top to bottom and then in the summer periods it=s strongly stratified with respect to oxygen.

One of the important things is I think it=s this kind of purplish color, I think it=s that color, that=s the five milligram per liter level and basically it says that throughout most of the lake, even in the upper shallower areas, at a depth below five meters late in the

summer dissolved oxygen levels are going to be less than five milligrams per liter, which may be significant from a fisheries perspective.

But by and large we have similar conditions throughout the reservoir, with the exception of the uppermost shallowest sample site. Dissolved oxygen temperature doesn=t really tell you anything unless you put it in context with something and for lakes and rivers and streams too the dissolved oxygen temperature regime that you have determines in part what kind of an eco system you may have there.

So here I focused on cool water fish, fish that prefer a higher DO, dissolved oxygen levels and cooler temperatures and plotted the suitability of the waters in the lake for cool water species. Here the green is temperatures less than 20 degrees C. The pink is what we call a marginal condition is 20 go 24 degrees C and the red is any temperature above 24 degrees C.

So here we would say, you know, by and large for most of the year Claytor Lake has temperatures that would be suitable for cool water fish. In the late summer -- I should also point out that we=re missing a couple months of data here, it=s a couple of critical months, it=s August, September, so what we see here is that this plot

is October 1 through August 1, but we=re missing some key time periods in terms of critical conditions.

So anyway, by and large most of the year at most depths in the lake and at most locations temperatures are suitable for cool water fish, but in the summer period, in the late spring, summer and perhaps early fall, probably early fall, we see that conditions are marginal for part of that time and unsuitable for some of the time, for two or three months perhaps in the surface waters for cool water fish.

We can do the same thing with dissolved oxygen. Here higher dissolved oxygen levels are better and because of the DO regime that I showed you before the lower DO levels are typically on the bottom. So here you draw similar conclusions, most of the time dissolved oxygen levels are fine in the lake at all depths and at all locations, but in the fall period into the late fall period at the bottommost waters and in the late spring and summer period in a lot more water conditions are marginal and unsuitable for cool water fish.

Here the green represents DO=s greater than five. Pink is two to five and the red is less than two milligrams per liter. So we can see that for probably two, maybe three months out of the year at depths greater than five meters dissolved oxygen levels would

generally be considered unsuitable for cool water fish.

We can put both of these together and combine both the temperature and the DO data to look at the suitability of the lake for cool water fish. Here we would, again the conclusions are similar, most of the time conditions are fine, but there is a period during the heat of the summer that there doesn=t appear to be any suitable habitat in Claytor Lake for cool water fish.

That period may last for two to three months. It may be July through September or July into September depending on the year and each year is somewhat variable.

This particular year that this data was collected was from the Virginia Tech report. This was 2002, which was an extreme year. It was extreme primarily because of low flow, but we don=t have a sense of how long this particular condition lasted because the data ends.

We did have one additional bit of data that was collected by DEQ. This is under the power lines just above the dam. This is August 29.

Here at the red line is dissolved oxygen, the blue is temperature. You can see that top to bottom dissolved oxygen levels were less than three milligrams per liter or no greater than three

milligrams per liter and below say 13 meters there was no dissolved oxygen, it was essentially zero.

So for this particular time period there was essentially no cool water that had any oxygen.

Unfortunately we don=t have -- I think I=ll skip this one and then come back. We don=t have any same day above and below Claytor Lake Dam dissolved oxygen data, at least I haven=t found any. For whatever reason sampling dates just weren=t the same, but we do have some discreet sampling periods where low dissolved oxygen levels have been noted downstream on the lake.

In this particular plot the black line is 2002 and that was generated by DEQ and it was for September 20. Here you can see that -- I don=t know if you can read these labels, but this is three milligrams per liter. You can see this line is Claytor Lake Dam, this is Route 11 bridge and that=s the 114 bridge.

Here you can see that for a couple of miles below Claytor Lake Dam dissolved oxygen levels were in the low three milligram per liter range and it had a significant jump at around mile 83 -- I mean 85, but we are still below five milligrams per liter and finally by the Route 11 bridge we=re back up above five milligrams per liter and that continues to rise downstream.

The red line is 2005. Here we also were down below five milligrams per liter just below the dam, but it rose very quickly downstream of that. I have several other spot measurements that we found in the database that I=ve included on the plot, two here and one here.

The red square was August 17, 1999, the blue star August 10, 2005 and the black circle August 15, 2006. Basically I simply put those on to say that there are other times when low dissolved oxygen levels have been measured downstream in Claytor Lake, but we found -- I could find no low dissolved oxygen levels at or beyond the 114 bridge.

So my conclusion is that reiteration occurs fairly rapidly and by the time you get below 114 conditions are fine relative to dissolved oxygen.

We also collected the DGIF temperature data. They have established sampling stations above and below Claytor Lake. I think there were two stations above and three below. This particular plot comes directly from their data from their Excel sheet, spreadsheet. What this is plotting is the difference in temperature from upstream to downstream Claytor Lake.

So this solid black line, the black line that=s horizontal at

zero is the reference station above Claytor Lake. Basically, taking the temperature and subtracting it from itself and it=s always zero. Then they take the downstream stations and subtract that from the reference station and you get the difference, you get the difference in temperature.

Here you can see that downstream temperatures are quite different than upstream temperatures. In fact, during the say March through July period temperatures downstream at Claytor Lake is colder than upstream and it=s colder by as much as four degrees, according to their measurements.

From August through January downstream temperature is warmer than upstream temperatures by as much as five degrees. The reason for this is very simple and very logical, you=ve got such a mass of water in Claytor Lake that it=s slower to respond to atmospheric input and it maintains -- it=s slower to change temperature.

So upstream where it=s shallow that temperature responds quite rapidly to the atmosphere whereas in the lake, because of it=s depth and mass, it=s slower to respond. So when upstream temperatures are warming in the spring and early summer Claytor Lake is warming more slowly and therefore the discharge

from the lake is cooler than upstream and the opposite is true when upstream is cooler in the late summer and fall period and into the winter. These are monthly average temperatures by the way.

I also looked at the station that=s immediately downstream of Claytor Lake. I did this primarily to get a sense for where water may be coming from, what level in Claytor Lake water is being withdrawn such that what we see downstream is representative of something upstream.

Here this is just a continuous plot of -- the black line is a continuous plot of the temperature downstream of Claytor Lake. It=s .25 miles over time. This is over a two year period.

On the plot I have overlaying red circles and blue squares. The red circle it=s the midpoint of Appalachians intake streams at 13.4 meters. The blue square is the average temperature over the entire depth of the intake streams, which is like 6.4 meters to 20.4 meters.

We have an amazingly close tracking of downstream temperature and temperature at certain levels associated with the intake and it doesn=t seem to make any difference whether you select the midpoint of the streams or the entire depth of the streams.

What we don=t know is how far beyond the streams you

might also be able to chart it. We will know that when we know dissolved oxygen, but right now we don=t. So we can=t -- we can simply say that if you want to predict temperatures downstream of Claytor Lake measure the temperature at the midpoint of their intake streams and you=re going to be very, very close to what=s there.

We also looked at the Friends of Claytor Lake data and in particular, as I said before, we looked at total phosphorous, chlorophyll A and secchi depth. I didn=t look at -- I didn=t spend any real time with the bacteria data that they are collecting, I didn=t spend any real time with nitrate, but I did with the total P and the chlorophyll A and secchi depth, primarily because that is the standard determinate of water, of the trophic state of a lake.

Friends of Claytor Lake had been generating this data for 12 years and have been using methods developed by Bob Carlson in >77 to determine trophic state of the lake in comparison to trophic state of lakes throughout the country.

I have four different lines here. The red is the trophic state that you would predict based on total phosphorus concentrations. The green is the trophic state you would predict based on chlorophyll A concentrations and the black is the trophic state you would predict based on secchi depth and then I have a line

which is the average of all three.

As means of reference I would say that a trophic state index of 30 or less is typical of oligotrophic conditions, low nutrients, clear water, low algal concentrations. Trophic state index of 50 is considered eutrophic, lots of nutrients, lots of algae growth. One of 70 is hypereutrophic, extremely rich system.

Here we see that, with the exception of chlorophyll A, everything is pretty is -- the trophic state predicted by one parameter or another is relatively the same. Also, it=s relatively constant from >96 to 2006, not much has changed. It seems to be stable.

Chlorophyll there=s some -- there=s been some up and down, I=m not sure why, it may relate to narrow lake to stream flow, I really don=t know. I should also add this is average for all stations in the lake for each year. My conclusion is it=s a eutrophic lake and it appears to be relatively stable in terms of its trophic conditions.

BILL KITTRELL: Chlorophyll A seems to be tracking lows pretty well. I mean that was during a drought period 2000 through 2002 then we went into a very, very wet year 2003 and that would have carried over into >04.

