**FINAL REPORT**

**OF THE SCIENTIFIC PEER REVIEW PANEL ON THE DATA AND METHODOLOGIES IN**

**MFL Establishment for the Econfina River**

**Prepared for**

**SUWANNEE RIVER WATER MANAGEMENT DISTRICT**
**9225 CR 49**
**Live Oak, Florida 32060**

**Prepared under Contract 03/04-137**
**By**

**Water & Air Research, Inc. Peer Review Panel**
**Ivan Chou, M.E., P.E.**
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# INTRODUCTION

The Minimum Flows and Levels (MFL) Program within the State of Florida is based on the requirements of Chapter 373.042 Florida Statutes. This statute requires that either a Water Management District (WMD) or the Department of Environmental Protection (DEP) establish minimum flows for surface watercourses and minimum levels for groundwaters and surface waters. The statutory description of a minimum flow is "the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Ch. 373.042 (1)(a), F.S.).

The statute provides additional guidance to the WMDs and DEP on how to establish MFLs, including how they may be calculated, using the "best information available," to reflect "seasonal variations," when appropriate. Protection of non-consumptive uses also are to be considered as part of the process, but the decision on whether to provide for protection of non-consumptive uses is to be made by the Governing Board of the WMD or the DEP (Ch. 373.042 (1) (b), F.S.).

WMDs are to develop priority lists of water courses and water bodies for which to establish MFLs and the proposed schedules to do so. These lists are to be updated yearly and sent to DEP for review and approval. In developing these lists, the WMDs are to examine the importance of the watercourse or water body to the State or region and the potential for significant harm to the water resources or ecology. Beginning in 2003, each priority list and schedule must include all first magnitude springs and second magnitude springs meeting certain characteristics (Ch. 373.042 (2), F.S.). For such springs within the Suwannee River Water Management District (SRWMD), the District may choose not to establish MFLs on said springs provided the District submits a report to DEP containing evidence demonstrating that such springs are not currently experiencing adverse impacts from withdrawals and are not anticipated to experience adverse impacts during the next 20 years.

The District enlisted a team of technical consultants to develop proposed Econfina River MFLs, pursuant to the direction and guidance provided within the Florida Statutes (summarized in the preceding paragraphs). After the report was prepared, the District chose to enlist a separate team of technical experts to undertake a voluntary peer review of the data and methodologies used in the determination of the MFLs for the Econfina River. The Peer Review Panel consists of Dr. Lou Motz, Dr. Jeff Hill, Ivan Chou, M.E., and Lynn Mosura-Bliss, M.S., (who led a team of Water & Air Research, Inc. reviewers). Resumes documenting qualifications of these technical experts are provided in Appendix A at the end of this Peer Review Report.

The District provided the Peer Review Panel with a set of general review constraints, a specific set of charges, and a specific set of limitations defining what the Peer Review Panel was to consider in its review, summarized as follows.

# SCOPE OF REVIEW REQUIRED BY THE DISTRICT

**Task 1. Determine whether the method used for establishing the minimum flows is scientifically reasonable.**

This section lists review panel comments that reflect uncertainties or concerns about issue that may materially affect the MFL.

a. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The panel shall assume the following:

1. The data and information used were properly collected;

2. Reasonable quality assurance assessments were performed on the data and information;

*Note: The reviewers are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and District hydrologic monitoring networks.*

b. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine whether:

1. The assumptions are clearly stated, reasonable and consistent with the best information available; and

2. Assumptions were eliminated to the extent possible, based on available information.

c. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:

1. The procedures and analyses were appropriate and reasonable, based on the best information available;

2. The procedures and analyses incorporate appropriate factors;

3. The procedures and analyses were correctly applied;

4. Limitations and imprecision in the information were reasonably handled;

5. The procedures and analyses are repeatable; and

6. Conclusions based on the procedures and analyses are supported by the data.

**Task 2. If a proposed method is not scientifically reasonable, the CONTRACTOR shall:**

a. Deficiencies: List and describe scientific deficiencies.

b. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies.

c. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.

# REVIEW CONSTRAINTS

CONTRACTOR and the review panel shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes) affecting the District's development of MFLs. CONTRACTOR shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board (hereinafter referred to as "givens") is not included in the Scope of Work. These givens include:

1. the selection of water bodies for which minimum flow and/or levels are to initially be set;
2. the determination of the baseline from which "significant harm" is to be determined;
3. the definition of what constitutes "significant harm" to the water resources or ecology of the area; and
4. the determination of the specific water-resource values considered in development of the MFL.

**Instructions:**

1. The results of this review are for the use of the District and they are not to be revealed to others without the express permission of the District.
2. By signing this form, the reviewer certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042(4)(b), in the discipline noted above.
3. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

The above instructions and limitations were provided to the peer review team as part of a peer review form that the reviewers were instructed to use. The completed forms are included in Appendix B.

# TIMETABLE

The Peer Review Panel received a draft document titled: "Minimum Flows and Levels: Econfina River, Florida" by Janicki Environmental, Inc., on October 19, 2015. That report included six sections and 106 pages describing the approach used to recommend the proposed MFLs, and a comprehensive reference list.

The Peer Review Panel was given a deadline to have its Peer Review Report to the District completed by November 25, 2015. This was accomplished, with a Peer Review Report that provided SRWMD questions about the methods and procedures, suggestions for text and figure clarification, and an assessment of the extent to which the report being reviewed had succeeded in developing scientifically valid methods and procedures.

# RESULTS OF PEER REVIEW

The technical report presents that data and analyses that provide technical support for establishing MFLs for the Econfina River. The stated goals of the MFLs are:

- To implement the intent and policy of the governing board (Board) of the Suwannee River Water Management District (District); and
- To satisfy the requirements of the state water law and policy.

The MFL report is divided into six chapters:

1. Introduction
2. Description of the Econfina River and Watershed
3. Conceptual Model and Approach to MFL Establishment
4. Approach and Methodology for the Establishment of the Econfina River MFL
5. Proposed Econfina River MFL
6. References

**Chapter 1. Introduction** provides an overview of the legal basis for the requirement to establish MFLs and reviews the water policy basis for them. A map of the watershed is also provided. The scope of the Econfina River MFL is defined, and specific water resources issues in the watershed are outlined. An overview of the content of the following sections is also provided in Chapter 1.

**Chapter 2**. **Description of the Econfina River and Watershed** provides a description of the river geomorphology, geology, and soils, and describes the bathymetry of the system. Rainfall, hydrology, seasonal flow patterns, and basin water uses are reviewed. A thorough description of the Econfina River and its setting is provided. An overview of the riparian habitats, aquatic biota, and typical water quality conditions is also provided in this Chapter.

