MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO/COLUMBIA PROJECT RELICENSING
Water Quality Meeting

SCE&G's Lake Murray Training Center
January 16, 2008

Final jms 2-29-08

ATTENDEES:

Bill Argentieri, SCE&G
Alan Stuart, Kleinschmidt Associates
Jeni Hand, Kleinschmidt Associates
Shane Boring, Kleinschmidt Associates
Gerrit Jobsis, American Rivers
Mark Giffin, SCDHEC
Vivianne Vejdau, SCDNR
Rick Kidder, LMA
Jim Ruane, REMI
Reed Bull, Midlands Striper Club
Ron Ahle, SCDNR
Dick Christie, SCDNR
Milton Quattlebaum, SCANA Services
Dan Tufford, USC
Steve Bell, Lake Watch
Joy Downs, LMA
Roy Parker, LMA
Andy Sawyer, REMI

NEXT MEETING

TBA

ACTION ITEMS

- Correct typos on the Applications of the CE-QUAL-W2 Model Appendices. Send out corrections to committee members in a word document.

Andy Sawyer

- Send out Water Quality Report as an information resource to committee members.

Shane Boring

- Provide lower Saluda River minimum flow recommendations to Jim Ruane.

Alan Stuart

- Provide a tracking sheet to the RCG of all recommendations for the operations model and send to Jon Quebman.

Kleinschmidt

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
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Water Quality Meeting

SCE&G's Lake Murray Training Center
January 16, 2008

Final jms 2-29-08

MEETING NOTES:

These notes serve as a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan Stuart of Kleinschmidt Associates opened the meeting at approximately 9:30 AM and meeting attendees introduced themselves. Alan noted that the focus of the meeting would be to discuss: (1) results of the Lake Murray sediment assessment considering the winter minimum pool elevation; (2) presentation distribution of Appendix 1 of the CE-QUAL-W2 model applications report; (3) findings from W2 modeling; (4) proposed presentation at the Quarterly Public Meeting on January 17th; and (5) set date, develop agenda and assign action items for the next TWC meeting.

Considerations about raising the winter minimum pool elevation-supplemental assessments; Jim Ruane. The presentation may be viewed at the following website:
http://www.saludahydrorelicense.com/MeetingSummaries.htm

Jim noted that he gave this presentation at the last water quality meeting, but explained that since the last meeting a sediment assessment and analysis was conducted on Lake Murray in November of 2007. Jim briefly explained each of the 21 sample location on Lake Murray. The sample locations were located in the Little Saluda River and Camping Creek embayment as well as the Saluda River embayment and every mile down river until the conversion of Rocky Creek. Shealy Environmental analyzed the sediments for nitrogen, phosphorus and carbon. Jim explained that the sediments were collected with an Eckman's dredge and the top "ooze" layer was removed for analysis. Jim noted that the "ooze" is the decaying material in the sediments, which is known as the active material.

Jim presented the results of the analysis and noted that sediment samples are known to have a good amount of outliers in the data. Two inflow stations had zero ooze, and no ooze was observed on the exposed shoreline sediments. He added that the first location downstream from the inflow points increased in TOC, P, and TKN showing that there would be more accumulation of organic matter near the surface of the lake unless the pool drops more and allows this matter to redeposit deeper into the lake. Jim explained that from the data, the sediments seems to increase from inflow sites to downstream sites (towards the Lake Murray dam). The ooze found in the sediment samples was very labile or active. Jim briefly explained the ratios of carbon, nitrogen and phosphorus for Lake Murray.

Jim discussed the effects of sediment processes on water quality and noted that sediment/water interface usually is the area of highest rates for biochemical process and explained that shallow water areas are impacted more than deep water areas due to less volume of water over the sediments. Jim noted that organic matter that is created by algal growths and aquatic weeds settles in the sediments where it decomposes and releases phosphorus and nitrogen back into the water

column. Jim explained that because the upper part of Lake Murray is labile, the biochemical process were higher.

Steve Bell enquired as to how the previous drawdowns over the years in Lake Murray have effected these results. Jim briefly explained that he thinks that there may be a delta located upstream of the Lake Murray dam, which is trapping a lot of the sediments moving downstream. Jim further explained that when a drawdown occurs, such as in 2003 and 2004, the delta is cleaned out and the sediments are washed downstream. Jim displayed hydrographic data used to develop bathymetry of Lake Murray showing possible sediment accumulation upstream from Rocky Creek. Jim explained that it is probable that this delta formed during times when the pool elevation was at 354 ft and when high flows occurred like in the year 2003.

Jim focused the groups attention to discussing considerations about raising the winter minimum pool for Lake Murray. Jim noted that when examining the inflow data from 1929 to 2003 half the time the elevation was at 350 ft and the other half of the time the pool level was at 354 ft. Jim noted that if the minimum pool is raised to 354 ft in the winter aquatic weeds will likely take root in some areas and may not be controlled by winter freeze conditions. He also explained that sediment would likely accumulate in these areas since deposition would be increased and erosion would be reduced, especially those areas where tributaries enter the lake. Finally he explained that algal growths would also likely increase in embayments because more phosphorus would be released from the lake sediments, especially in the spring. In summary, Jim noted that considering that summer pool elevation can drop to approximately 350 ft even when the May-June elevation starts at 358 ft due to low inflows, evaporation, and minimum inflow provisions, aquatic plants could take root at elevation ~350-352 ft when summer pools are low. Therefore, he explained that the minimum winter pool should be dropped to about elevation 350 ft periodically to freeze these plants. Dick Christie noted that SCDNR will insist on drawing down the lake to control aquatic weeds. Joy Downs noted that Lake Murray Association feels that the lake should not be dropped any lower than 354 ft during winter months. On behalf of Midlands Striper Club, Reed Bull noted that he was concerned with having a minimum lake elevation of 354 ft year around. He explained that from the information that Jim Ruane has presented, he feels that there may be potential negative impact on water quality and fish habitat in Lake Murray if the lake elevation remains at 354 ft year around.

Gerrit Jobsis noted that the group should use this information to manage lake levels. However, he noted that we should not base decisions on data recently collected because we have not had normal operations in recent years. Gerrit recommended developing an initial management plan on lake levels to control aquatic weeds and sediment transport. Jim Ruane noted that the answer maybe drawing down the lake every two years. He explained that this is what SCE&G has been doing in the past and it seems to be working. He noted that sediment transport is most beneficial when a fast drawdown occurs, because it allows sediment to move out quicker. Jim recommended drawing down the lake quickly in December and let it fill back up with winter rains in January. Ron Ahle noted that once we have a better understanding of minimum flows for the lower Saluda River and

operational decisions, then we should come back and address this issue to help make management decisions. Alan noted that all recommendations made for the operations model will be put in a tracking sheet and submitted to the RCG for review and once approved, recommendations will be given to Jon Quebman to run the operations model. Jim noted that before he made recommendations for winter minimum pool, he would first need to examine flow recommendations for the lower Saluda River.

Presentation/Distribution of Appendix 1 of the CE-QUAL-W2 Model Applications Report

Andy Sawyer distributed Appendix 1 of the CE-QUAL-W2 Model Applications Report. Andy lead the group in great detail through the context of Appendix 1 through 5 of the report.

Review of Findings from W2 Modeling, Especially Results Presented at the Meeting on November 6, 2007

Jim briefly explained the W2 model and noted that the Water Quality Technical Working Committee have recommended evaluating the following:

- The causes of striped bass fish kills reported in previous years, especially factor related to Saluda Hydro operations;
- The effects of Unit 5 operations on striped bass and entrainment of blueback herring;
- Determination of operational changes that might increase habitat for striped bass and blueback herring;
- Assessment of pool level management alternatives; and
- Track any impacts that could occur to the tailwater cold-water fishery due to potential operational changes.

Jim noted that the W2 report and calibration report was sent out for review and comment. The group noted that there were no questions on the report at this time.

Review of Proposed Presentation at the Quarterly Public Meeting on January 17, 2008.

Jim noted that he will be presenting the presentation he gave today at the January 17, 2008 Quarterly Public Meeting. He noted that in addition to discussing sediment assessment in Lake Murray, he will also be discussing turbine venting below the Saluda Hydro Dam. Reed Bull asked if dissolved oxygen enhancements have improved fishery in the lower Saluda River. Jim noted that he's not sure if dissolved oxygen enhancements have really changed the fishery a whole lot. He noted that this will be one of the issues discussed at the Quarterly Public Meeting.

Alan noted that SCE&G is considering potential upgrades for the Saluda Hydro Project. He explained that they are considering installing a minimum flow unit in one of the lower units. The group discussed how the new minimum flow units may potentially affect the striped bass and trout fishery. Ron noted that he was concerned that this would worsen Lake Murray's striped bass habitat and lower Saluda River trout fishery. Ron specifically noted that he was concerned that SCE&G would not be able to provide cold water if unit 5 was not used during summer months. Jim noted that generally, low flow years usually provide plenty of cold water. He explained that it's the high flow years that effect striped bass during the months of April and May, which would be in question.

Set Date, Develop Agenda and Assign Action Items for Next TWC Meeting

Alan noted that the only outstanding item for the Water Quality Technical Working Committee is the temperature study. He explained that the report would be sent out as an information resource. Alan noted that once minimum flow recommendations are made for the lower Saluda River, we will provide this information to Jim so he can run them in the W2 model. Once these items have been completed we will set a date for the next meeting.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TWC

SCE&G Training Center
November 6, 2007

final ACG 8-11-08

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Shane Boring, Kleinschmidt Associates
Milton Quattlebaum, SCANA
Richard Kidder, LMA
Roy Parker, LMA
Gina Kirkland, DHEC
Joy Downs, LMA
Jim Cumberland, CCL
Ron Ahle, SCDNR
Reed Bull, Midlands Striper Club
Steve Bell, Lake Watch
Andy Miller, SCDHEC
Jim Ruane, REMI
Amanda Hill, USFWS
Gerrit Jobsis, AR
Mark Giffin, DHEC
J. Charles Floyd, LMHOC

DATE: November 6, 2007

DISCUSSION

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Shane Boring opened the meeting and noted that Jim Ruane and Andy Sawyer had presentations for the group on the striped bass habitat and considerations for raising minimum pool elevations. Jim introduced himself and presented the group with a brief background on what the TWC had accomplished thus far at previous meetings and the previous modeling efforts that had taken place (Jim's presentation can be viewed at http://www.saludahydrorelicense.com/water_quality.htm). Jim also reviewed the relicensing issues identified by the water quality technical working committee. Jim discussed the data sets and the USGS data that was used. Steve Bell asked if there were any major drawdowns during the model calibration years. Jim responded that there was a major drawdown in 1996.

Jim continued to present the findings to the group in graph and model form. He pointed out that statistically, model data matched up very well with the actual USGS data. In a discussion on

phosphorus levels and eutrophication, Jim explained that some of the monitors near Black's Bridge indicated high levels of eutrophication.

The group also discussed the striped bass kills that occasionally occur on Lake Murray and any operational changes that can improve the quality of the habitat. Ron Ahle noted that the duration of the low DO event is of concern, and any operational changes that can shorten the duration of low DO will likely lead to less striper mortality. Jim showed the group that higher flow years typically lead to the higher likelihood of a fish kill because the habitat is drawn out of the lake very quickly.

Reed Bull posed the question of whether or not the Howell-Bunger valve could be used to increase dissolved oxygen downstream. Bill Argentieri explained the function of the HB valve and noted that it was really only a short term solution and would not be appropriate for weeks at a time.

After they completed their review of what had been previously accomplished. Jim described the new results since the previous August meeting. In the August meeting, Jim explained that they were tasked to determine either a date or trigger temperature at which to switch from Unit 5 back to the lower units. Jim explained that due to their findings, June 15th was the best date to switch to the lower units, however, in some cases it did not make a difference due to the various other conditions that affect it.**

The group reviewed the altered operational scenarios for various years. Jim also explained the effects of Unit 5 discharges on tailwater temperatures and there was some discussion on optimal temperatures for trout. Jim explained that they typically stop feeding around 19 to 20 degrees C. It was explained that with the proposed implementations, water was still cooler than with current conditions.

In conclusion, Jim made the following recommendations based on the balancing of striped bass habitat and the downstream trout habitat (directly from presentation):

The following protocol for unit operations was developed: for minimum flows, use units 1,3, or 4 June 15 thru Dec 1 and U5 for Dec 1 to June 15. For generation flows (i.e., flows > minimum flow)**,** use Unit 5 preferentially for 11 months of the year: November 1 until October 1 of the following year, and use Units 1-4 preferentially in October.
• These results of using the proposed unit operations protocol showed the following:
• Temperature in the releases was improved for all years, compared to other unit operational procedures. The temperature at the 5 to 20% levels of exceedence frequency was usually cooler, and at the

80% levels of exceedence frequency was usually warmer. This characteristic for temperature exposure for fish is best for trout fish growth rates. The maximum temperatures for the proposed protocol were usually about the same as the next-best alternatives for this consideration, but temperature results for near-maximum levels was much better for the proposed protocol.

• The proposed protocol for turbine unit operations for minimum flows and generation flows had very little or no effect on striped bass habitat enhancements achieved previously by increasing summer pool levels and using Unit 5 preferentially for 1991, 1992, 1996, 2000, 2001, and 2005. For 1997 and 1998, striped bass habitat was marginally impacted by the proposed protocol for turbine unit operations and the impacts were considerably less than the improvements provided by the higher summer pool level and Unit 5 preferential operations in the months preceding June 15.

Gina Kirkland pointed out that there were entrainment issues with Unit 5 that the group should consider. It was noted that they would monitor fish concentrations in front of unit 5 using the hydroacoustic sampler. Once fish concentrations in front of the unit were high they would revert to the lower units. Alan pointed out that as well as considering the growth rates for trout, the group should keep in mind the spawning needs of resident species as well. Ron asked if the switch to the lower units could occur in August as opposed to the June recommendation. Jim noted that it was a trade off due to the fact that waiting until August was bad for the tailwater. Ron noted that July could possibly be a good intermediate zone to switch to the lower units, however agreed that it was best to wait until the report was issued before any final recommendations were made.

Subsequent to discussions on striped bass habitat, the group shifted discussion topics to considerations on raising minimum pool elevations. Jim explained that raising the minimum pool elevation could, in turn, affect water quality and fish habitat. Jim explained to the group that the lake was not affected as to whether you began drawing it down at 350 or 354, the lake simply needed the drawdown in order to flush the nutrient rich sediments to the lower reaches of the lake where the waters are anoxic (without oxygen).

Jim also noted that since a higher winter pool level was being proposed (354'), than there would be less water exchange in the Little Saluda River embayment where internal nutrient cycling was occurring. He explained that internal nutrient cycling was not an unusual problem in reservoirs. Jim noted that the nutrient cycling could potentially reach a level where all of the phosphorus inputs to the reservoir could be cut off, and there would still be nutrients coming out of the sediments.

Jim presented the group with some background from other reservoirs he had worked with such as Douglas Reservoir. He also explained that minimum pool levels affect where phosphorus-rich sediment is deposited in the reservoir. Jim described that the sediments and aquatic weeds were connected, and if sediments start to build up at a higher level, than the weeds are able to get more light and start to accumulate as well. He noted that if the pool level was dropped to 350 in the winter, it would expose the plants to the dry and freezing temperatures. He also added that the more often the areas are exposed, the more opportunity there was to move the sediments.

Jim explained that a preventative measure would be to draw the reservoir down on a periodic basis to 350'. He also explained that there were concerns that if there was a winter drawdown to 350', the reservoir would not be able to refill the following spring. Jim noted that he had researched this issue and explained that he had found that if the inflows at the Chappells gage were greater than 1200 cfs the fall before, than there was a very high likelihood of filling up the reservoir the following spring.

Steve Bell asked Jim how long it would take before there would be a water quality problem if the lake was not drawn down and kept at 356. Jim explained that what they where concerned with was the Little Saluda River Embayment, which was a pretty big body of water. Jim further explained that if their results are correct, there would be no way to clean up the water quality. Steve then asked if it could be deduced that in 10 years they could expect that that area would not meet water quality standards year-round. Jim replied that that would be their concern. Jim further explained to the group that his opinion was that the lake should be drawn down to 350' for a winter pool.

The group continued to ask questions and Ron Ahle proposed increasing the 1200 cfs inflow trigger to 1500 or 1800 in order to increase the probability for a successful refilling the next year. Ron noted that he was concerned about this due to the potential for low water to affect fish spawning habitat. Joy Downs also asked about the proposed duration and timeframe for which the lake would be drawn down. Jim explained that it would entail dropping the reservoir and then letting it refill as the water became available. Jim suggested dropping the reservoir by a foot a month from Sept. through Nov., and then pulling it down the rest of the way in November. Jim also pointed out that it may benefit to drop the reservoir quickly because the sediments would be wet and more likely to wash down in a rain event.

Rich Kidder expressed concern that there was not data available on the sediments. Jim explained that there was a risk that they were taking by not drawing down the reservoir, even if the data was available. Ron Ahle pointed out that they had been focused on holding the water level higher to benefit the striped bass. However, if the phosphorus levels continue to rise, then that would be more detrimental to the fishery.

Reed Bull noted that it initially appears that a drawdown would be good for water quality and asked what the objection would be to periodically drawing the reservoir down to 350 during December and January. Steve Bell replied that many individuals in the recreation group believe that holding the lake level higher was better for recreation. Alan Stuart pointed out that the recreation season runs until around labor day and it would potentially be risking the health of the lake in order for someone to be able to keep their boat at the dock in the winter time. Ron pointed out that the water quality of the lake should take priority over recreation.

