

Caloosahatchee River Basin Technical Meeting Summary
March 11, 2016
9:00 am – 10:05 am

Participants

Martha Avila, DEP	David Liccardi, City of Bonita Springs
Amanda Booth, USGS	Erin Lincoln, Tetra Tech
Bob Burleson, ATM	Kelly O’Nan, Hendry County
Jennifer Carpenter, DEP	Roland Ottolini, Lee County
Terry Cerullo, DEP	Ray Pribble, Janicki Environmental
Marissa Corozzo, Conservancy of SW FL	Erin Rasnake, DEP
Sara Davis, DEP	Raulie Raulerson, FDACS
Patty DiDieso, Lee County	Gary Ritter, Florida Farm Bureau
Peter Doering, SFWMD	David Robson, Johnson Engineering
Rebecca Elliott, FDACS	Mohammad Sayemuzzaman, DEP
Lee Flynn, AIM Engineering	Jonathan Sieg, Pavese Law Firm
Marcy Frick, Tetra Tech	Detong Sun, SFWMD
Doug Gilbert, DEP	Richard Thompson, City of Fort Myers
Janet Hearn, ATM	Mike Walters, AIM Engineering
Anura Karuna-Muni, Lee County	Rhonda Watkins, Collier County
Keith Kibby, Lee County	Fawen Zheng, SFWMD
Lisa Kreiger, Lee County	Dongwei Zhu, Federico & Lamb
Sam Lee, Lee County	Rod Willis, Aris Horticulture

Introductions

Erin Rasnake welcomed everyone to the Caloosahatchee River Basin technical meeting and thanked them for their participation. Erin noted that comments on the Task 1 modeling memo, which was previously sent to stakeholders, are due to her on Monday, March 14th. The participants introduced themselves and the entity they represent.

Background and Project Overview

Doug Gilbert stated that the Florida Department of Environmental Protection established total maximum daily loads (TMDLs) for the Caloosahatchee Estuary, which require a 23% reduction in total nitrogen (TN) to meet the light target in San Carlos Bay to achieve seagrass at a depth of 2.2 meters. The basin management action plan (BMAP) to address these TMDLs was adopted by the department in 2012. Since the TMDLs were completed, the department has made some improvements to the model including expanding the grid, incorporating Next-Generation Radar (NEXRAD) rainfall data with help from the South Florida Water Management District (SFWMD), and improving the light attenuation module. The agricultural community and other stakeholders provided information about flows in the basin, as well as irrigation and drainage. The department formed a technical stakeholder group to provide feedback on the model. In addition, additional flow data were collected at the tributaries. The department and Tetra Tech are currently evaluating the flow data to determine which should be used for calibration in the updated model.

There are 12 verified impaired waters that the department will develop TMDLs for to address chlorophyll-*a* and dissolved oxygen (DO) impairments. Doug noted that the department is currently

going through the Cycle 3 assessment for these waterbodies so some of the impaired tributaries could be delisted and other waterbodies could be added to the verified list. The assessment of these waterbodies is being done using the new nutrient and DO standards.

Doug stated that the department met with technical stakeholder group and the Florida Department of Agriculture and Consumer Services (FDACS) in 2014 to obtain feedback on the model. It took longer than the department had anticipated to obtain contract support for the modeling. The contract with AMEC and Tetra Tech for this project started in January 2016. The Task 1 memo was recently sent to the stakeholders for feedback. This memo will set the framework for the rest of the project, and if something is not included now, it will be very difficult to change the model in the future. Comments are due to the department by Monday, March 14th but stakeholders should let the department know as soon as possible if they cannot meet this deadline. The presentation, which includes department staff contact information, will be posted the week of March 14th.

Keith Kibby stated that Doug mentioned that the light attenuation module was updated. He asked if the department looked at Kelly Dixon's work for the Charlotte Harbor National Estuary Program when they updated the module. Doug responded that if this work was not referenced in the Dynamic Solutions model report, Keith should notify the department. The details on the light equation are included in the 2009 TMDL report.