**Chapter 3. Conceptual Model and Approach to MFL Establishment** provides an overview of the conceptual model for MFLs, which relates flows to habitat suitability and availability, and considers the water resource values (WRVs) used in the MFL process:

1. Recreation in and on the water
2. Fish and wildlife habitats and the passage of fish
3. Estuarine resources
4. Transfer of detrital material
5. Maintenance of freshwater storage and supply
6. Aesthetic and scenic attributes
7. Filtration and absorption of nutrients and other pollutants
8. Sediment loads
9. Water quality
10. Navigation

Preliminary screening review and selection of relevant WRVs for this MFL was also covered in this chapter, and the WRV prioritization and selection process was summarized. The most relevant WRVs to the Econfina River were identified as recreation in and on the water, fish and wildlife habitat and fish passage, estuarine

resources, maintenance of freshwater storage and supply, and water quality. An overview of the MFL development process was provided. The criterion of an allowable 15 percent loss of useable habitat associated with a reduction in flow was discussed. The Econfina River threshold for the MFL is given as a 15 percent reduction in river volume tied to critical levels of salinity and in frequency of fish passage and out of bank flows.

**Chapter 4. Approach and methodology for the Establishment of the Econfina River MFL** outlines in detail the steps in the process of developing the Econfina River MFL. It is stated that the proposed MFLs are intended to mimic the natural flow regime. A basic MFL process as used elsewhere was specifically adapted for the Econfina River MFLs. The fish passage, estuarine resources, and water quality WRVs are used as resources of interest in the MFL development process.

Important estuarine resources present in the system are discussed in the context of salinity regimes. Critical estuarine salinity isohaline regimes are identified and supported by evidence from prior studies. Deviation from the baseline locations of these isohalines are modeled versus altered flow conditions. The MFL was established as defined by a 15 percent reduction in the volume of water, bottom area, and/or shoreline length, less than a given salinity, as a result of shifts in isohaline location due to reduced freshwater flow. The critical flows for fish passage were defined based on the occurrence of flows whereby the shallowest point along the thalweg was less than 0.8 meters deep. Flow reduction was modeled using various reduction percentages. A 15 percent reduction in frequency of occurrence of the critical flow defined the fish passage MFL. Critical flows for floodplain wetland maintenance were defined. A 15 percent reduction in frequency of occurrence of the critical flows necessary for floodplain wetland inundation defined the out-of-bank flows MFL. The application of the EFDC model to the Econfina River was described in this chapter. Details of the process of customizing the model for this river were presented.

**Chapter 5. Proposed Econfina River MFL** presents in numerous graphs and discusses the results of the EFDC model runs for various levels of flow reduction as it affects salinity regimes. River volume, bottom area, and shoreline length were key river features in these analyses. The MFL to maintain habitat within critical salinity levels was determined to be that level which corresponded to a 23 percent reduction limit from baseline flows. Model simulations for fish passage showed that water level changes would not preclude fish passage for the percent flow reductions tested; thus the MFL established for the estuarine habitats would also provide fish passage WRV protection. The reduction in frequency of out-of-bank flow days per year of 15 percent corresponded to a flow reduction of 8.6 percent. That flow level was identified as corresponding to 211 cfs at the USGS gage 02326000. The salinity and out-of-bank MFLs were presumed to be protective of fish passage on the Econfina River.

# REVIEW SUMMARY

Specific review comments regarding report issues are given in the Peer Review Forms from each reviewer (see Appendix B). As stipulated in the peer review scope, reviewers focused on data and data analysis procedures, and on whether or not comments would materially impact the MFLs. If the peer review panel was uncertain about the impact of a stated comment or concern, a “yes” was entered in the column reflecting that the comment may identify an issue that could materially affect the MFLs. A “no” generally means that the peer review panel is requesting/suggesting clarification on a subject that would not appear to affect the MFLs, correcting mundane report issues, or presenting an observation or comment that reflects the reviewers understanding of the subject.

The MFL method for the Econfina River is summarized below.

The MFL for the Econfina River was developed based on the available flow data from the USGS gaging station 02326000 near Perry. A flow duration curve was developed for the data from this station. Water Resource Values (WRVs) of greatest concern included Fish and Wildlife Habitat and Fish Passage, Estuarine Resources, and Water Quality, with Recreation in and on the Water and Maintenance of Freshwater Storage and Supply also being of concern. The regime suggested for the Econfina MFLs included two recommended MFLS. A limit of 23 percent reduction from the baseline flows was considered protective of the salinity distributions in the lower Econfina River during low flow conditions. An 8.6 percent reduction of flows at river flows ≥ 211 cfs was set for the high flow condition MFL. These MFLs were deemed protective of all of the WRVs of concern.

**Task 1. Determine whether the method used for establishing minimum flows is scientifically reasonable.**

**a. Supporting Data and Information**

Overall, we found the report thorough in its data review and presentation of background information.

**b. Technical Assumptions**

LM Comment 16 - “WRV 1 Aesthetics [? In Table 3-2, WRV#1 is Recreation] and WRV 5 Freshwater Supply are not included due to lack of data.” Also, “The relevant aspect of WRV 9 Water Quality is implicitly addressed by evaluating the relationship between river flow and salinity.” Correct apparent typo and identify WRV#1 correctly as Recreation. Identify what data would be needed to evaluate WRV#1 and WRV#5. Also, please explain how plots in Appendix D indicate that the proposed MFL will be protective of the water quality in the Econfina River (see comment no. 17 below pertaining to p. 5-27).

**SPACE RESERVED FOR AUTHORS’ COMMENTS**

LM Comment 17 - p. 5-27, lines 8-10: “Based on an examination of these plots [in Appendix D], the proposed MFL for the Econfina River will be protective of the water quality in the river.” How was this conclusion arrived at? Please explain this process.

**SPACE RESERVED FOR AUTHORS’ COMMENTS**

LM Comment 20 – p. 5-27, lines 8-10 Appendix D: Is there any text that should accompany these figures? What relations between water quality and river discharge do these plots show? Please refer to comment no. 17 above. How was this conclusion arrived at? Please explain this process.

**SPACE RESERVED FOR AUTHORS’ COMMENTS**

IC Comment 93 - The bank elevation at RM 3.4 (the upper reach of the study area) was used for the out-of-bank flows analysis. The lower reaches of the river have different vegetation cover and topography. Would the conclusion be different if the bank elevations of the lower reaches were considered? The authors assumed the bank elevation of 1.92 feet NAVD at RM 3.4 could also be applied to other sections of the river. The validity of this assumption was not substantiated.