The group discussed what the water level recommendation will be for the operational model. It was noted that the group should review the report before making a final recommendation. It was also explained that there would be downstream flow recommendations coming out of the instream flow committee in December that the group should consider. The next meeting date was set for January 16th.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TWC

SCE&G Training Center
August 7, 2007

Final ACG 10-30-07

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Shane Boring, Kleinschmidt Associates
Richard Kidder, LMA
Roy Parker, LMA
Roger Hall, SCDHEC
Jim Cumberland, CCL
Ron Ahle, SCDNR
Reed Bull, Midlands Striper Club
Tom Bowles, SCE&G
Andy Miller, SCDHEC
Jim Ruane, REMI
Amanda Hill, USFWS
Gerrit Jobsis, AR

DATE: August 7, 2006

DATE OF NEXT MEETING: **November 6, 2007 at 9:30 a.m.**
Located at the Lake Murray Training Center
RCG Morning – TWC Afternoon

DISCUSSION

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Shane opened the meeting and noted the purpose of the meeting would be to provide an update on the water quality modeling on the effects of operations on fishery habitat. Jim Ruane and Andy Sawyer presented the outcomes of the modeling in presentation format, which can be viewed at the following address: http://www.saludahydrorelicense.com/water_quality.htm . Jim noted that per the groups discussions from the last meeting, they focused on the reservoir operations, pool level and Unit 5 preference in their modeling. After a brief review of the previous analyses and findings, Andy presented the group with the effects of winter pool levels at 350 and 354 and a summer pool at 358. Andy reviewed that preliminarily, high flows, especially during March-August, is the primary cause for fish kills. Andy further explained that higher flows cause the bottom of the lake

to warm, which in turn increases the rate of DO depletions. Nutrients are still the single dominant factor that aid in habitat depletion.

Andy explained that the following were the next steps chosen in the May meeting:

1. For selected years, finalize assessment (i.e., assess changes in releases) of operating guide for U5 preference for "first on, last off" operation using the hourly releases
2. For selected years, finalize assessment of maintaining summer pool levels at 358
3. For selected years, finalize assessment of the combination of maintaining summer pool levels at 358 with U5 preference for "first on, last off" operation using the hourly releases
4. Analyze additional years, especially a low flow year
5. Assess effects of minimum winter pool level, including effects on Little Saluda embayment, increased SOD, internal nutrient cycling, aquatic plants, sedimentation in coves

Andy provided the group with all the years that were modeled and noted that the model was proven very reliable. He explained that the error around the mean for temperature is below one degree (.73), and .99 for DO. He noted that the fish kill years that were modeled were '91, '98, and '05. Andy explained all of the items modeled with the group, which included chlorophyll a, nitrate, TP, pH, ISS and turbidity, alkalinity, TKN, TOC. He also noted that this would be further detailed in the report. Andy presented the group with the graphed differences in water quality between the 350' and 354' winter pool scenarios. It was shown that during certain years, especially the dry years, holding the pool level up showed no difference in habitat. However there were certain years that holding the pool level up was shown to have an effect on habitat, as well as colder releases.

Andy then presented the group with scenarios where the winter pool level was held up and Unit 5 was run first on. Reed Bull asked if there were problems with warmer temperatures downstream by running Unit 5 first. Jim Ruane noted that it depends on the flow, and they have performed some modeling to show this.

The group further discussed the habitat loss in the lake. During some years it was shown that the habitat completely disappears around the units. Several group members pressed for long term solutions to habitat issues in the lake, such as phosphorus improvements, and a push to get funding to solve upstream problems. Gerrit Jobsis noted that oxygenation may be an option. It was noted that any operational changes, however minor, may be an important benefit for lake fishery habitat.

The group continued to review results of modeled pool level management and the use of Unit 5 as first on. It was shown that over the years, the trends shown with the graph either depicted small improvements, or no improvements. The group also briefly discussed release temperatures in the lower Saluda under this operating scenario. It was shown that by changing back over to Unit 5 "last

on, first off" by September 1, you do not affect striped bass habitat, however you then allow for the colder releases into the Saluda. It was shown that by using the lower units after September 1 allowed the river temperatures to drop by about a degree and a half. It was explained that the minimum flow should go out of unit 5 until discharges reach a certain temperature.

The group discussed that rather than a date trigger to switch to the bottom units, that they should possibly use a release temperature trigger. Gerrit suggested that the group move the switch date from September 1 to August 1 and the group considered this option. Andy explained that he could run a scenario with a switch on August 1 to the lower units. Jim Ruane explained that he felt that it would be best to use release temperature as a trigger. He continued to note that a good trigger would be to switch to the lower units when Unit 5 releases reached 15 degrees at 500 cfs. Bill asked if a minimum flow greater than 500 cfs would be detrimental to striper habitat. Andy noted that he assumed that it would.

The group also discussed when to switch back to the scenario of Unit 5 "first on last off". Andy Sawyer noted that once tailwater temperatures were not an issue anymore, that they may be able to switch back in order to start conserving the cooler water for the next season. It was explained that this was likely to occur in the November timeframe.

The group reviewed the conclusions.

- Unit 5 preferential operations can improve striped bass habitat in some years.
- Maintaining the summer pool level at 358 increases striped bass habitat in some years.
- The combination of Unit 5 preferential operations and maintaining the summer pool level at 358 can further increase striped bass habitat in some years. It can also improve water quality in the releases.
- When the discharge temperature from Unit 5 reaches 15^{o} C, the minimum flow should be released through a bottom unit.
- Unit 5 operations after August or September do not effect striped bass habitat.

The group also reviewed the next steps. Jim noted that they will be summarizing the results into a report.

Tom Bowles briefly discussed his work with the hydroacoustic monitoring equipment on the Unit 5 tower to monitor blueback herring movements. It was noted that they would want to make sure the proposed "unit 5 first on, last off" scenario didn't result in an entrainment event. The group decided that this scenario was still worth pursuing on a trail basis, with a monitoring of blueback herring movements. It was noted that Jim and Andy would write up the proposed scenario and it would be

passed around to the TWC. The group also discussed having this as the presentation topic for the January Quarterly Public Meeting.

After lunch, the group reviewed concerns about raising the winter minimum pool elevations. It was explained that raising the min pool elevation could affect water quality and fish habitat. Jim explained that without the pool level decrease in the winter, organic matter could build up in the sediments and cause internal nutrient cycling.

Jim explained to the group that the Little Saluda River Embayment, located in the upper portion of the reservoir, posed a great impact to water quality. He noted that if the minimum pool elevation was raised, there will be less water exchange between the embayment and the main body of water. He noted that there also would be less scouring of organic and inorganic matter, leading to internal nutrient cycling.

Jim noted that they had researched this using both the W2 model and previous experience. It was noted that the Little Saluda River Embayment is exposed when the lake is at or below elevation 350'. The group discussed that many factors led to problems with the build up of nutrients, such as aquatic plants, watershed size, land uses, types of soil, etc. The recommendation made by Jim to the group based on the W2 model, was a pool elevation drop to 350 whenever the inflow at the Chappell's gage was greater than 200,000 ac-ft (100,00 dsf) late in the previous year. He noted that they had looked at a series of years, and out of a 15 year period, if the flows were higher than 200,000 ac-ft from Sept 1 to December 15, then they would have enough inflows to fill the lake the following year.

The group also discussed some of the concerns of increasing the winter minimum pool level from 350 to 354. These concerns included:

- Sediment accumulation coves
- Aquatic plants increasing around the lake
- Organic and nutrient accumulation in sediments
- Water quality and algae in the little Saluda river embayment could already be controlled by internal cycling and increasing the minimum winter pool to 354 could cause worse conditions

Gerrit asked Jim if he had any predictions on how frequently a winter drawdown to 350 would need to occur. Jim noted that if it was done two-thirds of the time there would be significant benefits to water quality. The group decided to charge Jim with the task of further researching at what frequency a drawdown was needed in order to see benefits to water quality. It was noted that Jim would send the conclusions to the group via Alison.

Shane briefly noted, in reference to the ongoing temperature study, that USC professor John Greigo had contacted him concerning the temperature study and how it could be related to striped bass movements. He noted that the USC student would be performing statistical analyses and he would provide the group with more information when available.

As the group closed the meeting, there was a review of homework items. It was noted that Jim, Andy and Jon Quebbeman would develop scenarios for little Saluda River Embayment, and an Operating Protocol for Unit 5. Ron also noted that he would email the group when he presented this information to other DNR personnel.

Alan also announced that there would be another round of DO testing at the end of September, and consequently some periods of low DO at that time. He explained that Unit 3 was successfully sealed and that SCE&G was going to try to seal the other units in the same manner. It was noted that the hub baffle size on unit 5 was also increased.

Group Adjourned

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TWC

SCE&G Car ina Re earch Par
Ma 22, 2007

Final ACG 6-29-07

ATTENDEES:

Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Dan Tufford, USC
Roger Hall, SCDHEC
Shane Boring, Kleinschmidt Associates
Amanda Hill, USFWS
Andy Sawyer, REMI
Reed Bull, Midlands Striper Club
Ron Ahle, SCDNR
Jim Ruane, REMI
Tom Bowles, SCE&G
Amy Bennett, SCDHEC
Randy Mahan, SCANA Services
Gerrit Jobsis, American Rivers

DATE: May 22, 2007

DATE OF NEXT MEETING: **7 , 2007**

INTRODUCTIONS AND DISCUSSION

The group began the meeting and brief introductions ensued. The purpose of the meeting was for Jim Ruane and Andy Sawyer to present their findings on the Ce Qual W2 model applications to examine the effects of operations on fish habitat in Lake Murray. These were determined in the previous Water Quality TWC meeting. Jim briefly reviewed what had taken place during the previous meeting with the group, and noted that there were several issues identified during that meeting. These items included striped bass kills, blueback herring entrainment, habitat for fish species, and impacts to the tailwater fishery due to operational changes. As discussed in the previous meeting, Jim noted that the preliminary findings indicated that the primary cause for fish kills was shown to be high flows. Meeting discussions were supplemented with graphs that are depicted in the following PowerPoint presentation (http //www.saludahydrorelicense.com/documents/MicrosoftPowerPoint-May22-2007meetingreservoiroperationAnalysis.pdf). Andy also displayed a excel spreadsheet that depicted the monthly flows for several years. The spreadsheet cells were colored in blue if it was a high flow month, yellow if it was a low flow month and green if it was an average flow month. Fish kill months were colored in red. The special operation years of 2002 and 2004 were left off the illustration. Bill Argentieri asked if anything stood out to Jim or Andy in this illustration. Jim replied that primarily the year 1998 stood out. He explained that there were high flows from January through May. Jim also noted that 1993, also had several months of high flows early in the year. Ron Ahle observed that the chart indicates that it may almost have to be a drought situation

10/10/05 ACG

Water Quality

Study Requests:

- **Temperature Analysis – Downstream Effects[2]:** This request entails providing an analysis of the effects of the temperature of discharges from the Saluda Dam on downstream habitats including: (1) An analysis that determines the travel distance downstream to effectuate completion of temperature mixing in the Congaree River; (2) an evaluation of the affects to species and habitats within the downstream Congaree National Park; (3) an evaluation of the affects to upstream migrating diadromous fish.

  Requested by: USFWS

- **Water Quality Studies:** Request of studies in order to assess the effects of Project operations on water quality, and consequently the aquatic habitat in the lake and river segments. Suggested studies include those to determine the effectiveness of newly installed hub baffles, TMDL's in Lake Murray, effects of project operations on summer habitat for striped bass including mitigative measures for fish kills, effects of operations on water temperature as affecting the spawning and recruitment of diadromous and riverine fish in the Saluda and Congaree rivers, and the effects of D.O. and water temperature on mussel populations in the LSR and Congaree. SCDNR recommends that water quality models be developed to identify any relationships between point and non-point pollutants and operations. The Lake Murray Association (LMA) and Lake Murray Homeowners Coalition (LMHC) specifically request information to be collected on cove water quality. The League of Women Voters suggests that water quality studies also include a facet on the impacts of power boats and jet skis on drinking water quality.

  Requested by: CCL/American Rivers, American Whitewater, City of Columbia Parks and Recreation, SCDNR, LMA, LMHC, League of Women Voters, LSSRAC, National Marine Fisheries Service, S.C. Parks Rec and Tourism, SC Council Trout Unlimited, USFWS

- **Sediment Regimen and Sediment Transport Studies:** A request has been made that a study be performed on the sediment regimen in the Project area as well as the Project effects on the sediment regimen of the lower Saluda River. Should include such things as sediment composition, bedload movement, gravel deposition, sediment storage behind dams, and bedload changes below the dam; and project effects on downstream geomorphometry, sediment availability and streambank erosion, and the possible addition of gravel to mitigate

[2] Not included as part of meeting handout; however, this study request was discussed in the meeting and thus is included in the meeting notes.

for there not to be a fish kill. Dan Tufford asked the group if the fish will migrate toward the water surface during the late summer months to find habitat. Gerrit Jobsis noted that he has observed that the fish will come to the surface after a cool rain event.

Jim and Andy then began to discuss the new operational constraints that were considered after the previous meeting discussions. Jim noted that they had evaluated the raised pool levels with the following considerations and assumptions

Scenarios considered
- 354 (Jan 1) to 358 (May 1 through Sept 1) to 354 (Dec 31)
- 350 (Jan 1) to 358 (May 1 through Sept 1) to 350 (Dec 31)

Assumptions
- Assumed 500 cfs for minimum release
- Assumed reserve generation averaged 3 hrs every two weeks at 18000 cfs
- Balance of releases were assumed to be used to supplement system demand

Approach
- The above scenarios were developed by KA using daily average flows using HEC Res Sim
- CE Qual W2 was run using daily average flows and release flows were adjusted so that target pool levels were attained
- Using the daily average flows that were adjusted using the w2 model the hourly flows for each day were developed using the assumptions above

Andy then began to explain the scenarios to the group. He noted that when Unit 5 was run first on, last off, the model depicted that it either helped retain habitat, or did nothing. Andy also presented the group with an animation showing that running unit five first significantly preserved the cooler water for a longer period of time. Bill noted that although the habitat loss is delayed under this scenario, he asked if this scenario would only just serve to delay a fish kill. Ron replied that with delaying the habitat loss, they are increasing the potential for recovery. Dan Tufford asked if the animations could be placed on the relicensing website and Alison Guth noted that she would work with Andy to figure out the best way to do this.

The group also reviewed charts depicting the temperature changes in the tailrace during the unit 5 first on-last off scenario. Andy explained that it can be expected that there will be a warmer discharge by discharging out of unit 5. It was shown that there was a one to two degree difference during some times of the year. Andy also showed what the modeled difference in DO in the tailrace would be during this mode of operation. It was shown that there was not quite as big a difference with DO and in some cases the DO in the tailrace was improved by using unit 5 first. Ron noted that it would probably not be good to run Unit 5 first from August through September due to the cool water fishery downstream. Gerrit agreed and pointed out that the biggest jumps in temperature

downstream generally were depicted to be around September 15th , when they are past the crunch time in the lake. Ron also suggested using the discharge temperatures as an indicator for a switch in operation scenario. Andy asked if there was a specific temperature that would trigger a switch in mode of operations. Gerrit noted that it would be a temperature that allows the trout to remain healthy. Shane added that temperatures should probably stay below 17 to 18 degrees C. Ron noted that it would be important to determine at what release temperature would an appropriate temperature be provided for all the way downstream. The group also reviewed temperatures in front of unit 5 during alternative operation scenarios. The model showed that the temperature was cooler in front of unit 5 when it was used first on - last off.

Jim then reviewed what the next steps would be. Jim noted that one of the benefits of drawing down the pool level is it scours out the sediment buildup in the coves, particularly near the inflow areas. Jim continued to explain that most reservoirs do not have an issue with internal nutrient cycling, but the Little Saluda River embayment does have quite a bit of internal nutrient cycling, and thus not drawing the lake down could have a negative effect on water quality. The group discussed that there was quite a bit of information available that pointed to where most of the nutrient input was coming from. The group discussed DHEC criteria for nutrients and that it would take public outreach to help the nutrient situation in the lake. There was some dialogue on a TMDL, and Shane reminded the group that they had previously discussed a TMDL and it had been decided that it was outside the relicensing process, as there had to be an initiative from DHEC to begin establishing a TMDL. However, the group decided to focus on what they could do with respect to Project operation to improve water quality. The model had shown that water quality could be slightly improved with a higher pool elevation and the preferential use of Unit 5. Ron noted that before any changes were made in operation in 2007, however, the group should complete the next steps of the model.

Next Steps included

1. For selected years, finalize assessment (i.e., assess changes in releases) of operating guide for U5 preference for first on, last off operation using the hourly releases

2. For selected years, finalize assessment of maintaining summer pool levels at 358

3. For selected years, finalize assessment of the combination of maintaining summer pool levels at 358 with U5 preference for first on, last off operation using the hourly releases

4. Analyze additional years, especially a low flow year

5. Assess effects of minimum winter pool level, including effects on Little Saluda embayment, increased SOD, internal nutrient cycling, aquatic plants, sedimentation in coves,

The group concluded and decided that Jim and Andy would work on the next steps of the analysis before any operational changes were made. The next meeting will be held on August 7th, 2007, and Jim and Andy will attend in person to present their findings to the group. The group will then begin discussing recommendations.

Group Adjourned

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TWC

SCE&G Training Center
March 26, 2007

Final ACG 5-7-07

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Dan Tufford, USC
Richard Kidder, LMA
Roger Hall, SCDHEC
Roy Parker, LMA
Shane Boring, Kleinschmidt Associates
Charles Floyd, LMHOC
Andy Sawyer, REMI
Reed Bull, Midlands Striper Club
Ron Ahle, SCDNR
Jim Ruane, REMI
Tom Bowles, SCE&G
Amy Bennett, SCDHEC
Randy Mahan, SCANA Services
Gerrit Jobsis, American Rivers

DATE: March 26, 2007

HOMEWORK ITEMS:

- Jim and Andy – Run model with new scenarios that take into account altered lake elevation drawdown data

DATE OF NEXT MEETING: **Conference Call, May 22, 2007**

INTRODUCTIONS AND DISCUSSION

Shane Boring opened the meeting and introduced Andy Sawyer and Jim Ruane with Reservoir Environmental Mgt., Inc. Shane noted that Jim and Andy would be presenting the group with information on the results of the W2 Water Quality Analysis to address Lake Murray fish kills and unit 5 operation.