Marcy Frick stated that during BMAP development, stakeholders identified deficiencies in the model such as agricultural pumping, bidirectional flows, limited calibration stations, and outdated land use coverage. The TMDLs are based on two models: the Hydrologic Simulation Program – FORTRAN (HSPF) watershed model and the Environmental Fluid Dynamics Code (EFDC) estuary model. AMEC and Tetra Tech were contracted by the department to evaluate these models and determine how to improve them for use in updating the Caloosahatchee Estuary TMDLs and developing the TMDLs for the other impaired waterbodies, which Doug had discussed.

There are multiple tasks that will be stepped through to achieve the project goals. The first task is to review the existing models and the stakeholder comments received, and identify issues and recommendations to address those issues. The Task 1 memo summarizes the review findings, as well as the issues and recommendations. The draft memo was sent to the department on February 26th and the department sent the memo to the stakeholders the week of February 29th. Comments on the memo are due back to the department on March 14th so that the department can provide all comments received to Tetra Tech by March 18th. The memo will then be updated, as needed, and will be used as the blueprint for how the models will be revised moving forward. It is very important that all major issues are included in this memo because it will be difficult to make any other changes once the model updates begin.

Once Task 1 is completed, Tetra Tech will move onto Task 2, which is the HSPF model hydrologic calibration. The draft report on this calibration is due to the department at the end of April. Once the department has approved the HSPF model hydrologic calibration, Task 3, the water quality calibration, will begin. The draft memo on the HSPF model water quality calibration is due to the department in mid-July. Marcy noted that the EFDC model is being developed on a parallel track to the HSPF model. Task 4 of the project is to convert the current EFDC model from the proprietary version to the public domain version and add the light module. The updated model files and the draft Task 4 memo

summarizing how the model was converted is due to the department today, March 11th. Once the department has reviewed the public domain version of the EFDC model and approved it, Tetra Tech will start on Task 5, which is the EFDC hydrodynamic model calibration. The draft memo on the calibration results is due to the department in mid-May. Once the department has approved the hydrodynamic calibration, the water quality calibration will occur as part of Task 6. The draft Task 6 memo is due in mid-August. Then, once both the HSPF and EFDC models are finalized, Tetra Tech will use them to develop a background condition scenario in which the land uses will be turned back to natural land uses and Lake Okeechobee will be assumed to be meeting its TMDL. The draft Task 7 memo with the background scenario results is due mid-October.

Task 8 is communication and meetings. Tetra Tech is in communication with the department on a regular basis and there will be several stakeholder meetings throughout the process for input. During the past two days, Tetra Tech and the department also completed a site visit to better understand the conditions in the watershed. Task 9 is the final report that documents the results of the previous tasks, including model updates, calibration results, and background scenario results. This draft report is due to the department in early January 2017. Task 10 is the training for department staff so that they can use the models to develop the TMDLs. The overall project will be completed about this time next year.

Mike Walters asked what is meant by waterbodies with bidirectional flow. Erin Lincoln responded that the bidirectional flow occurs in the tidal estuaries where freshwater is exiting the system and salt water is moving into the system. In addition, bidirectional flow is occurring further upstream in the watershed from agricultural pumping for irrigation. Detong Sun asked what version of the EFDC model will be used. Marcy responded that the public domain version of the model that is available from the U.S. Environmental Protection Agency (EPA) will be used. Detong noted that the version on the EPA website is out of date. Erin responded that Tetra Tech maintains the EFDC code and has the latest version of the model. Tetra Tech will provide the department and the stakeholders with the source code, as well as the model executable file. Anura Karuna-Muni asked if there would be other stakeholder meetings before the model is completed next February. Marcy responded that there will be two more in-person meetings and potentially a few conference calls with the stakeholders. Sam Lee asked if the model training will be made available to the public and if it can be held somewhere in the watershed. Doug responded that the training is only for department staff. However, the department can then come to the watershed and provide the training and materials to the stakeholders. There may be an opportunity to have Tetra Tech on the phone to assist with the training.