**SPACE RESERVED FOR AUTHORS’ COMMENTS**

### c. Procedures and Analyses

LM Comment 13 - The three highest ranked WRV’s in Table 3-1 are Fish/Wildlife Habitat and Fish Passage (WRV#2), Estuarine Resources (WRV#3), and Water Quality (WRV# 9). The next two highest ranked WRV’s are Recreation (WRV#1) and Maintaining Freshwater Storage (WRV#5). The choices for the weighting factors and the resulting scoring in Table 3-1 are somewhat subjective and arbitrary. Please provide reference(s) such as peer-reviewed publications that support the choices for the weighting factors.

**SPACE RESERVED FOR AUTHORS’ COMMENTS**

LM Comment 14 - It is stated that considering only the five highest ranked WRV’s in Table 3-1, i.e., Recreation (WRV#1), Fish/Wildlife Habitat (WRV#2), Estuarine Resources (WRV#3), Maintaining Freshwater Storage (WRV#5), and Water Quality

(WRV# 9), will also provide protection for the other five WRV's that are ranked lower in Table 3-1. This result, shown in Table 3-2, is subjective and somewhat arbitrary. Please provide reference(s) such as peer-reviewed publications that support the selection of these five highest ranked WRVs.

**SPACE RESERVED FOR AUTHORS' COMMENTS**

**Task 2 Scientific Deficiencies**

**a. Deficiencies**

No major deficiencies were noted.

**b. Remedy**

None were required.

# CONCLUSIONS

Overall, we found the report to be thorough in its data review and presentation of background information.

We recommend that the water resource values analyses be revised to better justify, as appropriate, the selection of a limited suite of them. The process whereby some of the WRVs were deemed to be protective of other WRVs should be clarified and noted in the report where that is relevant. The fish section should be revised to include appropriate species that were not mentioned and to provide an overview of the fauna and their preferred habitats. More discussion on the regional significance of hydric hammocks should be added, given their importance in the region and their reliance on flows for their ecological maintenance.

The hydrodynamic modeling procedures and methodology for Econfina River was appropriate and reasonable. A 3-dimensional hydrodynamic model, EFDC, was used for the assessment. The calibration statistics for water level and flow were in generally acceptable ranges. It is recommended that the presentation of the results of the MFL simulations be reviewed and revised to give them in a more systematic and comprehensive manner. It is also recommended that the effects of tides and tidal motion and their important role in hydrodynamics and salinity transport be featured in the report. The assertion that "the proposed MFL for the Econfina River will be protective of the water quality in the river" should be better supported with an explanation of the methodology used to examine the water quality data plots. The calibration statistics from the EFDC model for salinity should be presented.

# APPENDIX A

# RESUMES OF THE PEER REVIEW PANEL

# *IVAN B. CHOU, P.E.*
## *Water Resource Engineer*

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## *Areas of Specialization*

Hydraulics, Hydrology, Hydrodynamic Modeling, Water Quality Modeling, Stormwater Management, Harbor and Marina Assessment, Coastal and Oceanographic Engineering

## *Relevant Experience*

**Project Manager; Lake Monroe Minimum Flows and Levels (MFLs) Assessment, St. Johns River Water Management District (SJRWMD)**—Conducted human use and water resource values (WRVs) assessment for Lake Monroe minimum levels considered by SJRWMD. Conducted hydrologic and frequency/duration analyses to determine if the MFLs for Lake Monroe would protect each of the 10 WRVs under consideration, according to Section 60-40.473, F.A.C. Performed statistical analyses of the Lower St. Johns River (LSJR) EFDC model simulation results for a 5-year period to quantify the salinity regime changes caused by various freshwater withdrawal scenarios and to evaluate the water use effects on the estuarine ecology.

**Project Manager; Hydrodynamic and Water Quality Modeling of the Gemini Springs Run for MFLs Assessment, Intera/SJRWMD**—Conducting modeling of Gemini Springs Run for SJRWMD using CE-QUAL-W2 model, to evaluate the effect of water withdrawals from Gemini Springs on water quality (e.g., water temperature, specific conductance, and color, etc.). The model will be calibrated by monthly water quality samples collected at 11 stations. Ten-year continuous simulations will be conducted for both the baseline and the MFLs conditions.

**Project Manager; Independent Scientific Peer Review for the MFLs Program, SJRWMD**—Provided independent scientific peer review for various documents related to MFLs development, hydrological analyses, and water resource values evaluation for many waterbodies, including Silver River and Silver Springs, Cowpen Lake, Lake Brooklyn, Lake Melrose, Lake Norris, Banana Lake, Lake Como, Little Lake Como, and Trone chain-of-lakes.

**Project Manager; Development of Environmental Resource Constraints for the Upper Santa Fe River, New Fields Company/SJRWMD**—Conducted hydrologic analysis and environmental resource assessment to evaluate the relation between reductions in stream flow/level and environmental harm to the Upper Santa Fe River. The evaluation was based on soil and vegetation coverage, frequency-duration analysis of the HEC-RAS model simulation results, and the identification of the most restrictive dominating water resources values, described in Rule 62-40.473, F.A.C., for the river reach. The study results may be used by SJRWMD to make permitting action decisions for future consumptive use permits.

**Project Manager; Lower Suwannee River EFDC Model, Water Resource Associates/Suwannee River Water Management District (SRWMD)**—Conducted hydrodynamic modeling of the Lower Suwannee River and Suwannee Sound using the 3-dimensional EFDC model. Conducted continuous modeling for a 4-year period to project salinity distribution in the estuary under various freshwater withdrawal scenarios. The model results were used to evaluate water use impacts on submerged aquatic vegetation, shellfish communities, fish habitats, and wetland vegetation; and to develop MFLs for the Suwannee River.

**Project Manager; Cumulative Impact Analysis for Alternative Water Supply, SJRWMD**—Evaluated the cumulative impact of surface water withdrawal from the St. Johns River as an alternative water supply on the salinity of the St. Johns River estuary. The cumulative impacts analysis also considered the effects of future deepening and expansion of Jacksonville Port, sea level rise, and removal/reuse of existing treated wastewater discharges. A 3-dimensional hydrodynamic model, EFDC, was used to quantify the salinity impacts of various scenarios.

**Project Manager; Environmental Assessment for MFLs Development in St. Johns River near Deland, SJRWMD**—Conducted environmental assessment of the MFL regime recommended by SJRWMD for the St. Johns River between State Road 40 and Lake Monroe. Per requirement of Section 60-40.473, F.A.C., ECT determined whether the MFL regime would provide protection to water resources values, including recreation in and on the water, fish and wildlife habitats and the passage of fish, estuarine resources, transfer of detrital material, maintenance of freshwater storage and supply, aesthetic and scenic attributes, filtration and absorption of nutrients and other pollutants, sediment loads, water quality, and navigation.