Jim Ruane opened discussions by noting that they developed a workplan with two parts. The first part, Jim explained, has to do with variables pertaining to the effect of water quality on striped bass and blueback herring habitat. Jim added that Andy had a presentation that discussed most of these variables. Jim explained that the analysis on this is not complete, as they were waiting for direction from the TWC. Jim noted that the second part of the workplan analysis was regarding concerns about changing the minimum winter pool level. He pointed out that for general purposes the water levels go down to about 350 and the group would like to address levels higher than that.

Andy then began a presentation focused on the fish kill analysis. Andy noted that they are in the process of determining what factors have an effect on fish kills and what factors do not. Andy noted that they would also consider water quality impacts that could occur in the tailrace during different scenarios. He explained that the main considerations have included annual flow regimes, pool level management, unit 5 operation, in-lake and release water quality, habitat for striped bass and blueback herring water quality, and meteorological data. He explained that there was an emphasis on the main branch of the lake.

The first set of information that Andy presented was pertaining to the analysis of historical data on fish kills. He explained that they set up a CE-Qual model for the years when a major striped bass fish kill occurred. He noted that they then ran the models in order to identify the causes that apparently contributed to the fish kills. He explained that the models were also used to explore ways to avoid fish kills in the future.

Andy explained that preliminary findings indicate that high flows, mainly during March through August, are the primary cause of fish kills. Andy pointed out that higher flows cause the bottom of the lake to warm up faster and increase the rate of DO depletion. He also explained that meteorological conditions can affect striped bass habitat. Andy showed that model results indicated that DO > 2.5 mg/l was preferential and the that Unit 5 could be used in a manner to help preserve the colder bottom water and was predicted to improve DO and increase striped bass habitat. Ron Ahle noted that he was concerned that the running of Unit 5 to draw off the warmer water could have a harmful effect on the trout fishery downstream. Andy noted that the model depicted the temperature rise in the lower Saluda was slightly elevated, however not dramatically.

The group discussed whether or not there were patterns in which the fish kills occurred. Andy noted that there were no strong patterns depicted by the model. He noted that the strongest correlation was with flow, the years with higher flows in the March through June timeframe typically have more fish kills. Andy explained that in their examination of meteorological data they also looked at air temperatures as well as wind speeds. With air temperature, Andy explained that they performed a 7 day running average as well as a 14 day running average temperature. He noted that the same was done with wind speed.

Andy continued to explain the model calibration and noted that it was originally run for 3 years and the model SOD (Sediment Oxygen Demand) was adjusted in each of those three years to improve DO calibration. Andy also presented the group with the model forebay profiles and graphs depicting the model outputs with the data. The model shown to be was very accurate in representing the data. Andy explained that the model depicts what comes out of the dam, and there is a slight data variation because the data comes from the monitor directly downstream. Andy noted that their main calibration years were 1992, 1996 and 1997.

Andy began to explain the model outputs. As the group viewed the animations of the lake, it was shown that in the years that the fish kills took place the preferential habitat completely leaves the lake. It was noted that the best match for Lake Murray was temperature less than 27 degrees and DO greater than 2.5 mg/l. Andy explained that now that they have calibrated the model, they can use this criteria as they go forward with their scenarios.

Bill Argentieri noted that since 2000, unit 5 has been operated last on-first off during the summer months. The group discussed that the model scenario now depicted that when unit 5 was run first it conserves the cooler bottom water. Andy noted that one thing that they noticed when running the scenarios where unit 5 was used to pull off the warmer water is that the lake took longer to turn over.

The group discussed scenarios in which to run unit 5. Alan Stuart suggested using unit 5 as first on from January until September 1 and then going to all bottom units. Ron Ahle noted that he believed that it should be tied to a temperature key rather than date. Gerrit Jobsis noted that they may be able to manipulate the temperatures some with the use of unit 5, however they are still going to have DO issues.

Andy further explained a few of the scenarios that he had run using the model. He explained that they looked at pool level management and it was shown that if you use unit 5 first on and then hold the pool level up slightly in the summer (358') you see a little further improvement in preferential habitat. Bill noted that they were experimenting with holding the water level up higher for longer in the summer to accommodate some of the requests of the stakeholders. He continued to explain that holding it higher in September could pose problems because of hurricane season.

Additionally, Andy showed a scenario that depicted the effect if nutrient loading reductions were made. The scenario showed a dramatic positive change in the volume of available habitat throughout the whole lake. Andy explained that the model considered reductions of total phosphorus to .06 in 96 Creek, Bush River, and the Little Saluda. The group realized that the nutrient loading into the Lake was a problem, but agreed to focus on what they could do with respect to project operations. Ron noted that he would be interested to see what unit operation scenario during what times of year would produce the best results for fish habitat.

After lunch, the group discussed what the next steps would be as far as the analysis of data. After much discussion, the group concluded that they suggested running the model with up to date pool level management strategies. Jim and Andy would run the model with two scenarios. The first will start with the lake elevation at 358' from May 1 through August 31, and take it down a foot a month from September 1 through December 31 until it is at 354'. From Jan 1 through April, Jim and Andy

will figure the pool level to come up a foot a month, as well. The second scenario will start with the lake elevation at 358' from May 1 through August 31, and take it down two feet a month from September 1 through December 31 until it is at 350'. From Jan 1 through April, Jim and Andy will figure the pool level to come up two feet a month, as well. Andy recapped that they will run the altered pool level management scenarios through 6 years and have the outputs from the fish kill and non fish kill years. Jim also suggested that they run a low flow year and the group agreed. The group decided that they will initially run the pool level management scenarios and then decide whether or not to further research unit combinations. Alan asked the group if they felt comfortable with what model runs were being performed. The group replied that they were. Andy noted that all the information will all be summarized in the calibration report

After the modeling discussions, Shane gave a brief update on the ongoing Temperature Study in the lower Saluda and the Congaree. Shane presented the group with graphs in a PowerPoint (*attach website address here*) that depicted the temperature differences in the left and right banks of the river. It was noted that the mixing of water from the Saluda is shown to occur in-between 1-77 and the Congaree National Park.

The group concluded their meeting and it was noted that the next meeting would take place by conference call on May 22, 2007.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TECHNICAL WORKING COMMITTEE MEETING

SCE&G's Lake Murray Training Center
November 13, 2006

Final jms 11-20-06

ATTENDEES:

Bill Argentieri, SCE&G	Alan Stuart, Kleinschmidt Associates
Shane Boring, Kleinschmidt Associates	Jeni Summerlin, Kleinschmidt Associates
Amanda Hill, USFWS	Ron Ahle, SCDNR
Andy Sawyer, REMI	Jim Ruane, REMI
Reed Bull, Midlands Striper	Roy Parker, LMA

ACTION ITEMS:

- Provide TWC with locations of Jason Bettenger's temperature sensors

Ron Ahle

- Prepare brief work plan for fish kill years/variables to be analyzed in the W2 Model

Jim Ruane

DATE OF NEXT MEETING: **February 13, 2007 at 9:30 a.m.**
Located at the Lake Murray Training Center

MEETING NOTES:

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Shane Boring opened the meeting at approximately 9:30 AM and welcomed all meeting attendees. He noted that the purpose of today's meeting would be to review: (1) analyses of factors contributing to historical fish kills in Lake Murray, (2) turbine aeration studies and cone valve tests, and (3) summary of the draft W2 Model report.

Shane briefly reviewed action items from the previous meeting and noted that he had contacted John Grego about possible analysis of the temperature data from the Congaree, Broad and lower Saluda river's. He specifically noted that John has a graduate student who would like to use the temperature data as part of her thesis. Bill agreed to share the temperature data with John's Graduate student. Shane enquired as to whether or not Ron Ahle had been in contact with Jason Bettenger about the location of the temperature sensors. Ron indicated that he has not contacted Jason about the location of his temperature sensors, but would do so before the next Water Quality TWC meeting. Jim Ruane noted that he had a hand draft work plan for fish kills in Lake Murray, which include variables that will be analyzed in the W2 Model and would send out an electronic form to committee members as soon as possible. Reed Bull noted that he has compiled dates and relevant data for the Lake Murray striped bass fish kills.

Update on Analyses of Factors Contributing to Historical Fish Kills in Lake Murray
Jim Ruane and Andy Sawyer, Reservoir Environmental Management, Inc.

PowerPoint presentation may be viewed on the Saluda Hydro Relicensing Website.

Jim noted that the analyses of factors contributing to historical fish kills in Lake Murray is a major component of the work plan. He explained that drawdown rates will be examined, as well as sensitivity of striped bass habitat to unit 5 operations. Andy began discussing his presentation on fish kills in Lake Murray and noted that the model will include historical data from 1990-2005. He noted that the model is calibrated for 1992, 1996, 1997, which adjusts the model to represent each year. Jim noted that the adjustments basically make the model more robust to examine each year. Andy presented several graphs detailing Lake Murray surface elevation, average annual flow, cumulative inflow/outflow, forebay temperature and D/O profiles. These graphs were constructed to examine potential correlations of fish kills in Lake Murray. He also presented contour plots with the purpose of describing an array of temperatures and D/O readings throughout Lake Murray (Blacks Bridge to Lake Murray Dam) during summer months. Some committee members seem to

think that there may be a correlation between the low D/O levels in Lake Murray and the high amount of inflow from the Saluda River, which may correspond to the fish kills.
The group briefly discussed D/O levels in the forebay of Lake Murray. Ron mentioned that it may be beneficial to operate Unit 5 during high D/O months (winter), to preserve D/O in the water column; once striped bass habitat is reached, then switch units. He added that releasing colder water may also benefit the trout in the lower Saluda River (LSR). Jim noted that bottom releases in early months may be as critical as releases in later months. Alan noted that Jim is in the process of developing a work plan, which will eventually make recommendations to the committee.

Update on Turbine Aeration Studies and Cone Valve Tests
Jim Ruane

PowerPoint presentation may be viewed on the Saluda Hydro Relicensing Website.

Jim noted that SCE&G has installed hub baffles on Unit 5 to increase D/O in the tailrace. Turbine aeration tests for Units 2, 3, and 4, as well as the cone valve, were performed in the last week of September. Jim began his presentation by discussing the cone valve, which is used to cool condensers at the McMeekin Station. He explained that the cone valve is located just below the powerhouse in the Saluda tailrace and is used for energy dissipation (170 ft water pressure). He displayed a table that presented D/O levels for each unit with different scenarios. He then pointed out the amount of total D/O added by the cone valve. He noted that there was not a significant amount of change in total dissolved gas. He explained that most of the bubbles traveled along the bottom when first discarded in the tailrace; smaller bubbles remained on the bottom while traveling with the current due to buoyancy. Jim noted that if the cone valve was pointed down, it may increase aeration, because it would inject bubbles further into the water column. Reed inquired if there were any limitations on using the cone valve. Bill indicated that the use of the cone valve corresponds to SCDHEC regulation 316 (a), which addresses environmental impacts associated with thermal discharge. Bill explained that SCE&G has to have permission from SCDHEC before releasing any water out of the cone valve. Ron noted that he was concerned about the effect of the high pressure water from the cone valve may have on the banks, in that they may begin to erode.

Jim focused attention on the results of the turbine aeration testing. He explained that for Unit 1, there was a 3.0 mg/L improvement. He specifically noted that each of the Units are sensitive to tailwater elevation. The addition of the new hub baffles on Unit 5 did not prove to increase aeration as expected. He mentioned that Unit 4 was not as beneficial as Unit 1 in that there is about 20% less air flow going into Unit 4. Unit 3 had an even lower quality of aeration than Unit 4. Reed asked if there were any other options for improving turbine aeration for the LSR. Bill noted SCE&G

has a list of options that they are considering, but are first examining environmental targets before any decisions are made.

Summery of Draft W2 Model Report
Jim Ruane/Andy Sawyer

Jim informed committee members that a final draft of the W2 model will be sent out to committee members soon. He explained that one variable has changed in the model, First Order Sediment Oxygen Demand (SOD). There are two types of SOD's, First Order SOD and Zero SOD. The difference between the two is that, zero SOD does not oxidize as fast and is considered to be long term. He explained that First Order SOD has been built into the model and Zero SOD varies from year to year in the model. Draw downs may effect SOD in that it moves organic materials closer into the forebay. He noted that the W2 model is the same just more robust. He noted that a calibration report will be sent out at the end of the month.

Lake Murray Association Water Quality Assessment
Roy Parker, Lake Murray Association

Roy briefly reviewed sampling methods that were used in the Lake Murray Association (LMA) water quality assessment and noted that they recently received the results. He noted that for the month of September, there were elevated levels of phosphorous present. He specifically noted that the reference cove had elevated levels of phosphorous. He asked committee members what they thought could be done about these results. Alan noted that the group was headed into this direction at one point, but SCDHEC stated that they would not issue a TMDL for Lake Murray. Jim mentioned possible explanations for elevated phosphorus levels and specifically noted that in a low flow years, point source pollution can dominate. Jim encouraged LMA to continue collecting water quality samples, in that it may be beneficial for future reference In the discussion of point source pollution, Reed noted that he had talked to the City of Columbia/West Columbia about the historical fish kills in Lake Murray and he was informed that the City of Columbia/West Columbia had problems meeting their water quality standards in 2005.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TECHNICAL WORKING COMMITTEE

SCE&G's Lake Murray Training Center, Irmo, SC
August 23, 2006

ATTENDEES:

Bill Argentieri, SCE&G
Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
John Grego, Univ. of SC
Shane Boring, Kleinschmidt Associates
Randy Mahan, SCANA Services
Roy Parker, Lake Murray Assoc.
Dan Tufford, Univ. of SC
Reed Bull, Midlands Striper Club
Ron Ahle, SCDNR
Jim Ruane, Reservoir Environmental Management, Inc.

ACTION ITEMS:

- Compile dates and relevant data for Lake Murray striped bass fish kills

Reed Bull

- Provide TWC with locations of Jason Bettenger's temperature sensors

Ron Ahle

- Prepare brief work plan for fish kill years/variables to be analyzed in the W2 Model

Jim Ruane

- Provide John Grego with copy of temperature study plan

Shane Boring

- Determine potential for temperature analysis as graduate student thesis topic

John Grego

DATE OF NEXT MEETING: **TBA**

MEETING NOTES:

These notes serve as a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Shane Boring opened the meeting at approximately 9:30 am, reviewing the action items from last meeting. Specifically, it was noted that the fish kill memo that had been prepared by Ron Ahle and distributed at the March 23, 2006, TWC meeting had been passed on to Amanda Hill via e-mail. Shane also enquired as to whether or not Reed Bull had been able to gather any further information on striped bass fish kills in Lake Murray. Reed indicated that, while he was able to pull together any information on additional fish kills, he felt it was important to look at how the known kills relate to various environmental and operational variables (i.e., meteorological data, project operations, USGS gage data, reservoir level, etc.). Reed indicated that he would formalize the known fish kill dates and pass them on to Shane to ensure that they are analyzed as part of Jim Ruane's W2 analysis.

Roy Parker then gave a presentation highlighting the Lake Murray Association's cove water quality monitoring efforts (available on the Saluda Relicensing Website at http://www.saludahydrorelicense.com/documents/LMAWQ3.pdf).

Jim Ruane then provided an update on development of the CE-QUAL-W2 water quality model being developed for Lake Murray (available on the Saluda Relicensing Website at http://www.saludahydrorelicense.com/documents/MurrayWQandW2Presentation8-23-06.pdf). Gerrit Jobsis noted that Jim's presentation focused mainly on highlighting the model's capabilities and enquired as to whether there were plans to use the model to evaluate different operational alternatives that might help reduce impacts to striper habitat. Jim R. noted that most of the effort to date had been focused on calibrating the model, adding that various operational scenarios could be developed by the TWC and run once the calibration report is finalized.

Andy Miller enquired as to how Phosphorus (P) inputs associated with non-point sources are being accounted for in the model. Jim R. noted that the models assume that everything, both point and non-point, meets the standard as it enters the lake. Andy enquired as to whether P was sensitive to precipitation in the model. Jim replied that annual mean and median values had been uses for theses runs; thus effects associated with precipitation would not be detected. Jim noted the importance of evaluating Bush River in the model, adding that a significant load is being contributed due to the presence of the wastewater treatment plant. Gerrit reminded the group to be mindful of what can be accomplished in the context of relicensing, adding that many of these inputs (i.e. the wastewater treatment plant on Bush River) are upriver of the reservoir and may be beyond the influence of the relicensing process.

The group then discussed factors they would like to see evaluated once the model calibration is complete. Identified factors included:

- Reservoir Level
  - Rate of Drawdown
  - Drawdown Timing
- Project Operations
  - Unit 5 Operation
- Inflows
- Climatological Data
- Time periods preceding known fish kills

Shane then quickly reviewed the action items, noting that Reed Bull had been tasked with compiling years in which major fish kills were know to have occurred. Jim R. noted that it may not be necessary to run all years, as many of the years may have similar hydrologic characteristics and agreed to develop a brief "work plan" for determining which years are best to analyze.

Several group members enquired as to whether acoustic doppler data would be beneficial for understanding impacts of project withdrawal zones on the summer striped bass habitat. Jim R. noted that this has potential; however, the sensitivity analyses have not been run.

Shane Boring then provided a brief review of the status of the temperature study being conducted in the Lower Saluda and Congaree Rivers (available on the Saluda Relicensing Website at http://www.saludahydrorelicense.com/documents/LowerSaludaandCongareeRiversTemperatureStudy.pdf). Shane noted that the temperatures in the Broad and Congaree appear to diverge from those of the Saluda sometime in late-March/early-April. In addition, he noted that, due to the cold water influence of the Saluda, the west bank of the Congaree is noticeably colder than the east bank and that this effect appears to continues at least as far downstream as I-77 Bridge.

