Status Report
Modeling Technical Review Group (MTRG)
Savannah Harbor Expansion Project
October 5, 2000

A meeting was held on Thursday, October 5, 2000 in Atlanta, GA at the EPA office. The goals of the meeting were as follows:

- Discuss August 29, 2000 MTRG Status Report.
- Discuss the Responses to Draft Data Report Comments document.
- Present and discuss Salinity and Hydrodynamic model calibration results.
- Discuss a summary from the Long Term Biochemical Oxygen Demand (LTBOD) Curve Fitting Discussion Group.
- Present update on chloride model development.

The following persons attended the meeting and participated in the MTRG discussions:

William Bailey	USACE	912-652-5781	william.g.bailey@sas02.army.mil
Jim Greenfield	USEPA IV	404-562-9238	greenfield.jim@epa.gov
Larry Neal	Harbor Committee	770-499-6791	lneal@lawco.com
James Martin	USACE, WES	601-634-3714	martinj@wes.army.mil
Bo Ellis	ATM	843-884-8750	boellis@worldnet.att.net
Chris Ahern	ATM	843-884-8750	cahern@appliedtm.com
Dan Mendelsohn	ASA	401-789-6224	mendo@appsci.com
Eduardo Yassuda	ASATM	843-884-8750	eyassuda@asatm.com.br
Paul Conrads	USGS	803-750-6140	pconrads@usgs.gov
John Sawyer	City of Savannah	912-964-0698	jsawyer@ci.savannah.ga.us
Harvey Seim	UNC	919-962-2083	Harvey_seim@unc.edu

Jack Blanton and William Bailey submitted written comments for consideration by the group.

General Discussion

Discussion of August 29, 2000 MTRG Status Report

William Bailey submitted an electronic message on September 29, 2000 requesting that the MTRG review the wording of the August 29, 2000 Status Report. Specifically Mr. Bailey requested that the MTRG review the description of the MTRG responses to the model calibration results.

The MTRG discussed edits to the wording of the August 29, 2000 Status Report. All edits discussed at the October 5, 2000 MTRG Meeting were in the "*Presentation of the Savannah River Salinity and Hydrodynamic Model Results*" section of the August 29, 2000 Status Report. The MTRG recommended edits were applied to the September 29, 2000 Status Report. The revised MTRG Status Report was distributed electronically to the MTRG October 10, 2000.

Discussion of MTRG Responses to Draft Data Report Comments

The MTRG discussed the document, *Responses to Comments on the 1999 Savannah Harbor Draft Data Report, Received as of September 12, 2000,* which was distributed electronically September 29, 2000 as Attachment D of the August 29, 2000 Status Report. The document was a summary of the August 29, 2000 discussion of recommended responses to the MTRG Draft Data Report Comments. As stated in the August 29, 2000 MTRG Status Report, the purpose of the document was to provide guidance in the preparation of the Final Draft of the 1999 Savannah Harbor Data Report.

The MTRG reviewed each of the purposed MTRG responses to the individual MTRG comments. Two edits were recommended by the MTRG for the Responses 61 and 62. The recommended edits to the responses were applied and the revised document was titled *Final MTRG Responses to MTRG Comments on the 1999 Savannah Harbor Draft Data Report, Received as of September 12, 2000* which is included as Attachment A. The document *Final MTRG Responses to MTRG Comments on the 1999 Savannah Harbor Draft Data Report, Received as of September 12, 2000* will also be include as Appendix S in the 1999 Savannah Harbor Data Report.

The document, *Final MTRG Responses to MTRG Comments on the 1999 Savannah Harbor Draft Data Report, Received as of September 12, 2000*, describes the MTRG recommended edits to be performed for the 1999 Savannah Harbor Data Report. Therefore, upon completion of the recommended edits, the Data will be sent to GPA for further project coordination. Since the MTRG recommendations were finalized at the October 5, 2000 MTRG Meeting, the date on the 1999 Savannah Harbor Data Report will be October 5, 2000.

Presentation of the Savannah River Hydrodynamic Model Calibration Draft Report.

The following is an outline of the slide show presentation given by Daniel Mendelsohn of ASA, on the status of the hydrodynamic model calibration and verification effort. The Powerpoint presentation used for the October 5, 2000 Meeting is shown in Attachment B. The four major sections of the presentation addressed:

1) The status of issues raised at previous MTRG meetings
2) A review of the 1999 data set with a focus on important physical properties and forcing mechanisms in the Front and Back Rivers
3) The new 1999 model simulation results compared to measured data
4) The new 1997 model simulation results compared to measured data

Presentation Outline

- Issues from previous MTRG meetings
- 1999 data review
- 1999 model-observations comparison
- 1997 model-observations comparison

Outstanding Issues

1. Data issues
    - 1999 surface currents at GPA-06
    - GPA-04, GPA-06 neap tide, high salinity event
    - GPA-08 salinity surface salinity data (gradients)
    - 1999 bathymetric data

2. Data/Model presentation issues.
    - Slack high tide salinity vs. river mile
    - Velocity profile plots
    - Horizontal gradient contours
    - Working on salinity profile “waterfall” plots
    - “Upstream/Downstream” convention adopted
    - Statistics plots divided into Front and Back River sets
    - Volume flux
    - Salt flux

3. Modeling issues.
    - Convergence tests in progress
    - Implemented temperature boundary conditions from GPA data
    - BFHYDRO/BFWASP salinity comparison in progress
    - Improved excursion at GPA-04
    - Improved salinity predictions at GPA-05
    - Captured neap tide high salinity event

1999 Data Review

- High Salinity Event
- GPA-08 Salinity
- GPA-07 Salinity
- Open Boundary Condition

Data Plot Slides

- GPA-08 Salinity August 1999
- GPA-09 Salinity August 1999
- Front River Surface Salinity August 1999
- Front River Bottom Salinity August 1999
- Salinity and tide at GPA-07 in the Back River August 1999
- Salinity along the Back River August 1999
- Open Boundary Conditions:
    - 1999 Flow, Tide and Salinity
    - 1997 Flow, Tide and Salinity

1999 Model to Measured Comparison

- Currents
    - Vertical Profile GPA-04, GPA-06
    - Major Axis GPA-04, GPA-06
    - Volume Flux FR, BR
- Temperature Time Series
- Horizontal Salinity Gradient:
    - Bottom
    - Surface
- Salinity Time Series
- Salt Flux
    - Front River
    - Back River
- Salinity Intrusion Plots
- Salinity Statistics

1997 Model to Measured Comparison

- Salinity Time Series
- Salinity Intrusion Plots
- Salinity Statistics

MTRG Discussion Points:

A. A review of the status of issues raised at previous MTRG meetings was presented. The status review was broken down into three major groups: 1) Data issues, 2) Data/Model presentation issues and 3) Model issues. Points of interest under each of these groups were presented as outlined below.

1) Data issues.

a) 1999 surface currents at GPA-06.

It had been observed that at GPA-06 the current vector observations had a number of zero values, in the v-component when the u-component had a value. After a review of the data, it was determined that the null values were present in the original recordings as well and were not a presentation or analysis error. These values will be removed from the useful record.

b) GPA-04, GPA-06 neap tide, high salinity event.

Speculation arose during an earlier MTRG meeting as to whether an exceptional, high salinity event that appeared in the 1999 model-data, salinity comparison at GPA-04, was anomalous. The data plot of stations along the Front River from GPA-04 to GPA-09 showed that the high salinity event appears in the salinity signal at the bottom of each station. Although not presented, the high salinity event also appears in the salinity data at GPA-11 during the same time period but is absent completely from GPA-14.

c) GPA-08 surface salinity data (gradients).