JOHN SMITH: I haven=t looked in detail at any of the flow record at this point, but that was just my guess. In this particular

slide I show the trophic state indices for each location in the lake and here at zero is the dam and 12 is the upstream most station in the lake.

Here we have the similar pattern by and large most everything is tracking the same. There is a slight downward trend in trophic state as you go from the upper level to the lower level, probably related to sedimentation. Lakes act as nutrient sinks and in particular phosphoreus. You will lose some phosphoreus as you go from upstream to downstream and therefore the lake responds in kind, both with respect to secchi depth and chlorophyll.

The interesting thing about chlorophyll though in the headwaters chlorophyll levels are relatively low. They are low because it=s a river up there. What we have is a transition from a riverine system to a lacustrine system. So you would expect chlorophyll to be low. The methods weren=t developed to describe rivers.

So here chlorophyll isn=t a good predictor of trophic state in the lake because it=s riverine and it transitions into the lake and it becomes much more predictive of a trophic state along with the other parameters. The bump in the middle, which is station 7, is actually at Peak Creek.

So I=m not looking at that as a real in lake trend. I think it=s an artifact of the sampling location. We also put together and you probably can=t see this either, we also put together the listing, the DEQ listing of impaired waters.

Essentially the waters in the entire project area from upstream of Claytor Lake down through to Glen Lyn are listed as impaired for one reason or another. It may be nutrients, as in Claytor Lake, it might be metals related to sediments, there might be PCB=s related to fish. The whole area is listed as impaired by DEQ.

My conclusions are pretty straight forward. I mean, Claytor Lake is a seasonably stratified eutrophic lake. I don=t think there=s any other way to describe it. The temperature and dissolved oxygen regime that we see in the lake are typical of what we would expect in any eutrophic deep water lake in this area.

During the late summer and early fall dissolved oxygen levels downstream of Claytor Lake have occasionally been measured below five milligrams per liter and rarely down near 3 milligrams per liter. But this area seems to be limited to that location or the location that=s about within ten miles of the dam.

Downstream of that is substantial reiteration through ripple areas and ledge areas and small falls, areas that bring

dissolved oxygen levels back up.

In general, I would conclude that the existing data, when combined with the data we=ll be collecting this summer will be sufficient to assess existing conditions and project impacts on water quality upstream and downstream of the project area.

There are a select few things where I think that it would be worth considering some modifications to the proposed sampling plan for this year to make sure that we are in a position to address all potential issues. The first one is located to the proposed locations for the sampling stations in the lake.

As presently proposed all of the sample locations would be within two kilometers of Claytor Lake Dam. There would be four sampling stations per transect, three transects, 12 sampling stations. My concern is that from the very first slides I show there=s a lot of water quality things happening throughout the whole lake. We won=t know what those are. From the previous data we=ll have a sense of what they likely are but we won=t know.

Some of the other activities that are going to be ongoing, some of the modeling activities, I think it=s going to be really important to them to have the whole lake water quality data. I would also add that the Virginia Tech report evaluated horizontal

differences in water quality in the lake.

By and large those differences were not significant enough for him to continue sampling at multiple stations along a transect. All the sample stations were along the center line of Claytor Lake from dam to headwaters. I would suggest doing the same thing.

I think we should leave the multiple stations per transect near the dam just because we might see some influence there from the intakes and we want to be in a position to measure that, but the rest of the stations I would suggest we just take those stations and spread them up the lake. I haven=t really thought about locations and probably should try to locate in areas that have already been selected for sampling stations, either the Virginia Tech stations or DEQ stations or a combination of both just so we have them in the comparable locations.

The second thing that I=m a little concerned with and it shows in some of the data, I mean, our sampling program has been proposed to go from June 15 to September 15 and judging from the data that I=ve seen low dissolved oxygen conditions may occur after that time frame in the downstream and almost definitely occur in the reservoir upstream.

So I think that we should be prepared, depending on the year we should be prepared to continue the sampling program, the weekly sampling program downstream and in the lake until such time as the potential for low dissolved oxygen levels downstream disappears and that will be when either Claytor Lake turns over and it=s mixing top to bottom or when the volume of water in the lake that has low DO is so small that even if it mixed completely it wouldn=t have a significant -- wouldn=t have the potential to significantly affect downstream DO levels.

Finally, most of the data that=s available for the lake itself has been collected mid morning through the afternoon sometime. We know that the lake is eutrophic, we know that it is at times very actively growing algae and we see dissolved oxygen levels in the surface waters of the lake up around ten milligrams per liter or higher, which is probably three milligrams per liter higher than saturation. This is caused by just algae growth.

Conversely at night they are using oxygen. Algae uses oxygen rather than producing it. We don=t have sense for how dissolved oxygen levels would fluctuate in the lake on a daily basis. The sampling program isn=t designed to do that.

What I would propose is that we spend sometime mid

summer when things are cooking out there and we=re seeing elevated dissolved oxygen levels that we spend a day and sample hourly throughout the day from dawn til dark and compare that data. I would propose to do this just down by the dam.

Give that data to our continuous monitoring data downstream of the dam and then we can establish a relationship such that if we know downstream DO we=ll know upstream DO.

Otherwise, I don=t think the program will pick up what=s happening in the lake. We=ll know what=s happening downstream but we won=t know why. If somewhere down the line there are proposed operational changes we need to know how those changes will affect the lake and therefore we can predict what will happen downstream.

I think that=s it.

TERESA ROGERS: I mailed out a copy of this information, the report to everybody that was on the water quality workgroup, you should have gotten an email from me too. If you got an email from me you should have a copy of the report by now or it=s in your inbox today.

In the email I suggested that we would be talking about it today some but that we would get back together at a later date to

discuss exactly what we want to do as far as changes. I want you to have a chance to look through this report before we actually sit down and say we=re going to do this, this and this.

I sent an email and based on what I=ve heard back so far it looks like the 29th is about the only day that people are available because of the symposium and that type of thing. So right now I=m proposing that we have a meeting/conference call on the 29th, that morning, the morning of the 29th. If that looks like it=s going to work for everybody in the water quality workgroup.

MARY RHOADES: Did you set the time at 10:00?

TERESA ROGERS: 10:00, uh-huh. We can start narrowing down -- what I do need to know if you=re going to do conference calls, I have to set up a certain amount of ports for conference calls. I=ve heard back from some that they prefer a conference but I can meet here as well. So if some people want to come and meet in person I can do that as well too.

I do also need to involve DTA because they=re the ones that are doing that W2 stratification model and they=ll be pulling some of this information in so I don=t want to mess up anything that they are doing. Preliminarily they=re saying that changing it is not going to mess it up, but, you know, they still need to be involved in

the final determination of where those locations are going to be too.

RICK ROTH: I have a question, what study is going to take this data, particularly the downstream data where you=ve got fluctuations and you=ve got the sort of dampening of the DO, temperature and sort of say, okay, so what as far as the biological community in the river, whose going to do that and at what point?

JON MAGALSKI: That would be more of the Aquatic resources estimate.

TERESA ROGERS: Later on we=ll be hearing or we=re looking at -- I think we sent an email out earlier about the instream flow needs study, collecting additional downstream temperature, but that=s really not related to this study.

JOHN SMITH: I should add we=ve already added temperature monitors upstream of Claytor. We=ve got three monitors at a site determined, location determined by DGIF.

RICK ROTH: Is that the muscle depth.

JOHN SMITH: The muscle depth area. Those are in place, they=ve been in place for almost three weeks. We=ve downloaded data once and everything was working out great. Those will be in place for about a year.

BILL KITTRELL: Were there three transects originally

planned for the -- down at the lower end of the reservoir? Are you talking about taking one of the, maybe the farthest transect away from the dam and running it -- was that the recommendation?

JOHN SMITH: My recommendation would be to take the two lower transects. They=re both within two kilometers.

BILL KITTRELL: Right.

JOHN SMITH: I would take them both. There are eight stations associated with those and I would take those eight stations and spread them up the lake.

BILL KITTRELL: I was just wondering if you need a second transect off the face of the dam to see what=s happening with the water quality as the intakes were pulling that --

JOHN SMITH: I don=t know. I don=t think so. From the data that I=ve seen and if you look at some of those profiles in detail you won=t see any significant difference between from the station that is under the power lines to the one that=s two miles up. They=re virtually the same.

The Virginia Tech report did some long term, not a long term but intensive monitoring of temperatures in front of the intakes as related to operations, you know, when they were in their 20 minutes on 40 minutes off mode looking at the temperature

fluctuations. There are some but they=re relatively slight.

So I just haven=t seen enough variability where I would say, ah, gees, I think the intakes are really having an impact on water quality up there. So I think if we leave the one that closes to the dam we will get a good sense of if something is happening relative to water quality on the intakes and the upstream ones are basically background for the downstream ones.