The group then discussed potential statistical analysis methods for the temperature data. Ron noted that it may be beneficial to evaluate relationships between temperature and the varying percentage of flow being contributed by the Broad and Saluda, adding that varying contributions over time undoubtedly results in a dynamic mixing zone. John Grego noted that there are a number of potential statistical methods for dealing with the data and added that he may have a graduate student interested in taking it on as a thesis topic. John agreed to discuss this with his student and report back to the group. Shane noted that he would provide John with a copy of the study plan.

Shane noted that Jason Bettenger with SCDNR has placed several additional TidBit temperature sensors in the Congaree as part of striped bass study, adding that some of his data may be beneficial for filling in gaps in our dataset. Ron Ahle indicated that he would discuss the TidBit locations with Jason and report back to the group. Citing the relevance of Jason's study to both the temperature

study and striped bass evaluations, Ron suggested that having Jason present a seminar on this work could also be beneficial.

The group briefly discussed how temperature swings may affect the fisheries and spawning. Specifically, Gerrit J. noted that shortnose sturgeon, striped bass, and other anadromous species are know to spawn at least as far upstream as approximately I-77 and may be coming as far upstream as the confluence. As such, Gerrit suggested collaborating with the Fish and Wildlife TWC's to evaluate potential impacts to fish spawning once the Water Quality TWC has compiled all of the data and determined the extent of the mixing zone.

The meeting adjourned at approximately 2:30pm.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TECHNICAL WORKING COMMITTEE

SCE&G Training Center
May 23, 2006

draft jms 5-23-06

ATTENDEES:

Bill Argentieri, SCE&G
Shane Boring, Kleinschmidt Associates
Gerrit Jobsis, SCCCL & Am. Rivers
Tom Bowles, SCE&G
Amanda Hill, USFWS
Roy Parker, LMA
Alan Stuart, Kleinschmidt Associates
Jeni Summerlin, Kleinschmidt Associates
Reed Bull, Midlands Striper Club
Andy Miller, SCDHEC
Ron Ahle, SCDNR
Jim Ruane, REMI

ACTION ITEMS:

- Shane Boring – e-mail fish kills to Amanda Hill
- Reed Bull – make an excel table summarizing fish kill information
- Shane Boring – ensure the March 24 meeting notes include fish kill data
- Bill Argentieri – review unit 5 operation data

DATE OF NEXT MEETING: **August 23, 2006 at 9:30 a.m.**
Located at the Lake Murray Training Center

MEETING NOTES:

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Shane Boring opened the meeting at approximately 9:30 AM. Shane B. briefly discussed the status of the action items listed in previous meeting notes. It was noted that the purpose of today's meeting would be to review: (1) the status of TMDL discussions, (2) the status of the temperature study on the lower Saluda and Congaree Rivers, (3) information pertaining to striped bass fish kills in Lake Murray, and (4) set a date and time for the next Water Quality Technical Working Committee (TWC) meeting.

Review Status of TMDL Discussions

Alan Stuart noted that Jim Ruane, Dan Tufford, Andy Miller, and himself met on May 3rd and developed a list of action items to be undertaken for the application of the W2 model to a TMDL. Jim Ruane noted that the W2 model will be finalized in July of this year. Jim R. noted that the W2 model will evaluate certain water quality parameters in Lake Murray, which will ultimately set a standard for the TMDL. He briefly discussed methods for monitoring phosphorus loads in reservoirs. Jim R. explained that phosphorus is mostly tied up in organic matter such as algae. He noted that clay also plays a key role in phosphorus transport which is an important component in how Lake Murray behaves. Jim R. further explained methods for monitoring phosphorus in the lake.

The group then began to discuss the 222 SCDHEC station and Jim R. noted that the bridge above Lake Murray forms an embankment and effects the width of that water, which may ultimately result in high levels of phosphorus in the Saluda River. He mentioned that the W2 model might be able to calculate the water flow under the bridge by using flux. During continuing discussion on the TMDL issue, Andy Miller noted that SCDHEC does not have the funding to perform a TMDL on Lake Murray at this time. Andy M. noted that if funding was available, then SCDHEC would like to examine both embankments on Lake Murray. Ron Ahle pointed out that water quality in the Saluda tailrace should also be considered in order to obtain necessary results. Alan S. noted that he would find out SCE&G position on this issue.

Discussions continued, highlighting briefly on the draw of water at different operations, including discussions about the draw from unit five. It was decided that it would be beneficial for Jim R. to run the W2 model for the years; 1990-1991, 1998-1999, and 2005 Bill Argentieri noted that 1998-1999 operation data for unit five will not be available. Gerrit Jobsis briefly described the overall plan which included upgrading calibration on the W2 in July, running a model for the major fish kill

years, and reviewing output of the analysis. The group discussed the development of various operation scenarios that could be applied to the W2 model after it's calibrated.

Temperature Study Update

Shane B. briefly discussed the status of the temperature impacts study in the lower Saluda and Congaree Rivers. Shane B. presented a map that displayed each temperature sampling location. Ron A. asked if the temperature probe located downstream of the I-77 bridge was placed below Columbia discharge. Shane B. noted that he would find out exactly where the Columbia discharge enters the Congaree River and will adjust the temperature probe if needed. Shane B. noted that the temperatures on the Saluda River are very different from temperatures on the Broad River. He pointed out that probes located on the left bank below the Gervais Street bridge are reading higher temperatures than those on the right bank. He noted that temperature impacts continue between the I-77 bridge and the Congaree National Park locations. However, midstream of the Congaree National Park, the water temperature readings are warmer. Shane B. noted that he has not compared the temperature data to water releases from the Saluda Hydro Dam**.** Shane then concluded his presentation and asked the group for any future needs.

Gerrit J. noted that Dr. John Gray, a statistician whom he worked with on compiling a statistical comparison of flows between the Congaree and Broad Rivers, may be willing to assist with the statistics of the temperature study. Bill A. questioned the types of parameters to be analyzed. Jim R. recommended plotting the data in a time series, using hourly averages to reduce the amount of data collected. Jim R. added that structural data analysis, from when a project is operating versus not operating, should also be included. Bill A. noted that the Saluda Operating Report is available and can be distributed. Jim R. also suggested adding flows to the analysis, frequency and duration should be included with the time series. Alan S. pointed out that a six month time series should be completed before the data is turned over to Dr. John Gray for analysis.

Striped Bass Fish Kills Discussions

Alan S. opened the discussion on fish kills by reviewing the two major kills in 1990-1991 and 2005. When asked for a summary of what will be included in the study, Alan S. explained that several variables will be examined, such as operation, dissolved oxygen, temperature, and instream flow data. He added that each of these variables will be examined for each year of fish kills, as well as each year before and after a fish kill. Reed Bull added that rainfall data should also be taken into account. Ron A. noted that the group should begin examining the time of year when Lake Murray begins to stratify. Alan noted that since operational data for unit five is not available, it would only be feasible to use the 2005 fish kill year.

Date/Location of Next Meeting

The group agreed to meet again on August 23, 2006, at the Lake Murray Training Center. It was noted and the group agreed that this meeting will be dedicated to discussing striped bass issues. Shane B. noted that he would have another presentation to update the group on the temperature study. Gerrit J. added that he would contact Dr. Gray about analyzing the temperature data. Roy Parker also noted that he would update the group on the Lake Murray Association water quality study.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TWC TMDL SUB-MEETING

Kleinschmidt Offices
May 3, 2006

6-8-06 final acg

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Andy Miller, SCDHEC
Jim Ruane, REMI
Dan Tufford, USC
Wayne Harden, SCDHEC

DATE: May 3, 2006

These notes serve as a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

DISCUSSION

During the March 24th Water Quality TWC meeting, the TWC members decided that the issues regarding TMDL would be better discussed during a small group session initially with Jim Ruane, Dan Tufford and Andy Miller as members. Prior to this meeting, and after email correspondence, the above listed individuals developed a list of agenda items to discuss and developed a meeting date. The agenda items are listed below:

1. The need for a TMDL on Lake Murray. Should it focus on the Western side of the impoundment?
2. The Sufficiency of a W2 model as a component of a TMDL
3. Is the current W2 a potential component (in principle) or would we need a new one focusing on the Western end?
4. What other models would be needed to supplement the in lake processes model?
5. What kind of extra monitoring would be needed?
6. What other data would be needed?
7. Current modeling objectives vs. TMDL objectives
8. Model documentation availability
9. Larger modeling issues and concerns
10. How to proceed.

Dan Tufford opened the meeting and expressed that he believed that Relicensing was a good forum to begin working towards a TMDL by doing the analysis phase, since all the appropriate individuals were already "at the table" so to speak. He noted that he felt that it could be performed within the framework of the relicensing to achieve an end product that could be usable to DHEC. Alan Stuart asked if Dan T. could further explain how the TMDL was related to the relicensing of the Project,

and what further information on this issue was needed in order for the FERC to perform the NEPA analysis. Dan T. replied that he believed that given the term of the license, the group needed to look ahead in regards to future compliance with water quality standards. Dan T. also noted stakeholders have made it clear to him that they had concerns on the upstream conditions and added that he would encourage SCE&G on a corporate level to consider those concerns. Jim Ruane replied that he believes that SCE&G does consider those concerns and that the current model (W2) could help with a TMDL down the road. He added that the data in the model can be built upon and added to. After continued discussion on this topic it was noted that although this issue may not be directly linked to the issuance of a new project license that it may have positive benefits for SCE&G. It was also noted that relicensing may be beneficial toward the future implementation of a TMDL in that it will provide a forum for documentation of discussion on this topic and how the W2 may be beneficial in the TMDL. Dan Tufford explained that the group should first move forward by looking at the current W2 model.

The group looked at the first agenda item and began to discuss areas of concern. Andy Miller noted that he was currently looking at the western stations and asked if it would be appropriate to model those points with the W2 model. Jim R. noted that there were slight roadblocks due to the lack of data at a couple of the points. He explained that the current W2 could be used to examine some of the points that were mentioned (specifically mentioning Station 222) and the more data could be collected if needed. The group noted that the two stations of concern that were currently listed were S-222 and S-309. Andy M. asked Jim R. if he believed there was enough data at these locations to calibrate a W2 model. Jim R. replied that he did not believe there was enough information, however he noted that he did believe that a Bathtub Model could be implemented. Jim R. further explained that the W2 could help in an understanding of the dynamics of the system before a simpler model was used. The group also decided to check on the amount of data available at station S-310. There was also discussion of the use of a watershed-scale model to address some of the issues that cannot be assessed with a model such as W2. Dan T. mentioned the WARMF model and that one of its strengths in this context is that it can use a W2 model as the reservoir component model. This would allow us to leverage Jim's work in Lake Murray and another W2 model for Lake Greenwood.

In discussions on a TMDL's focus on the western side of the Lake, Jim noted that in reference to the issue of the "oxygen crunch period" and its implications on striped bass and blueback herring, Bush River reductions would probably have the biggest improvements for striped bass. Jim R. continued to note that a western focus alone may not directly address the issues with the striped bass. Wayne Harden agreed that in order to address that issue a TMDL needs to include the upward sections of the Lake.

The group continued to discuss the sufficiency of a W2 model as a component of a TMDL. Jim R. noted that the W2 could be useful in order to look at what data was available now and to help define data needs, it was also a good way to understand what was happening at the Stations. Andy M. asked if Jim R. could further define the goals of the current W2 from a water quality standpoint. Jim R. replied that the goals were to 1) look at the effects of operational changes on water quality, 2) to look at the effects of the operation of unit 5 on striped bass habitat, 3) to look at Phosphorus loads with the hopes of DHEC implemented Phosphorus reductions, 4) a contribution that SCE&G can make after relicensing.

It was noted that whatever was done in regards to TMDLs would have to coincide with what was feasible at DHEC. Andy M. noted that there were tight and busy schedules at DHEC and he would have to discuss this more in depth internally.

Agenda item number 8 focuses on model documentation availability, and the group briefly discussed this topic. It was agreed at the last TWC meeting that a confidentiality non disclosure agreement of the draft W2 model and report would be prepared for Dan T. and Andy M. signature. After numerous revisions of the agreement, the matter was unresolved at the time of the meeting. Additional discussions were had regarding this matter. Alan indicated that all documentation would be made available after the W2 model and report was finalized based on the requested upgrades March 24, 2006 TWC meeting, thus eliminating the need for a confidentiality agreement.

Jim R. explained briefly what changes to the W2 model he was to incorporate and noted that the model would only be made available to the agencies until the license was complete. He pointed out that sharing the model to individuals other than the agencies without the signing of the agreement was a process risk. After much discussion on this topic it was noted that the written report would be finished in the next few months and would be shared with the group then.

The meeting began to come to a close and the group discussed how to proceed. Alan S. and Dan T. briefly discussed what extent SCE&G should/may want to play a role in the TMDL process. It was noted that there were many other concerns that SCE&G has to consider during relicensing. Alan S. noted that he would have further discussion with SCE&G as to the scale of their focus regarding this. Alan S. noted that there may be the opportunity for Dan T. to talk to SCE&G regarding this directly. Dan T. also mentioned that he would meet with the stakeholders that he is talking with in order to more clearly define what their objectives were in regards to water quality and its relation to relicensing. Jim R. reiterated that he would take the next few months to calibrate the model with the new work arounds and finalize the written report. He noted that he would be ready to prepare a package for DHEC if they would like. Andy Miller noted he would check to see if it was needed. Jim R. also briefly pointed out that DHEC may want to consider approaching NRCS about

modeling and that there may be federal assistance available. The group adjourned and noted that any future meetings would be scheduled after Homework Items were completed.

HOMEWORK ITEMS:

- Jim Ruane – Finish additional W2 model calibrations and to finalize written report
- Andy Miller – Check on what data is available at station S-310, as well as internal discussion with DHEC on what was feasible from a DHEC standpoint in regards to a TMDL, would a W2 package be needed, and if NRCS could provide modeling assistance.
- Alan Stuart – Discussions with SCE&G on what their vision was in regards to TMDL and relicensing and if there was an opportunity for discussions with Dan Tufford on this topic.
- Dan Tufford – Discussions with represented stakeholders on intentions to meet more clearly defined objectives. Preparation for possible discussion with SCE&G.

The following comments in email format were sent after the draft notes were issued and are included in the record:

-----Original Message-----
From: Alison Guth
Sent: Thursday, May 18, 2006 5:01 PM
To: Alan Stuart; 'Dan Tufford'; 'Jim Ruane'; 'Andy Miller'; 'wharden@mindspring.com'
Cc: Tom Stonecypher; Alan Stuart; Alison Guth; Amanda Hill; Andy Miller; Bill Argentieri; Bill Hulslander; Bill Marshall; Brett Bursey; Cam Littlejohn; Charlene Coleman; Charles Floyd; Craig Stow; Daniel Tufford; Dick Christie; Don Tyler; Donald Eng; Ed Diebold; George Duke; Gerrit Jobsis (American Rivers); Gina Kirkland; Hank McKellar; Jeff Duncan; Jennifer O'Rourke; Jim Glover; Jim Ruane ; John Davis (johned44@bellsouth.net); Joy Downs; Karen Kustafik; Keith Ganz-Sarto; Kim Westbury; Larry Turner (turnerle@dhec.sc.gov); Malcolm Leaphart; Mark Leao; Mike Sloan; Norman Ferris; Patrick Moore; Prescott Brownell; Ralph Crafton; Randy Mahan; Reed Bull (rbull@davisfloyd.com); Richard Kidder; Robert Keener (SKEENER@sc.rr.com); Ron Ahle; Roy Parker; Shane Boring; Steve Bell; Steve Summer; Suzanne Rhodes; Tom Bowles (tbowles@scana.com)
Subject: Meeting Notes Comments - May 3rd

Hello all,

There has been several sets of changes made to the May 3rd meeting notes. As I have been doing in the past with such matters, I am sending out a copy with changes before they become final on May 26th. While reviewing the document please note that its primary purpose is to provide a general but accurate overview of the course of the meeting and the topics discussed there-in, and not delve too far into the minutia of "he said, she said". Please have any further comments on this document to me by the 26th. Thank you. Alison

-----Original Message-----
From: Dan Tufford [mailto:tufford@sc.edu]
Sent: Thursday, May 25, 2006 10:34 AM
To: Alison Guth
Cc: Alan Stuart; 'Jim Ruane'; 'Andy Miller'; 'wharden@mindspring.com'; Bill Argentieri; Randy Mahan
Subject: Re: Meeting Notes Comments - May 3rd

Hello Alison,

Of course these notes are full of "he said, she said" so the minutia you are referring to must be the comments of mine that you excised as if they had not been there in the first place. I strongly believe there is a need to set the record straight.

We were told during the May 3 meeting that SCE&G reacted negatively to my refusal to sign the agreement. I assume this means Randy and/or Bill. I have not had the opportunity to get to know either of them very well yet, but my impression from the meetings is that both are very reasonable people. So the only way they could react negatively is if they were given a distorted explanation of the facts of the situation.

The agreement I was asked to sign contained extensive language detailing stipulations and provisions that I knew nothing about and that had not come up in the meeting in which I agreed to sign a non-disclosure agreement. I asked to have the language removed and when that request was refused then I refused to sign the agreement.

No reasonable person would think negatively of me or anyone else for refusing to sign an agreement like that, especially after making a good faith attempt to get the extraneous language removed. Apparently KA considers this minutia. As reasonable people yourselves, I am sure you can undertand why I do not. That is the issue my comments were attempting to deal with.

If the agreement and the documentation were a minor point in the process I would not be that concerned that this issue be clarified. But as I predicted all along, the meeting was much less effective than it could have been due to the fact that I was still uncertain about the details that I wanted to see about the model.

I will be happy to work with you on the specific wording, but some language that sets the record straight needs to be in the minutes. If you take a stab at it I want to review it before the minutes are considered final.

