

Scope of Work

For the Caloosahatchee River Basin Watershed Model Review and Calibration Refinement in support of Dissolved Oxygen and Nutrient TMDL Development and Basin Management Action Plan Activities

Project Description:

The objective of this Task Assignment is for the contractor (AMEC) to assist the Florida Department of Environmental Protection (department) Watershed Evaluation and TMDL Section (WET) to address department and stakeholder issues regarding the setup and calibration of the current most versions of the Caloosahatchee River and estuary set of models, including the Hydro logic Simulation Program-FORTRAN (HSPF), and the Environmental Fluid Dynamics Code (EFDC) being used both to develop Total Maximum Daily Loads (TMDLs) for impaired freshwater bodies within the Caloosahatchee River Basin and to drive the boundaries for a three-dimensional EFDC model of the Caloosahatchee River estuary being used to refine the Caloosahatchee tidal estuary TMDLs that the department adopted in 2010.

The department, with the assistance of a previous contract, developed a HSPF model that covers the entire Caloosahatchee River Basin, including the watershed areas downstream of Lake Okeechobee, and upstream and downstream of the control structure S-79. In addition, the EFDC model used for developing the seagrass TMDLs for tidal estuary segments of the Caloosahatchee River was also updated spatially and temporally to improve the open ocean boundary setting and bring the model time domain to cover more recent years.

Several issues were raised by local stakeholders on this set of models during the model review. One major issue was that the HSPF model overestimated the measured low flow and underestimated the high flow condition. Part of the discrepancy between the simulated and measured flow could have been caused by the pumping and irrigation in the part of the watershed dominated by agricultural land uses.

The Caloosahatchee River watershed includes significant agricultural areas that use both surface and ground water for irrigation. Ground water use includes wells in both the surficial and deeper aquifers. Surface water use for irrigation includes water from Lake Okeechobee, the Caloosahatchee River (C-43 Canal) above the S79 structure, as well as from tributaries to the Caloosahatchee River. Measured flow data indicates that at times the flow in several tributaries to the Caloosahatchee River as well as flow in the Caloosahatchee River above the S79 structure can reverse direction due to water use activities. Currently, while the HSPF model includes some ground water pumping to account for ground water irrigation, the pumped water was directly added into receiving waters without being applied to the agriculture lands. This may cause uncertainties to the hydrology simulation for the watershed. In addition, the use of surface water for irrigation is not included in the model. Based on available measured flow data it appears that the current approach may not be sufficient to calibrate flows. The contractor will review the ground water pumping data in the model against known agricultural and other ground water use data to determine the suitability of this approach to simulate ground water use in the basin versus the use of the HSPF agricultural irrigation subroutines, make recommendations to the department of any suggested changes, and incorporate the department selected options into the modeling framework. Should the department select including agricultural irrigation in the revised model, the contractor will re-evaluate the hydrology calibration of the HSPF model, and refine the hydrology and water quality calibration for both C-43 Canal and tributaries as needed.

The contractor will evaluate the suitability of using HSPF for developing dissolved oxygen (DO) and nutrient TMDLs in the freshwater streams/canals in the basin and make recommendations to the department for either using the current model to accomplish the TMDL development or other approaches that would be practical and scientifically defensible. If the contractor recommends an alternative approach to develop these TMDLs the department will review the recommendations and select the appropriate approach. Once the department has selected an alternative approach, the contractor shall work with the department to implement the selected alternative approach as needed by the department.

It is expected that, once the hydrology and water quality of the HSPF model is refined, the hydrodynamics and nutrient dynamics of the tidal estuary EFDC model should also be refined through this Task Assignment. The contractor will also convert the existing proprietary EFDC model into a public domain model, which includes the new light attenuation algorithm included in the existing proprietary EFDC model. Based on stakeholder comments, updates to the HSPF model should significantly improve the calibration of the EFDC model, particularly in the uppermost areas of the modeling domain. Therefore, the revisions to the EFDC model, both hydrodynamics and water quality, are expected to be relatively few.