JOHN COPELAND: One thing we talked about in earlier meetings was a metal magnetic oxygen maximal that sets up in the lower lake area. It=s detectable. I=m looking at Kilpatrick=s spreadsheet here, it detectable all the way to where the state park cabins are. I think that=s three sites there. So we want to make sure that=s detectable as documented.

JOHN SMITH: Yep.

JOHN COPELAND: If it sets up like it did in 2001 we had large striped bass that were trapped down there and when that went away through generation they died off.

JOHN SMITH: They died off, yeah. That=s the other thing, there is that component. I suppose it=s algae piling up on that particular thermal layer and you will get oxygen increases or decreases depending on what they=re doing. But that=s not really

micro habitat but it is kind of, can be real important.

JOHN COPELAND: It was important in 2001 but in 2002 the conditions were so critical that it just wasn=t there.

BILL KITTRELL: Are those same transect sites going to be used for the intake velocity measurements?

TERESA ROGERS: For fish entrainment or for --

BILL KITTRELL: Yeah.

JON MAGALSKI: That was the initial thought.

JOHN SMITH: The one closest to the dam I don=t know if you -- beyond that --

BILL KITTRELL: I was thinking that those same transects at one time they talked about using the same ones and then they decided, I think they decided it wasn=t really necessary, but you would have to use at least two transects wouldn=t you get some type of determination of intake velocity on places at the dam.

JOHN SMITH: That=s still going to be done. We wouldn=t do it in conjunction with water quality --

BILL KITTRELL: It=s not being done in conjunction with water quality?

JOHN SMITH: If those transects get moved they wouldn=t be.

BILL KITTRELL: If they get moved it won=t be, is that what you=re saying?

TERESA ROGERS: So if we move those transects you need to be involved or are you saying that it won=t change --

JOHN SMITH: I think we should keep -- for the velocity stuff we should maintain those other transects.

TERESA ROGERS: We=re not talking about changing the velocity.

JOHN SMITH: Right.

TERESA ROGERS: But his changing his for water quality won=t mess up your report?

DOUG ROYER: I don=t think so would it.

JOHN SMITH: Not that I know of unless --

DOUG ROYER: We were just going to do a point --

JOHN SMITH: Unless DTA is going to use some of that information, use a combination of the velocity and water quality information I don=t know. That=s something -- that=s a discussion you=ll have to have during that --

BILL KITTRELL: Just so moving those transects won=t impact our, you know, determination of what=s going on with the intake velocity and how that affects water quality or if it does. I like

the idea of moving on up the reservoir and --

JOHN SMITH: Well, there=s a lot happening up there. The way it=s set up we would be ignoring 90 percent of the lake at least in terms of distance.

I think if we do a limited one day even, because we have a continuous monitoring downstream, once we correlate what that=s seeing with what=s in the lake you would be able to, hopefully, determine, based on the downstream one, what=s happening upstream even if we=re not measuring it.

RICK ROTH: Is that downstream one you=re referring to is just downstream of the dam, like a quarter mile?

JOHN SMITH: It=s closer than that. It=s in the tail race area and that will be a continuous DO temperature kind of activity PH.

TERESA ROGERS: So May 29, 10:00 I=ll send out another email with the call in information and then what I plan to do is to write up exactly what we agreed to on the changes and I=ll be sending it out to some of you from the workgroup but these are changes that we want to make and I=ll be filing that with the FERC so it becomes part of the official study somehow.

JOHN COPELAND: Also I=m not sure why -- there was some other data that I collected with Tom, at the Lynchburg College,

there was DO data that was nighttime --

JOHN SMITH: Really.

JOHN COPELAND: It would be great data for someone to look at because it covers four summers.

JOHN SMITH: If you could give me --

JOHN COPELAND: We measured vertical chlorophyll A as well.

TERESA ROGERS: Did you send that to me?

JOHN COPELAND: No. I just need to call Tom again and see if it=s fairly easy to share. It would be very good information if you could use it.

JOHN SMITH: We would be happy to -- we did not find anything in talking with people they felt we had the majority of it but this is something that --

JOHN COPELAND: It was a four summer time series. We generally started in May and finished in August. That would be samples that occurred along the main line reservoir at three sites, the dam, state park cabins and the mouth of Clapboard Hollow and one year we were at the mouth of Peak Creek and three or four sites up the main line about on a seven to ten day cycle.

TERESA ROGERS: So you=ll check on --

JOHN COPELAND: Yeah, I=ll check on whether we can get that together.

JOHN SMITH: Yeah, that would be great.

BILL KITTRELL: The one thing that impresses me of what you presented is that, you know, we=re still seeing major temperature differences 29 miles downstream on average two and a half degrees, you know, at least in the springtime. Those are cooler temperatures which John was saying can definitely impact spawning and certainly may even have impacts on muscle populations.

JOHN COPELAND: And angler success as well. I met a few anglers on the river right now and they notice that when generation occurs, when the temperature goes down, you can feel it.

JOHN SMITH: Like a storm front comes through it. It would be -- I mean it=s difficult to say that all of that is from Claytor Lake. It could be partly from tributaries, but certainly the appearance is there that goes well downstream.

TERESA ROGERS: I=ll be getting back with everybody on the specifics for that conference call.

[Recess.]

TERESA ROGERS: I just thought of what I wanted to say a few minutes ago, we are on a time line for the water quality

because there=s supposed to start June 15, just keep that in the back of your mind.

Debris Study Update

MIKE RAVEN: Good Afternoon. My name is Mike Raven, I=m with Kleinschmidt & Associates and we=re here to talk about debris. We=ll roll right into it.

For a little bit I think most of you in the past have talked about water quality or other issues and this is a little bit with our experience in debris but also that=s an issue with a number of projects to various extents.

One thing we all can see it as a component of the shoreline management plan or as an operational plan for hydroelectric facilities. There a few that we=ve been involved in, which are in the southeast here and another one we=re currently involved with the shoreline management plan, but some of the problems are very comparable to what we have here at Claytor.

Dave Falcinelli, who you=ve met also is the project manager and I=m the technical lead for this study. We have supported the various engineers we deal with and biologists on staff. Typically many of our engineers deal with debris in terms of operational perspectives, designing trash racks, trash rigs and debris

removal systems, things of that nature.

The debris study, I think there=s seven objectives that are very related as you go through them and as you see when we address these as we go through this presentation you=ll see some of them really overlap to other objectives.

The first one is pretty straight forward, determine the amount and type of surface debris on Claytor Lake, characterize the debris types, try to complete an evaluation of where it comes from, where does it enter the lake, is it coming from on the lake shore, tributaries, things of that nature, how far upstream.

Determine the relationship between debris and flow, assess methods for reducing and removing debris and define types of woody debris that are beneficial to fish habitat. Debris is one of those things that definitely beauty is in the eye of the beholder kind of thing. What might not be nice for a pleasure boater is very important say to a bass fisherman or a fishery biologist and ultimately use this information to development a debris management plan with the ultimate goal being assess facility operations on debris accumulation within the lake.

Here=s a picture you=ve probably seen before, this is from the Friends at Claytor Lake. Darla is smiling, she=s seen it

many times. I want to point out a few things while we have this up here. A couple of things, first of all, not all of you can see it from back there but there=s a before and after picture of this dock area. I think that explains why debris is a concern. As you can see, these facilities are largely unusable under this condition.

If you are using these docks or you are the property owner near there that=s not what you want to see. You want it nice and clean so you can recreate on the lake and enjoy the whole reason you=re living there.

This is one of the methods for debris removal and it=s what you use here at Claytor. This is a conveyor system and that will lift the debris up into basically a floating dumpster, for lack of a better word. So you move that rig into place, basically shuttle debris on the conveyor and lift it into the dumpster.

But you=ll notice a lot of manual labor goes into this as well. In addition to the equipment it=s very labor intensive to get the debris out of the lake and then once you have it in the dumpster then dealing with it afterward, getting it off the water so to speak and then in the situation here at Claytor they put it on the shore in a location where it will dry out and then they burn it, otherwise you have to haul it to the landfill, you have hauling costs, tipping fees, that type of

thing.

Just keep this kind of thing in mind as we move forward throughout this study trying to determine, you know, logistics of what=s feasible, what=s realistic and what the real need is.

Why is debris a concern? Boating safety and limitations. Obviously if you=re running boats on the lake you don=t want to run into a floating log or other debris, large debris that can cause damage to your boat or even, you know, potentially cause a safety concern. Aesthetics, those are your docks, you don=t want debris accumulating in there. You want to look out over the water.

There are limits to recreation, like I said. Boating, during certain times there=s high debris, you may not be able to boat in certain areas of the lake or limit the type of boating you want to do. You=re not going to want to water ski where there=s a lot of debris like that.

Pollution due to manmade material, whether it=s plastic or, you know, tires or barrels which can possibly contain residues or chemicals of some sort. Why is debris also good? What are the benefits of woody debris? As I said before, it=s kind of beauty in they eye of the beholder kind of thing in your perspective.