Along river surface salinity gradients had indicated a higher salinity upstream at station GPA-08. The original data was reviewed and it was determined that the salinity signal at GPA-08 surface was bad during the period in question. The bad data was removed from the calibration data set.

d) 1999 bathymetric data.

A question arose at the previous MTRG meeting as to whether the most recent bathymetric data from the 1999 survey was being used in the 1999 grid. At that time it was not being used. It has been incorporated however in the most recent model grid.

2) Data/Model presentation issues.

a) Slack high tide salinity vs. river mile

Data plots representing the slack high water salinity (the highest value at each station along the river), for both the model predictions and the observations, as a function of river mile had been requested by the MTRG. These plots were prepared from the most recent model simulation and presented at the meeting.

b) Velocity profile plots.

Color contour plots of the vertical profile of the velocity, as a function of time, at GPA-04 and GPA-06 for model-data comparison (where there were ADCPs deployed during the 1999 field program, GPA-04 and GPA-08 during the 1997 field program) had been requested by the MTRG. These plots were prepared and presented at the MTRG meeting.

c) Horizontal gradient contours.

Color contour plots of the along stream salinity gradient as a function of time for model data comparison had been requested by the MTRG. These plots were prepared and presented at the meeting.

d) Working on salinity profile “waterfall” plots.

A “waterfall plot” consisting of a series of vertical profiles of salinity, constructed from the intensive survey data had been requested by the MTRG. The vertical profile salinity data proved to be too sparse for this particular type of plot. These plots were removed from the request list by the MTRG.

e) "Upstream/Downstream" convention adopted.

It was requested by the MTRG that a consistent notation of upstream/downstream, rather than East/North, be adopted for all flow and current representations. This convention has been adopted and will be applied to all new presentation plots created and to all plots in the Model Calibration Report.

f) Statistics plots divided into Front and Back River sets.

It had been requested that plots representing data as a function of river mile be broken down into Front River plots and Back River plots respectively. This format has been adopted.

g) Volume flux.

Model to data comparisons of the volume flow measurements taken during the summer 1999 field program had been requested by the MTRG. These plots were prepared and presented at the meeting.

h) Salt flux.

Model to data comparisons of salt flux calculations had been requested by the MTRG. These plots were prepared and presented at the meeting. These plots were generated in response to comments submitted electronically to the MTRG by Jack Blanton and Harvey Seim on September 29, 2000.

3) Modeling issues.

a) Convergence tests in progress.

Model simulations for the grid convergence tests are still in progress. The convergence test were discussed in the message submitted by Jack Blanton on September 29, this message was submitted for discussion at the October 5, 2000 MTRG meeting.

b) Implemented temperature boundary conditions from GPA data.

Time varying temperature boundary conditions for the open boundary as well as for the upstream river boundary have been implemented for the 1999 calibration run. For the open boundary, the temperature record from station GPA-26 at Ft. Pulaski was used. Upstream, the temperature record from GPA-17 was used.

c) BFHYDRO/BFWASP salinity comparison in progress.

The MTRG had suggested that a comparison between the salinity predicted by the water quality model and the hydrodynamic model be made. At present the BFWASP model is in the preliminary stages of application and this test has not yet been performed. It will be performed as requested, at a later date.

d) Improved excursion at GPA-04.

It had been observed at the previous MTRG meeting, that the model simulations then being shown had predicted a much larger tidal salinity excursion at GPA-04 than the data indicated. The model predictions of the new calibration scenario showed a decreased in the excursion and therefore an improvement in the predictions at GPA-04.

e) Improved salinity predictions at GPA-05.

The magnitude of the predicted salinity at GPA-05, near the Tide Gate, had been observed to be lower than that of the observations on a consistent basis for the previous calibration simulation. The new calibration simulation shows an increased salinity magnitude, improving the comparison at GPA-05.

f) Captured neap tide high salinity event.

It was observed that model predictions shown at the previous MTRG meeting, had failed to capture a distinctive, high salinity event observed in the data during the latter half of August 1999. The new 1999 calibration simulation was shown to clearly capture the high salinity event.

B. 1999 Data Review. A number of questions had been raised at earlier MTRG meetings regarding the 1999 data set. To address theses questions, A brief review of certain key points, primarily regarding salinity, was presented. A number of data plots were shown and the following points were discussed:

a) High Salinity Event
b) GPA-08 Salinity
c) GPA-07 Salinity
d) Open Boundary Conditions

The following plots were shown:

- GPA-08 Salinity August 1999
- GPA-09 Salinity August 1999
- Front River Surface Salinity August 1999
- Front River Bottom Salinity August 1999
- Salinity and tide at GPA-07 in the Back River August 1999
- Salinity along the Back River August 1999
- Open Boundary Conditions:
- 1999 Flow, Tide and Salinity
- 1997 Flow, Tide and Salinity

C. A comparison of the model predictions to measured data for the 1999 data set was presented. A series of comparison plots were shown which focused on the key issues raised at earlier MTRG meetings and which were discussed in the outstanding issues section above. The comparison topics and plots included currents, volume flux, temperatures, horizontal salinity gradients, salinity time series, salt flux, salinity intrusion and statistics. The plots shown for the 1999 model-data comparison were:

- Model/data comparison color contour vertical profile plot of currents at GPA-04
- Model/data comparison color contour vertical profile plot of currents at GPA-06
- Model/data comparison currents major axis plot at GPA-04
- Model/data comparison currents major axis plot at GPA-06
- Volume flux comparison plots at stations along the Front River
- Volume flux comparison plots at stations along the Back River
- Temperature time series comparisons at all GPA stations
- Temperature statistics table
- Low pass filtered horizontal bottom salinity gradient color contour comparison plot
- Low pass filtered horizontal surface salinity gradient color contour comparison plot
- Salinity time series comparisons at all GPA stations
- Salt flux comparison plots at stations along the Front River

- Salt flux comparison plots at stations along the Back River
- Model predicted Front River bottom salinity percentile plot
- Observed Front River bottom salinity percentile plot
- Model predicted Front River surface salinity percentile plot
- Observed Front River surface salinity percentile plot
- Model predicted Back River salinity percentile plot
- Observed Back River salinity percentile plot
- 1999 mean salinity along the Front River
- 1999 mean error in salinity along the Front River
- 1999 RMS error in salinity along the Front River
- 1999 mean salinity along the Back River
- 1999 mean error in salinity along the Back River
- 1999 RMS error in salinity along the Back River

D. Discussion of the 1999 hydrodynamic model calibration.

a) A suggestion was made concerning the color contour plots of the vertical profile of the velocities that the surface elevation data at GPA-04 and GPA-06 be used to specify the surface cutoff for the data, (i.e. no ADCP data from bins that would be above the surface will be used for plotting.)

b) In review of the vertical profiles color contour comparison plots of velocity indicated that the model predicted less shear at GPA-04 than the data showed. The model predicted velocities were high at the bottom.

c) A suggestion was made that ATM could extract predictions at other model grid cells around the cell chosen to represent GPA-04, for comparison purposes. The model representation is different enough from the real world that the offset is potentially justifiable.

d) An observation was made that the current predictions had a phase lead over data at GPA-04. It was suggested that the temperature and salinity response be checked to see if the phase shift appeared there as well as the currents at GPA-04.

e) The currents at GPA-06 compared well with the data where in general the system is more rectilinear. The comparisons were seen to be good for both the vertical profile plots and the major axis plots.

f) The temperature response of the model predictions appeared to appropriately follow the seasonal trends observed in the data. The predictions however, were better for the lower river area nearer the open boundary than for the upper river area nearer the upstream river boundary. It was suggested that ATM check the upstream temperature boundary condition.