**Project Manager; LSJR Salinity Regime Assessment, SJRWMD**—Conducted salinity regime analysis to determine the effects of stream flow reduction in the St. Johns River near Deland on the salinity distribution and ecological resources in the LSJR estuary. Analyzed the EFDC model simulation result in the LSJR for a period of 3 years to quantify the temporal and spatial changes in salinity at various locations in the river. The effects of freshwater withdrawal on *Vallisnaria americana* due to salinity changes was evaluated.

**Project Manager; Scientific Peer Review of Ecologic Evaluation of Blue Spring Minimum Flow Regime, SJRWMD**—Conducted independent scientific peer review of *Human Use and Ecological Evaluation of the Recommended Minimum Flow Regime for Blue Spring and Blue Spring Run, Volusia County, FL*, in accordance with Rule 373.042(4)(a), Florida Statutes. Rendered opinion and recommendation based on the result of the review.

**Task Manager; LSJR TMDL Modeling Review, First Coast Manufacturer's Association (FCMA)**—Served as a technical advisor on behalf of FCMA to review the modeling effort by U.S. Army Corps of Engineers (USACE) Waterways Experiment Station and SJRWMD for the LSJR TMDL development. Compiled and evaluated the existing hydraulic, hydrologic, and water quality data to identify any potential short fall of the database. Reviewed the EFDC model grid configuration, tidal boundary conditions, upstream flow conditions, meteorologic inputs, and evaluated the results of hydrodynamic calibration. Provided technical recommendations to the modeling approaches.

**Task Manager; Savannah River Water Quality Modeling For TMDL Development, Georgia Ports Authority**—Conducted water quality modeling for Savannah River using WQMAP, a 3-dimensional finite difference model with boundary-fitted curvilinear grid. The model was used to develop TMDLs for nutrients, dissolved oxygen, and chloride. Extensive field monitoring was conducted to calibrate the hydrodynamic and water quality model, including tide, currents, meteorological data, water quality data, and flow data. The model was also used to quantify the water quality impacts of the Savannah Harbor deepening.

**Project Engineer; Charleston Harbor Water Quality Modeling For TMDL Development, South Carolina Department of Health and Environmental Control (SCDHEC)**—Conducted hydrodynamic and water quality modeling for Charleston Harbor, Cooper River, Wando River, and Ashley River. A 3-dimensional finite difference model WQMAP with boundary-fitted curvilinear grid was used for the project. The model projections will be used to develop TMDL for the watershed. Conducted water quality simulations for model verification and assisted with workshop preparation and technology transfer.

**Project Manager; Independent Peer Review of Magnolia Bay Marina, SRWMD**—Conducted independent peer review of an environmental resource permit (ERP) application for a proposed 374-slip marina near Dekle Beach, Florida. Reviewed permit documents and evaluated water quality and hydrodynamic impacts of the proposed marina and the construction activities. Rendered opinion and recommendation based on the result of the review.

**Project Manager; Independent Peer Review of Jason Jennings Ditch Relocation Project, SRWMD**—Conducted independent engineering peer review of an ERP application for the relocation of a waterway. Reviewed permit documents and hydraulic modeling inputs/outputs. Evaluated potential flooding and hydraulic impacts of the channel relocation on the adjoining properties. Rendered opinion based on the result of the review.

**Project Manager; Sampson River Hydraulic Structure Assessment, SRWMD**—Conducted a hydrologic and hydraulic assessment to evaluate the potential effects of a proposed hydraulic structure modification in Sampson River near the outlet of Lake Sampson in Bradford County, Florida. The assessment included the consideration of flooding, ecology, and water quality impacts.

**Project Manager; Steinhatchee River Basin Management Plan, SRWMD**—Conducted hydrological studies for the Steinhatchee River Basin in Florida. GIS was used to quantify the land use and hydrographical changes taken place between 1950 and 1980. Hydrological model HSPF was used to determine the impacts of human activities such as forestry, timbering, ditching, road construction, etc. A basin management plan was recommended to alleviate the hydrologic impacts resulting from the watershed changes based on the model simulations.

**Project Manager; 3-Dimensional Modeling of Pollutant Transport, JEA**—Conducted hydrodynamic modeling of the LSJR, from Mayport to Buffalo Bluff, to determine potential water quality impacts of the Buckman Outfall, approximately 30 MGD, operated by JEA. A 3-dimensional model EFDC was used to simulate tidal hydrodynamics and pollutant plume dispersion. Two large-scale dye studies with 3 to 4 days' continuous injection were conducted to characterize the chemical mixing zones and to verify the model. The dye study data were used to verify the EFDC model. Two-year real-time flow and tide data were used as the boundary input data for the long-term simulation. Tecplot was used to visualize the plume animation. Statistical analyses were conducted for the model results.

**Project Manager; Cannon Creek Basin Assessment, SRWMD**—Conducted a hydrologic and water quality assessment for Cannon Creek Basin in Columbia County, Florida. Conducted extensive field investigation and data analysis to identify flooding and water quality problems in the watershed. Provided conceptual solutions for the identified problems. The recommended solutions included hydraulic structure improvement, stormwater detention and treatment, best management practices, maintenance, management of existing septic tanks, and establishment of basin-specific criteria.

**Project Manager; Salinity Regime Assessment, CH2M Hill**—Analyzed EFDC model results to quantify the effects of a proposed 5.5-MGD surface water withdrawal from the St. Johns River by Seminole County near Lake Monroe on the salinity regime of the LSJR. Assessed salinity impacts of various withdrawal scenarios. Testified as an expert witness in an administrative hearing.

**Project Manager; Alligator Creek Entrance Channel Realignment and Dredging Feasibility Study, Charlotte County**—Conducted a coastal engineering study to assess the engineering and permitting feasibility to realign the entrance channel of the Alligator Creek in Charlotte County, Florida. The study included bathymetric survey, benthic survey, sediment transport evaluation, conceptual dredged channel design, estimation of dredge quantity and project cost, and future maintenance dredging needs.

**Task Manager; Storm Surge Modeling for Max Brewer Bridge Scouring Study, Metz & Associates/Florida Department of Transportation (FDOT)**—Conducted hydrodynamic modeling, using CE-QUAL-W2, to determine the flow velocity in the Indian River under various storm surge conditions. The model results were used to compute the sediment scour depth at the bridge piers under the worst-case conditions as required by the bridge hydraulic report.