Submerged and floating debris can increase habitat for

fish as well as macroinvertebrates, amphibians, reptiles, aquatic mammals, things like that. It=s an important part of the eco system. Large mass of debris in the flood plane areas can help establish vegetation and also absorb energy from wind or boat wakes, wind driven waves or boat waves and help protect from erosion to some degree.

I was talking to Ron over at lunch, you know, some of the coves he said actually are filling in, the back end of some of these coves where debris has built up over the years and now you do see that vegetation. While that is occurring as a benefit here for people that use those coves or boat in those areas that causes a conflict.

Large complex debris such as branching trees create important littoral habitat for many species. You have a lot of fish in the lake that, black bass and sunfish species that this is a very important habitat component and from the little bit of research I=ve been able to do and read that=s a concern. The amount of that type of habitat is largely limited to the upper portion of the reservoir, is it not, John?

JOHN COPELAND: Peak Creek has a good bit.

MIKE RAVEN: Okay. In the lake as a main body the amount of it is a concern.

Woody debris imbedded on shorelines, like I said before, can help provide some erosion protection and stabilize banks.

Instream bank erosion protection that=s one of the methods they=ll use where they will take trees and logs, root wads, things like that and actually imbed them in the banks and leave them there to help stabilize it and protect, absorb some of that energy from the current. A little different situation in the lake environment.

So we have conflicting thoughts on debris. For some reasons debris is good, for some reasons debris isn=t so good. As always we need to achieve a balance and as part of that we need to define what=s acceptable or beneficial debris and what=s unacceptable or non beneficial debris. We=ll talk about that in a little bit.

So, going through our objectives one of the first things we=re tasked with is determine the amount and type of debris. Friends of Claytor Lake have records of their debris removal efforts that they=ve been working on since the early >90's. We=re going to acquire that from them.

We had a good chat over lunch where we sat down and talked about what may be out there, so we=ll try to put that together in somewhat of a small database that we can use as historic data, but

we=re also going to conduct four quarterly field surveys approximately every quarter over the next year.

We=re going to do that in two ways, we=re going to do a flyover each time to try to observe where debris accumulations are and then we=re going to go out and do a boat survey essentially or, depending on where it=s at, possibly a truck based survey.

We have a survey planned for next week. The thought there is they are just going to begin next week using the conveyor to start the debris removal efforts, so whatever has been accumulating over the winter and spring should be there waiting for us to see. We=re going to go in and try to quantitatively assess how much is there in certain locations and what it=s comprised of.

So we=re going to look at the debris types, the locations, quantities and we=re going to, as I said, we=ve started discussions with Friends of Claytor Lake but we=ll also touch base with John and Mike and other folks who may have some input on debris issues in the lake.

Rough categories for debris, there=s two types, natural and manmade. Natural debris, you=ve seen some of all this, if you=ve spent enough time at the lake I=m sure you=ve all seen it, there=s logs, trees, sticks, branches, dead fish, dead animals. You

see all these in the reports of people complaining about things that wash up on their shore.

Dimensional lumber, when I say that like 2X4's, 2X12's. When they=re not treated they=re wood essentially, they, you know, break down. Manmade debris, oftentimes that=s what stands out. You have a large pile of debris with those plastic bottles, basketballs, volleyballs, those are what stand out, a tire floating there. You can see styrofoam from docks is a common one. All that type of thing that=s what stands out.

Talking to Ron earlier on their debris collection efforts he would have guessed that probably one percent of the debris they collect is plastic and the vast majority of everything else is woody debris. That falls right in line with an assessment done in the mid >90's down at Blue Stone Dam, they did a debris assessment down there and they had 99 percent of their debris was woody debris.

We have to look at potential debris sources, locations of debris, accumulation documented by surveys and local entities will be assessed to determine likely sources. Basically what we=re trying to say there is it coming in on the tributaries and remaining in the coves or is it coming from the upstream areas, coming down the lake and either through wind or boat generated waves being driven into coves

where then it=s somewhat protected and is going to remain in those areas without flushing out.

We=re going to focus largely on the New River and water tributaries such as Peak Creek. Shoreline activities will also be assessed as potential sources. Now, there are some guidelines for shoreline use, I don=t know how I want to say that in terms of what development along the lake can do in terms of the type of vegetation they can remove and the size of vegetation. I think they are restricted to less than six inch diameter trees and there=s some other --

TERESA ROGERS: I don=t think we get into that kind of detail up here, but we will be. That=s just a natural progression.

MIKE RAVEN: Right. So there are some guidelines out there but they=re not hard and fast rules and that=s one of the things we=ll be looking at. Looking at the flow and debris relationship. We look at the historical data that the Friends of Claytor Lake have on the past removal efforts and we=re going to try to very qualitatively correlate that with flow.

One of the things that, in talking to folks here and at other facilities that we=ve been, you know, making inquiries about debris issues, it=s fairly common sense that you see higher debris

loads with higher flow, but the thing that generally occurs is you see your highest debris loads with high flow that have been proceeded for several years by a low flow.

In other words, that debris accumulates for several years and is not flushed into the system, not flushed into the lake. Then you get that gully washer or that hurricane that comes through, several years worth of data instead of being spread out for several years now comes in one event. That=s when we see the heaviest loading.

I think it=s very analogist to, bear with me here, very analogist to forest fires, also woody debris. You have that woody debris accumulating over a number of years, it=s fuel. You have very few fires, very small fires, very manageable for a number of years, then when you do get a good fire you have so much fuel it=s a major event. Very analogist to what we=re seeing with debris loading.

Current information, we=re going to conduct the field surveys after high flow events as much as we can realistically do. This hasn=t been a real high flow spring. There was some high flow in the middle of April and then it dropped off pretty quick.

We originally planned to do this in our first survey in May, looking at the hydrograph May was a high flow month and it seemed

to make sense. The flow really hasn=t been that high but it looks like we might luck out for next week because you=re going to get a bunch of rain.

Usually if you want high flow plan a study and you=ll have a drought and vise versa. So, one of the things we=re also going to do is try to maintain contact with the Friends of Claytor Lake. So over the course of summer if they=re getting a lot of calls and they=re saying, boy, we=re really loading up on debris we=re going to get down here and do a survey on it.

I mentioned that earlier that we like hopefully we get a high flow event in the summer and a lot of debris and they just about kicked me out of the restaurant at lunch. They didn=t like that.

We=re also, besides looking at things that are specific to Claytor Lake in terms of debris, we=re going to look at what=s being done for debris reduction or removal programs elsewhere. It largely involves literature review, contacting other licensees, and I say that licensees in terms of FERC projects but we=re also trying to contact some other projects that are not FERC licensed, Army Corps and specifically TVA projects.

But I want to remind everyone it=s not an engineering evaluation, it=s an assessment, what=s being done, what=s out there

for either reducing or removing debris. We=re not specifically going to go into, well, we=re looking at this type of mechanism and what would you have the engineer to do at Claytor. That=s not within this part of the study.

Interesting enough this was mentioned at lunch also and an obvious solution folks like to look at is there a way we could put a boom or some kind of object that would catch the debris or accumulate the debris to one area where then you could deal with it before it becomes spread out over the lake and becomes an issue. That=s something we=ll look at.

This is one type of boom, it=s called a tough boom. It=s specifically to keep debris out of certain areas. We=ll look at, you know, is that a potential to put in the upper end of the lake if most of the debris is coming in say at Peak Creek or at New River, can you logistically do something like this and put it in and what are the pros and cons.

Cons might be does it affect recreation or navigation. One of the pros may be that it accumulates debris there and your actual removal cost are less. It=s fairly self explanatory, but another one of the cons I=ll mention here, how important is that woody debris to get into the lake, the amount that will settle out.

So are we taking away potential habitat, which over time is going to be seen in its effects to the fishery. As I said, we=re going to have to define beneficial and non beneficial fish habitat. For the species that are in the lake we look at a literature review, what is -- how important is debris to those species

As I mentioned a number of species here, the sunfish species, black bass, it=s very important, flathead catfish, channel catfish. Woody debris is a very important habitat component and from what I=ve seen fishing is a very important recreational use of Claytor Lake.

We=ll contact the resource agencies, specifically John and talk to him about it and we=ll make our own observations during our debris surveys. We=ll also have to combine some aspects of some of the other studies being worked on, such as the aquatic resource assessment. What is their take on the status of woody debris within the system.

So we probably -- I=ll have to work on the wording here but I=m just putting out a few components of what we=re going to say is beneficial debris, it=s woody debris that=s considered beneficial habitat, unless it=s a navigational hazard, if it=s in the middle of the channel obviously that creates a problem because boating is pretty

important.

Natural debris in coves that will not become floating or into the main channel during normal flow conditions is considered beneficial. In other words, it=s imbedded or it=s above the typical water level, whether we say that=s full pond at 1846 or somewhat higher than that. There=s always extreme cases that are going to make things like debris come into the lake.