g) A suggested goal for the 1999 temperature calibration was to reduce the RMS error to the order of 1^{o} C.

h) Jim Greenfield suggested that he may be able to assist ATM in the retrieval of temperature monitoring data for the two power stations within the Savannah River study domain.

i) Low pass filtered horizontal salinity gradient color contour plots showed good comparison between the model predictions and the data. The model predictions showed a lower gradient, below river mile 15, than the data. The color contour plots considered an excellent method for reviewing the complex salinity (and velocity) data.

j) Model-data salinity time series comparisons generally considered much better that the predictions shown at the previous MTRG meeting. In most cases the salinity predictions adequately captured the salinity response observed in the data. The model also clearly captured the high salinity event observed during the latter half of August 1999 and there was clear improvement at GPA-05. There were a few stations that did not perform as well as the others. The predicted salinity signal at GPA-15 was consistently higher than that of the data.

k) It was suggested that the salinity intrusion plots, (the slack water high salinity as a function of river mile), should use a consistent time period for all the stations. In order to enhance data presentation and station intercomparison, a line connecting the similar percentile categories at each station could be drawn (e.g. the 90^{th} percentile value at each station would be connected by the line).

l) A request was made that ATM plot the along river salinity in the same type of color contour plot used to display the along river salinity gradients.

m) The criteria for model acceptability were discussed. The MTRG is responsible for developing the appropriate evaluation criteria. The discussion touched upon a number of key issues regarding how to define and evaluate model performance and how “acceptable” should be defined:

i. Do some parameters take precedence over others?
ii. What criteria should be examined?
iii. What are the limits of acceptable performance?
iv. Are there universally accepted criteria for model performance?

Suggestions for how to proceed and discussion points regarding performance evaluation were:

v. No clear and universal rules exist for model performance acceptability
vi. Performance acceptability is difference for different situations
vii. Look at literature citations for criteria used by other investigators
viii. Look at literature cited numbers for actual applications in similar environments, (i.e. estuarine, tidal, stratified etc.)
ix. Compare the Savannah River application to other similar BFHYDRO model applications
x. Focus on 3 specific locations to be selected by the MTRG
xi. May want to focus on specific time periods when there is a good consistent data set
xii. An understanding of model sensitivity would assist evaluation
xiii. Performance evaluation should take application objective into account
xiv. Model performance should be evaluated along two lines; qualitative (trends, processes) and quantitative (direct model-data comparison, statistics).

ASA will put together a representative sample of evaluation criteria and some example comparisons used by other investigators and present it to the MTRG for review.

E. A comparison of the model predictions to observations for the 1997 data set was presented. The 1997 model-data comparison focused on the salinity predictions. The plots shown for the 1997 model-data comparison were:

- Salinity time series comparisons at all GPA stations
- Model predicted Front River bottom salinity percentile plot
- Observed Front River bottom salinity percentile plot
- Model predicted Front River surface salinity percentile plot
- Observed Front River surface salinity percentile plot
- Model predicted Back River salinity percentile plot
- Observed Back River salinity percentile plot
- 1997 mean salinity along the Front River
- 1997 mean error in salinity along the Front River
- 1997 RMS error in salinity along the Front River
- 1997 mean salinity along the Back River
- 1997 mean error in salinity along the Back River
- 1997 RMS error in salinity along the Back River

F. Discussion of the 1997 hydrodynamic model calibration.

a) In general the statistics for the 1997 model calibration were better than those for the 1999 calibration in spite of the fact that the focus had been switched to 1999. This is most likely attributable to the more consistent salinity signal observed during the summer 1997 field program.

Discussion of LTBOD Curve Fitting Discussion Group Recommendations

The LTBOD Curve Fitting Discussion Group was formed to analyze the LTBOD Data Collected during the 1999 Monitoring Event. The goal of the LTBOD Curve Fitting Discussion Group was to determine what kinetic rates to use for dissolved oxygen model calibration. Roy Burke III, Jim Greenfield, Margaret Tanner (Harbor Committee / Law Engineering), Larry Neal, Eduardo Yassuda and Chris Ahern participated in the LTBOD Curve Fitting Discussion Group.

Jim Greenfield, Larry Neal, Eduardo Yassuda and Chris Ahern described the October 3, 2000 LTBOD Curve Fitting Discussion Group Meeting recommendations at the October 5, 2000 MTRG Meeting. For the purposes of calibration, the LTBOD Curve Fitting Discussion Group recommended that a single oxidation and nitrification rate would be sufficient to accurately represent the Lower Savannah River Estuary System. The LTBOD Curve Fitting Discussion Group recommended to the MTRG that an oxidation rate of 0.06 day^{-1} and

nitrification rate of 0.035 day^{-1} be used for the calibration of the Dissolved Oxygen Model. The MTRG accepted the LTBOD Curve Fitting Discussion Group recommendations. The Dissolved Oxygen Model will be calibrated using the recommended rates.

The MTRG also discussed the January 25, 2000 EPA Report titled *Dissolved Oxygen Diffusion Study and Sediment Oxygen Demand Study in the Savannah River*. For Dissolved Oxygen Model Calibration, the MTRG recommended that the Sediment Oxygen Demand (SOD) reflect the January 25, 2000 EPA Study results. The SOD rates will be interpolated for river mile between the downstream value at the Savannah River entrance, 0.9 $gmO^2/m^2/day$, and the upstream value at Houlihan Bridge (RM 21.5), 1.5 $gmO^2/m^2/day$. The SOD rate in the Back, Little Back, and Middle Rivers systems will be set at a constant 1.0 $gmO^2/m^2/day$. Higher SOD rates, up to 2.58 $gmO^2/m^2/day$ measured at GPA-22 (KITB), can be used in specific areas during calibration.

Larry Neal discussed the possibility of using a "two-rate approach" when model runs using the calibrated dissolved oxygen model are attempted. A description of the "two-rate approach" will be included in the October 3, 2000 LTBOD Curve Fitting Discussion Group Summary Report. Eduardo Yassuda discussed the possible use of BFWASP to represent the "two-rate approach", two single order rates occurring simultaneously. Eduardo stated BFWASP is capable of adding the deficit results from two separate model outputs, using separate rates for each model run, to represent a cumulative deficit but would require significant work on the Dissolved Oxygen Model.

Update on Chloride Model Development

ATM presented an update on Task SEGDO3, Chloride Model Development. The presentation shown at the October 5, 2000 Meeting is shown in Attachment C. Hydrodynamic data analyses, chloride/bromide data analyses, model grid development and tasks objectives remaining were presented to the MTRG.

Chloride and bromide data plots from the 1999 Data Report were used in the presentation to the MTRG. Issues related to the continuous chloride and bromide data collection and instrumentation were discussed with the MTRG. Communication with the instrumentation manufacture, as of October 2nd, 2000 were also discussed.

The model grid presented in the October 5, 2000 Presentation to the MTRG did not extend downstream of I-95 Bridge. The model grid that will be used for the Chloride Model will extend to Houlihan Bridge. The MTRG discussed not including Steamboat Cut, McCoy's Cut and McCombs Cut from the Front River model grid thereby Chloride Model will only represent the Front River downstream of I-95 Bridge. It was determined that not including those connections to the Front River would have little influence on the area of study since the Chloride Model is focused upriver of I-95 Bridge. The purpose of the Front River grid is to accurately represent the hydrodynamics and transport. The boundary condition at Houlihan Bridge was selected in order to obtain correlation between conductance and chloride concentration.