**Project Manager; Beach Erosion Assessment and Shoreline Stabilization, Technical Consulting Group**—Conducted field investigation and littoral transport assessment at Tocones Beach near Dorado, Puerto Rico. The purpose of the study was to determine the causes of beach erosion at the shorefront of Dorado Beach Cottages, and to determine the potential impacts of a recently constructed seawall. Prepared a beach erosion assessment report that provided various options to stabilize the shoreline. A conceptual design of the erosion control measures was also recommended.

**Project Manager; Marina Engineering Investigation, Zhejiang Nine Dragons Development Company, Ltd./Applied Technology and Management**—Conducted marina site investigation and engineering evaluation for a resort marina facility in Hangzhou Bay near Zhapu, Zhejiang Province, approximately 100 km southwest of Shanghai, China. The investigation included tide, current, storm surge, waves, bathymetry, sediments, and geotechnical issues. Assessed engineering feasibility of the proposed sites and recommended an alternate marina plan.

**Task Manager; ERP and National Pollutant Discharge Elimination System (NPDES) Permit Applications, Southern Monitoring and Environmental, LLC**—Conducting surface water assessment to evaluate the potential impact of the construction of a proposed bulk terminal for Keystone Properties in

Jacksonville, Florida. The proposed project includes the demolition of an existing bulkhead, deepening the existing berth to 41 ft-MLW, construction of a new bulkhead, and construction of a coal pile facility. An estimated 350,000 cubic yards of dredge spoil will be generated during the deepening of the channel. Preparing the application for an ERP and the modification of an existing NPDES permit.

**Project Manager; Level II Water Quality Based Effluent Limitations (WQBEL) Study, Volkert & Associates**—Prepared and implemented a plan of study to conduct a Level II WQBEL study for an NPDES outfall at the Main Street wastewater treatment plant (WWTP) operated by Escambia County Utility Authority in Pensacola, Florida. An outfall from a nearby Naval Air Station facility is also considered in the study. The purpose of the study is to determine the assimilative capacity of the Pensacola Bay, to quantify the water quality impact of the existing facility, and to evaluate effluent limitations. Conducted mixing zone analysis to assess the water quality impact of the outfall.

**Project Manager; Diffuser Design and Mixing Zone Analysis for a WWTP Discharge, Jehle-Halstead, Inc.**—Conducted mixing zone analysis, using CORMIX model, to determine the mixing zone sizes of various water quality parameters for an outfall in Pensacola Bay from the Main Street WWTP operated by the Escambia County Utility Authority. Designed diffuser to minimize the mixing zones.

**Project Manager; Sediment and Water Quality Assessment for a JEA Cross-River Pipeline, Ocean Engineering Associates**—Conducted water quality impact assessment for a proposed 2-mile water line crossing the St. Johns River near Jacksonville, Florida. State-of-the-art directional drilling technology will be used to install the majority of the pipeline to minimize environmental impacts. Conventional dredging method will be used to construct cofferdams in the river, where pipeline connections can be installed. A 3-dimensional hydrodynamic model, EFDC, is used to quantify the turbidity mixing zone during the construction. A sediment transport study will be conducted to evaluate the zone of sediment deposition near the dredging site.

**Project Manager; Maximum Probable Flood (MPF) Analysis for Fortuna Reservoir, El Paso Corporation**—Conducted hydrologic and hydraulic modeling to evaluate the existing design capacity of the Fortuna Reservoir and spillway at a hydroelectric power plant in northwest Panama. Evaluated the probable maximum precipitation (PMP), conducted MPF analysis, wind wave analysis, wind setup, and wave runup calculations.

**Project Manager; Thermal Modeling for Cooling Reservoir, Cogentrix**—Conducted thermal modeling to determine the feasibility of a 255-acre cooling water reservoir for the proposed Mercer Ranch Energy Project in Benton County, Washington. A two-dimensional model, CE-QUAL-W2, was used to evaluate the cooling efficiency of the reservoir. The model was also used to assist facility design and to locate the optimal intake and discharge structures.

**Task Manager; Hydraulic Design for Hickory Mound Impoundment, Florida Fish and Wildlife Conservation Commission**—Conducted hydraulic modeling and designs to stabilize the levee surrounding Hickory Mound Impoundment, a 1,800-acre wildlife management area in Taylor County, Florida. Provided hydraulic design to minimize erosion and to prevent levee damage during a 50-year storm surge event. Also provided erosion control designs to protect the levee from current scouring, wave impacts, and human foot traffic. EXTRAN model was used to predict the water level in the impoundment and the current speed at the proposed emergency spillway.

**Project Manager; Stormwater Improvement Evaluation, City of Atlantic Beach, Florida**—Conducted third-party review of the hydraulic design and stormwater modeling for the City of Atlantic Beach Stormwater Improvement Project. Identified potential hydraulic and water quality impacts of the proposed project and provided recommendations for alternative design to minimize environmental impact, salinity intrusion, and project cost. ECT's recommendations were accepted by City Engineer and were implemented in the final design.

**Project Manager; Hydrodynamic Study of Shipyard Creek, Kinder Morgan Bulk Terminal**—Conducted hydrodynamic study of the Shipyard Creek near North Charleston, South Carolina, to assess the navigational impacts and boating safety issues incurred by a proposed public boat ramp in the vicinity of marine terminal operations. The potential impacts of ship mooring procedures and tugboat propeller wash on recreation vessels were investigated. The study report was used as evidence of a civil litigation.

**Project Manager; Pollutant Transport Study for Charleston Naval Complex (CNC) RCRA Facility Investigation, Ensafe**—Conducted hydrodynamic evaluation of the Cooper River, Shipyard Creek, and Noisette Creek near CNC to assess the fate of potential pollutant sources from CNC. A hydrographical study of the Noisette Creek was conducted. Mixing zone modeling was also conducted to quantify the zone of water quality impacts of the stormwater outfall.

**Project Manager; Buckman Dye Study, JEA**—Two comprehensive dye dispersion studies were conducted in the LSJR to evaluate the water quality impacts of a 30-MGD discharge from the Buckman Water Reclamation Facility operated by the JEA at Jacksonville, Florida. In each of the study, large quantity of Rhodamine W2 fluorescent dye was continuously injected into the effluent for 3 to 4 days. Dye concentrations in St. Johns River were measured in an 18-mile river segment between Blount Island and Point La Vista for a period of 4 days. A thorough 1-day background fluorescence survey in the study area was conducted before the dye injection, and a background fluorescence vs. salinity relation was established to resolve the temporal and spatial variability of the background fluorescence. Three boats equipped with Turner Design Model 10-AU and Model 10-005 fluorometers were used to conduct near-field mixing zone mapping and far-field plume tracking. The measurements included synoptic snapshots, vertical profiles, horizontal transects, and time-series of the dye concentrations.