We have to kind of -- there=s some gray area there but use some common sense and try to craft something that we say, hey, this is beneficial type debris we shouldn=t mess with it, we should leave it in there for habitat reasons. But likewise there=s some debris that=s going to be non beneficial or unacceptable and use some common sense that, yes, even if it provides some habitat component we should remove it when we can.

Woody debris that=s floating or even imbedded in the main channel if it=s up towards the water surface where it could be a navigation hazzard we should probably consider having that removed. Manmade debris, like I said, the tires, the plastics, things like that, barrels, let=s take it out.

Woody debris that=s floating freely within the reservoir, it=s going to eventually end up in the main channel where it has the

potential to become floating under just typical water levels, typical flow conditions, those are objects that should probably be removed.

So we=re going to take all this information, hopefully we=ll get together as a group and be able to talk about, hash out some different perspectives on debris and how it should be handled and we=re going to use that information to roll it into a draft debris management plan.

The components that are going to go into that are the review of the current debris management on the lake, that=s largely handled by the Friends of Claytor Lake, research of existing debris management plans and other projects and we=ll show a few of those here in a minute.

We=re going to incorporate the information from other studies such as the aquatic resource assessment. Define management practices that are most applicable to Claytor, you know, do things like that will make sense here. Do things like a skimmer as opposed to a conveyor makes sense here.

Every place is a little bit unique and a little specific and as we talk about the debris management plan that I=ll show you I=ll point out a couple of places where tried and true methods were not successful at a given project, on specifically a skimmer type

operation. Then that=s all going to be assembled into the debris management plan. So here=s part of what we=ve been working on is just contacting other licensee=s, researching some FERC records and trying to talk about or trying to find out how other folks deal with debris.

One thing we=ve got to keep in mind as we look through these, everyone of these situations is different and comparing any two of them you=re never comparing apples to apples. Some of them I don=t have all the details on yet but the ones I have up here I have most of those.

The first one I put up is the Housatonic Hydroelectric Project up in Connecticut. It=s actually two reservoirs. I put this one up here because the management plan there is fairly new. I think last year was the first full year implementing it. I think they tested it in 2005.

They used a skimmer craft for debris removal. A skimmer craft is similar to a floating conveyor but it has arms on the side which basically are used to funnel debris. You move the skimmer along into the debris area, it funnels it into a conveyor and you can lift it out onto a floating barge of some type.

Now, that very skimmer craft used here is being used

very successfully and it=s working really well. One of the other projects I=m going to show you a little bit later on the Susquehanna River, they own that very skimmer and it was very useless for them, it didn=t work at all. So they were all too happy to sell it to the folks on the Housatonic.

Basically two days a week at each of the reservoirs they go out and remove debris. They do it during the week to avoid recreational interference as much as possible. I think the amount of debris they are removing exceeded what they originally anticipated but also they hadn=t done it for, you know, it hadn=t been done prior to that so they were playing catchup probably the first couple of years.

They=re keeping a database of what they=re removing, you know, trying to get a handle on how it=s entering the lake and how they can maybe in the future reduce that so it will help their removal costs and their removal efforts.

Here=s a project in Wisconsin. Much smaller. You can see it=s by local standards it would be just a pond, large pond, but there large woody debris is passed downstream. It=s in their plan that once it accumulates at the dam it=s passed downstream because it=s an important habitat component for downstream areas.

They need that woody debris for downstream.

That=s to the large debris. Smaller woody debris they put it in the bypass channel where during high flows the bypass gets water and it flushes it through that part of the system.

There=s a couple of projects in the southeast. Alabama Power Company, Coosa and Warrior projects, basically their debris management plan is somewhat similar to what=s being done here at Claytor. APC promotes and then assists with debris removal or trash cleanup efforts by various groups on these reservoirs.

The part of the plan calls for periodically evaluating debris accumulation and specifically they=re worried about downstream areas, but I think to some extent on the lake as well. Part of that is done by -- there is done by the Marine Police. If they think there is a significant public safety issue then it=s going to be revisited and they go in and see if they need to have some type of other removal efforts or something other than what they=re currently doing.

Likewise, resource agencies there, if they have environmental concerns they=re going to revisit the issue as well. Right now they=re not removing large volumes of debris themselves. They are helping the forest service and cooperatively removing it

from recreation sites the forest service maintains on those reservoirs.

Duke Energy=s Catawba-Wateree Project, they have a debris component of their shoreline management plan. Basically they realized that they had lost woody debris within the reservoir and they are, you know, continually losing more so they have a habitat enhancement program. This is one of my favorites actually. It=s I think fairly simple.

What they=re doing is installing woody debris in areas underneath boat docks where it would be out of recreational use and largely it=s cribs, wood filled cribs. I=m not sure of the maintenance part of it but if you took a large crib say 5X5X5, almost envision a stack of pallets if you will or pallets made into a box, they fill that with all the branches and stuff they get in their yards or along their shoreline, put them in there, submerge them under the dock and it provides some littoral woody habitat in the littoral zone.

The one in the upper Midwest, there once again woody debris is really important in downstream areas so they sluice it and stuff that accumulates on the bank near the projects then they remove it and decide where to burn.

Here=s another one, apparently a small project 200 acres. Large woody debris is sluiced downstream when possible, if

not they remove it, cut it up and dispose of it. Small debris that they get on the racks and that impacts project operations they remove, sort it out and all manmade, if you will, all manmade debris is disposed, you know, in the land field.

Then here is actually two projects on the lower Susquehanna. This is data from Safe Harbor and kind of Conowingo Dam combined. These projects are a little different than Claytor Lake in that these are on a very large river system and it=s largely a flow through system.

They basically removed debris from the May to November period and, as you can see, they remove 7,000 tons per year. Quite a bit of debris, but typically what they do is during high flow events a lot of the debris is actually spilled. This is only debris that accumulates on the racks or right at the powerhouse that will not pass the dam during spill condition or that may be blocking the spill gate and needs to be removed so they can operate safely.

More often than not most of the projects we looked at their internal debris management component is such that they deal with debris when it gets to the project. Very few places go out into the reservoirs, get debris and deal with it at that point. Most of them, when debris gets to their trash boom in front of the intakes or on their

trash racks that=s the point at which they begin to deal with it.

Like I said, when you look at that you have to also look at, you know, is it a flow through system such as this or is it something more as a large lake such as Claytor.

Schedule; we=ll continue to acquire the existing data and compile that as best we can. We=re going to begin our quarterly field surveys next week. Hopefully if we have good flying weather that will occur.

We=ll provide study updates in May, which we=re doing today and again in November and next spring the final study report will be available to everyone after review of drafts and revisions as necessary. I think that=s all I have.

Questions, comments? It=s not the most exciting topic but it=s very near and dear to a lot of folks.

BILL KITTRELL: There=s some woody debris that=s sluiced through the dam, is there any kind of quantification on how much has actually passed? I mean do you all quantify that in any way at all or just whenever it builds up some woody debris you just sluice it through?

TERESA ROGERS: We haven=t been. If you look at this picture here so you know what they=re talking about. There is a

sluice there that allows for anything that=s floating there on the surface to go downstream, but we=ve never really looked at how much or anything. I can=t remember the size of it. It=s the small area it=s not one of the larger ones.

MIKE RAVEN: It=s between the powerhouse and the spill gates here.

TERESA ROGERS: The spillway gates themselves open from the bottom up so anything that=s floating on the water won=t necessarily go through a spill gate when it opens because that=s just the way it=s designed.

MIKE RAVEN: Let me ask you this, do you have any thoughts on downstream woody debris? Is that a limiting factor downstream that the woody debris is not getting down there?

BILL KITTRELL: That=s what we were just talking about. You know, that=s something maybe the instream flow books can provide some input on, but, you know, obviously the lower region, you know, the lower river is being starved of large woody debris.

Now there are plenty of inputs that are coming in, you know, from tributaries downstream and from the stream banks themselves, so I don=t know if there is a deficit downstream or not. You would think there would be in the immediate downstream reach

but it=s hard to say.

MIKE RAVEN: In the projects we looked like with down streams harmonic populations, that=s a big issue, lack of woody debris. Some projects on the west coast where they=re actually getting debris that they accumulate, truck it around and deposit it downstream so that they get it in the system.

One project in Michigan that they=re working at that they never spill so you don=t have any woody debris getting in except local inputs and that takes a while to accumulate. Actually the forest service came in, helicopter, full sized trees, dropping them in --

BILL KITTRELL: It might be more noticeable in a trout stream situation where they=re a critical component, but, you know, in a small mouth bass stream primarily I don=t think it=s as critical, quite as critical as it is in a smaller trout stream.

MIKE RAVEN: The study I mentioned about Blue Stone Dam that=s one of the concerns was woody debris downstream but how it affected recreation and aesthetics and things of that nature and, you know, I have to scour that study a little bit more but that was one of the issues. Like I said, once again, depending on your use of the system, whether you want it there or not, but that was one of the things they talked about.