Future Activity

Comments and questions related to any particular issue should be directed to Chris Ahern of ATM (cahern@atm-s2li.com).

The MTRG agreed that the next meeting will be held in Savannah at the USACE building on Oglethorpe Avenue on Monday November 13th, from 9:00 AM to 3:30 PM.

October 5, 2000 Report:
Final MTRG Recommendations for Responses to MTRG Comments on the 1999 Savannah Harbor Draft Data Report

ATTACHMENT A

FINAL MTRG RECOMMENDATIONS FOR RESPONSES TO MTRG COMMENTS ON THE 1999 SAVANNAH HARBOR DRAFT DATA REPORT RECEIVED AS OF SEPTEMBER 12, 2000

Comments provided by the following MTRG members:

1) Wade Seyle, USACE
2) Jack Blanton, SKIO
3) William Bailey, USACE
4) James Martin, WES
5) Paul Conrads, USGS
6) David Sample, Law Engineering
7) Roy Burke III, GA EPD
8) Jim Greenfield, EPA

Please note that all comments shown in this document appear as they were received by Chris Ahern (cahern@atm-s2li.com) of ATM. Comments are presented in the order in which they were received.

Please also note: All MTRG comments on the Draft Data Report were discussed at the August 29, 2000 MTRG meeting in Atlanta, GA. A summary of MTRG recommended responses, an earlier draft of this document, was distributed electronically to the MTRG with the August 29, 2000 MTRG Meeting Status Report (Attachment D) on September 29, 2000. The MTRG Recommended Response document was discussed at the October 5, 2000 MTRG meeting. The MTRG recommended responses presented in this document are therefore the final MTRG recommendations for the 1999 Savannah Harbor Data Report. Each finalized MTRG recommended response is numbered and appears in a text box (such as the one around this note) beneath the MTRG comment.

COMMENT 1:

>>> "Seyle, Wade F SAS" <Wade.F.Seyle@sas02.usace.army.mil> 05/03/00 11:01AM >>>

Chris - I reviewed the subject report and have the following comments. I also added a few since we talked.

Section 1 - Only 19.5 miles of the lower Savannah River are being considered for deepening as part of the expansion project, not 21.5.

Response 1: Agree, “21.5 miles” will be edited to “19.5 miles”.

Section 3 - The first paragraph in Section 3.5 indicates that the data is plotted relative to the elevation of the pressure transducer. Consider including a table that lists the elevation of the transducers.

Response 2: The first paragraph of Section 3.5 will be replaced with the following paragraph:
"Depth data were collected by water quality instruments at Continuous Water Quality Stations. Continuous Water Quality Stations are described in Section 2.1.1. Stations where depth data was collected are referred to as tide stations and are shown in Figure 3-1a and 3-2b. The depth data for each tide stations are shown in Figures 3-3 through 3-33. Depth data for each tide station are relative to the water quality instrument pressure transducer. In general, the pressure transducers are less than 5 cm vertically from the water quality probes. Therefore, the pressure transducers were elevated at the same level as the water quality probes. The water quality probes were elevated at predetermined height of 1 meter from the river bottom."

Section 4 - Consider adding a statement in the write-up that velocities with negative values indicate a flood tide (or upstream flow) and velocities with positive values indicate an ebb tide (or downstream flow).

Response 3: The following sentence will be added to the first paragraph after the first sentence:
"Figures 4-3 through 4-58 and Appendix G show positive values (red) indicating velocity in the ebb direction and negative (blue) values indicating velocity in the flood direction."

Section 10 - Should be proof-read, there are several missing/extra words in sentences throughout the section. In Table 10-1, suggest indicate that the marsh exchange transects were taken at the mid-point of high and low tides.

Response 4: Agree, Section 10 was redistributed June 16, 2000 when the LTBOD data was available and was edited to address this comment.

Section 11 - The last sentence of Section 11.2 is confusing and difficult to understand how the adjustment was made to reference the GPA water surface elevation to NGVD using USGS water surface elevations. Perhaps a more detail could be provided to make the explanation clearer.

Response 5: Agree, Section 11 was redistributed June 16, 2000 when the Water Surface Elevation Data Comparison was complete. Section 11 was edited to address this comment.

Appendix L - Some of the depths appear to be actual depths and some (Sattion 26 and Houlihan Bridge) appear to be "cells". If this is the case, consider indicating all depths as a distance, if possible. Also, consider indicating that the depth unit is in meters (if that is the unit of measure). Houlihan is misspelled in this appendix.

> Response 6: Depths listed in Appendix L are actual depths. Field crews positioned (raised and lowered) the instrument to get the approximate whole meter depth for 24-hour Station 01 and 03. The rationale for profiling to the whole meter is the place is the profile is easier to track through the profile.

Following are some general comments:

It may be appropriate to include the statement concerning the flow direction (see section 4 comment above) in the Introductory section since some of the appendices have the same plots and figures that show positive and negative flow values.

> See Response 3

Consider stating that cross-section plots are oriented "looking upstream (or downstream)" instead of "south to north", etc. If some one reviewing the data is not familiar with the orientation of the river, they may not be able to tell which direction they are looking.

> Response 7: The South to North orientation was chosen to make the format universal for all transects that might not have a easily distinguishable upstream or downstream direction.

Are all of the depths listed in the appendices in meters?

> Response 8: All ATM generated figures in the Appendices are in meters. The figures will be edited to label the units more clearly.

Thanks, Wade

COMMENT 2:

>>> Jack Blanton <jack@skio.peachnet.edu> 05/25/00 12:01PM >>>
Chris, Seems like I forgot to forward you a list of recommendations for the Draft Data report on the Savannah River. This list represents requests for Harvey and me. We recommend that the next report provide:

1. time-series contour plots of the moored ADCP station data

> Response 9: Time-series contour plots of the ADCP data will be included in the Modeling Report and compared to the modeling output time series. Contours will be velocities through the water column vs. time.

2. vertical profiles of salinity and temperature of the
longitudinal station data

> Response 10: Waterfall plots of the EPD profile data presented in Figures 9-10 to 9-17 will be also be presented in the form of Waterfall plots. The MTRG recommended the Waterfall plots of the EPD Data be included in the Final Data Report to better present and compare the data. The completed waterfall plots will be discussed with Jack Blanton for comment.

3. ASCII files of the plotted data

> Response 11: The schedule of data availability to the MTRG is yet to be determined. ATM is presently analyzing the data and acknowledges MTRG members would like ASCII files of the data to perform their own analyses.

Enjoyed meeting you at the last meeting.

Regards, Jack

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COMMENT 3:
>>> "Bailey, William G SAS" <William.G.Bailey@sas02.usace.army.mil> 07/06/00 03:44PM >>>
I am writing to concur with a discussion held during last month's MTRG meeting and present additional views on this issue. Please consider this an an official comment on the Draft Data Report.

A discussion I started at the June MTRG meeting concerned the report's minimal discussion about the instream DO samples that were lost when the lab prematurely diluted them. The issue is mentioned in Appendix R, Section 3.2. However, I believe that discussion needs to be substantially expanded. Since we lost such a large percentage (44 %) of the instream BOD/CBOD samples collected that week, the report should identify what samples were lost.

The general issue expands to one of notifying the reader/reviewer that not all the data discussed in the SOW was actually obtained. The MTRG agreed to a sampling plan -- a scope of work. That plan was the result of thoughtful discussions between representatives of various organizations that led to

decisions on the information that would be needed to fully determine and describe the intricacies of the water quality conditions in the harbor. As a result of various factors, ATM was not able to produce data for all the samples identified in the SOW. There were variances from the approved sampling plan. At this point, ATM, GPA, the MTRG and subsequent reviewers will need to be confident that the data that was collected is sufficient to (1)adequately represent the variable water quality conditions in the harbor, and (2)allow adequate calibration of a hydrodynamic model that represents those variable conditions, thereby sufficiently fulfilling the intentions of the original SOW.