This Task Assignment also requires that the contractor provide technical support to activities related to the development, refinement, and update of the basin management action plan (BMAP) for the Caloosahatchee River Basin.

The completion of the work efforts to refine the watershed and receiving water models identified under the Task section below is expected to take no longer than 58 weeks and result in a direct benefit to the department of calibrated watershed and estuary models that can be used to facilitate the development and or refinement of multiple TMDLs. The technical support required by the BMAP activities is expected to be provided on an as needed basis and on schedules defined in the BMAP related tasks.

Tasks:

Task 1. Evaluate HSPF and EFDC model integrity and development of project templates

Task 1. Description. The contractor shall evaluate the overall model integrity.

Task 1. Deliverables. The contractor shall provide to the department a summary report of their findings from the evaluation of the overall model integrity, templates of the evaluation comparisons, memos and reports, sample model performance criteria, and the site visit. The report shall contain recommendations to resolve any issues discovered. In addition, the contractor shall prepare a summary of the site visit and describe their findings, data gathered or located, and any comments/suggestions from the local government or other stakeholders

Task 2. Evaluate Current HSPF Hydrology Calibration and Recalibration of HSPF Model

Task 2 Description. The contractor shall evaluate the HSPF hydrology calibration.

Task 2 Deliverables. The contractor shall provide to the department a summary report of their finding on the elements evaluation of the HSPF hydrology calibration. The summary report should describe the hydrology calibration in a detailed manner, regarding what hydrology processes were considered, what parameters are most sensitive for the hydrology calibration, the model calibration and validation results, goodness-of-fit evaluation, and recommendation for refining the calibration. Detailed parameters used in the model and the source of these parameters should also be properly documented in the summary

report. Copies of all the reference materials cited in the summary report should be submitted to the department. In addition, the report shall contain recommendations to resolve any issues discovered.

Task 3. Evaluate both the existing water quality data needs for TMDL development and the HSPF water quality model calibration and recalibration of HSPF water quality model

Task 3 Description. The contractor shall evaluate the HSPF water quality calibration.

Task 3 Deliverables. The contractor shall provide to the department a summary report of their findings on the evaluation of the water quality calibration. In addition, the report shall contain recommendations to resolve any issues discovered. The contractor shall provide the department with a reasonably calibrated model that will work properly on the department's computers. The contractor shall provide to the department all data used to re-calibrate the model, including numeric values and GIS coverages and shapefiles.

Task 4. Converting the Existing Proprietary EFDC Model into a Public Domain Application and Incorporate the Light Module in the Existing Proprietary EFDC Model into the Public Domain Application

Task 4 Description. The contractor shall convert the existing EFDC model (DS-EFDC), which is a proprietary application, into a public domain application (PD-EFDC), and include the light module of the existing proprietary EFDC model into the public domain application.

Task 4 Deliverables. The contractor shall provide to the department a functioning public domain version of the EFDC model (PD-EFDC) that includes all the active modeling components included in the existing proprietary EFDC model (DS-EFDC) and produces results that are similar to the DS-EFDC model output. The PD-EFDC should execute properly on the department's computers. A report describing the model conversion processes, including the model parameterization, all the modeling components included, the model grids, boundary condition, and all input time series, as well as any issues associated with the conversion, and recommendations to solve observed issues, should be provided to the department.

Task 5. Evaluate the public domain EFDC's existing hydrodynamic model calibration and recalibration of EFDC hydrodynamic model

Task 5 Description. The contractor shall evaluate the PD-EFDC hydrodynamic calibration. Based on stakeholder comments, updates to the HSPF model should significantly improve the calibration of the EFDC model, particularly in the uppermost areas of the modeling domain. Therefore, the revisions to the EFDC hydrodynamic model are expected to be relatively few.