TERESA ROGERS: What I=ll do is I=ll ask the plant people to start tracking just to give us an idea for this study of, you know, how much. It probably won=t be real scientific but at least they can tell us how many times because a lot of times --

BILL KITTRELL: Just curious, it would be interesting to know how many times they open that up to pass debris --

TERESA ROGERS: I=ll find out.

BILL KITTRELL: Is it daily, is it once a week, is it, you know, once a month.

TERESA ROGERS: Truthfully a lot of it doesn=t even make it down that far.

BILL KITTRELL: Right.

TERESA ROGERS: I mean just because it saves, you know --

MIKE RAVEN: Well, and you also have -- you have a line here; right?

TERESA ROGERS: Yeah, a boom up there. There=s some -- I=ll get them to start like a sheet anytime that they do release there they --

MIKE RAVEN: Just a qualitative idea, you know, do they do it a few times in the summer --

TERESA ROGERS: They may be able to get some photos just to give us some idea.

MIKE RAVEN: Like I said, some of the places with the folks we=ve talked to it accumulates at the dam, if it=s not causing a problem they don=t deal with it, they just leave it there until it accumulates enough mass that it=s an issue or a high flow comes and the spill gates open and it goes downstream.

One of the general thoughts around projects has always been if you touch it then you own it, so if you start manipulating it you have to deal with it, take it out and haul it away, so, you know, they try to avoid that for obvious reasons. Like I said, more and more systems are learning that. They need that habitat component on downstream.

TERESA ROGERS: Okay. Let=s go ahead. We have fish entrainment and impingement.

Fish Entrainment and Impingement DOUG ROYER: For those of you I haven=t met before I=m Doug Royer, from Normandeau Associates. I will be conducting the entrainment and impingement study analysis for Claytor. By the way, my luggage did make it to Roanoke.

The overall objective of this project is to evaluate the

likelihood of entrainment impingement at Claytor. Species of interest that were developed -- we had this problem before. The species of interest that were developed through earlier conversations, striped bass, large mouths, small mouth, a complete list of species here.

This is a flow chart of basically what we=re going to accomplish to come up with impingement entrainment. We=re going to do a literature based estimate of I&E, description of the site characteristics, which are the operational characteristics, plant characteristics. The survival observed at other sites with similar characteristics and survival predicted by models.

From that we=ll have qualitative and quantitative assessment of I&E and target survival and come up with a total qualitative assessment of target survival for the target species. This is some of the entrainment impingement mortality factors that we=re going to look at and roll into this.

The size and depths of the intakes, equator, velocity of the intake entrance, intake locations relative to fish habitat, which equator I think is pretty much not real close from what we=ve seen so far. The characteristics of the fisheries populations from previous research and fishery assessments are going to be conducted, which include the number and size of the species and their behavior as far

as whether they=re migratory or resident.

Knowing the characteristics of turban units, the type, size, blades, spacing of the blades, turban speed and water pressure, which is a function of the elevation. All of those come into play as to what mortality you might observe.

Within that major objective we have a primary task, we=re going to conduct literature review of swim speed behavior with species of concern, review of any evidence of impingement entrainment with current operations at the literature based, any observations by plant personnel or any resource agency personnel, literature review and compare with analysis of impingement entrainment for problems at other projects with the similar characteristics I had said before.

We=re going to measure intake velocity fields during maximum hydraulic capacities and compare velocities against the swim speed information. We=re also going to conduct intake velocity measurements with a single unit in operation as well for comparisons. That goes back to the transects that we were discussing this morning. Then we=ll roll that into a qualitative and quantitative analysis of I&E.

The methods by task we=re doing literature search,

which includes the upper end database of impingement entrainment that has been conducted, Gray literature, reports submitted from other studies. It was very helpful all the stuff that was pulled together earlier and provided on the diskette, all the studies that=s been conducted, that was very useful in our research.

Then we=ll review any evidence specific to the project here. Identify and review studies of similar design or projects of similar design, that would be, like I said, the same relative head. You know, we=ll look at a range above and below what occurs here, runners, that type of stuff.

Review information specific to the fish which I mentioned. Request quantitative information needed, which I=m not sure what all we=re going to need yet to add. We would estimate the intake and bar rack velocities which are going to include a field survey with the ADCP on the transects that were outlined in the study plans.

Possibly right at the bar racks the velocities are going to be done through probably a curve of potential engineering analysis if needed if we can=t get in close enough to do the field measurements because of the signal balance for the ADCP. Just is just a shot of a typical setup. We=ll put the boat in and run the transects,

mark the GPS coordinates and then based on what we do with the water quality we may still go back at the four points and do standing measurements in conjunction with water quality profilers at that time.

We=re going to use predicted model testing turban mortality. That comes from, again, mostly the upper end database. We=ll look at all turban past survival studies and call them out by study characteristics, how well they relate to the station here and the species are concerned. Some of them we may be able to use surrogate species based on body size, things like that that you don=t necessarily have here or vice versa, whether the data is not out there or not.

When we go back into the database we=ll look and make sure the studies are valid in nature, mark recapture techniques, whether it be entrainment or other passage survival studies, whether they had adequate control groups and things like that.

Completeness of the data. Some of the stuff we found in the past you have fishery data, which looks good, but you don=t know what the turban specs were at that time, how you apply them to this particular thing.

Like I said, just make sure it=s scientifically sound research and then in the end professional judgment, you know, if you

see something that just doesn=t look right when you=re going through these you don=t even include it.

This is just an example of the study. I think I presented this earlier in January but you can look. You have two different stations. You go through the parameters, the runner of diameters, the discharge the head, the runner buckets which all play in the survival of any given project.

You look at the actual for the given plant and then we, like for example here, we put a rank of criteria of what was in the database above and below to, you know, help boost the evaluation size. You can see example A is a much larger facility than example B, a lot of that depends on where studies were done over the years and put it in the database, what=s available, what=s not.

For the literature bases IOS target species or similar species, as I said, the fish lance, we found the size is more important than the species itself and a lot of these studies over the years were done with surrogate fish, you know, as opposed to using one of the populations. They would get hatchery trout or whatever to do their tests.

Typically there=s three sizes of fish for the >97 study for the entrainment density and four sizes for the >97 study for survival.

I=m not sure which way we=ll piece that together yet, whether we=ll use three throughout or three and four. The predictive model we=re going to use is Franke et al model. I did not include the example for the turban type of concern and example for fish lance.

That was something I presented previously. I didn=t think it was needed at this point, but for those mathematically minded here=s the equation. If you want to write that down and run your own calculations feel free.

These are the parameters that go into this equation, which include the probability of strike, what=s the likelihood of a fish getting hit by a blade itself based on the runner diameters, spacing between the buckets, correlation factor, which was something built into the equation, the number of blades, fish lance, the angles of the turbans, discharge coefficients, rotational speed.

It=s obvious that something going really fast is going to be more damaging than something going slower. The radius of where the fish actually enter into the turbans and as is ultimately the survival probability. Quantitative estimates are going to be derived from the field studies at other sites and the literature. That will be the basis for qualitative descriptor which we=ll classify as high to low from incorporating the entrainment potential swim speed and

actual survival model calculations.

Here=s some, just an example of when you=re going through the database how many stations other than what you have here met the criteria of the size of station or plant. Then how many met the criteria for the species of concern. This is specifically at the survival end of it.

You can see here in this example the average survival rates based on four different fish species, small, medium and large fish. The status of where we=re at as far as schedule, swim stream, behavior reviews done, the review of any I&E problems associated with Claytor is done. Review of similar projects is ongoing. The review of Claytor operating regimes is ongoing.

The survey, the velocity survey intakes are pending right now for strictly flow related tasks so we have to work with nature to be able to get those in. Turban mortality estimates will pending September >07 depending on if we get the velocity studies down at that point.

TERESA ROGERS: That=s one thing I wanted to bring up. You said you needed four units for six hours, eight hours?

DOUG ROYER: I just figured six as a max.

TERESA ROGERS: Six hours. So depending on what

inflow there is it could have an impact on the water level of course of the lake but also downstream flows. I know, based on past conversations, the spawning downstream would be a concern at high flows.

So, if we had to go ahead and schedule some higher flows to get this in what would be the time of year that would definitely be out of question, if we don=t have normal high flows? Is it end of July or --

BILL KITTRELL: You=re only talking about a six hour duration. You=re only talking about a six hour duration so I think --

JOHN COPELAND: May not be a major impact.

BILL KITTRELL: That=s like a very minor event, you know.

DOUG ROYER: Thunderstorm.

BILL KITTRELL: Yeah. I can=t imagine that would --

TERESA ROGERS: So for this particular -- now the next -- why are we talking about instream flows --

BILL KITTRELL: That=s a different story.

TERESA ROGERS: Because it is much longer but for a six hour period --

JOHN COPELAND: What kind of flow?