Existing Model Review and Recommended Review

Project Overview

Marcy stated that the goal of Task 1 is to review the existing HSPF and EFDC models for their conceptual structure, subbasin and waterbody reach delineations, input files, parameterization, and reaches with bidirectional flow. During Task 1, Tetra Tech also reviewed the comments raised by stakeholders in the past. Based on the review and the stakeholder comments, Tetra Tech identified a list of issues and recommendations for how to update the models to address these issues. These issues and recommendations are detailed in the Task 1 memo and will be summarized by Erin Lincoln during this meeting. Also included in the memo, but not part of the discussion for this meeting, are templates for the figures, tables, and reports that will be used to present the model update results. In addition, the memo recommends criteria to evaluate statistical results for model performance. These criteria will be one way to evaluate the model results. Throughout the memo, there are references to three model

versions: (1) the 2009 Model, which is the original Dynamic Solutions/CDM model used to develop the current TMDLs; (2) the 2014 Model, which includes the updates that Doug mentioned earlier; and (3) the 2017 Model, which will be the final model from this project.

HSPF Model Review

Erin Lincoln stated that the Task 1 memo is still a draft, and Tetra Tech will finalize it over the next few weeks once comments from the department and stakeholders have been received. The site visits also provided some good information that will be used to create the final memo, which will be used as the blueprint going forward with the project.

Erin noted that the overall HSPF model structure is in good shape. The biggest issue with the structure is that the bidirectional flow, both tidal and from agricultural irrigation, is not included. The F-Tables, which is how streams are represented in the model, are correct. The model meteorological data from NEXRAD and other sources are reasonable. The current model includes nine point sources, of which seven are reuse, and Tetra Tech will be removing the reuse point sources. The updated model will include three point sources. The model parameters were found to be within recommended ranges.

There are several issues that were identified with the HSPF model. The first issue is that the current model period ends in 2011. Tetra Tech will extend the period through December 31, 2014, which will allow for the inclusion of new data such as the flow data that were collected. Another issue is that some of the watershed delineations need to be modified. The Deep Lagoon Canal and Cape Coral subbasins will be revised, and new subbasins will be delineated to use the new flow data for calibration. Several of the model reaches have bidirectional flow, which is not currently represented in the model. Erin noted that during the site visits and meeting with SFWMD and Lee County, Tetra Tech was able to gather more information about where bidirectional flow is occurring and this information will be used to update the recommendation in the Task 1 memo. The Townsend Canal, C-2, C-3, and industrial canal have bidirectional flow. Some of the tributaries that were thought to have bidirectional flows really do not and only appeared to due to data collection issues. The HSPF model does not represent bidirectional flow so Tetra Tech is recommending that an EFDC model be added along a portion of the river to represent the bidirectional flows related to agricultural pumping. The estuary EFDC model grid will be extended to include the tributaries along the tidal portion of the river. These tributaries include the Cape Coral canals, Orange River, and Billy's Creek. The flow data that have been collected in these areas can be used in the EFDC model.

Another issue identified, which was also a stakeholder comment, is that septic systems are not explicitly included in the model. Tetra Tech will be adding septic systems to the model and is looking for input on the factors included in the memo. It would be helpful to have any local information that could be used to refine these factors. As mentioned earlier, only three point sources will be included in the HSPF model, and the rest will be added to the EFDC model. The stakeholders had also previously commented that there were not enough stations used to calibrate the model. Tetra Tech has identified 14 flow stations that may be used for model calibration. Three of these stations represent boundary conditions and three stations only have 13 data points. Tetra Tech also completed an initial water quality station selection. A total of 43 stations at 28 unique locations were selected, and 27 of these stations have five or more years of data. Erin noted that the recommendation for incorporating agricultural irrigation will be updated based on the site visit. The Task 1 memo discusses the equations that will be used in the model for agricultural irrigation demand. The current model does not represent the correct source (C-

43, Lake Okeechobee, or ground water) for the irrigation, and this will be corrected. The updated model will also represent the irrigation as applied to the land surface where it will be subject to natural processes. The final issue is that the current model includes the 2004 land use coverage. Tetra Tech will update the model to include the 2008/2009 coverage. In addition, the land uses will be split into more classes than currently represented. The Florida Department of Transportation will provide information to create a separate road right-of-ways coverage, which will help with the BMAP process.