At the MTRG meeting I requested that the locations of the lost BOD/CBOD samples be identified. This would allow a determination of whether sufficient instream data exists in all portions of the harbor, especially critical ones, to fullfill the two needs expressed above. I continue to believe such a map would be helpful and I again request you include it in the Data Report.

One MTRG member suggested you prepare a table comparing the samples specified in the SOW with the data that is useable. I concur with that suggestion. I believe such a table would allow ready identification of any large discrepancies from the SOW which may indicate potential problems in fulfilling the original intent of the data collection effort.

Another MTRG member suggested you handle this issue in a separate chapter or appendix to the Data Report. That would certainly make it easy to determine exactly what data was obtained from your substantial effort. If you feel that the information can be included in an existing chapter, that would be fine, but it would appear that the issue of variances from the SOW would extend beyond the individual Appendices J through R where data are presented.

The data collection effort was a LARGE and complicated task. From my understanding, ATM did well in performing that task. Most of the reasons that not all the data was obtained were not controllable by your firm. I believe the comments above will assist you in closing the loop in a professional manner on this extensive data collection effort.

William Bailey
Corps Of Engineers

Response 12: The MTRG decided that a sub-section should be added to Section 1 describing the data collection effort. Section 1.5 was added to the Draft Data in response to this decision. Section 1.5 is titled, Results of the Summer 1999 Data Collection Effort. Table 1.1 describes the specific incidents where the Data Collection Effort Scope did not comply with the Scope of Work (SOW)**.**

COMMENT 4:
>>> "Martin, James L WES" <martinj@wes.army.mil> 07/17/00 01:29PM >>>
Review of Draft Report: Hydrodynamic and Water Quality Monitoring of the Lower Savannah River Estuary, August 2 through October 9, 1999 (Sections on CD's dated April 27 and June 19, 2000)

James L. Martin
ERDC WES

General comments:

I found this to be a very well prepared and presented summary of the data collection effort and data results. The only comment of significance I have is with regards the discussion at the past MTRG meeting and the recommendations by William Bailey, CESAS regarding lost samples and deviations from the accepted sample plan. I concur that additional text (and/or tables) is required identifying deviations from the original sample plan. While much of this material is in the text, the deviations should be summarized in a single section so that impact of these deviations can be addressed point by point in the subsequent data analysis report. Otherwise, I offer only the following minor specific comments.

See Response 12

Specific Comments

1. Does everyone concur that it will be necessary to have a color printer? Otherwise a number of the figures will not be readable in hard-copy.

Response 13: ATM distributed the Draft Data Report in pdf format on Compact Disk so every MTRG member could view the color images on the computer screen instead of printing the hardcopies of the color images.

2. It would help if the date of preparation were given on all documents prior to final to aid in identifying revisions (as was done on some tables; and if there are to be any further revisions).

Response 14: The next distribution of the Data Report will be the final and therefore will not be added to page. However in future reports to the MTRG, revision dates will be added to the documents. Revision dates will allow the MTRG to better keep track of what version they are commenting on.

3. References to updates (such as "data have been updated" or "will be updated" should be removed from the final report.

Response 15: Agree, the references described will be removed.

4. Section 3.6, 3rd paragraph" change "on after Hurricane" to "after Hurricane"

Response 16: Agree, the edit will be completed for the Final Data Report.

5. Section 3.6.2, 1st paragraph change "measurement and deploy the" to "measurement and deployment of"

Response 17: Agree, the edit will be completed for the Final Data Report.

6. Insert figure for 3-30

Response 18: Figure 3-30 will be inserted for the Final Data Report.

7. Change Figure numbering from "3-01" and "4-01" to "3-1" and "4-1" for consistency with other sections

Response 19: Figure numbers will be made consistent in future reports.

8. Figure 4-2 is missing

Response 20: Figure 4-2 will be inserted for the Final Data Report.

9. Section 5.4, 1st paragraph: change "equilibrium of dissolve oxygen" to "equilibrium of dissolved oxygen"

Response 21: Agree, the edit will be completed for the Final Data Report.

10. Section 5.5 to 5.7: complete section

Response 22: Section 5.5 to 5.7 will be completed for the Final Data Report. It is important to note that the reference “Compare to 1997 Data” does not mean a detailed comparison. A general reference will be made to the 1997 Data in each of these sections. A comparison of the 1997 data and 1999 will be performed in future analyses.

11. Section 7.4: Could the City's data be included in plots for these Stations? How about a comparison with the salinity signal?

Response 23: Comparison of the City of Savannah’s chloride data to the summer 1999 Continuous Chloride Data Collection will be addressed in the Chloride Modeling Report. The reference to a comparison of the Chloride Data to the summer 1999 Continuous Chloride Data will be edited to refer to the Chloride Modeling Report.

12. Section 8.3.2: Reference to request for raw dissolved oxygen data no longer in revised section 8.3.1.

Response 24: Reference to request for raw dissolved oxygen data removed because the requested data was received and presented in the June 16th distribution of the Draft Data Report. A historical account of the MTRG requests to the laboratories was provided in section 8.3.1.

13. Section 9.5: complete section

Response 25: Example Cross-Sectional Distribution plots will be presented in Section 9 for the Final Data Report. Raw Cross-Sectional Profiling Data is presented in Appendix O.

14. Change legend on profile plots for DO so that lower numbers are in red

Response 26: Legend for Figures 9-8, 9-10, 9-12, 9-14 and 9-16 will be edited such that lower values of DO are in red.

15. Page 10.3, second paragraph , 1st sentence (revised chapter): change "10-gallon" to "10-gallon bucket"

Response 27: The edit described will be completed for the Final Data Report.

16. Section 11.3: complete salinity comparisons once USGS data become available

Response 28: USGS Conductivity Data for the requested Savannah River Stations were still not available as of September 15, 2000. Suzie Grams of USGS in Atlanta promised to contact ATM when the data became available.

17. Appendix B: Station GPA-15 and others following, correct alignment at end of paragraph

Response 29: Alignment of paragraph bottom on pg B-12, in Appendix B will be corrected for the Final Data Report.

18. Appendix J: The revised (6/19) version only contained only the week 1 water chemistry samples (with the revised CBOD-5 data).

Response 30: Weeks 1 through 7 were inadvertently left out of Appendix J.pdf distributed on June 19, 2000. Appendix J will include all weeks in the Final Data Report.

19. Appendix J: Explain/correct highlights on week 7 water chemistry data

> Response 31: Highlights on Week 7 water chemistry columns labeled TKN-N, Total P, and Orthophosphate will be removed.

20. Appendix J: It would help if the station order in the sample description were the same for each table. Missing data could be indicated in this way.

> Response 32: Order of Appendix J water chemistry sample data is based on sample number to allow for easier tracking of data. Where samples were not collected due to extenuating circumstances, missing station numbers will be referred to. Where samples were collected and improperly diluted by the laboratory (see Section 8 or Appendix R or Section 1.5) sample number will be referred to.

21. Appendix P: Missing from original and revised CD

> Response 33: Appendix P will be included for the Final Data Report Distribution.

****

James L. Martin, Ph.D., P.E.
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COMMENT 5:
>>> <pconrads@usgs.gov> 07/19/00 11:19AM >>>

Chris,

Sorry for the delay getting review comments to you on the Savannah Harbor Data Report. Better late than never. I grouped all my comments together by sections and did not break out the editorial and technical comments. I believe the editorial comments will be fairly obvious. Give me a call if you have any questions or comments.