TERESA ROGERS: 8,000 CFS, full generation.

BILL KITTRELL: Do you ramp up to that to some degree?

TERESA ROGERS: What I=ve done, because I know how much volume is in a foot of water and based on discharge and time you kind of get a feel, based on inflow, how much to fluctuate the reservoir so there are spawning issues up there as well.

So it depends on how much ramping you want to do I could figure that into it and give you an idea before we actually do anything what that would mean --

JOHN COPELAND: You=re kind of waiting for a flow event to decide when to do it?

TERESA ROGERS: I don=t know because there=s so much to mobilization it=s almost like we can watch the weather at some point --

BILL KITTRELL: When would you prefer to do it? I mean what=s your schedule?

DOUG ROYER: Based on our original schedule and proposal we had the time period of between April through June blocked out, within any time then -- then we got the copy April 15 you had to go over the May, June --

TERESA ROGERS: Yeah, we=re on a level now for spawning --

BILL KITTRELL: May would probably be a better time than June. That=s the normal high flows anyway in May.

JOHN COPELAND: Yeah. There=s a lot of small mouth on beds right now.

TERESA ROGERS: On the lake?

JOHN COPELAND: On the river -- June may be a little bit better.

TERESA ROGERS: Well, we=ll start looking at towards June and we=ll assess the conditions then and kind of predict what we think might happen we=ll go from there.

DOUG ROYER: When are your --

TERESA ROGERS: We=re in levelized flow until October. The other aspect of this, if we=re going to have high flow during this period I need to do some publicizing in papers and that type of thing so anybody recreating downstream -- I need to be really proactive. It won=t be what they=re normally used to so I need to do some of that as well.

JOHN COPELAND: You probably have more storm events in May. June and July is a bad month to have a real high

flow.

TERESA ROGERS: For fish?

JOHN COPELAND: For small mouth.

BILL KITTRELL: How much would that lower the lake?

TERESA ROGERS: Depends on inflow. I could look. I don=t have it with me. Maybe I will pull it up tonight and --

DOUG ROYER: From our standpoint we have a real flexible schedule.

TERESA ROGERS: It would be really nice if we could correlate some of it with the instream flow needs. Maybe we=ll talk to instream flow needs a little bit tomorrow and then we=ll kind of go back and see if --

JOHN COPELAND: Because they want a 6,000 CFS flow; right?

TERESA ROGERS: Instream flow needs they would need --

BILL KITTRELL: Up to 6,000?

TERESA ROGERS: Yeah. But they were going to need it for a lot longer, plus they=re doing transects going down the river, this is going to be a real coordinating nightmare. They=re talking about eight hours of flow but they=ll need that for several days.

DOUG ROYER: How much rain are we supposed to get next week?

MIKE RAVEN: If I don=t want any you=ll get all you want.

TERESA ROGERS: We=ll get Tom tomorrow and talk a little bit about it and look at it when we get back.

BILL KITTRELL: The final result, I noticed a lot of your tables there had survival estimates you=re saying turban mortality estimates, obviously you get both of them if you get determine survival the converse of that is mortality. How is it reported, the mortality estimates or do you report it as survival?

DOUG ROYER: It will be reported as survival.

BILL KITTRELL: Because if you look at mortality then you almost have to come up with a number, which --

DOUG ROYER: Yes, that will be in the calculations, you know, for those size classes of fish. You=ll have a value of estimated mortality.

BILL KITTRELL: By species?

DOUG ROYER: By species.

BILL KITTRELL: By the three size category?

DOUG ROYER: By the three size categories and you

can take that one step further, which we=ll do. Maybe I didn=t get that clear, but you=ll also roll in the entrainment potential for that in the fish. Now, you=ll assign a --

BILL KITTRELL: There will be an empirical value?

DOUG ROYER: Of high, medium, low.

BILL KITTRELL: Yeah. Is it --

DOUG ROYER: You can=t -- without --

BILL KITTRELL: You can=t come up with a number --

DOUG ROYER: No, not without having a population estimate. You could never come up with a number.

BILL KITTRELL: You basically have the qualifier of high, medium, low?

DOUG ROYER: Yes. You can assume that say like just use Elway, for an example, you may pass or come up with a survival estimate of 95 percent of young -- but without ever, you know, knowing --

BILL KITTRELL: The beginning start number of population aspect.

DOUG ROYER: Yeah. You=ll have the entrainment potential of those fish. There is no way --

BILL KITTRELL: The only way to quantify that is with a

netting study or some type of study like that, which you don=t really --

JOHN SMITH: John Smith. We=ve kind of gotten away from the catch them and count them kind of studies anyway, we=re really focusing more on the health of the fishery. So when we go over the species I wasn=t clear on whether there=s a -- I don=t even know if the data is out there but just some general characteristics of the fishery --

DOUG ROYER: Yes, and that=s included in the study.

JOHN SMITH: Because that=s what we focus on the most and then if you can correlate a fish that=s got a high mortality rate or something, what=s happening to the fishery that=s --

TERESA ROGERS: The other thing I=ll do is I=ll get with our operations and ask them to give me a heads up if it looks like we=re going to have a high flow event because they monitor flows down to North Carolina and weather channels and they may can give me some -- how much lead time do you need?

DOUG ROYER: I=ll get back to you on that.

TERESA ROGERS: Okay. If you can let me know that. I=ll get him to -- I=ll pass that along.

DOUG ROYER: It=s mainly getting the equipment in

place.

TERESA ROGERS: Then you don=t want too much flow because if we=re spilling it=s probably not a good place to be. Just the right amount of flow.

MARK HUTCHINS: Teresa, also keep us water quality people informed if you=re going to be modifying flows in various flow releases, just so we know what=s going on. We might try to avoid those times if you=re releasing unnaturally high flows or maybe we target it, I don=t know.

TERESA ROGERS: I think if nothing else we flag it saying flows of this are being released for this specific report so that it=s obvious when we do that, but I=ll let you know when it will be.

DOUG ROYER: Any other questions?

Habitat and Aquatic Vegetation

SARAH ALLEN: I=m Sarah Allen and I=m also from Normandeau. I will present and update on habitat studies, which will include wetlands, the littoral zone work, some component of woody debris. There are several studies going on associated with woody debris. We=ll be looking at flood plans in riparian habitat. We=re doing bald eagle studies and also looking at submerged aquatic vegetation for both native and exotic vegetation.

Most of this is going to be an update but just to refresh your memories as to what we=re doing, for wetlands and riparian habitat we=ve reorganized the study plan. We=re doing all the components we=re just reorganizing a little bit to fit in to field studies.

So for wetlands and riparian habitat the objectives are to identify and to map the habitats within 1,000 feet of the shoreline for the project area and also to focus on those wetlands and riparian habitats that are within the influence of the reservoir, because obviously the main purpose is to associate with project operations.

As such we will assess the effects of project operations on both wetlands and riparian habitats and for wetlands our primary focus so far, as we understand operations, will be to look at the fall dry down zone when some of these wetlands are potentially dewatered.

For the riparian we will certainly look at water regimes but we=ll also be looking at land use as the riparian habitats could be contributing to either water quality or some of the other habitats in the lake. So we=ll be looking at logging, we=ll be looking at development in the flood planes and trying to -- we=ll be mapping them according to land use.

We=ll assess the effects of sedimentation and erosion on both those habitat types and we=ll be identifying measures that could protect or enhance both wetlands and riparian habitat.

The parameters for it include for wetlands we=ll be looking at Claytor Lake and the tributary streams within the project boundaries. We=ll be putting a 1,000 foot buffer around those so wetlands that lie within 1,000 feet of the full pond line will be included in the map. For riparian, and actually we=re mapping wetland habitats as well, we=ll extend 2,000 feet downstream of the dam.

For the analysis for using stereo aerial photographs flown by Appalachian Power. We=re using the ones that Brady Todd referenced this morning. They are black and white. The scale is one inch equals 800 feet. Because they are in stereo we can get topography and do a 3-D analysis of it. We will also be using the topographic and bathymetric analysis that AEP is coming up with as well.

Using photographs we=ll delineate and cover type all the wetlands and riparian habitats, that will include -- we=re using national wetland inventory protocols so that will include everything from aquatic vegetation to emergent shrub swamp and wetlands and where we can we=ll break it up by some finer cover type definitions

as well as hydrologic regime.

Using the one to 800 scale our minimum map unit will wind up being about half an acre in size. We received the photos a week or two ago so I just figured I=d throw -- we haven=t done much with them so I don=t have a whole lot to update on that but I figured I would throw in one that you will probably all recognize.

This is obviously Claytor Lake Dam down here. When we=re mapping we will follow the contours of the shoreline. We=ll certainly include islands and we=ll be looking at the cover types again within that 1,000 foot buffer.

This is the other end of the lake. This is, I believe it=s Paradise Point, as I=m coming to learn the area. We have started some cover typing, as a matter of fact, after today I=m going to run down and take a look at this wetland here which is one of the primary in lake wetlands.