Regards,
Daniel L. Tufford, Ph.D.
Research Assistant Professor
University of South Carolina
Department of Biological Sciences
Sumwalt 209A (office)
701 Sumter Street, Room 401 (mail)
Columbia, SC 29208

e-mail: tufford@sc.edu
web: http://www.biol.sc.edu/~tufford
Ph: 803.777.3292 Fx: 803.777.3292

-----Original Message-----
From: Alan Stuart
Sent: Thursday, May 25, 2006 10:39 PM
To: 'Dan Tufford'; Alison Guth
Cc: Alan Stuart; 'Jim Ruane'; 'Andy Miller'; 'wharden@mindspring.com'; Bill Argentieri; Randy Mahan
Subject: RE: Meeting Notes Comments - May 3rd

Dan,

I would like make a clarification. What I said at the meeting was that your initial refusal to sign the original agreement raised concerns by KA/REMI and SCE&G. I never inferred or said that SCE&G acted negatively to your refusal nor thought anything negatively about you. I did say I was personally struggling to understand if a state agency such as DHEC, who has authority in regulating TMDL's, had no problem signing the agreement as originally written then why was it unacceptable to you. Again, this was me speaking, not speaking on behalf of SCE&G. As you recall we had numerous subsequent discussions which were not all recorded as part of the summary. Further, I did not see where my statements above added any positive value to the summary so I did not see it necessary to include them as part of the record. Our goal was simple, to capture the meat of the disagreement(s) and resolution.

As I stated, I did not add to the minutes all of this extraneous language contained in my opening paragraph of this email because I saw it having little value to the summary. I believe the main points of the dialogue were: issues were taken on the original agreement, problems existed on the revised agreement, and ultimately the agreement was not signed by the parties prior to the meeting. Therefore, no resolution was reached on the matter of the releasing the parameterizations/calibrations on the draft W2 model. While it is unfortunate we could not reach agreement prior to the meeting on the agreement we obviously can still move forward. As you recall, I did state that the information would be released (July timeframe) when the W2 Model was finalized. This is what you are ultimately seeking and anyone reading the minutes can effectively understand that there were disagreements on the wording in the agreement (and revised agreement) but we did reach resolution on releasing the information. This in essence in my opinion is what's important and believe this to be a totally reasonable and pragmatic approach.

In my opinion, your added language will likely require clarifications/additions from other meeting attendees and will only serve to create a verbose lengthy transcript. This is not the point of the meeting summaries as stated in the operational procedures. They summaries are a courtesy service provided for those individuals not present at the meetings.
However, if you are steadfast in getting some of this specific material in some form of the record, may I suggest we just include this email in the record. I believe your email captures the message, theme, and spirit of what you want to convey.

Regards,
Alan

Senior Licensing Coordinator
Kleinschmidt Energy and Water Resources
101 Trade Zone Drive Suite 21A
West Columbia, SC 29170

-----Original Message-----
From: Dan Tufford [mailto:tufford@sc.edu]
Sent: Friday, May 26, 2006 10:58 AM
To: Alan Stuart
Cc: Alison Guth; 'Jim Ruane'; 'Andy Miller'; 'wharden@mindspring.com'; Bill Argentieri; Randy Mahan
Subject: Re: Meeting Notes Comments - May 3rd

Hello Alan,

Our recollection of this differs somewhat, but I appreciate your elaboration of why my edits to the meeting notes were altered. I fully understand how diffucult it is to distill the important material from long meetings into a coherent set of minutes. As I have stated before, I appreciate the work that KA does in this regard.

I am not sure what constitutes "the record" in these proceedings, but I
accept your suggestion that this e-mail exchange be included.

Regards,
Dan

-----Original Message-----
From: Jim Ruane [mailto:jimruane@comcast.net]
Sent: Thursday, June 08, 2006 9:02 AM
To: Dan Tufford; Alan Stuart; Alison Guth; 'Andy Miller'; wharden@mindspring.com
Cc: Bill Argentieri; Randy Mahan
Subject: Re: Meeting Notes Comments - May 3rd

I apologize for taking so long to respond to these emails, but would like to offer the following comments for the record.

Concerning Dan Tufford's comments about the agreement for release of certain information about the Lake Murray CE-QUAL-W2 water quality model, we think it's important to have such an agreement through out the duration of the relicensing process.

SCE&G wants water quality analyses and modeling to be conducted in an open process that allows stakeholders to effectively review what is being done to the extent practicable. However, due to the complexity of models and the need to support only one model for the main body of Lake Murray, an agreement is needed to provide understandings between reviewers and SCE&G's modelers. The agreement

is intended to protect SCE&G's investment in the model; to provide a means for incorporating modeling in an orderly process for relicensing; present a process for conflict resolution; and provide general information about the modeling process used by SCE&G's modelers.

As was promised at the TWC meeting on March 24, we modified an existing agreement that has been used before in South Carolina. We plan on using this agreement for the foreseeable future, probably through out the relicensing process, for most all stakeholders, subject to them being approved by SCE&G for getting the model or information regarding the calibration of the model.

It's anticipated that the agreement would be similar for all reviewers, so some reviewers may consider the agreement to be overly protective. However, for those who are interested in limiting their objectives to reviewing and commenting on the model or considering the model for future uses, the agreement is expected to be satisfactory. The agreement requires that all modeling supported by SCE&G be conducted by their consultant, and that competing models for simulating water quality for the same or similar purposes on Lake Murray will not be considered (i.e., models that would simulate operations and water quality for the main waterbody of Lake Murray). Reasonable requests for model calibration checks and model applications will be considered by SCE&G. SCE&G is interested in developing a good water quality model and allowing it to be used in the future for improving water quality in Lake Murray.

I thought we had a fruitful meeting on May 3. However, it was not possible to provide some of the information that Dan requested, especially considering that the upgraded model is being developed over the coming months. He had asked for detailed model information that will be revised during the course of the model upgrade. Also, the TMDLs being considered for Lake Murray that require modeling were not planned to be developed before the new upgraded model would be ready for use. Hence, we questioned the urgency for his request at this time.

When the upgraded model is developed, a draft calibration report will be prepared and issued to the TWC for their review. We are not planning to release additional detailed information to anyone unless they sign the agreement, and even then some information will be withheld to avert others from developing a similar model on Lake Murray.

This approach has been used successfully over the past two years, and we are optimistic that it will prove successful for relicensing of the Saluda Project.

Thanks, Jim

Richard J. Ruane, Reservoir Environmental Mgt., Inc.

900 Vine Street Suite 5
Chattanooga, TN 37403

SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife and Freshwater Fisheries
Environmental Programs Office

MEMORANDUM

To: Water Quality Technical Committee
From: Ron Ahle
Date: 3-24-06
Subject: Striped Bass Fish Kills on Lake Murray

The following is a summary of the history of striped bass "die-offs" due to oxygen/temperature squeeze in the lower lake area of Lake Murray.

In reports by Ortho May in the late 1970's, it was stated that "annual die-offs" of striped bass were so regular as to be "predictable" and had occurred for the "past 10 years or so". Ortho studied the water quality conditions from 1977 through 1979 in an effort to determine the cause of the annual die off, but unfortunately (or fortunately) no striped bass die offs occurred during the study.

The occurrence of striped bass "die-offs" during the 1980's were largely not reported, however a significant event occurred in August 1989 and two events exceeding 1000 individuals were reported in 1990. On August 17, 1990, a single event was reported to have 1, 157 individuals ranging in length from 12'' to 37''. This event plus several herring entrainment events resulted in the completion of a study report prepared for SCE&G entitled "An Evaluation Of Recurring Fish Kills In Lake Murray and the Saluda River, SC". The conclusion of this report was "Any striped bass using the deep portion of Lake Murray near the intake towers in late-summer 1990 would have been affected to some degree by thermal and/or oxygen stress."

The summer of 1991 was a particularly bad year for striped bass "die-offs". Dead fish were reported from July 19th through August 9th with 3,139 fish ranging in size from 12" to 41". It was reported that the kill area was much larger than in past years and that there was no way to count all the fish that perished. Parasite and disease examination results were negative thereby supporting the theory of thermal/oxygen stress as being the probable explanation for the mortalities. After this event, SCE&G agreed to operate Unit 5 in a "last on/first off" mode and that was soon to prove an important factor in avoiding or shortening the duration of periods of poor habitat.

In September of 1993, a small but significant fish "die-off" was reported where 580 individuals with lengths of 15" to 23" were found between the intake towers and Jake's Cove. Another "die-off" was reported in August 1998 where 456 individuals with were found. It was reported in both instances that the "last on/first off" operation mode was

an important factor in reducing the duration and the magnitude of the fish kill.

A die-off of adult striped bass occurred over a several week period in August of 2005. The kill was confined to the forebay area of the lake, extending several miles out from the dam. The exact magnitude of the event was not determined but transect counts during the period confirmed the death of at least 742 fish ranging in size from 17"-38" in length. Numerous dead fish were observed along the shoreline area outside the transect areas over the entire lake.

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SPECIAL NEWS RELEASE #93 - 66

September 10, 1993
For Immediate Release

LAKE MURRAY STRIPED BASS DIE-OFF
LINKED TO HEAT, LAYERING OF LAKE

State wildlife department fisheries biologists have counted nearly 600 dead striped bass near the Lake Murray dam in a natural die-off caused by poor late-summer water quality in the lake.

And while the number of fish killed may increase during the next week, state wildlife officials say an agreement with South Carolina Electric and Gas on the operation of its Lake Murray hydro station has likely lessened the severity of the fish kill.

Gene Hayes, district fisheries biologist with the S.C. Wildlife and Marine Resources Department, said 580 stripers were counted Thursday in an area from the Lake Murray dam to just past Spence Island. The fish ranged from 15 inches to 23 inches, with 80 percent of the stripers less than the legal length limit of 21 inches.

Hayes said summer die-offs like this one have occurred regularly at Lake Murray since 1973, and a condition called the "temperature-oxygen squeeze" is to blame. Some hooking mortality of fish caused by anglers also occurs in this area, but to a much lesser extent.

During hot weather Lake Murray becomes stratified, or divided into several layers, with the upper layer being the warmest and

--more--

highest in oxygen. Deeper levels are cooler but contain less dissolved oxygen.

During the early summer months striped bass concentrate at depths containing the best balance between cool temperatures and high levels of oxygen. As summer progresses, the upper layer becomes too warm for stripers, which generally prefer water less than 78 degrees, and the fish move to deeper and cooler waters. As the oxygen levels in the lower layers are depleted to around 2 parts per million, the striped bass become stressed and some eventually die. Biologists call this condition the "temperature-oxygen squeeze."

Fisheries biologists have documented a steady decline in oxygen levels since mid-July in the deeper waters near Lake Murray dam, so Hayes said they were not surprised when the fish kill occurred.

South Carolina Electric and Gas (SCE&G) for the past two years has agreed to a "last on, first off" operation schedule for its No. 5 hydro unit at the Lake Murray dam. When habitat conditions for striped bass are at their worst, the 80-foot-deep area around the intake of the No. 5 hydro unit seems to be one of the last, best refuges for the fish. Not operating the hydro unit seems to prolong the quality of this refuge. Hayes said SCE&G has used the No. 5 hydro unit few times this summer.

"We think the agreement with SCE&G is a definite factor in improving habitat for striped bass," said Hayes. "Without SCE&G's cooperation, we could have had this die-off earlier in the year. In fact, the die-off has historically occurred between mid-July and mid-August, and because we are moving into a cooler time of year, with the lake layers beginning to break up, this fish kill should not be as large or as long as some we have seen in the past."

In July-August 1991, an estimated 3,139 stripers were killed in a die-off attributed to temperature-oxygen squeeze.

(Writer - Greg Lucas)

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TWC

SCE&G Training Center
March 24, 2006

Final ACG 4-27-06

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Steve Summer, SCANA Services
Dan Tufford, USC
Richard Kidder, LMA
Andy Miller, SCDHEC
Reed Bull, Midlands Striper Club
Ron Ahle, SCDNR
Jim Ruane, REMI
Tom Bowles, SCE&G
Gina Kirkland, SCDHEC

DATE: March 24, 2006

HOMEWORK ITEMS:

- Ron Ahle – to acquire size/length distributions of striped bass in die-offs
- Reed Bull – to research anecdotal data regarding the 1996 fish kill
- Bill Argentieri – Review record of July 2005 reports to acquire information on how often and why unit 5 was run.
- Dan Tufford, Andy Miller, Jim Ruane – convene meeting to discuss the suitability of the information that is available and what information is needed in regards to performing a TMDL

DATE OF NEXT MEETING: **May 23, 2006 at 9:30 a.m.**
Located at the Lake Murray Training Center

INTRODUCTIONS AND DISCUSSION

Alan opened the meeting and noted that Ron Ahle would first be discussing striped bass die offs on Lake Murray. Ron distributed a memorandum on this issue (will be posted to web 4-13-06) to the group and began discussions. The group discussed the history of the striped bass die offs and Ron Ahle noted that evidence shows that fish kills have occurred less frequently, shorter in duration, and later in the season since unit 5 has been operated "last on, first off". He also noted that drawdowns can suspend nutrients in the water that also seem to worsen fish kills. Ron asked what happens at the oxygen gage when unit 5 is turned on. Jim Ruane replied that it typically stays the same with a few fluctuations, Jim also noted that wet years and dry years will also effect the oxygen in the lake. Alan asked Ron if it was possible to acquire size-length distributions of the fish that had died off.

Ron agreed and noted that they had good data for 1991. Reed Bull also noted that he would research anecdotal data regarding the 1996 fish kill.

Alan began to give a presentation on Acoustic Doppler Technology (will be posted to web 4-13-06). The group discussed performing an acoustic doppler study to determine what area of the lake unit 5 pulls water from. The group noted that any doppler studies should be run in the June time frame to avoid fish kills. Ron Ahle noted that one of the questions of interest would be how much water is being taken from the thermocline. Steve Summer also noted that another question to be answered would be how a unit will impact critical habitat as well as the entrainment issue. Jim Ruane added that the W2 model will show how the unit impacts critical habitat. Tom Bowles noted that the fish start to congregate around Unit 5 usually in the 3rd or 4th week of August.

In a discussion on how this study would be performed, Gina Kirkland suggested that a wet year, a dry year and a normal year be studied. There was also a recommendation of studying it on a February, Summer, and Fall time frame. Ron Ahle noted that during testing, Unit 5 should be run along with the other units, as it would under typical operations of the plant. The group concluded that although the study will not be performed this year due to the repair work on the units, that they would start to draft a study plan. The group also noted that they would coordinate with the Fish and Wildlife TWCs and DNR to discuss fish entrainment issues and coordinate the studies.

During continuing discussion on a the doppler study, it was noted that unit 5 was used a number of times in June and July. Bill Argentieri noted that he would look into this and also send out a reminder email that Unit 5 is last on, first off, starting July 1st. Steve Summer noted that he believes this was due in part to the large amount of rainfall coming into the basin.

After lunch the group began to discuss the topic of TMDL. Alan noted that if a TMDL was performed that it may run concurrent to Relicensing, however it should not hold up the process by being directly tied to Relicensing. Andy Miller explained that although they would be happy for SCE&G to perform the studies, that he does not believe that it should be required of SCE&G. Andy Miller acknowledged that responsibility to develop TMDLs was the State's(DHEC) responsibility He expressed hope that a Lake Murray TMDL would come about as a result of the Stakeholder process of the FERC relicensing but didn't believe that the two were necessarily linked. Andy also remarked that most of the stakeholders at the table probably have an interest in a phosphorus TMDL. Gina further noted that as long as the TMDL was scientifically defensible, SCE&G may want to consider it for potential mitigation. Randy Mahan agreed that although a TMDL may be beneficial, that there was only a limited amount of things that SCE&G could do about the issue. He also expressed concern about the length of time in which it would take for the benefits of a TMDL to exhibit themselves, and the possibilities that SCE&G may be required to put in oxygen injection in during that time period. Gina agreed that that is a factor that SCE&G would have to consider.

Gina explained that the department has taken on several TMDL's in the past and they can take a considerable amount of time to accomplish. She explained that part of the reason for this is because concerns vary by areas and the dischargers also have concerns that lengthen the process. Dan Tufford explained that what we need to focus on is not the TMDL as an implementation of regulation. Rather that given the mission of the WQ RCG and the fact that several areas in Lake Murray and the LSR are already impaired for one or more constituents, the most reasonable water quality study to undertake will use the tools and methods of a TMDL analysis so that the work will be usable for subsequent implementation. He also stated that he believes it is possible that this analysis can be completed in the timeframe of the relicensing process. He also pointed out that a substantial amount of work has already been done on Lake Greenwood and Lake Murray that can be leveraged for TMDL analysis, thus helping reduce time and cost. Ron pointed out that much of what was talked about in the morning would be directly affected by water quality improvements. Gina noted that although the initial capital expense of oxygen injectors is unavoidable, it is possible that as their useful life ends there may not be a need to refurbish all of them. Both Ron and Gina's comments were not agency decisions but were intended to illustrate dollar benefits from TMDL implementation that potentially could be realized by SCE&G during the life of a 30-50 year license. The group agreed that a TMDL would be beneficial, however there was no decision made on whether it would be performed concurrently with Relicensing, or in the future by SCDHEC. Dan Tufford proposed that Andy Miller and Jim Ruane join him in determining the suitability of the information that is available and what else may be needed and subsequently to make a proposal to the group on a TMDL. Jim Ruane noted that there has been several improvements that could be made to the W2 model since it was first run. Randy and Bill noted that Jim should add in the additional work arounds, including refractory organic data. It was decided that Jim Ruane, Dan Tufford, and Andy Miller would meet at the end of April, while the entire TWC would meet again on May 23 in the Lake Murray Training Center. At the request of Dan Tufford and Andy Miller, Jim Ruane noted he would send a provisional copy of the W2 model to them for review. He noted that he would first send them a "gentlemen's agreement" to be signed before they received the W2 that specified that the draft should not be circulated. He said the agreement was intended to protect SCE&G's investment in the model; identify the needs for an orderly process for relicensing; present a process for conflict resolution; and other information about the modeling process used by REMI.