**Project Manager; East Indian River County Stormwater Management Modeling, Calpine Eastern**—Developed a comprehensive stormwater management model for a 50,000-acre watershed in Indian River Farms Water Control District (IRFWCD) with extensive irrigation and drainage canal system. Visual-SWMM model was used to simulate 1,080 nodes, 312 natural channels, 787 culverts, 34 detention ponds, and 14 flow control structures. A graphical users interface and GIS database was developed for the model. Data collected at six rain gauges, five water level recorders, and three USGS gauging stations were used to calibrate the model. The modeling task is to assist Indian River County in achieving the pollutant load reduction goal.

**Project Manager; Water Quality Modeling of Freeport Harbour, Enron**—Thermal and water quality modeling were conducted to evaluate the potential impacts of a cold water discharge into the Freeport Harbour, Grand Bahama Island from a proposed LNG terminal. CE-QUAL-W2 model was used to simulate the cold water plume dispersion in the tidal basin and to assess the potential impacts on the coral reef community outside of the harbor. Continuous simulation was conducted using 3 years real time data.

**Project Manager; Alligator Lake Restoration, SRWMD**—Prepared a conceptual design to rehabilitate Alligator Lake, a severely degraded water body in Columbia County, Florida. The objectives of the project were to restore aquatic and wetland habitat, improve water quality, provide outdoor recreation facilities, create environmental education opportunities, and to estimate the rehabilitation costs. Various restoration schemes were considered, including dike removal/alteration, wetland creation, fish habitat creation, stormwater retrofits, and lake water level management. ECT staff conducted field observation to identify potential problems and likely causes of lake degradation. Reviewed pertinent data, including bathymetry, historic photography, land use data, lake and groundwater level data, water quality data, sediment data, phytoplankton data, aquatic plant cover and species, and sinkhole history. Prepared a restoration plan and recreation plan that were presented to the Alligator Lake Technical Working Group and the Governing Board of SRWMD.

**Task Manager; Contaminant Spill Forecast Modeling, Detroit Water and Sewerage Department**—Conducted hydrodynamic circulation and dispersion modeling to simulate the transport and dispersion of potential pollutant spills in the St. Clair River-Lake St. Clair-Detroit River system. The arrival time and pollutant concentration at the water treatment plant intake were predicted. A 2-dimensional hydrodynamic model CAFE1 was used to simulate the current circulation pattern. The output of CAFE1 was then linked with a dispersion model DISPER1 to simulate the transport and dispersion of the pollutant plume. Three large scale dye studies were conducted in Lake St. Clair to calibrate the models. User friendly pre and post processors and graphical interface were provided for operation efficiency. Conducted training seminars to transfer the technology to DWSD staff. Also participated public meetings to provide information and demonstration of the emergency response system.

**Principal Investigator; Environmental Assessment and Salinity Impacts of Savannah Harbor Expansion, Georgia Ports Authority**—Conducted extensive studies regarding the proposed expansion of the Savannah Harbor up to the Mulberry Grove site in Georgia. Technical tasks included coordination with the USACE

regarding field studies, salinity intrusion modeling, sediment transport modeling, alternative site evaluations and spoil disposal area assessments, evaluation of project impacts on adjacent wildlife areas, and groundwater and geological impacts of the proposed dredging. Served as a member of the Savannah River Salinity Model Study Group to investigate the hydraulic and water quality impacts of Back River tide gate. Responsibilities included evaluation, improvement, and calibration of the LAEMSED model.

**Project Manager; Water Quality and Salinity Study of Loxahatchee Estuary, Jupiter Inlet District**—Prepared a basin management plan for the Loxahatchee River Estuary in Florida. Water quality modeling was conducted to determine the salinity impacts resulting from dredging activities. Prepared a water quality monitoring program to collect water quality and flow data for model calibration.

**Task Manager; Circulation and Thermal Plume Modeling for Tampa Electric Company (Tampa Electric)**—Conducted hydrodynamic and circulation analyses to assess the impacts of thermal discharge from the Big Bend Unit 4 of Tampa Electric. The finite element model CAFE1 was setup for the entire Tampa Bay area to establish the farfield circulation pattern using course grid segmentation. Subsequently, a finegrid model was set up for Hillsborough Bay to establish circulation with finer resolution near the outfall, using the results of the course-grid model as the boundary condition. The results of CAFE1 were linked with a finite element dispersion model, DISPER1, to calculate the size and temperature of the thermal plume caused by the cooling water from the power plant. Both CAFE1 and DISPER1 were modified in order to simulate the realtime tide condition and to simulate the heat transfer to the atmosphere. Continuous wind, tide, and current data and infrared images were used to calibrate the models.

**Task Manager; Estuarine Hydrodynamic and Water Quality Modeling for Lower Maurice River, Atlantic City Electric (ACE)**—Used SWMMII Model to evaluate freshwater consumptive use impact caused by proposed coal-fired power plant near Millville, New Jersey. Simulated farfield pollutant transport and nearfield mixing due to cooling tower blowdown. MIT's salinity intrusion model was used to predict salinity intrusion. Also developed a potential flow model to predict effects of the intake structure on fish larvae transport, entrainment, and impingement. Models PLUME and PDS were used to perform nearfield mixing and dispersion studies.

**Project Manager; Hydraulic Impacts Assessment, Pensacola Naval Air Station (Homeport) Dredging Improvements, U.S. Navy**—Studies were performed to evaluate the U.S. Navy's proposed ship channel and turning basin modifications within the Pensacola Bay system adjacent to the Pensacola Naval Air Station in Florida. Assessed potential impacts which may result from the proposed Pensacola Bay channel and turning basin improvement and evaluated dredged material disposal options. This tidal hydrodynamic prediction in Pensacola Bay was accomplished by using the 2-dimensional, finite element, circulation computer model CAFE1. Based on these simulation results, the dredging and disposal impacts were evaluated for various disposal alternatives, including upland disposal, offshore open water disposal, or inshore open water disposal.

**Project Manager; Water Quality Modeling, Norfolk Harbor**—Model simulations were conducted to assess the sediment and water quality impacts of tributyltin anti-fouling paint being leached from the ship hulls. Hydrodynamic model DYNHYD3 was used to simulate the tidal current and water surface elevation in the Norfolk Harbor, Hampton Road, Elizabeth River, and James River in Virginia. Water quality model TOXIWASP was used to predict the dissolved TBT concentration in the water column and the quantity absorbed by the sediments. The impacts from the recreational, commercial and military vessels were evaluated. The study results were used by EPA to develop policy to regulate trbutyltin usage.