I haven=t mentioned yet that after we do the mapping we will go out and groundtruth to make that both our cover types and our delineations are accurate.

We=re also doing a bald eagle study. The objectives are to identify and map all bald eagle habitats that are existing in the area and potential areas for bald eagles to either winter or nest. We also

want to look at any proposed construction activities that are near the existing nests or potential roosting or perching habitats.

Finally, we want to assess project related impacts, if there are any, on bald eagles or their habitats. The Center for Conservation Biology is doing this study for us as a subcontractor. They are looking at Claytor Lake and its tributaries at again 2,000 feet downstream.

They are extending up to half a mile away from the shoreline, simply for nesting activity at least, simply because in other projects they found that to be a reasonable area that the eagles will travel to nest. They=re mapping within 200 feet of the shoreline for potential habitat. As I said, The Center for Conservation Biology of William & Mary College is conducting the aerial surveys.

They flew a nest survey in March. They=re getting ready to fly a productivity survey on the nests they did find to see if they are -- they found an incubating adult in late March and they=ll go back to see what that nest produced, hopefully this week.

They do this by systematically flying the impoundment at an altitude of 300 feet, so if you felt like you were being buzzed in late spring, or in early spring that was probably Brian Watts. While he=s in the air he also maps all the potential forest habitat that could

support these birds.

I just figured you might be interested in what he sees from his 300 foot altitude. This is an eagle at the northern end of the project area. If you had a little bit better resolution you can actually see the bird on the nest. He=s gotten a GPS coordinate on it and is providing us with GPS coordinates as well as his habitat map.

Some of the other components of the study that really haven=t gotten underway yet include looking at native and exotic aquatic vegetation. The photos that we=re using were flown, obviously if you look at it, they were leaf off, they were flown in March so they will not help us in mapping aquatic vegetation.

We have -- we=re hopefully going to find some mid summer hopefully orthophotos that will help us a lot in mapping aquatic beds. We=re also going to piggyback with Kleinschmidt when they do some of their flights to take a look from the air so we can start getting limits of aquatic beds and then ultimately in late summer we will groundtruth to both map the extent of the aquatic beds and put in some permanent transects so we can sample vegetation and some of the structural components of these aquatic beds to get a sense of both the extent that exotics dominate the aquatic beds and what we might be able to do for any control mechanisms.

I think that=s it for the studies that are underway. We are also doing the littoral zone habitat mapping which will include running the shoreline and mapping littoral habitat at the draw down period. So that won=t even occur -- the field studies for that won=t even occur until November or whenever the draw down is going to occur.

For schedule we are pretty much on schedule. We haven=t gotten started much but that=s because we won=t be able to do a whole lot until later. The bald eagle surveys, as I mentioned earlier, are essentially completed or will be this week. Photo interpretation is underway now. I hope to have that wrapped up in a few weeks. Progress report is occurring as we speak.

We=ll do a preliminary aquatic vegetation survey in probably early to mid July for the purpose of identifying both major aquatic beds and also where our survey locations will be and we will provide those to the stakeholders for review and comment.

In August we=ll go back out and actually do our sampling for the aquatic beds and also for the wetlands and riparian habitat and photo interpretation. And again, we=ll do another study update in November followed by the -- unfortunately the littoral field survey will probably occur after that update although -- did you say it=s occurring

in December now?

TERESA ROGERS: I haven=t decided.

SARAH ALLEN: It may or may not include that in our next update. Then we have a draft report in January with a final report in March. That=s pretty much it.

TERESA ROGERS: I did give Sarah John=s name and Dave Collett=s and also -- is it Mike Spraker with Friends of Claytor Lake that=s on hydrilla?

RON POWERS: Right.

TERESA ROGERS: I gave Sarah all of your all=s names and numbers so she will probably be calling you asking questions about your experience with hydrilla.

RON POWERS: We=re going to schedule two sprayings for hydrilla above the bridge.

SARAH ALLEN: Oh. All right.

RON POWERS: We have a contractor that comes out of North Carolina I think and sprays with coating, but he=s going to wait until the plant blooms to see where it is and then knock it down.

SARAH ALLEN: Is that an ongoing program?

RON POWERS: This will be the third year. It occurs primarily above the bridge in shallow areas.

SARAH ALLEN: We=ll definitely have to coordinate on that, so it would be good to get the extent of it before it=s sprayed obviously so we can know what ultimate conditions are and hopefully when either Normandeau or Kleinschmidt is up they might be able to take a look at the extent after spraying as well.

JOHN COPELAND: Where=s the main spraying area, is it upstream of Max Creek?

RON POWERS: Yeah, right there in my neighborhood is the first neighborhood above Max Creek and then in the bend where the Bed and Breakfast is and then I think up in towards the -- the opposite side of the lake that you=re going to.

JOHN COPELAND: So there=s hydrilla growing along those --

RON POWERS: There is on the left side. I=m not sure. You=ll have to check with Dave about that because, you know, we don=t gather payment from him from the different locations for property up there far. But I do know it will start right at Max Creek.

BILL KITTRELL: Spring flows can, you know, high spring flows tend to delay it coming up, particularly hydrilla, but we haven=t had that this spring so. Sometimes you can -- it seems like, I could be wrong about this, it seems like some years September it popped

out really well, but this year you may be able to see it very good in August since it=s been sort of dry.

RON POWERS: As soon as we knock it down it will be back in bloom and we=ll knock it down again in August or September. But another large spot for hydrilla that=s occurring is under the trestle that crosses the upper end of the lake. The massive bloom is occurring now that we do not spray.

SARAH ALLEN: Okay. Well, we will definitely --

JOHN COPELAND: There=s a lot of it is in the State Park Marina now too. It=s all through there.

TERESA ROGERS: That=s being --

BILL KITTRELL: Is there any permitting for any --

RON POWERS: Yeah. He takes care of that and like nuisance control.

BILL KITTRELL: Is that Chad?

RON POWERS: No. We don=t do permitting that=s why --

BILL KITTRELL: Do you know who they get permits with?

RON POWERS: No.

BILL KITTELL: Do you all have to issue a permit for spraying?

TERESA ROGERS: Not here.

BILL KITTRELL: You all don=t issue that permit?

UNIDENTIFIED SPEAKER: Depends on what it is.

BILL KITTRELL: For aquatic vegetation control.

UNIDENTIFIED: Generally isn=t it the agriculture people that do that?

BILL KITTRELL: Well, they regulate spraying, the Department of Agriculture.

TERESA ROGERS: From what we gather --

BILL KITTRELL: Or they regulate exotic aquatic vegetation I=ll put it that way.

RON POWERS: I think we did at one time but I=m not sure if that=s still the case. We were trying -- we were looking at doing the spraying on our own and then we realized it=s problematic. The Department of Agriculture --

BILL KITTRELL: It=s best to go through a certified applicator anyway.

RON POWERS: Right. Absolutely.

TERESA ROGERS: From what I=ve gathered so far the

Department of Ag is the one that -- I guess you have to have a license to spray and you have to --

BILL KITTRELL: Until you get your certified applicator=s license --

TERESA ROGERS: And they=re the ones that deal with that.

BILL KITTRELL: Supposedly they=re the lead agency on aquatic nuisance vegetation, exotic or aquatic vegetation.

TERESA ROGERS: I don=t think anybody actually issues permits.

SARAH ALLEN: Any other related questions?

BILL KITTRELL: So in terms of identifying vegetation and quantifying it I guess the determination will be made later, I mean once you get the aerial photos and sort of determine where you go groundtruth it then you=ll set up transects and so forth at that point?

SARAH ALLEN: Correct. And I=ll have to think about this spraying piece a little bit because ideally we would do it before it=s sprayed.

BILL KITTRELL: See, they like to spray it while it=s coming up, before it=s topped out.

SARAH ALLEN: We have two pieces we have to balance

out, one is that we are looking for exotics and probably hydrilla will be the dominant one, but the other pieces that we=re looking for natives to see if there is any sort of displacement or something along those lines.

Certainly for those you want to wait until later in the growing season. So, we=ll have to think about that a little bit. I would like to know the spraying program. We might even try to hit the slot that=s kind of in between the two sprays. That might be the best way to go.

MIKE MCLEOD: The applicator has identified more than just hydrilla as an exotic form, brittle niad, ripply pond, curly leaf, curly pond.

TERESA ROGERS: Would Mike have all that information like spray zones.

RON POWERS: Well, if not Mike can be --

TERESA ROGERS: Could Mike give me that information?

RON POWERS: We can get that information for you.

TERESA ROGERS: That would be great. I guess this is the opportunity if there is any additional questions on process or -- I think tomorrow we won=t actually start until closer to 9:15 because it

won=t take long to overview. At 9:30 we=ll start with cultural resources.

If there is nothing else we can meet back tomorrow.