Before the adjournment of the meeting Richard Kidder briefly described the water quality monitoring program being undertaken by LMA. He noted that there would be a focus on the water quality in coves especially. Rich continued to explain that there would be fecal coliform and phosphorus testing. He also mentioned that there would be testing performed around commercial arenas in order to develop data that will be helpful to SCE&G on multi-slip dock issues. Rich noted that they would begin the testing in May and continue until October.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY GROUP

SCE&G Training Center
February 21, 2006

Final-CSB-03/21/2006

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Amanda Hill, USF&WS
Andy Miller, SC DHEC
Bill Argentieri, SCE&G
Bob Seibels, Riverbanks Zoo
Dan Tufford, USC
Dick Christie, SCDNR
Donald Eng, Trout Unlimited
George Duke, LMHOC
Gerrit Jobsis, SCCCL & Am. Rivers
Gina Kirkland, SC DHEC
Jennifer Summerlin, Kleinschmidt Associates
Joy Downs, Lake Murray Association
Randy Mahan, SCANA Services
Reed Bull, Midlands Striper Club
Richard Kidder, Lake Murray Association
Ron Ahle, SCDNR
Roy Parker, Lake Murray Association
Shane Boring,* Kleinschmidt Associates
Steve Bell, Lake Watch
Steve Summer, SCE&G
Tom Bowles, SCE&G
Tom Eppink, SCANA

**facilitator*

ACTION ITEMS:

- Provide info on historical distributions of freshwater aquatic mussels in the LSR
  Shane Boring
- Provide info regarding temperature impacts on mussels (Weiss Bypass publications)
  Gerrit Jobsis
- Provide location of SCE&G's seven water quality sample sites
  Tom Bowles
- Obtain historical information on stripped bass fish kills in Lake Murray
  Ron Ahle
- Provide summary of SCE&G water quality data, including monthly and intake monitoring
  Steve Summer
- Provide information on LMA cove water quality studies
  Roy Parker
- Incorporate additional tasks identified in 02/21/06 Water Quality RCG meeting into list of study requests/tasks to be addressed by the Water Quality TWC and distribute for review
  Shane Boring

MEETING NOTES:

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan Stuart opened the meeting at approximately 9:00 am, and meeting attendees introduced themselves. Alan then reviewed the protocol being used to distribute draft RCG meeting notes, noting that comments would be solicited from RCG members in attendance, but that the notes would be also distributed to all members of the RCG for informational purposes. .Dick Christie asked that meeting agendas to be sent out at least one business week before the meeting. Alan noted that the primary purpose of today's meeting would be to form the Technical Working Committees for the Water Quality RCG and that Shane Boring would be taking over facilitation for the remainder of the meeting.

Mission Statement

Shane reviewed the following mission statement for the Water Quality RCG, noting that it had been finalized and placed on the Saluda Relicensing website:

> *The Mission of the Water Quality Resource Conservation Group (WQRCG) is to develop water quality related recommendations to be included in the Saluda Hydroelectric Project FERC license application. The goal will be to achieve or exceed levels of compliance for State water quality standards for Lake Murray and the lower Saluda River. A means to work towards that goal is to identify data needs and to gather or develop that data necessary to ensure that water quality standards are currently being met and that they will be maintained in the future. A primary measure of success in achieving the mission and goals will be a published WQRCG Protection, Mitigation, and Enhancement (PM&E) Agreement.*

Formation of Technical Working Committee (TWC)

Shane proposed that a single Water Quality TWC be formed due to the interdependent nature of the issues and the fact that many of the same personnel are likely to be involved. The group agreed that a single TWC would be acceptable.

Review of Relevant Study Requests

Shane reminded the group that, at the initial RCG meeting, a document was distributed that summarizes the study request received in response to issuance of the Initial Consultation Document (ICD). He added that one of the primary purposes of today's meeting would be to review the water-quality-related study requests (see attached handout from the meeting[1]) and to determine which requests should be handled by the Water Quality TWC. He added that an additional goal of the meeting would be to formalize any other requests/comments not covered in the study requests received thus far. Comments and discussion regarding the study requests to be handled by the Water Quality TWC are summarized below:

Downstream Impacts of Coldwater Releases

Amanda Hill noted that USFWS, National Park Service, and others would like to know how far downstream in the Congaree mixing occurs at different flows and at different operations. Alan Stuart explained that, with the variable influence of the Broad, the scenarios are unlimited. Amanda noted the major concern is how seasonal water temperatures in the Broad and Saluda effect habitat down stream in the Congaree and in the Congaree National Park. Ron Ahle noted the need for understanding how the different flows and temperatures effect migration of diadromous fish. The group agreed that this study request was deserving of further discussion and that the Water Quality TWC would be the appropriate venue for such discussions.

TMDLs

Shane asked Andy Miller if he would give a quick synopsis of TMDLs. Andy noted that TMDLs are wired into the Clean Water Act and that every water body listed as impaired is required to have a TMDL implemented at some point. Andy added that impaired waterbodies are those listed on the 303-D list, which is issued by SCDHEC. Dan Tufford noted that there are a number of parameters for which a waterbody can be considered impaired, and often each of these parameters may have its own TMDL. He added, as an example, that portions of the Lake Murray watershed are considered impaired for phosphorous, while the LSR is considered impaired for DO.

Randy Mahan noted that, while TMDLs obviously have great utility in regulating NPDES discharges, it was unclear to him how SCE&G could implement a TMDL for Lake Murray without having the regulatory authority to do so. Tom Eppink added that, while they recognize the utility of TMDLs for improving water quality, SCE&G may be limited in what they can do in terms of a TMDL as part of the relicensing process. Steve Bell noted, and the

[1] Issues outlined in handout to be addressed by the Water Quality TWC unless otherwise noted.

majority of the group voiced support for, the need for a TMDL to be implemented for all of Lake Murray. Dan Tufford noted that it might be helpful to view TMDL development as a 2 phase process: 1) the study phase, in which studies are preformed in support of developing an appropriate TMDL for the water body 2) the implementation phase. He added that while SCE&G may not have the regulatory authority to implement a TMDL, they have the potential to contribute significantly to studies done to develop an effective TMDL. Shane noted that TMDLs are an issue that obviously deserves consideration at a more technical level and proposed that the issue be deferred to the Water Quality TWC for further discussion. The group agreed.

Effects of Project Operations on Summer Habitat for Striped Bass

Ron Ahle noted there was a problem with low DO in late summer and early fall in Lake Murray, often resulting in suitable habitat being limited to the area in front of the Unit 5 intake. Gerrit Jobsis noted a need to evaluate different operational scenarios and how they relate to this habitat "crunch" and ultimately to fish kills in the lake. He also noted the need to look at how water quality varies across years, particularly in the area in front of the forebay. Steve Summer noted that the magnitude of the habitat "crunch" varies from year to year, regardless of whether you use unit five, due to evaporation and flow regime. Steve suggested an acoustic Doppler profile study on the towers to characterize the interface between suitable habitat and the unit intakes under various scenarios. The group agreed that this issue should be handled in the water quality TWC.

Potential DO and Temperature Effects on Freshwater Mussels

Shane noted, and the group agreed, that the effects of DO and water temperature on mussel populations should be addresses in the TWC. Alan noted that the water quality standards are formulated to protect aquatic invertebrates, including mussels. Gerrit noted there is some debate because mussels are typically located in the interstitial area (between the water column and the substrate), which often has lower DO than the water column. Shane noted that before water quality effects can be evaluated, we first need to know what mussel species, if any, historically occurred in the Saluda Hydro vicinity and their current status (i.e., are they extant). Shane agreed to gather information regarding historical occurrence of mussels in the area.

Cove Water Quality In Lake Murray

Roy Parker noted the Lake Murray Association (LMA) is in the process of implementing a cove water quality monitoring program, which they hope to have their program up and running by May. Roy explained they have picked the types of coves they want to sample, but have not yet picked specific locations. He added that they would like to sample all quadrants of the lake. Tom Bowles noted SCE&G has seven sites where they take samples and will provide these locations to LMA. Several group members expressed the need for a comparative evaluation of water quality in coves before and after marinas are installed.

Sediment Regime and Transport Studies

Gerrit proposed, and the group agreed, that the sediment regime and sediment transport studies should be discussed in the F&W TWCs, namely the Instream Flow and Aquatic Habitat TWC.

Impacts of Power Boats and Jet Skis on Drinking Water Quality

The group briefly discussed the League of Women Voter's request for a study to evaluate the impacts of jet skis and power boats on drinking water quality. Several meeting attendees noted that they were unsure of exactly what is being requesting and the project nexus. Gerrit noted that some individuals pump drinking water directly from the lake to their homes, and he assumed that is what is being referred to in the request. Randy Mahan noted that SCE&G does not permit individual water withdrawals as part of its current lake use permitting process, nor does SCE&G have the regulatory authority to regulate watercraft usage on the lake. The group agreed that the Water Quality TWC is the appropriate venue for further discussion of this issue.

Status of Existing Water Quality Data and Identification of Data Gaps

Dick Christie, Gerrit, and others noted that data from SCE&G's existing studies needs to be shared with the TWC in order to provide an idea of baseline conditions for relicensing studies. Group members noted specifically a need for information related to SCE&G's monthly water quality monitoring, monitoring conducted at the five turbine intakes, and results of the hub baffle effectiveness testing. Alan Stuart noted that Jim Ruane is nearing completion of the draft report on the hub baffle effectiveness nesting, which was conducted in fall 2005, and will distribute it to the TWC when it is received. Dan Tufford enquired as to when the technical documentation would be available for the W2 model performed by Jim Ruane for Lake Murray. Alan noted that it will be available as soon as it is finalized,

which is scheduled for late late-March/early-April. The group agrees that water quality data needs could be further refined in the TWC.

Water Quality TWC Membership

After a short break, the group began to assign members to the TWC and agreed that the members should have technical expertise. The following people volunteered and were assigned to the water quality TWC:

Gina Kirkland
Alan Stuart
Jim Ruane
Gerrit Jobsis
Reed Bull
Richard Kidder
Roy Parker
Dan Tufford
Tom Bowles
Amanda Hill
Ron Ahle
Andy Miller
Shane Boring

Dates and Agenda of Upcoming RCG and TWC Meetings

THE RCG meeting was closed at approximately 2:00 pm and the group agreed to use the remainder of the afternoon to convene the first Water Quality TWC meeting (notes prepared separately). No date was set for the next Water Quality RCG meeting as the group determined it best that the TWC meet a few times and then propose a date to the RCG for its next meeting.

for project impacts. Also, the effects of the Project operations on habitat requirements for spawning fishes.

Requested by: CCL/American Rivers, USFWS

Information Needs:

- **Aquatic Habitat Decline Model**: In order to understand the reasons and contributing factors of seasonal habitat decline associated with the combination of increasing water temperature and decreasing dissolved oxygen. Thus resulting in a decrease in available cool-water habitat for some species. This model would be developed to better understand the causative factors that result in habitat declines, and to evaluate scenarios that could reduce or eliminate this problem.

  Requested by: SCDNR

- Request information that will help to a) forecast striped bass habitat reductions with new operational protocol implemented, and b) help develop an operational protocol to minimize impacts on striped bass habitat. ***SCDNR***

- Temperature profiles, on at least a monthly basis, at the unit intakes in the reservoir (specifically June-September) to have a better understanding of the relationship between project operations and water temperature and dissolved oxygen as they pertain to our management programs. ***SCDNR***

- We recommend that trends in water quality data associated with Lake Murray and the Lower Saluda River be reviewed and summarized. Special attention should be given to the stations and parameters that did not meet State standards or are declining. ***SCDNR***

- Marina water quality monitoring records in order to understand the degree of water quality impacts related to large multi-slip docking facilities. ***Lake Murray Homeowners Coalition***

- An updated report on the status of dissolved oxygen concentrations in the lower Saluda River and the efficacy of existing enhancement measures. **USFWS**

Requests for Potential Mitigation: None

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TECHNICAL WORKING COMMITTEE

SCE&G Training Center
February 21, 2006

Final csb 03/21/2006

ATTENDEES:

Alan Stuart, Kleinschmidt**
Alison Guth, Kleinschmidt
Amanda Hill, USF&WS**
Andy Miller, SCDHEC**
Bill Argentieri, SCE&G
Dan Tufford, USC**
Dick Christie, SCDNR
George Duke, LMHC
Gerrit Jobsis, SCCCL & Am. Rivers**
Gina Kirkland, SC DHEC**
Jennifer Summerlin, Kleinschmidt
Reed Bull, Midlands Striper Club**
Richard Kidder, LMA**
Ron Ahle, SCDNR**
Roy Parker, LMA**
Shane Boring, Kleinschmidt*,**
Tom Bowles, SCE&G**

*Facilitator
**Water Quality TWC member

ACTION ITEMS:

- Provide historical information pertaining to the fish kills on Lake Murray

Ron Ahle

- Obtain stocking rates of striped bass in Lake Murray

Ron Ahle

- Provide data on water chemistry profiles on Lake Murray

Tom Bowles

- Make arrangements for Jim Ruane to present information on TMDL and acoustic Doppler methods.

Alan Stuart

- Provide more information about the status of cove water quality study plan

Lake Murray Association

- Prepare a study plan on the effects of project operations on temperature in the Lower Saluda River (LSR)

Shane Boring

DATE OF NEXT MEETING: **March 6, 2006 at 2:00 p.m.**
Conference call

March 24, 2006 at 9:30 a.m.
Lake Murray Training Center

MEETING NOTES:

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Shortly after the water quality RCG meeting, the group agreed to proceed with the Water Quality Technical Working Committee meeting. Shane Boring opened the meeting at approximately 2:30 PM, noting that the purpose of the meeting was to begin evaluating and prioritizing the study requests assigned to the Water Quality TWC.

Cove water quality

Roy Parker noted that Lake Murray Association (LMA) is currently preparing a study plan to examine cove water quality, which has potential to assist with addressing this issue. Roy Parker noted that they have selected cove types, but have not selected specific locations. Roy also explained that they will be monitoring coves that are planned to be developed in the future and monitor after development has occurred. He added that septic system drain fields systems and marinas located around these coves are among the LMA's main concerns. He also explained they want to examine phosphorus and fecal coliform. Dick Christie suggested to LMA that a simulation model, such as those used for land use planning, should be considered. Dick noted that he was familiar with these guidelines and would help LMA figure out what is needed. Alan Stuart suggested that LMA's study plan include timing and location of proposed sampling, as well as the parameters to be sampled, to ensure that LMA and SCE&G do not duplicate efforts. Tom Bowles noted that SCE&G samples twice a year, March and September, to obtain a representation of the best and worst water conditions. Tom noted that his sample locations include Shull Island, Hollow Creek, the forebay near the intake towers, Bear Creek, Camping Creek, the Little Saluda River and Turner's Cove. LMA noted they would have more information in about two weeks and would forward information to the group as it becomes available. Roy noted that he would like to send the study plan to Gina Kirkland and then on to the Water Quality TWC following her review.

Effects of project operations on dissolved oxygen (DO) in Lake Murray and the LSR

The group briefly discussed the issue of periodic low dissolved oxygen levels in the forebay. Gina Kirkland noted that she would like to see Lake Murray at its normal (water) level before any DO study is conducted. Several group members expressed a need to further understand the impact of project operations on DO in the forebay and how it may be impacting the striped bass population. Ron noted that it would be important to look at the conditions present for each of the significant fish kills to date, such as operations, weather, and stocking rates. Ron agreed to provide the group with information on historic fish kills in the lake. The group decided that a acoustic Doppler study may

be appropriate to evaluate the impact of operations on striped bass habitat during the late summer/early fall "crunch" period; Alan suggested setting up a date and time for Jim Ruane or other staff to come in and discuss this issue.

Briefly, the group discussed the unit upgrade study and specifically it was noted that hub baffle tests were performed on units one and five. It was also noted that units two through four could not be tested due to seal failure. A report is being prepared on the unit one and five testing, and the seals on units two through four will be repaired by July and tested this fall.

Gerrit Jobsis noted that data regarding current DO conditions below Saluda Hydro are needed to provide an adequate baseline for relicensing studies. He added that data showing the percentage of time the new site-specific DO standard is being met would be particularly useful. Alan Stuart noted that the result of the hub baffle effectiveness study (see discussion above) will likely provide much of the information referenced by Gerrit. He added that the hub baffles were installed to increase aeration potential of the turbines and to help ensure that the standard is being met. Bill Argentieri noted that if any modifications to operations or equipment (i.e. auto-venting turbine runners, etc) are needed to improve DO conditions, SCE&G would like to ensure that they provide generation as well. Gina Kirkland noted these modifications should be installed and in place by the application deadline. Bill noted that any such modification would certainly be included as an enhancement in the license application, but it is unlikely that they could be installed before the license application is filed.

While the group agreed that DO conditions in the lake and LSR are of extreme importance to relicensing, it was determined that the remainder of the meeting should focus on the proposed temperature study in the LSR and Congaree as it would need to be implemented as soon as possible to capture temperature dynamics associated with the onset of spring.

Effects of project operations on temperature in the Lower Saluda(LSR) and Congaree Rivers

Amanda Hill noted temperature profiles in the LSR and Congaree are high priority for USFWS. Ron Ahle noted there needs to be some baseline data established, which will help measure success for future studies. After a brief discussion, the group agreed that a temperature study on the LSR and Congaree was appropriate.

The group then discussed areas in the LSR and Congaree where water temperature should be measured[1]. It was suggested, and the group agreed, that the USGS gages at Alston and below Saluda Hydro could be used to provide data for the Broad and Saluda, respectively, and that paired

[1] Locations were discussed during the March 6, 2006 Water Quality TWC conference call. Final TidbiT placement locations will be as identified in the final study plan and 3/6/06 conference call minutes.

Tidbit temperature sensors (left and right bank) should be deployed downstream at 10 mile intervals thereafter. The group agreed that gathering data at 15 minute intervals would be adequate if the instrumentation will allow. After some discussion, it was determined that TidbiTs should be deployed at the following locations[2]:

- The Saluda upstream of the confluence with the Broad;
- the Congaree in the vicinity of the USGS gage near Gervais St. Bridge;
- the Congaree near the I-77 bridge;
- the Congaree near the upstream extent of the Congaree National Park;
- the Congaree near the downstream extent of the Congaree National Park; and
- the Congaree midway of the Congaree National Park.

