CESAS-PD-E 31 March 04
Rev 10 May 04

MEMORANDUM FOR RECORD

SUBJECT: Savannah Harbor Expansion Project;
Summary of 31 March Meeting of the Interagency Water Quality Team

1. Attendees:

USGS	Paul Conrads
GA DNR-EPD:	Roy Burke III & Paul Lamarre
SC DHEC	Larry Turner
COE-Savannah	Dan Parrott; Bill Bailey & Ken Derickson
COE-ERDC	Sung-Chan Kim
EPA	Jim Greenfield & Steve Whitlock
Harbor Committee	Larry Neal
GPA	David Schaller & Hope Moorer
LGE	Larry Keegan
ATM	Tom Schanze, Steve Peene, Bo Ellis, & Danny Mendelsohn

2 The meeting was held to provide ATM an opportunity to explain the vertical mixing approach used in their Hydrodynamic & Salinity Model. Agency reviewers had provided comments on the vertical mixing approach and ATM had provided written responses to those comments. This face-to-face meeting was to insure the agencies are making their review decisions based on correct information and a correct understanding of the written documents.

3 I opened the meeting by stating that we had all invested a lot of time and effort into these models, that the Final Reports had taken much hard work, and that hard decisions now had to be made on the acceptability of the models. I stated that all attendees were present because we are professionals concerned about a quality product. The meeting was to review only the vertical mixing comments on the models.

4 Steve Peene gave an **overview**. He stated that ATM had developed the vertical mixing equations for the 1997 model. ATM did not alter those equations when they began their Tier II calibration efforts. They applied the 1997-based equations to the 1999 data and found that they reasonably reproduced the 1999 dataset. After reaching that conclusion, they did not adjust the equations to calibrate to the 1999 data. ATM used the same basic set of equations in both the calibration and validation efforts. They applied the 0.0001 offset in January 2004 to marginally increase the performance of the H&S Model. That same offset was used in both the calibration and validation efforts. Steve stated that numerous other projects had used an empirical formulation for vertical mixing.

5 Steve then opened the floor up to any **general questions**. Dr. Kim stated that based on the charts ATM provided, ATM would likely have developed a different set of constants for the vertical mixing equation if they had started with the 1999 data. The need for a 2-component equation such as ATM developed would not have been obvious based only on the 1999 data. He expressed concern that the model validation still contained a mixture of 1999 and 1997-derived data/constants. ATM responded by saying that because of the drought, 1999 was an odd-ball year and that 1997 was more of a normal year in terms of flows. They had been fortuitous in having data from 1997 to produce a more comprehensive foundation from which to develop the equation constants. They stated that they should not be penalized for having a better foundation upon which to develop the constants. ATM stated that in their response-to-comments they evaluated the model's performance over other time periods: 1992, and the entire years of 1997 and 1999. They feel that this work demonstrates that the equation applies well to a broader set of conditions than just those observed during the data collection periods.

I asked whether the other models that ATM had listed as successfully using an empirical approach had been applied to address changing bathymetry (harbor deepening) or were they TMDL-type projects evaluating changes in water quality inputs. ATM did not know if any had been used to address the issues facing this project.

Dr. Kim did not believe ATM had used a true zero order model to calculate vertical eddy viscosity. Such a model is used for each of several vertical layers, while ATM's approach applied a single number throughout the entire water column. ATM concurred.

Dr. Kim questioned the relationships for the Richardson Number developed from the data shown in Figure 9 (page Q-25) and Figure 18 (page Q-31). He did not think that one could easily conclude that the data from the two years, as expressed in the two figures, were from the same population. The relationship developed to represent each year did not match each other well. He said that with the variability in the data, the relationship that was developed was not reliable – it would have a wide confidence interval. He questioned whether using that equation was truly representative of that entire population. ATM stated that the model did not use the relationship developed from those figures as an input.

ATM believes that the model is good for flows between 5,000 and 20,000 CFS. No impact analyses have been requested outside that range.

6 Dr. Kim stated that after having read ATM's responses to his comments, he still could not defend the approach to determine eddy diffusivity. ATM stated that the approach they used is based upon and represents well the observed data and patterns in the data.

7. ATM said they feel that performance is an important part of defensibility when using an empirical approach. The group stated that the defensibility of the empirical approach is critical and needed to be addressed before considering how well a model may represent observed data. The Federal agencies had decided that it would be best to conduct a phased review (defensibility before performance) prior to release of the Jan 04 Calibration Reports.

8. The group concluded that **further efforts to refine the empirical approach** will not likely result in the model becoming acceptable. ATM said they could replace the empirical approach for vertical mixing with a physics-based approach. The group believes that such a replacement would provide the basis for an acceptable model.

9. GPA asked **whether the reviewers felt the D.O. Model was or could become acceptable**. I went around the table asking for the reviewers' opinions on this question.

GADNR stated that they expressed their concerns about the D.O. Model at the last meeting. These concerns included the reaeration rates, SOD, and BOD mass loading. The model and calibration as described in the Jan 04 Calibration Report would not be acceptable. They believe there is still a significant amount of work ahead to make the D.O. Model and its calibration satisfactory.

SCDHEC stated that they have not been able to perform sufficient review to make a determination.

The Harbor Committee stated that they believe the reaeration rates are 3-4 times too high and that ATM was then forced to make several counter-balancing adjustments to correct that situation. They believe the BOD balance is not good. They have numerous questions about the model formulation and calibration. They are resistant to adopt the model as presented in the Jan 04 Calibration Report, but they believe they can help in identifying realistic and defensible values to use in the calibration.

USGS stated that their review had centered around the technical defensibility of the vertical mixing routine in the model, and that the approach was presently unacceptable. In addition, there was concern with how the riverine dynamics were handled in the model.

EPA stated that their review had centered on the technical defensibility of the model, and that the approach used by ATM was presently unacceptable. EPA also had questions on the data portion of the report and how marsh issues were handled. They concurred that there were D.O. issues, but believed that those could be fixed if the Hydro Model was calibrated correctly and was technically defensible. With sufficient time and manpower the D.O. Model most likely could be made acceptable, but until the Hydro Model fixed it would not be fruitful to start on recalibration of the D.O. Model.

10. EPA stated that they are **pursuing development of the Plan B model for their Dissolved Oxygen TMDL**. They expect to have the D.O. Model developed by June and have a draft TMDL out for review in August. Jim stated that the Plan B Model would be acceptable for use in the Expansion Project, even though developed for the TMDL. He said that the Plan B Model would be designed to meet the Expectations Document, as had the ATM (Plan A) Model.

11. As a summary, the group reached three major **conclusions**:
(A) The empirical vertical mixing approach is not acceptable for use on the Expansion Project. Further refinement of this approach is not likely to make it acceptable for such use.
(B) ATM could replace the empirical approach with a physics-based approach. Assuming this is successful, the agencies would then evaluate in detail the performance of the H&S and D.O. Models.
(C) There are several concerns about the formulation and calibration of the D.O. Model.

12. I identified the following **next actions**:

<u>Plan A</u>	
Agency letter on acceptability of the H&S and DO Models	5 April
<u>Plan B</u>	
Email from technical reviewers on preliminary assessment of Hydro Model	31 March
Agency letter on acceptability of H&S Model	30 April
Meeting of Executive Management Group	7 April

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William Bailey
Environmental Resources Branch