Mike asked if Tetra Tech will be using Lee County's rainfall data in the model. Erin Lincoln responded that Lee County will be providing their information for review. Mike asked if the agricultural irrigation will be represented in the model as only volume or also water quality. Erin responded that if the water is pulled from the C-43, the water quality information can be incorporated. There are likely no water quality data for the ground water sources.

Detong asked if the EFDC model to represent bidirectional flow is a separate model. Erin Lincoln responded that it would be a separate model. Tetra Tech is open to other ideas for representing the bidirectional flows and is working with department to determine the methodology that will be used in the modeling. The EFDC model has the ability to represent structures and the model would only be gridded to a portion of the HSPF model reach; it will not include areas that do not have bidirectional flow. Detong stated that he is not sure the dynamics can be accurately represented if only a portion of the reach is included in the model. Erin responded that the HSPF model would still be used for the rest of the reach to deliver the flows to the EFDC model. This detail is needed to help with TMDL development for the streams with bidirectional flow. Detong asked how Tetra Tech will determine the boundary for the new EFDC model. Erin responded that the model will extend from the S-79 to the S-77 and will go out into the portions of the creeks and canals with bidirectional flows. Sam stated that he has a similar reservation to using the EFDC model in this area. The HSFP model is unidirectional and he is not sure that adding the EFDC model will help. Erin responded that the HSPF model would be used only to represent the loads and the EFDC model would be used to represent the instream dynamics.

Gary Ritter asked what data would be used to represent the agricultural withdrawals for irrigation. Erin Lincoln responded that Tetra Tech does not have specific information on the amount of water withdrawn. They have a coverage with the source of the water and information on crop demand and rainfall in this area, which will be used to estimate what the agricultural withdrawals would be for irrigation. Gary noted that SFWMD has consumptive use permit (CUP) information that could be used to estimate the amount of water withdrawn. The Lower West Coast Water Supply Plan also has some information. Raulie Raulerson asked if there is any storage capacity for the irrigation water. Erin responded that the irrigation water will be applied to the land and will be subject to the same processes as rainfall, including some ground water storage and loss to evapotranspiration.

Anura asked if the department is revising the TMDLs for all the creeks in the watershed. Doug responded that the department is reevaluating the tributary TMDLs presented to the stakeholders in 2014. The department will also use the revised model to update the estuary TMDLs with newer information. If the change in the estuary TMDLs is not significant, new TMDLs will not be needed and the change will be addressed in the BMAP.

Rebecca Elliott asked if the Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS) model will be used to represent agricultural irrigation. Erin Lincoln responded that she will have to talk

with the modelers and get back to Rebecca with an answer. Fawen Zheng asked what years will be used for model calibration and what years will be used for validation. Erin responded that Tetra Tech is still working on making a decision on the years for each. Fawen noted that there are only measured data in the tributaries for 2008-2013. Erin responded that there are water quality data at several tributaries stations for the entire period. However, the flow data are more limited.

EFDC Model Review

Erin Lincoln stated that the current EFDC model grid has a good spatial representation of the harbor and estuary. The current EFDC model is based on a proprietary code so Tetra Tech is transferring the model into the public domain code. The model grid currently includes boundary cells for both the main waterbody and marsh areas, which is causing instability. In addition, some of the deep water model cells are not well connected to the channels, and some of the depths are deeper than what is shown on National Oceanic and Atmospheric Administration (NOAA) charts. The linkages between the EFDC and HSPF models look good, and the EFDC model water quality parameters are within normal ranges.