Task 5 Deliverables. The contractor shall provide to the department a summary report of their findings on elements evaluation of the PD-EFDC hydrodynamic calibration. The summary report shall contain recommendations to resolve any issues discovered. In addition to the summary report, the contractor shall provide the department a functioning PD-EFDC model calibrated for hydrodynamics. This model should run smoothly on the department's computers. All model input files, input time series, data used for model calibration, and related model grid files and GIS files should be provided to the department in a format that is readily usable by the department. All materials referenced in the summary report should be submitted to the department.

Task 6. Evaluate the public domain EFDC's existing water quality model calibration and recalibration of EFDC water quality model

Task 6 Description. The contractor shall evaluate the PD-EFDC water quality calibration. Based on stakeholder comments, updates to the HSPF model should significantly improve the calibration of the EFDC model, particularly in the uppermost areas of the modeling domain. Therefore, the revisions to the EFDC water quality model are expected to be relatively few.

Task 6 Deliverables. The contractor shall provide to the department a summary report of their findings on elements evaluation of the PD-EFDC water quality calibration. The report shall contain recommendations to resolve any issues discovered. In addition to the summary report, the contractor shall provide the department with a functioning EFDC model calibrated for all the water quality and light attenuation. This model should run smoothly on the department's computers. All model input file, input time series, data used for model calibration, and related model grid files and GIS files should be provided to the department in a format that is readily usable by the department. All materials referenced in the summary report should be submitted to the department.

Task 7. Create a Background Plus Lake Okeechobee at its TMDL Model Scenario Run

Task 7 Description. The contractor shall use the final calibrated HSPF and EFDC Models to create a Background Landuse Plus Lake Okeechobee at its TMDL (Background Plus) model scenario.

Task 7 Deliverables. The contractor shall provide to the department all HSPF and EFDC input files and model executables necessary to simulate the Background Plus scenario and a summary report of their findings from developing the element Background Plus model scenario. The summary report shall identify any issues discovered during the development of this task and contain recommendations to resolve any issues discovered.

Task 8. Communications and Meetings

Task 8 Description. The contractor shall be available for in-person meetings and teleconferences. The contractor shall be responsible for ensuring that the model scenario will successfully run on at least two department computers.

Task 8 Deliverables. Subsequent to the execution of this agreement, the contractor shall be available to meet with the department as necessary. The contractor shall attend at least 4 meetings in person and participate in teleconferences with department staff, as needed. The contractor shall, as needed by the department, provide technical support in person or by teleconference for at least 3 TMDL technical and/or public meetings, and attend in person 1 site visit and 1 public workshop.

Task 9. Documentation Final Report

Task 9 Description. The contractor shall prepare a final report and include electronic copies of all working models and model scenario runs and all the model input files and input data associated with all the model applications.

Task 9 Deliverables. The contractor shall provide to the department a Final Report. The Final Report shall include a complete documentation of all Tasks 1 through 8, all contractor findings, responses to department and/or stakeholder questions/concerns, meeting summaries, and any remedies implemented. In addition, the contractor shall provide to the department fully functioning copies of the calibrated/validated (hydrology and water quality) HSPF and EFDC models that include all revisions approved by the department, all scenarios modeled, all model input files and input data, any pre or post

processing applications or instructions, and detailed instructions for modifying the models for conducting TMDL development scenarios.

Task 10. Training and department staff support

Task 10 Description. The contractor shall provide such technical support and training to department staff as required.

Task 10 Deliverables. The contractor shall provide training to no more than six (6) department staff. In addition, during the last two (2) weeks of this agreement the contractor shall provide such technical support as the department requires.

Task 11. BMAP Technical Support

Task 11 Description. The contractor shall provide Basin Management Action Plan (BMAP) technical support to the department which will include processing model outputs for both the existing and background plus scenarios runs to ensure they fit the needs of BMAP allocation.

Task 11 Deliverables. The contractor shall provide to the department a summary of the loading output for each and all nutrient species for each and all land use types in each and all verified impaired sub-watersheds in the Caloosahatchee watershed. The contractor shall also provide to the department the existing and background plus scenarios with the proper BMAP allocation output and ensure that these scenario applications can be executed properly on department's computers.