The group then requested a brief report summarizing the study status be issued at 6-month intervals during the study period, with a final report upon completion. Shane Boring agreed to have a study plan draft and distributed for review within approximately one week.

Shane Boring closed the meeting at approximately 4:00 PM, noting that the next meeting would be via conference call on March 6th at 2:00pm to review the water temperature study plan. The group also agreed that the next face-to-face meeting will be on March 24, 2006, and the group agreed to wait until that time to discuss the TMDL issue. Alan noted that he will attempt to have Jim Ruane present at the March 24th meeting to participate in the TMDL discussion. Roy Parker noted LMA would have more information about their study plan for the March 24 meeting.

[2] Locations were discussed during the March 6, 2006 Water Quality TWC conference call. Final TidbiT placement locations will be as identified in the final study plan and 3/6/06 conference call minutes.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY TECHNICAL WORKING COMMITTEE

Via Conference Call
February 6, 2006

final csb 04032006

ATTENDEES:

Bill Argentieri, SCE&G
Reed Bull, Midlands Striper Club
Alison Guth, Kleinschmidt
Shane Boring, Kleinschmidt*
Gerrit Jobsis, SCCCL & Am. Rivers
Tom Bowles, SCE&G
Dan Tufford, USC
Richard Kidder, LMA
Ron Ahle, SCDNR

*Facilitator

ACTION ITEMS:

- Incorporate agreed-to changes to study plan and distribute as final.
  Shane Boring

MEETING NOTES:

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Shane opened the meeting at approximately 2:00 pm, noting that its primary purpose would be to review the draft temperature study plan (attached), which was distributed to the TWC via e-mail on March 1st. The group then discussed needed changes to the plan, which are summarized below.

Sampling Locations

The group agreed that, in addition to the locations indicated in the draft study plan, Tidbit temperature loggers should be placed at the following locations:

- at the USGS gage below the dam to verify data recorded by the USGS Gage;
- on the Broad, at the head structure to the Columbia Canal; and
- in the Congaree between I-77 and the upstream extent of Congaree National Park.

Ron noted that an additional sampling location in the Broad is needed to ensure that data is available for the Broad should the sensor at the head of the Columbia Canal fail. Bill A. proposed, and the group agreed, that temperature data from the USGS gage below Parr Hydro (02160991) could be used for this purpose.

Gerrit noted that the sensors located in the vicinity of the I-77 bridge should be placed upstream of the Columbia wastewater treatment plant to avoid influence from the facility. It was similarly noted that the most downstream sensor (near the downstream extent of Congaree NP and the confluence with the Wateree) should be located far enough upstream to avoid backwater effects of the Wateree. It was also noted that the site added between I-77 and Congaree NP should be sufficient distance (approx. ½ mile) to avoid influence by the Eastman Kodak (Viridian) Plant. Gerrit also suggested placing a sensor adjacent to the USGS gage at Congaree NP (02169625) to examine correlations between stage and temperature. The group agreed that this location could be used that the upstream location for Congaree NP.

It was also noted that the USGS gage at Riverbanks Zoo should be added to the map.

Study Reporting / Data Availability

Gerrit requested a meeting of the TWC following each 6-month update report and that the data collected to date be shared with the TWC following each 6-month period. The group agreed and Shane agreed to incorporate these changes into the study plan.

Study Implementation

Several attendees enquired as to when the study would begin. Bill A. noted the purchase order would likely be issued by the end of the month, at which time the study will begin.

The meeting was closed the meeting at approximately 2:30 PM. Shane noted that he would incorporate the agreed-to changes into an updated study plan and distribute it along with the draft meeting notes.

Saluda Hydroelectric Project (FERC No. 516)

Study Plan: Effects of Releases from the Saluda Hydroelectric Project Dam on the Temperature Regime of the Lower Saluda and Congaree Rivers

Water Quality Technical Working Committee
DRAFT February 28, 2006

I. Study Objective

The study objective is to characterize the effects of water releases from the Saluda Hydroelectric Project Dam on the temperature regime of the Lower Saluda River (LSR) and Congaree River, including downstream extent of temperature alteration, timing and duration of temperature alteration, and mixing characteristics.

II. Geographic and Temporal Scope

Temperature investigations will focus on the LSR from downstream of Saluda Hydro Dam to its confluence with the Broad River; the Congaree River from its origin at the confluence of the Saluda and Broad rivers to its terminus at the confluence with the Wateree River; and the lower Broad River from the Alston USGS gage (#02161000) to its terminus at the confluence with the Saluda (Figure 1).

The study is scheduled to begin in March 2006 and will continue through October 2007.

III. Methodology

Water temperature data will be acquired at 15 minute intervals (or lowest time duration above 15 minute intervals allowable by the instrumentation) from 8 locations in the study area, as determined in consultation with the resource agencies (Figure 1). Specifically, the USGS gages at Alston (#02161000) and below Lake Murray (# 02168504 and #02169000) will be used to characterize the temperature regime in the lower Broad and the lower Saluda rivers, respectively. In addition, paired temperature probes (StowAway® TidbiT™) will be deployed along the north and south riverbank at the following locations to provide temperature data for the remainder of the study area:

- the LSR upstream of the confluence with the Broad (possible in the vicinity of Riverbanks Zoo);
- the Congaree River in the vicinity of the USGS gage adjacent to downtown Columbia (#2169500);
- the Congaree River in the vicinity of the Interstate-77 bridge;
- the Congaree River at the upstream extent of the Congaree National Park;
- the Congaree River midway of the Congaree National Park; and
- the Congaree River near the downstream extent of the Congaree National Park (near the confluence with the Wateree).

Temperature data will be compared by location using appropriate statistical methods to determine timing, duration, magnitude, and spatial extent of temperature alterations.

IV. Schedule and Required Conditions

The study is scheduled to begin in March 2006 and will continue through October 2007.

A brief report summarizing the study's status will be issued at 6-month intervals, with a final report upon completion of the study period. Study methodology, timing, and duration may be adjusted based on consultation with the resource agencies.

V. Use of Study Results

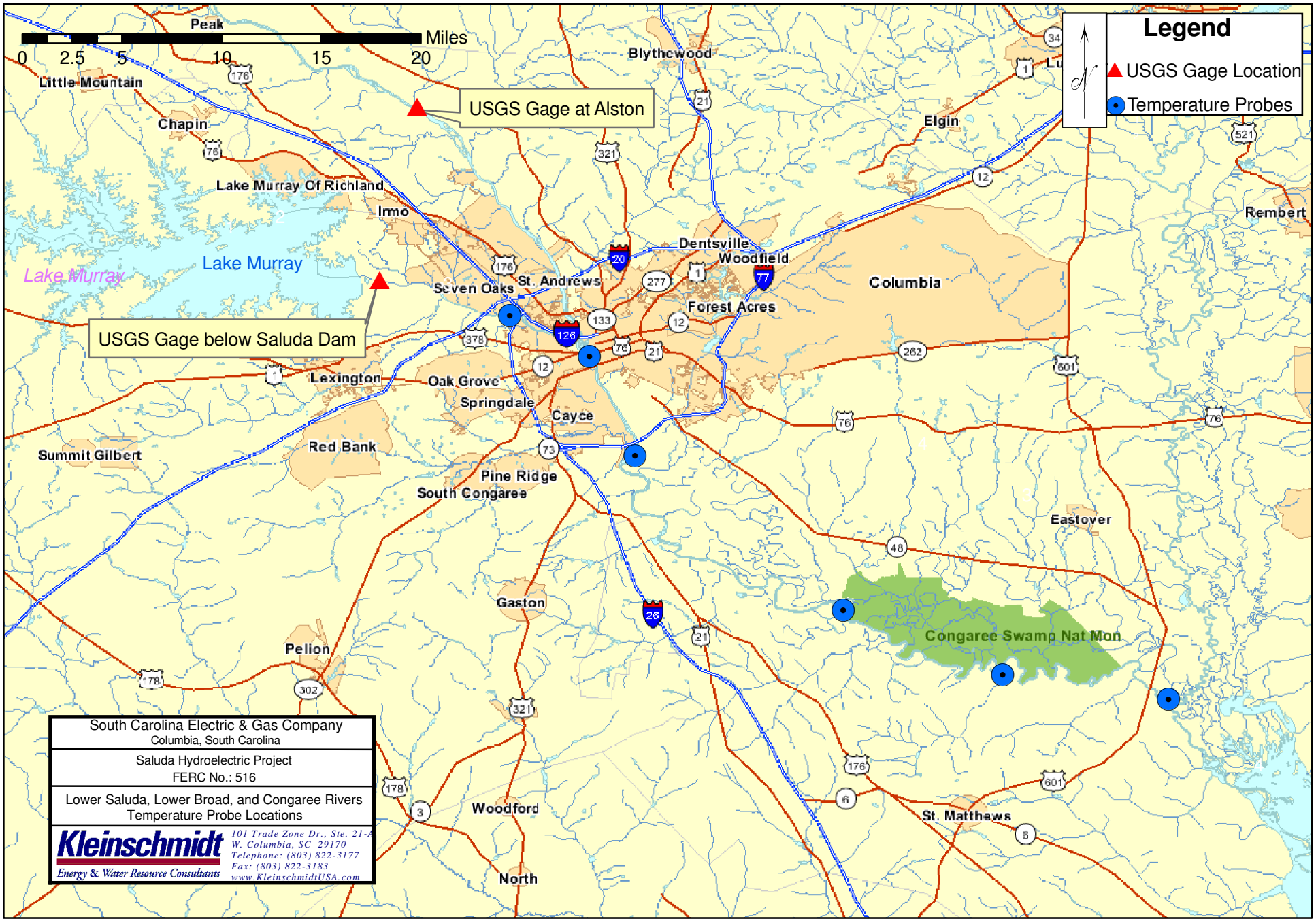
Study results will be used as an information resource during discussion of relicensing issues with the SCDNR, USFWS, Water Quality RCG and TWC, and other relicensing stakeholders.

VI. Study Participants

NAME	ORGANIZATION	PHONE	E-MAIL
Water Quality Technical Working Committee			
Gina Kirkland	SCDHEC	(803) 898-4250	KIRKLAGL@dhec.sc.gov
Gerrit Jobsis	American Rivers	(803)771-7114 x 22	gjobsis@americanrivers.org
Reed Bull	Midlands Striper Cl.	(803)256-4121	bbull@sc.rr.com
Ron Ahle	SCDNR	(803)743-2728	ahler@scdnr.gov
Roy Parker	LMA	(803)808-7188	royparker38@earthlink.net
Dan Tufford	USC Dept. of Biol.	(803)777-3292	tufford@sc.edu
Tom Bowles	SCE&G	(803)217-9615	tbowles@scana.com
Andy Miller	SCDHEC	(803)898-4031	millerca@dhec.sc.gov
Alan Stuart	Kleinschmidt	(803)822-3177	Alan.stuart@kleinschmidtusa.com
Richard Kidder	LMA	(803)892-6539	rkidder@pbtcomm.net
Jim Ruane	REMI	(423)266-5217	jimruane@comcast.net
Amanda Hill	USFWS	(843)727-4707, x303	Amanda_hill@fws.gov
Shane Boring	Kleinschmidt	(803)822-3177	shane.boring@kleinschmidtusa.com
Applicant Contacts			
Stephen E. Summer	SCANA Services	(803)217-7357	ssummer@scana.com
William Argentieri	SCE&G	(803)217-9162	bargentieri@scana.com
Randy Mahan	SCANA Services	(803)217-9538	rmahan@scana.com

VII. List of Attachments

Figure 1: Temperature Probe Locations in the Lower Saluda, Congaree and Lower Broad River


Legend
USGS Gage Location
Temperature Probes
USGS Gage at Alston
USGS Gage below Saluda Dam
Lake Murray
Lake Murray Of Richland
Miles
0 2.5 5 10 15 20
Peak
Little Mountain
Chapin
Irmo
Blythewood
Elgin
Rembert
Dentsville
Woodfield
Columbia
Forest Acres
Seven Oaks
St. Andrews
Lexington
Oak Grove
Springdale
Cayce
Red Bank
Summit Gilbert
Pine Ridge
South Congaree
Eastover
Gaston
Congaree Swamp Nat Mon
Pelion
Woodford
St. Matthews
North
South Carolina Electric & Gas Company
Columbia, South Carolina
Saluda Hydroelectric Project
FERC No.: 516
Lower Saluda, Lower Broad, and Congaree Rivers
Temperature Probe Locations
Kleinschmidt
Energy & Water Resource Consultants
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MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
FISHERIES AND WILDLIFE RESOURCE CONSERVATION GROUP
WATER QUALITY RESOURCE CONSERVATION GROUP
JOINT MEETING

Saluda Shoals Park, Irmo, SC
December 7, 2005

ATTENDEES:

Bill Argentieri, SCE&G
Alison Guth, Kleinschmidt Associates
Shane Boring, Kleinschmidt Associates
Steve Bell, Lake Murray Watch
Gina Kirkland, SCDHEC
Malcolm Leaphart, TU
George Duke, LMHOC
Joe Logan, Midlands Stripers
Jeff Duncan, National Park Service
Bill Marshall, SCDNR & LSSRAC
Glen Siebels
Gerrit Jobsis, American Rivers
Ron Ahle, SCDNR
Amanda Hill, USFWS
Bud Badr, SCDNR
Bob Keener, Lake Murray Assn./LMSCA
Wade Bales, SCDNR
Tony Bebber, SC Parks, Rec. & Tourism
Norm Ferris, TU
Richard Mikell, Adventure Carolina
Jim Ruane, REMI
Ray Parker, Lake Murray Assoc.
Alan Stuart, Kleinschmidt Associates
Steve Summer, SCANA Services
Randy Mahan, SCANA Services
Dick Christie, SCDNR
Bob Seibels, Riverbanks Zoo
Tom Bowles, SCE&G
Steve Leach, SCDNR
Hal Beard, SCDNR
Bill Hulslander, Congaree National Park
Mary Kelly, League of Women Voters (Cola area)
Patrick Moore, Coastal Conservation League
Mike Summer, SCE&G
Joy Downes, Lake Murray Assn.
Bill East, Lake Murray Assn.
Jim Goller, Midlands Striper Club
Reed Bull, Midlands Striper
Dan Tufford, Univ. of SC
J. Charles Floyd, Lake Murray Homeowner's Assoc.
Andy Miller, SCDHEC
Pamela Greenlaw, Sierra Club - John Bachman Group
Andy Sawyer, REMI

ACTION ITEMS:

- Review list of study requests.

DATE OF NEXT MEETING:

February 1 (Water Quality) and 2nd (Wildlife and Fisheries) at 9:00 a.m. at SCE&G's Lake Murray Training Center[1].

[1] Due to conflict with the Catawba-Wateree Relicensing, dates were subsequently changed to February 21st and 22nd for the Water Quality and Fish and Wildlife RCG's, respectively.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
FISHERIES AND WILDLIFE RESOURCE CONSERVATION GROUP
WATER QUALITY RESOURCE CONSERVATION GROUP
JOINT MEETING

Saluda Shoals Park, Irmo, SC
December 7, 2005

MEETING NOTES:

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan Stuart opened the meeting at approximately 9:30 AM, noting that the Water Quality and Fish &Wildlife Resource Conservation Groups (RCG)s had been combined for this meeting due to several common requests for presentations to provide background information relevant to the relicensing of Saluda Hydro. He added that, because the meeting consisted almost exclusively of presentations, the meeting would be mostly educational in nature and would likely not include significant discussion of relicensing issues. Following Alan's introduction, the following presentations were given (click on presentation title to view):

Water Quality Standards and *§**401 Water Quality Certification Process for Federal Energy Regulatory Commission (FERC) Hydro Relicensing***, Gina Kirkland, South Carolina Department of Health and Environmental Control (SCDHEC).

Water Quality Update: Lower Saluda River and Lake Murray, Andy Miller, Watershed Manager - Saluda and Santee Basins, SCDHEC.

Developing a Site-Specific Dissolved Oxygen Standard for the Lower Saluda River, Shane Boring, Kleinschmidt Associates.

(Note: This presentation was a recap of the presentation given by A. Stuart, J. Ruane, Dr. G. Chapman (Paladin Water Quality Consulting), and G. Hauser (Loginetics, Inc.) at the July 30th, 2003, Public Information Meeting for establishment of the Saluda site-specific DO standard.)

Water Quality Data Analysis and the CE-QUAL-W2 Modeling for Lake Murray, Jim Ruane and Andy Sawyer, Reservoir Environmental Management, Inc. (REMI).

(NOTE: Some portions of this presentation are not available through the website due to virtual memory, software and animation requirements.)

Alan Stuart closed the meeting at approximately 4:00 PM, noting that the next Water Quality and Fish and Wildlife RCG Meetings would be held at the SCE&G Training Center on February 1st and 2nd, 2006, respectively[2]. In closing, he urged group members to review the compiled list of study request and to be prepared to discuss them.

[2] Due to conflict with the Catawba-Wateree Relicensing, dates were subsequently changed to February 21st and 22nd for the Water Quality and Fish and Wildlife RCG's, respectively.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
WATER QUALITY RESOURCE GROUP

SCE&G Training Center
November 9, 2005

final 11-30-05 acg

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Steve Summer, SCANA Services
Shane Boring, Kleinschmidt Associates
Randy Mahan, SCANA Services
Donald Eng, Trout Unlimited
Roy Parker, LMA
Dick Christie, SCDNR
Gina Kirkland, SCDHEC
Andy Miller, SCDHEC
Hank McKellar, SCDNR
Bill Marshall, SCDNR & LSSRAC
Steve Bell, Lake Watch
Amanda Hill, USFWS
Bob Keener, LMA & LMSCA
Tom Bowles, SCE&G
Reed Bull, Midlands Striper Club
George Duke, LMHOC
Patrick Moore, SCCCL, Am. Rivers
Bill Hulslander, Congaree National Park
Jeff Duncan, National Park Service
Ron Ahle, SCDNR

DATE: November 9, 2005

HOMEWORK ITEMS:

- Go through list of study requests.
- Review the ICD and the water quality report at the back of the ICD.