**Task Manager; Hydrodynamic and Water Quality Modeling for Pungo River and the Canal System, Peat Methanol Associates**—The study area included Pungo River, Pungo River Canal, Intracoastal Waterway, and Alligator River in North Carolina. The RECEIVII model was calibrated by four tide gauges, two current meters, a dye study, and two seasonal water quality sampling surveys. The effects of wind, tide, and proposed methanol plant discharge on the estuary salinity, metal ion, and BOD/DO were investigated. The preferred methanol plant discharge site was recommended. The SWMMIII model was also used to perform continuous realtime modeling to determine the effects of peat harvesting on the surface runoff characteristics, and to evaluate the salinity changes in the Pungo River caused by harvesting activities. Qualified as an expert witness.

**Project Manager; Hydrological Modeling of a Phosphate Mining Site, Occidental Chemical**—Hydrological modeling of a phosphate mining site near White Springs, Florida, for Occidental Chemical

Agricultural Products, Inc., to evaluate the hydrological impact of the mining activities. Hydrological model HSPF was used to perform continuous realtime simulation and compare the Suwannee River hydrology under premining conditions, existing conditions, and reclaimed conditions. Twenty years precipitation and evaporation data with 1-hour intervals was used for simulation.

**Project Manager; Thermal Plume Modeling for Florida Power & Light Company's (FPL's) Fort Myers Power Plant, Golder & Associates**—Conducted comprehensive hydrodynamic and thermal modeling in Caloosahatchee Estuary and Orange River to quantify the thermal plume created by the repowering of FPL's Fort Myers Power Plant. CE-QUAL-W2 was used to simulate the longitudinal distribution and vertical thermal stratification in the study area. A dye study and intensive monitoring of temperature and salinity was conducted to calibrate the model. The modeling tasks included (1) thermal plumes for the existing and repowered conditions, (2) determining the most effective option to protect manatee during brief plant downtime in the winter, and (3) effects of S-79 lock operation schedule on the thermal plume.

**Project Manager; Northwest Florida Beaches International Airport Master Drainage Plan Review; Vezina, Lawrence & Piscitelli, P.A.**—Reviewed the stormwater master plan for the International Airport in Panama City, Florida, and assessed potential causes of the flooding issues during construction. Served as an expert witness.

**Project Manager; Riverview Substation Stormwater Design, Seminole Electric Cooperative, Inc. (SECI)**—Designed stormwater management facility for the expansion of a substation in Putnam County, Florida.

**Project Manager; Water Budget Study for Seminole Generating Station, SECI**—Conducted hydrologic and water budget study for the flue gas desulfurization (FGD) landfill area. Components of the water budget included rainfall, runoff, evaporation, evapotranspiration, seepage, retention pond inflow/ outflow, groundwater flow, and pump operations.

**Project Manager; Bridge Hydraulic Report and Scouring Analysis, WBQ Design & Engineering, Inc/FDOT**—Conducted a technical review of a 2-dimensional model (RMA2) of Escambia River, Blackwater River, and Yellow River to assess the hydraulic impacts of a US90A bridge crossing over the Escambia River near Pensacola, Florida. The bridge scouring under 100-year and 500-year storm surge conditions were completed. A review of the bridge hydraulic report was also completed.

**Project Engineer; Cape Fear River Dye Study, City of Wilmington**—Two comprehensive dye dispersion studies were conducted in the Cape Fear River and Northeast Branch Cape Fear River to evaluate the water quality impacts of the outfalls from two domestic waste treatment plants in Wilmington, North Carolina. A total of 1,000 pounds of Rhodamine W2 fluorescent dye was continuously injected into the effluent for a 6-hour period, and dye concentration was monitored for 4 days. The primary objectives of the study were to determine the upstream excursion limit of the discharge plume, and to use the data to calibrate a 3-dimensional EFDC computer model.

**Project Manager; Water Quality Assessment for a Power Barge, Enron**—Conducted mixing zone modeling to determine potential thermal and water quality impacts of the 36 MGD discharge from a power barge in Puerto Quetzal, Guatemala. CORMIX model was used to evaluate various discharge options, including offshore ocean outfall, onshore surface discharge, and discharge in the harbor. The potential for thermal recirculation between the intake and discharge was investigated.

**Task Manager; Cooling Reservoir Assessment, SECI**—Conducted thermal assessment to evaluate the potential impacts of Hardee Unit 3 design modification on the existing cooling reservoir at Hardee Power Station and to ensure that the reservoir would have sufficient cooling capacity for the revised project.

**Task Manager; Hydrologic Modeling for Blue Heron Energy Center, Calpine Eastern**—Conducted surface water modeling to assess the potential impacts from a proposed power plant in the IRFWCD, including water use impact, stormwater impact, and water quality impact. Stormwater model Visual SWMM was used for runoff and flood routing simulations.

**Task Manager; Thermal Mixing Zone Analysis, Coastal Power Company**—Conducted thermal mixing zone analyses to determine the most cost-effective design of a submerged heated water discharge pipe from a power plant mounted on a floating barge in El Realejo Estuary near Corinto, Nicaragua. Prepared diffuser pipe design and estimated the potential of recirculation of the cooling water.

**Project Manager; Environmental and Engineering Evaluation of Carlos Waterway, Jack M. Berry, Inc.**—Evaluated a flood control waterway near Fort Myers, Florida, proposed by the East County Water Control District. The assessment included environmental impacts, costs, and safety and design alternatives. Served as an expert witness in an Order of Taking hearing and presented the study findings in the courtroom.

**Project Manager; Water Quality Assessment for NPDES Permit Renewal, SECI**—Conducted water quality assessment for a FGD system modification which would create a chloride bleed stream at SECI's Palatka facility. Projected water quality of the internal and external NPDES outfalls and determined the size of the chemical and thermal mixing zones in the St. Johns River under various blowdown options. The results were used to support the renewal of an NPDES permit.

**Task Manager; NPDES Permit Modification, Tampa Electric**—Conducted water quality assessment to support an NPDES permit modification for the outfalls at the Big Bend Station in Tampa, Florida. The modification involved the addition of a chloride bleed stream from the FGD system.

**Project Manager; Circulation Study for Lake Minniola, Modica & Associates**—Conducted circulation study for Lake Minniola to assess the potential impacts of a proposed city marina in central Florida. A drogue study was conducted to quantify the circulation pattern near the project site.