Paul

(See attached file: Savannah Harbor Data Report Review.doc)

Paul Conrads
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720 Gracern Road
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fax: (803) 750-6181

ATTACHED FILE: Savannah Harbor Data Report Review.doc

Section 1

Show ALL geographical references mentioned in the text in Figure 1-1. Include Fort Pulaski, South Channel, Fort Jackson, Front River, Back River, Savannah National Wildlife Refuge, Abercorn Creek, and Raccoon Creek.

> Response 34: Features mentioned are included on other Section Figures where referenced. The purpose of this figure is to orientate readers to the Savannah area. Therefore Figure 1-1 will not be relabeled.

Delete the last two sentences on page 1-1. This information is repeat in Section 1-4, which is the more appropriate place for it.

> Response 35: Agree, the last two sentences will be edited as to not repeat the sentences in Section 1-4.

The list on page 1-3 can be improved to help the reader get a better understanding of the monitoring program and the structure of the report. Consider breaking the list into two groups of bullets—continuous monitoring and field sampling. Add a reference to the appropriate Section and figure in the report at the end of each bullet.

> Response 36: Agree, the list on page 1-3 will be edited to better distinguish between continuous monitoring and water sampling. References to sections will also be added for the Final Data Report.

Section 2

Section 2.1.1 states “a total of 24 locations”. On page 1-3 states “21 stations”. Make sure the number of stations is consistent.

Response 37: The reference in Section 2.1.1 refers to the total number of Continuous In-stream Water Quality Data Collection Stations in the summer 1999 Data Collection Effort. The reference on page 1-3 refers to the total number Water Quality Data Collection Stations at which YSI instruments were deployed. Stations where bottom and surface instruments were deployed are counted as one Stations. The list on page 1-3 will be edited in response to a separate comment, see Response 36, the text will be further edited to further distinguish between the “21 Station locations” and “24 Station locations” references.

Fourth paragraph of Section 2.1.4, last sentence is incomplete.

Response 38: The fourth paragraph in Section 2.1.4 will be edited to the following:
“The 24-hour stations were distributed throughout the Lower Savannah River System to capture longitudinal characteristics over a 24-hour period. The 24-hour sampling locations were selected to be on the Front River downstream of Fort Jackson, on the Front River near the City of Savannah, upstream of the Navigation Project and on the Little Back River at the Fish and Wildlife Dock. The 24-hour sampling event is described in detail in Section 9.2.“

Page 2-6, last set of bullets includes “24-hour Dynamic Event”. Should “Event” be plural?

Response 39: The reference “24-hour Dynamic Event” is correct because only one 24-hour event was performed. The “24-hour Dynamic Event was described in Task Statement SEGP312, which is located in Appendix A.

Figures 2-3 through 2-8 not listed under “List of Figures” on page v.

Response 40: Figures 2-3 through 2-8 were inadvertently not included in the List of Figures and will be added for the Final Data Report.

Table 2-2, No.22—space in MacroCTD

Response 41: The description for the Water Quality Meter listed on Lines 21 and 23 in Table 2-2 will be edited to “Macro CTD”, as it appears in Line 22.

Section 3

Figures 3-23b and 3-25 need an explanation of measured points and best-fit line. Need update to Figure 3-30.

Response 42: A description of the best-fit lines in Figures 3-23b and 3-24b will be added to Section 3.6. Figure 3-30 will be added for the Final Data Report.

Section 4

I counted 30 ADCP transect locations on Figures 4-1a and 4-1b and 29 locations are listed in Section 1, page 1-3.

Response 43: The reference to "29 ADCP Transect locations" in Section 1, page 1-3 will be edited to "30 ADCP Transect locations".

The ADCP, due to the limitations of the instrument, does not measure all the water in the cross section. The depth of the instrument and the blanking distance is discussed in Section 4-4. Are estimates made of the amount of flow in the top 1.5 meters of the cross section? The ADCP is also limited by the depth of water that it can profile, usually 1 to 2 meters. Were estimates made at the edge of water to account for the flow where it is too shallow for the ADCP to measure? Moving bed can be a problem making transects. What were the field procedures used to check for moving bed? Appendix F has a good summary of QA/QC field procedures but discussion of these issues would be appropriate in the text of Section 4.

Response 44: Reported discharge data was determined by the RD Instrument's TRANSECT program. The program and the flow calculating algorithms are discussed in Appendix F. References to Appendix F and the how the discharge values were calculated by the RD Instruments TRANSECT program will be added to Section 4.3.

Section 5

Update the historical references in the section.

See Response 22

Page 5-4, third paragraph, second sentence – *dissolved* instead of dissolve.

Response 45: The second sentence in third paragraph on Page 5-4 will be edited as follows:
"By allowing the tap water to sit in the container overnight and/or throughout the day for at least 4 hours, the dissolved oxygen in the container would reach an equilibrium of dissolved oxygen concentration."

I was unclear of how the QA/QC data was used in finalizing the data. For example, if field measurements by a monitor showed the dissolved-oxygen concentration to be 4.8 mg/L and the monitor was recording 5.0 mg/L, was a 0.2 mg/L correction (or shift) applied to the data to compensate for the drift? A description of the post-deployment procedure in the text would be helpful. Appendix H gives a YSI example but it is difficult to tell if the same procedure was used.

Response 46: A discussion of the QAQC procedures used to determine what data to ultimately present will be detailed in Section 1.5 of the Final Data Report. Examples of each parameter will be given and general QAQC guidelines described.

Were the dissolved-oxygen data corrected for specific conductance internally in the instrument or as a post-processing routine?

Response 47: Dissolved Oxygen readings were collected by YSI instruments. These instruments correct DO for salinity internally, a parameter recorded simultaneously during the 1999 Data Collection Event. References to the internal salinity correction for DO will be added to section 5.0 text for the Final Data Report.

Was salinity computed internally in the monitor or as a post-processing routine? What algorithm was used for the computation?

Response 48: Salinity is reported by the instrument. Salinity is calculated from conductivity and temperature readings using the algorithms found in *Standard Methods for the Examination of Water and Wastewater* (1989 ed.).

Section 6

In Section 6.1, change “USGS No. 02198500” to “USGS Gaging Station No. 02198500”.
Section 6.3, second sentence—station should be plural.
Page 6-2, first complete sentence—give the units of measure for “approximately 45 above MHW”.

Response 49: Section 6.1 will be edited as suggested. In Section 6.3, “station” will be edited to “stations”. On page 6-2, “approximately 45 above MHW” will be edited to “approximately 45 ft above MHW”.

Section 7 – No comments

Section 8

Make sure oxygen uptake values are computed from the raw data are included in the report. (Section 8.3.2, page 8 -6, paragraph 2)

Response 50: Raw laboratory analysis resutls are presented in figures 8-3 and 8-4 for BOD-5 and CBOD-5 respectively.

Reference *Standard Methods* and the version number in Tables 2 and 3.

Response 51: As mentioned in Response 48, references to *Standard Methods for the Examination of Water and Wastewater* (1989 ed.) will be added to the report text.

In the Figures 8-3 through 8-9, where reporting limits of the labs are given, identify on the plots the lab that was responsible for the analysis.

Response 52: The laboratories that performed the analysis presented in Figures 8-3 through 8-9 are listed in Table 8-1. As suggested, references to Savannah Laboratories and Analytical Environmental Services will be added to Figures 8-3 through 8-9. References to the laboratories and the weeks of the analysis will made in the figure title block.