AGENDA TOPICS FOR NEXT MEETING:

- Presentation: Water Quality Standards and Classifications of Lake Murray and the Lower Saluda River
  Gina Kirkland
- Presentation: Status on impaired areas within Lake Murray
  Andy Miller
- Presentation: A Review of 25 years of Water Quality in Lake Murray
  Jim Ruane - Reservoir Environmental Management

- A Review of the QUAL 2 -E Water Quality Model and its Application to Lake Murray
  Jim Ruane
- A Review of the Site-Specific Dissolved Oxygen Standard
  Alan Stuart/Shane Boring

DATE OF NEXT MEETING: **December 7, 2005 at 9:00 a.m. (Combined Meeting with Fish and Wildlife Resource Group)**
Located at the Saluda Shoals Park Rivers Center

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

INTRODUCTIONS

Alan opened the meeting and began introductions. Alan pointed out that in answer to many questions that had come up, the FERC Representative for the Saluda Hydro Project is Allan Creamer.

DISCUSSION

Alan began by commenting on the draft Operational Procedures and asked the group if everyone had received a copy. He then noted that some comments were received from Patrick Moore. Patrick then proceeded to read a list of the co-signing parties. Alan also noted that comments were received from Bill Marshall of the LSSRAC as well.

Alan then pointed out that one of the recommendations that has been tabled is the development of a procedures group. He noted that he believes that some of the NGOs are in the process of developing an internal group.

Patrick Moore pointed out, "Yes we have drafted a second set of comments and will develop an informal group."

Alan Stuart then asked, "Are there any questions in regard to the procedures. The revisions will be circulated after we receive Patrick's second set."

Alan then switched gears to discuss the development of a mission statement for the group. "One thing that we have done in the other RCGs is develop mission statements. Bill Cutler mentioned three things necessary in achieving a mission statement I would like to first start to develop this mission statement."

The group then began to discuss what needed to be included into the mission statement. The following is some of the dialogue that went on between members of the group:

Gina Kirkland noted, "How about attain and maintain water quality standards and improve water quality be included."

Randy Mahan pointed out, "I think that the goal for the group is to address programs and operations that impact the resource goals. I think that we need to develop the goal for the resource and then the goal for the group."

Gina Kirkland explained, "There are some goals that are going to be beyond what SCE&G can accomplish."

Jeff Duncan noted that he believed it was important that the group become well versed with what the standards were.

Gina Kirkland: "My specific job at DHEC is a WQ standards coordinator and my job is to identify those standards, etc. If it would be beneficial I could bring copies of the WQ standards."

Don Eng asked, "Are we not going to put down anything specific like the oxygen level required for the trout?"

Alan Stuart noted, "I think that goes back to Attain and Maintain."

Don Eng replied, "I would like to see the standard raised."

Gina Kirkland pointed out, "I would tell you that is not something that I would pursue."

Jeff Duncan added, "That is a regulatory thing, first we have to make sure we are in attainment with the standard."

Amanda Hill: "I think that would be a specific issue."

Randy Mahan noted, "I think it is appropriate to consider what the standards may be, to learn about and understand them, and make recommendations. On behalf of SCE&G we would not apply to increase the standards, the first thing we would like to make sure of is that we can support the current standard. The setting of standards is really a public policy issue and if the policy is to protect a trout fishery then you set the standards to support that trout fishery WQ standard setting is a public policy issue and that is one that is taken up with DHEC."

Dick Christie added, "It seems like one thing we need to focus on is going by the rules and learning the rules for water quality standards."

Alan Stuart pointed out that many were involved in the revisions of the WQ standards in 2004, it involved a rigorous process that has to go through much review and approval. It is not a simple thing to change a WQ standard.

Don Eng asked, "What happens when we get new information that says current WQ standards are not good enough."

Gina Kirkland replied, "WQ standards are revised every three years. A lot of stuff comes from the public and public presents information."

Bob Keener noted, "It seems to me the standard is more a floor, not a ceiling, and you should keep at that and not go below that. Things can happen that negatively impact on dissolved oxygen that may drive it down – I think we are trying to make these more infrequent."

Alan Stuart noted that one thing that everyone needs to keep in mind, it doesn't drop below that standard much but at a certain time of year. He continued to note that there was a misconception in the newspaper; they made it seem like it happens year round, and that is not true.

Gina Kirkland explained, "When you are looking at WQ standards you often set an acute value, a lethal value. Then there are chronic conditions that impact how they breathe, eat, and grow. Those are expressed as averages. What you have is a number that you want the organism to be at and healthy organism. Can it fall below a certain number for short spans of time and not have anything happen to the system and it be okay?…Yes…what you don't want is a long period of time below that number. You are going to have occasional blips without affecting the system. We set the numbers in order to make sure that we are not having long term impacts. Typically when the toxicity test is done, they would take an organism and keep it at a DO level for a certain period of time. What they found is that organism does quite well at fluctuating DO, and that's what we found on the lower Saluda. That there is a healthy growing trout population, even though they are very sensitive to DO we found the LSR provides a very healthy habitat for them."

Don Eng: "From fishing experience, the trout have been affected by the few days of low DO."

Gina Kirkland replied, "We were aware and concerned about that and we have issued them a letter and they have replied and a lot of the time there are reasons for the low DO."

Steve Summer pointed out, "A list of action items we first need to do is to look at the applicable standards for LM and the LSR….DO, metals, phosphorus, etc. In order to know where we are. Then look at the standards and see which of the standards are not being met currently. Then we need to focus on those areas and identify the mechanisms for improving those areas. I think we can also have a goal for improving WQ. I think we could spend months discussing whether the trout are happy or not, but if we can work on getting the standards met at least gives us something to shoot at."

Steve Summer added, "We did some electro-fishing on the river after the low DO, and there are still decent populations of fish."

Gina Kirkland noted, "The classifications we are talking about is Freshwater on lake, and right below the lake is Trout Put Grow and Take, and that class has a number assigned to it and a site specific standard. Meaning, that this is not a natural trout area. And three things important to trout are clarity, cold water and DO. And what we are trying to protect is the regular aquatic biology, as well as the Put Grow and Take, not a natural trout population."

Randy Mahan noted, "We also need to look at a goal of developing a common understanding of things. We are going to have these technical working committees that are getting into the nitty gritty of things, and I think it is really important that we all become educated in this process."

Jeff Duncan noted that he thought that it would be helpful if Gina gave a presentation on Standards and Classifications and 401 standards. He requested that part of it would include Gina and the Applicant's view of the 401 Water Quality Certification Process.

Patrick Moore pointed out that in discussions with Bill Argentieri it was noted that not all of the violations as seen on the USGS site are actually violations, some are just bad data. He noted that it might be good for Bill or Lee to go through the violations noting which ones were actually violations versus bad data or operational obligations.

Randy Mahan replied, " I don't know if we want to do that every time. Each week Ray puts out an update on operations with a link to the USGS Preliminary data and it gives you a snapshot as to what has been going on."

Alan Stuart noted, "SCE&G is required to prepare an annual operations report every year as a Settlement with the SCCCL, one thing that is a problem is that the monitor fouls quite frequently."

Steve Summer added, "USGS maintains two monitors on the LSR, one immediately below the dam and one upstream of the zoo. They will routinely go out and service the instrumentation, but during this time of the year the monitors tend to foul frequently. USGS will often contact me and I will go out and look at them. If he goes out and finds that that monitor is reading 2 or 3 mg/l below the norm then usually he will bring it up. If you are looking at the data and you see a lot of jumping around, it is usually fouling. Another issue is the location of the USGS monitor below the dam. There is a large rock that interrupts the flow. We've been doing testing in order to see whether there is a better place for it."

Gina Kirkland: "It is extremely hard to maintain a continuous DO meter."

George Duke noted, "I think we need to know what the reasonable expectations are. A population of fish below the dam would be a reasonable expectation."

Steve Summer replied, "You would think the standards would address that."

Gina Kirkland replied, "I can gear my presentation to do that. And the LSR could not be a location for a reproducing trout population. There is not location for them to lay eggs. Understand that if you do see a dead fish occasionally, I mean they do die. Overall the biological community is healthy in Lake Murray and the LSR."

Bob Keener noted, "A non-technical concern I have, on the DO sensors we have, should there be additional sensors, more than two? How expensive are they, and are there new sensors out that would not have the problems that those have now."

Randy Mahan replied, "The license requires that USGS has monitor data. That is one reason we prefer to have USGS to do that, because they are more likely to be believed and they do a great job."

Steve Summer explained, "USGS uses two different brands: Hydrolab and YSI. The Hydrolab has a stirrer which would get jammed with vegetation. YSI has been installed, and those have been having membrane problems. We have now been looking at a new portable unit that costs about 10,000 dollars. Right now USGS will not use any sensors that are not tested at their lab. This new sensor has not been tested at their testing facility yet, but may be tested in the future. They are working with us and we are trying to figure out the best location of a sensor."

Gina Kirkland, "If we wanted to make a suggestion that you do install more monitors would you have an objection."

Randy Mahan, "No we do not have an objection to the idea of putting more out there. If our operation is driven by science, then we should have the best data to govern our operations. The only problem, besides the money, is that if you do have a USGS station out there and we start getting different readings does that help the situation, or make the problem worse."

Jeff Duncan pointed out, "I think we have identified an issue here, the issue is that more DO meters are needed. USGS funds are tight."

Steve Summer responded, "We fund the USGS monitors they have now."

Steve Bell pointed out, "I think one of the goals should be to review the data on the current conditions of WQ on the lake. I think it is important to see what they are saying and why and then go back and see what we need to improve."

Alan Stuart noted, "If you go to the back of the ICD, there is a comprehensive report that addresses phosphorus issues etc. I am going to propose this as a HW assignment. One of the things I was going to propose is to have Jim Ruane come down and explain the W2 Model. He did his report on the nutrients on LM."

Gina Kirkland noted, "Jim even got DMR data off of discharges upstream."

Randy Mahan noted that he would be happy to put a straw man mission statement out there but I would be glad to give it a shot. He noted that he didn't want it to appear that SCE&G is doing this whole thing but if the group would like him to, then he would.

Steve Bell asked if the group could add to the draft to which Randy and Alan noted that they certainly could.

The group began to discuss the objective of the Water Quality RCG. Randy Mahan noted that the objective is to get to a license application and a desired outcome is a settlement agreement or an agreement that the issues that have come up will be addressed in a certain way. He noted that when the application is filed it will include these agreed upon items.

Gina Kirkland noted, "Our expectation is that at the point you apply for 401, that you can demonstrate how the WQ standards are going to be achieved. And this group is one of the ways that we can get to this point."

Ron Ahle, "I think what we would like to do is identify areas of potential problems and see if we can change any of the areas to remedy a problem that exists."

Gina Kirkland pointed out, "There may be problems that are beyond the scope of a licensing issue, that are outside SCE&G's control."

Randy Mahan noted that it needs to be what SCE&G can have a material and direct impact on.

BREAK

Alan Stuart noted that at the break, he was talking with Jeff, who noted that the group may want to come up with a work plan. He noted that a workplan will be an assignment for himself or SCE&G.

Alan then noted, "We have 2 presentations that people would like to see. Are there any other presentations you would like to see?"

Patrick Moore replied, "A presentation on the statutory articles, regulatory articles."

Alan Stuart pointed out, "We do have an ex FERC employee at our company maybe she could come down."

Jeff Duncan: "I think that there are current trends and interpretations that FERC uses right now."

Steve Bell: "I think FERC could come down in every group."

Alan Stuart pointed out, "I think we should have one big meeting."

Dick Christie noted, "Include a discussion of baseline in the FERC meeting."

Steve Bell suggested, "I think we should have a presentation on the trout growth study that was performed"

Jeff Duncan added, "I think it is important in terms of understanding the history of this, in terms of developing context."

George Duke pointed out, "We may want to do a joint meeting of WQ and Fisheries when we do the WQ presentations.

The group agreed and an all day educational combined meeting was set up.

LUNCH

After lunch the group discussed the straw man Mission Statement that the group drew up during lunch.

Randy Mahan read the mission and noted that one of the thoughts that went into the writing of the mission statement was that the quality of the water flowing into Lake Murray as that water quality/nutrients cannot be materially controlled by the operation of Saluda Hydro..

Gina Kirkland noted that she understands why you would want to make recommendations to things outside the impact of SCE&G to agencies, however we want to make sure that it discusses what we can do relevant to the project.

Patrick Moore read his version of the mission statement and the group discussed.

Jeff Duncan noted that Randy's version tended to be focused toward the LSR, and that there were also concerns further downstream.

Don Eng noted that the issues he was concerned about are those that SCE&G is having on the system.

Randy Mahan explained that the source of the problem needed to be dealt with, not to requiring SCE&G to treat the problems that are originated elsewhere. He noted that SCE&G was not a wastewater treatment plant. He noted that he feared that SCE&G was going to be required to put oxygenation in when it would better be treated at the point source.

Steve Bell asked, "Are we having problems because there are nutrients coming in from the outside or just because the lake is there and is causing a buildup?"

Alan Stuart: "In the W2 model you will get an understanding of this process. There are two wastewater discharge facilities that produce 70% of the nutrient input into Lake Murray."

Gina Kirkland added, "And do understand that the dept. is worrying about putting phosphorus controls in place, but it will take a while. All of that in terms of implementing it, etc., will take a while and then, once it is in place, it will be a while before we see results."

Randy Mahan noted that we should mull over and merge the two mission statements.

Gina Kirkland noted, "There is one other issue, if you have insufficient quantity of water then you are not going to have a healthy environment. I would like to see that the quantity of water also be included in the statement."

The group discussed that they would like to reach agreement in terms of a settlement as the goal of the group.

Randy Mahan noted he would like to amalgamate them and then send out from there.

The group decided that the next meeting will be on December 7th.

The agenda would include Gina's presentation on water quality standards and classifications for the lake and downstream. Jim Ruane will give a presentation on W2 model. Andy Miller will give an update on current water quality status on the lake in the river. And Jim will give a historical assessment of data that was collected for W2.

LEE'S PRESENTATION

Lee's Powerpoint Presentation of Saluda Hydro System Control can be viewed through the website as well as through the November 1st Operations meeting notes. The following is a summary of the questions posed during his presentation:

Jeff Duncan, "Do you have gas turbines."

Lee Xanthakos, "Yes, we have two kinds of gas turbines, one which shoots fuel in a jet type engine turbine, and a combined cycle turbine that contains a mechanism that captures the steam off the turbine."

Steve Bell: "How long does it take the Jasper facility to come online?"

Lee noted that it was a complicated question to answer because it could take from 1 hour to 8 hours depending on what was online at the time.

Steve Bell asked if VC Summer was either 1000 MW on or off, or was there an in between.

Lee noted that although they can run it lower, it is not beneficial to do so unless something is wrong, such as a pump is out or Lake Monticello's water is not cool enough.

Steve Bell: "So when it is not running at 1000 then you will have to use something else to make up that power."

Lee: "Yes, but out of 18 months I would guess it would only be out for about 6 hours."

In discussions on the operational requirements of Fairfield Pump Storage, Lee noted that it was a requirement that the Broad River could not already have a flows surpassing 40,000 cfs. Jeff Duncan asked, "How many times a year does the environmental factors such as too much flow happen."

Lee noted that it usually happens between 4 and 10 times a year.

Don Eng then asked, "Why is it when the broad is flooding, you open the gates at Saluda, and add more water."

Lee Xanthakos replied, "Well if the Broad River is flooding it is very likely that the Saluda is flooding also, and you do not want the Lake coming up to fast."

In a discussion on buying power Jeff Duncan noted that he did not understand how the power came in once it was purchased from another company.

Lee explained, "You create inadvertent flow. What happens is a marketer finds where you can buy the electricity and creates the lease for 1 hour for the amount of power. When the hour comes, the company you are buying from ramps up the generation while SCE&G ramps down its generation in order to create a hole and the electricity finds the path of least resistance to fill that hole."

Bob Keener asked, "What would happen if a storm came and the lake came up very fast."

Lee replied, "If there is a storm that is projected to come across our path we start to generate before the storm gets here."

Bill Argentieri added, "We have a flood forecasting model and it will help us develop scenarios based upon weather service data and we decide how much we need to generate in order to get the lake down."

Randy Mahan also explained, "When it comes to opening the spillway gates we have a agreement with the Public Service Commission that we not waste water unless it is a condition that is in the license, it is like shoveling coal in the trashcan, and if the public service commission decides we were not prudent with our generation, they will not let us recover some of our costs.

Andy Miller, "When are you in danger of a major rolling blackout."

Lee Xanthakos replied, "There are days when our systems are stressed such as when it is really hot or really cold and we have everything running, and everyone else has everything running, and a nuclear station trips. A blackout occurs when everyone is under-generating by a certain amount."

Jeff Duncan: "A rolling blackout is what happens on purpose."

Lee replied, "Yes when we know we can't buy power."

Ron Ahle asked, "Are there any plans to look at alternative energy generation, something that will come on quickly and reliable."

Lee replied, "We do have a group that is looking at those alternatives. But you have to think that it is not always sunny to use solar power and it is not always windy, and every single type of plant has its problem, if it is not the trout folks worrying about the trout then it is the bird folks worrying about the birds that are getting hurt in the wind generators."

Randy Mahan replied, "The main problem I see with alternative power is there always has to be something that will back them up if it is not sunny or windy."

Reed Bull asked, "What is the cheapest electrify you produce, nuclear?"

Randy Mahan replied, "Overall yes, in the amount of kilowatt hours, most of it comes out of VC Summer nuclear."

Ron Ahle added, "So if you built another nuclear power plant it would just be another 1000 base load."

Randy Mahan replied, "Yes, but you would still have to have reserves."

Meeting adjourned at 3:45.