The first issue identified is that the current time period ends in 2010, and Tetra Tech will extend it through the end of 2014. Both open water and marsh areas have tidal boundaries, which is causing instability. Tetra Tech will modify the tidal cells to only include tidal boundaries for the open water areas. The current model includes a sigma grid of four layers, and Tetra Tech will update this to a variable grid with about one layer for shallow areas and up to six layers for deeper areas. This updated grid will help with representation of flux in the estuary. The stakeholders previously commented that there were too few stations used for model calibration. Tetra Tech has identified 10 hydrodynamic stations at nine unique locations. Three of these stations have continuous temperature and salinity data. Tetra Tech has also identified 35 preliminary water quality stations at 26 locations. Seven of these stations are co-located with U.S. Geological Survey (USGS) gages and nine stations are in grid extension locations. All of the water quality stations have four or more years of data.

Another issue is that the deep areas are not well connected, which is causing the salinity wedge to not move in the model. The NOAA data were used to determine an average depth for each cell and this will be corrected to help with connection. There is instability in the first years of the model period so Tetra Tech will ensure the initial water depths are consistent with bathymetry. The current inputs into the EFDC model are three times what is shown in the HSPF model, which is causing too much freshwater to enter the estuary. This will be corrected in the updated model. The current model also does not include vegetative resistance, which is likely affecting flow in the estuary. Tetra Tech will add depth zones to represent the vegetation in different parts of the estuary. Tetra Tech will also increase the algae to three classes from one class to better represent actual conditions. The representation of point sources will also be improved. The current model inputs the point sources as loads but this will be changed to concentrations to help with representation and BMAP allocations. The Florida Power & Light (FPL) power plant will be added to the model. This facility withdraws water from the Caloosahatchee River and discharges to the Orange River, and both the withdrawal and discharge points will be within the updated EFDC model grid. In addition, atmospheric deposition will be added to the model.

Mike asked if the temperature input from the FPL facility will be added to the model. Erin Lincoln responded that temperature will be included. Keith asked what three types of algae will be included in the model. Erin responded that she will follow up with Keith to provide this information.

Next Steps

Marcy stated that the stakeholder comments are due this Monday, March 14th to the department. The department will then compile all the comments and provide them to Tetra Tech by next Friday, March 18th. Tetra Tech will create the final Task 1 memo based on the comments and site visits, and will provide the memo the department on April 1st. This memo will be the blueprint for the rest of the project. The Task 4 EFDC model conversion to the public domain code is ongoing, and the model files and draft memo will be sent to the department today. The department will review the files and memo and suggest any changes. Tetra Tech will then finalize the files and Task 4 memo by the end of April.

Stakeholder/Public Comments

Erin Rasnake stated that comments on the Task 1 memo are due to her on Monday, and stakeholders should let her know if they will not be able to submit comments by this date.

Adjourn

The meeting was adjourned at 10:05 am.

Action Items

1. Stakeholders should submit comments on the Task 1 memo to the department by March 14th.
2. Keith Kibby should let the department know if Kelly Dixon's work was not included in the light attenuation module.
3. Stakeholders should provide any local information they have to revise the septic system parameters included in the Task 1 memo.
4. The department will contact SFWMD for the CUP information for agricultural withdrawals and will review the Lower West Coast Water Supply Plan for additional information.
5. Tetra Tech will review the Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS) model to determine if it could be used in this modeling project.
6. Tetra Tech will provide information on the three algae classes that will be used in the EFDC model. – *Tetra Tech will be modeling cyanobacteria, diatoms, green algae.*
7. The department and Tetra Tech were informed after the meeting that a 2012 land use coverage is available, and they will determine if this coverage can be used in the model given the data period.
8. The department was informed after the meeting that Sharon Peterkin at SFWMD could provide the latest NEXRAD data for the model. The department will follow up with Sharon for these data.