When comparing the historical STORET data, indicate in the text (and perhaps in a footnote to the tables) that it is a comparison of all the historical data and not just the August and September or summer data from the database.

Response 53: Tables 8-4 through 8-9 list the dates of historical data compared to the 1999 In-Stream Water Chemistry Data. As suggested by the above comment, a statement will be added to Section 8.3 describing both the time of record for the historical STORET data and the 1999 In-Steam Water Chemistry Data.

Section 9

Section 9.2.3, second paragraph—Dissolved Oxygen should be lowercase.

Response 54: The phrase “Dissolved Oxygen” will be edited to “dissolved oxygen”.

Make sure to include Section 9.5.

See comment 25

Section 10

Page 10-3—first paragraph states that the travel time from the USACE depot is approximately 20 minutes. Unclear as to the destination and the significance of the statement.

Response 55: The last sentence in the first paragraph on page 10-3 will be edited to the following:
"Travel time from the USACE Engineers Depot to LTBOD-01, for example, is 20 minutes. Therefore the field crew had to depart from the Engineers Depot more than 20-minutes before the predicted high slack event at LTBOD-01."

There is a lot of description of the messenger sampler (Van Doren Sampler). Most of the other monitoring equipment is shown in the appendix. May want to consider including a picture/drawing of the messenger sampler.

Response 56: A sketch of a messenger sampler (Van Doren Sampler will be included in Appendix C. The sketch will be referenced in Section 10.

The last Law Engineering Report did not have a date, only a month. Probably should be "September 22,1999 through January __, 2000."

Response 57: The title of the report is *Long Term Biochemical Oxygen Demand Test, Marsh Exchange Samples, Savannah Georgia, September 1999 through January 2000. May 2000*. As stated in Table 10-1, the Marsh Exchange Transects were collected September 22, 1999.

Section 11

1. Grid lines and legends did not come through in the second version.

Response 58: Gridlines appear lightly on printed versions of the pdf format. The MTRG determined including a copy of the most recent *Adobe Acrobat Reader* program with the Final Report on compact disk would be helpful.

COMMENT 6

>>> "Sample,David" <DSample@kennesaw.Lawco.com> 08/04/00 04:16PM >>>
Chris, I apologize for the lateness of these comments. Here they are:

1. Distribution of BOD and COD: The frequency component (lower half) of figures 8-3 and figures 8-4 might be made more meaningful if a reference continuous fitted distribution was included for comparison. For figure 8-3, the normal, or log normal distribution may be appropriate, for figure 8-4, an exponential distribution may be appropriate.

Response 59: The requested analyses of the BOD and CBOD data will be addressed in the Dissolved Oxygen Modeling Report. The purpose of the Data Report is to present the data collected during the Summer 1999 Data Collection Event.

2. Appearance of negative salinity: Figures 9-2 and 9-3 exhibit a graphic anomaly in which salinity appears to dip below zero due to the "smoothing" function, both from river mile 20 to river mile 22. Since the values actually are zero, or close to it, is it possible to turn off the "smoothing" function between river mile 20 and river mile 22 on these figures?

Response 60: The purpose of the best-fit line is to demonstrate general trends in the data. The MTRG concluded that the best-fit line for Figures 9-2 and 9-3 should be “less smoothed” for the Final Data Report.

3. Supersaturated dissolved oxygen: In figures 9-28 (transect 1) and 9-32 (transect 3) oxygen values obviously well above saturation values (correcting for salinity) are shown. Both of these are transects are along a slough near the Middle River. For interpretation of these values, water temperature and/or oxygen saturation and/or deficit values would also be necessary. In general, dissolved oxygen is a very important parameter of concern in the Savannah River system, and needs to be monitored and/or reported in this context to enhance the effectiveness of the dataset being collected.

Response 61: The raw data for the Marsh Exchange Transects, including temperature and percent saturation, is shown in Appendix M. Data from Transects 1 and 3 were collected the same day, September 9, 1999. Primary productivity could account for the super-saturated dissolved oxygen and the values for other marsh transects just below saturation. However, after reviewing the instrument calibration sheets for September 9, 1999 the high dissolved oxygen data may be the result of a bad dissolved oxygen calibration. Since the high dissolved oxygen concentration cannot be definitively explained, the dissolved oxygen data in Figures 9-28 and 9-32 will not be presented in the Final Data Report. A reference to the removed dissolved oxygen data will be added to Section 9.3.3. A dissolved oxygen deficit analysis will be presented in the Dissolved Oxygen Modeling Report.

4. Large difference between high slack and low slack LTBOD values: The values for LTBOD for weeks 2 exhibit a marked difference between the high slack and the low slack values for stations LTBOD-01, LTBOD-03, and LTBOD-04 that is not exhibited in LTBOD-02, LTBOD-05, and LTBOD-06 (figure 10-9). Looking ahead to week 4, this trend is not repeated for LTBOD-04 and is markedly dampened for LTBOD-03 (figure 10-10). Looking further to week 6, only LTBOD-01 exhibits a marked difference between the high and low slack LTBOD values. Since the trend seems to be independent of the river distance, I suggest a review of the sampling logs in particular for week 2 and LTBOD-04. Possibly some resuspended "fluff" from bottom sediments may have entered the sample erroneously.

Response 62: The MTRG Response to this comment has two parts, the creation of the LTBOD Discussion Group and observations.

1) The MTRG concluded that a separate discussion would be formed to discuss the LTBOD Data. The LTBOD discussion group is open to all MTRG members all of received the LTBOD Data and the analysis program to obtain their own results. The goal for forming the LTBOD discussion group is to discuss observed trends and finalize kinetic values for each LTBOD station. The LTBOD discussion group will meet October 4, 2000 in Atlanta, the day before the MTRG meeting.

2) Neither laboratory notes nor field notes indicate that any samples contained large amounts settled material either during the laboratory analysis or during the sample collection. High LTBOD values for week 2 samples at LTBOD-03 and LTBOD-04 also had high BOD-5 values, thereby confirming the LTBOD laboratory results.

5. River Mileage: It would be helpful to record the river mile on the figures 10-4 through 10-16 so that comparisons could be made to other historical information.

Response 63: Table 10-3 will be added to Section 10 to list river miles for each LTBOD Station and Marsh Exchange Transect Location.

6. LTBOD graphs mislabeled: Figures 10-2 through 10-7 state in their title block that they are for LTBOD01. This appears to be mislabeled, as it states elsewhere on the figure that the figure is for LTBOD-01 through LTBOD-06.

Response 64: Figures 10-3 through 10-7 are mislabeled. All figures titles are shown as follows: "Figure 10-X, LTBOD Test Results: BOD and NBOD at LTBOD01 for Weeks 2, 4 and 6". "LTBOD01" will be edited to correspond with the LTBOD station listed on the plots in Figures 10-3 through 10-7.

COMMENT 7

>>> "Roy Burke" <Roy_Burke@mail.dnr.state.ga.us> 08/31/00 11:25AM >>>
Good Morning Chris,

I have examined your Savannah Harbor Draft Data Report and concur with comments made by others on the MTGR committee with respect to additions and corrections. As a representative of the Georgia Environmental Protection Division my response appears below:

"The 1999 field data gathered by ATM, and yourself, comprise the largest and most comprehensive model calibration data set that I have ever seen. The quality assurance and quality control measures employed were rigorous and consistent throughout, even during difficult times. I am therefore confident that the available 1999 data are appropriate for subsequent model development to support the difficult decisions that lie ahead.

Given the enormous and unwieldy volume of field data on hand, the Draft Data Report does an excellent job of describing and presenting this information in a friendly and easy to use format. I therefore congratulate you and ATM for doing a fine job with this difficult effort. There are no deficiencies in the Draft Report, detectable to me, that would detract from a most commendable effort."

COMMENT 8

>>> <Greenfield.Jim@epamail.epa.gov> 09/12/00 06:55AM >>>

The data collected on the Savannah Harbor during 1997 and 1999 is an excellent data set , along with the existing historic data, for model development and are appropriate for subsequent model development to support the difficult decisions that lie ahead.

The data report, when accompanied by the data text files will be a good compilation of the data ATM collected and great historic record.

Good job.

James M Greenfield
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October 5, 2000
Presentation to the MTRG:
Task SEGDOD2:
Refine, Revise and Verify
Hydrodynamic Model Report

ATTACHMENT B

PRESENTATION TO THE SAVANNAH MTRG

Task SEGDO2
Refine, Update and Verify Hydrodynamic Model Report Presentation

Thursday, October 5, 2000

Presentation Outline

- Issues from previous MTRG meetings
- 1999 data review
- 1999 model-observations comparison
- 1997 model-observations comparison

Outstanding Issues

1. Data issues
   1. 1999 surface currents at GPA-06
   2. GPA-04, GPA-06 neap tide, high salinity event
   3. GPA-08 salinity surface salinity data (gradients)
   4. 1999 bathymetric data

Outstanding Issues

2. Data/Model presentation issues
   - Slack high tide salinity vs river mile
   - Velocity profile plots
   - Horizontal gradient contours
   - Working on salinity profile "waterfall" plots
   - "Upstream/Downstream" convention adopted
   - Statistics plots divided into Front and Back River sets
   - Volume flux
   - Salt flux

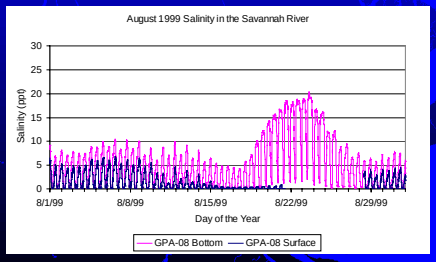
Outstanding Issues

3. Modeling issues
   1. Convergence tests in progress
   2. Implemented temperature boundary conditions from GPA data
   3. BFHYDRO/BFWASP salinity comparison in progress
   4. Improved excursion at GPA-04
   5. Improved salinity predictions at GPA-05
   6. Captured neap tide high salinity event

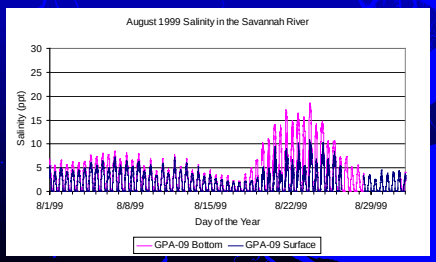
1999 Data Review

- High Salinity Event
- GPA-08 Salinity
- GPA-07 Salinity
- Open Boundary Condition

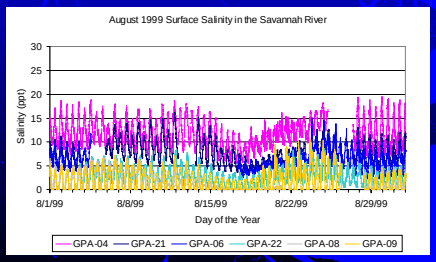
GPA-08 Salinity August 1999



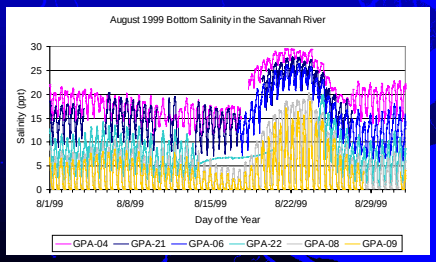
GPA-09 Salinity August 1999



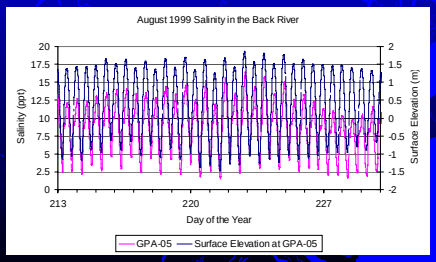
Front River Surface Salinity August 1999



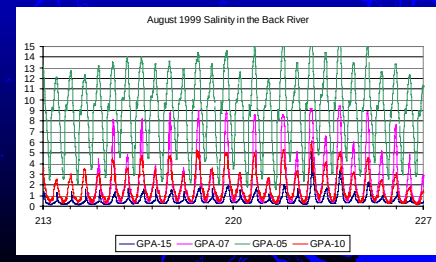
Front River Surface Salinity August 1999



Salinity in the Back River August 1999



Salinity in the Back River August 1999



Open Boundary Conditions

- 1999 Flow, Tide and Salinity
- 1997 Flow, Tide and Salinity

1999 Model-Observations Comparison

- Currents
  - Vertical Profile GPA-04, GPA-06
  - Major Axis GPA-04, GPA-06
  - Volume Flux FR, BR
- Temperature Time Series
- Horizontal Salinity Gradient
  - Bottom, Surface
- Salinity Time Series
- Salt Flux FR, BR
- Salinity Intrusion Plots
- Salinity Statistics

1997 Model-Observations Comparison

- Salinity Time Series
- Salinity Intrusion Plots
- Salinity Statistics

END OF PRESENTATION

October 5, 2000
Presentation to the MTRG:
Update on Task SEGDOD3:
Chloride Model Development

ATTACHMENT C

Presentation to the

Modeling Technical Review Group

Update on Task SEGDO3: Chloride Model Development

October 5, 2000

Applied Technology and Management, Inc.

Overview of Presentation:

I. Review Chloride Data presented in Data Report

II. Current Data Analysis

III. Discussion of Grid Development

IV. MTRG Recommendations

Review of Chloride Data Presented in the Data Report

Data Collected During Summer 1999 Effort

- Continuous Water Surface Elevation, Temperature, Conductivity, Chloride and Bromide Data

  Section 7.0 Figures

- Continuous Current Data

  Section 3.0 Figures

Current Data Analysis

Progressive Vector Analysis

- The purpose of the Progressive Vector Analysis is determine net direction of the water in Abercorn Creek
- Results show that net direction of the water in Abercorn Creek is downstream (from the Raw Water Intake toward the entrance to Abercorn Creek)
- Each of the four Aquadopp Current (Velocity) Meter Deployments for each station were analyzed

Progressive Vector Plots

Model Grid Development

Upstream Bear Creek Connection

- Communicating with Savannah District USACE Hydraulics Division, Stan Simpson about Bear Creek characteristics
- Obtained upland and hydrographic data for bend and entrances to Bear Creek and Mill Creek
- Instrumentation, water quality and current measurement, will be deployed in the next two months by USACE as part of long term monitoring

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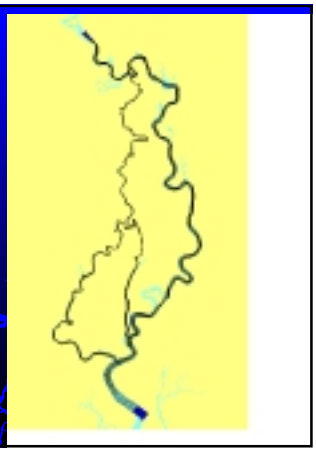
Model Grid Development

Model Grid



Model Grid Development

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Downstream Boundary

- Developing algorithms for downstream boundary, I-95 Bridge
- MTRG Suggestions

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