**Task Manager, Water Quality Assessment and Mixing Zone Analysis, Calpine Corporation**—Conducted water resources assessment for the 700-MW natural gas-fired Magic Valley Generating Station in Hidalgo, Texas. Effluent from the City of Edinburg WWTP was used as cooling tower makeup water source. Mixing zone modeling was conducted to determine the water quality and hydrological impact of the cooling tower blowdown into the North Main Drain, a receiving water.

**Project Engineer; Mixing Zone Analysis for a Proposed Power Plant in Thailand, Edison Mission Energy**—Conducted mixing zone assessment to determine the water quality impacts in the Mae Klong River in Thailand from a proposed power plant.

**Project Engineer; Turbidity Study, MacFarlane, Ferguson, McMullen**—Conducted a turbidity study to determine the potential turbidity impacts of the operation of the Sun Cruz casino boat in Crystal River, Florida. Turbidity measurement was taken along the course of the boat navigation before, during, and after the boat passage. The turbidity impact during docking/undocking operation was also investigated.

**Project Engineer; Water Quality and Thermal Mixing Zone Analysis, Coastal Power Company**—Conducted thermal mixing zone analyses for the 50-MW diesel engine power plant in Tipitapa, Nicaragua.

**Project Engineer; Hydrological Study, TECO Power Services Corporation (TPS)**—Conducted hydrological assessment for the proposed 60-MW Pavana Power Plant in San Lorenzo, Honduras.

**Project Engineer; Environmental Impact Assessment (EIA) for 120-MW San José Power Plant, Central Generadora Electrica San José, Ltd.**—Responsible for conducting thermal and water quality modeling of discharges from coal-fired power plant in Puerto Quetzal, Guatemala. Modeling results were used to demonstrate compliance with applicable World Bank environmental guidelines. Also evaluated the dredging impact due to the construction of a ship channel and coal loading piers. Conducted environmental assessment at an alternate site near Campo Nuevo, including thermal mixing zone analysis and flood analyses for a bridge elevation design.

**Principal Investigator; Thermal Mixing Zone Analysis, Brooklyn Navy Yard Cogeneration Partners**—Conducted thermal analysis and circulation study to determine the thermal mixing zone of the cooling water discharge from a proposed cogeneration facility in Brooklyn Navy Yard Basin, New York. Assessed the potential for recirculation of the heated discharge. Also conducted water quality assessment to evaluate the impacts of the dredging activity associated with the construction of the discharge pipeline.

**Principal Investigator; Floodplain Forest Modeling for Rodman Reservoir Restoration, SJRWMD**—Use bottomland forest floodplain model, FORFLO, to simulate the growth and succession of hardwood species on the floodplain of Florida's Lower Ocklawaha River for various hydrologic conditions and restoration schemes (a total of 267 scenarios). The model was modified so that it could be applicable for all hydrologic and ecologic conditions. Tree species surveys were conducted to calibrate the FORFLO model. The results of the model were used to assist SJRWMD in making restoration recommendations.

**Principal Investigator; Mixing Zone Study, Amoco Oil Company**—Conducted mixing zone study for two NPDES stormwater outfalls at Amoco's Tampa Terminal in Florida. Established and implemented monitoring program to characterize the ambient tidal current and water quality in the Sparkman Channel. Used mixing zone models CORMIX1 and CORMIX2 to optimize the discharge configuration and determined the mixing zone size for copper, iron, lead, and pH.

**Project Manager; Coastal Engineering and Water Quality Assessment for Paradise Island Resort, Sun International**—Conducted thermal balance and water quality assessment to evaluate environmental conditions in fish display pools and lagoons at Paradise Island Resort, Bahamas. Conducted tidal hydraulic analysis to determine lagoon flushing and circulation. Designed dune restoration to mitigate the construction impacts on sand dunes. Conducted coastal engineering analysis to improve and stabilize the north inlet of the Paradise Lagoon, and designed terminal groin to control sediment transport. Also implemented a stabilization plan to prevent erosion of a manmade beach in the lagoon.

**Task Manager; Oxbow Restoration Feasibility Study, Wayne County, Michigan**—Conducted an environmental study to evaluate the feasibility and cost/benefit to restore a detached oxbow near Henry Ford Museum at Lower River Rouge, Michigan. Conducted site assessment, vegetation survey, and topographic survey to determine existing hydrologic and ecologic conditions compared with the historic conditions. Evaluated the feasibility of restoring wetlands, fish habitats, and navigation potential in the oxbow. Identified major environmental and engineering issues related to oxbow restoration, i.e., dredge/disposal, sediment quality, hydroperiods, flood hazard, sedimentation/erosion, and stormwater retrofitting.

**Project Engineer; Water Quality Assessment for Rodman Reservoir Restoration, SJRWMD**—Conducted water quality modeling, using QUAL2E model, to predict the water quality of the restored Lower Ocklawaha River in Florida between Eureka Dam and Rodman Dam under various restoration schemes. The water quality impacts of restoration schemes for the riverine zone, lacustrine zone, and the transition zone were evaluated.

**Project Manager; Marina Permitting, Andell Harbor**—Conducted water quality analysis and modeling to determine the potential environmental impacts of a 400-slip lock harbor on Seabrook Island, South Carolina. Fecal coliform and biochemical modeling was conducted to project the water quality in the marine. The receiving water impacts in the Bohicket Creek was also assessed. Conducted substantial water quality data collection at Queen's Harbour, a similar lock harbor in Jacksonville, Florida, to support the Andell Harbor study. Conducted salinity measurements in Queen's Harbour navigation lock and the adjacent creek to compute the exchange coefficient for the lock. Conducted wind wave forecast and boat wake analysis to assess the bank erosion impacts from boat traffic. Testified in the administrative hearing as an expert witness.

**Task Manager; Storm Surge and Wave Force Calculation for Transmission Line Design, POWER Engineers, Incorporated**—Conducted coastal engineering analysis to determine the design wave heights in Pine Island Sound for Lee County Electric Cooperative's transmission line design spanning Captiva Island and Pine Island, Florida. Computed the total wave forces and maximum bending moments on transmission line supporting structures. The scour depth at the structure foundation by wave forces was also conducted.

**Task Manager; Mixing Zone Modeling for Ocean Outfall, Fertinal Group**—Conducted mixing zone modeling, using CORMIX, to evaluate the effectiveness of several alternative designs to replace an existing outfall pipeline in the nearshore zone of the Pacific Ocean from a fertilizer plant near Lazaro Cardenas, Michoacan, Mexico. Current velocity, temperature, and water quality samples were collected to characterize the ambient condition.

**Task Manager; NPDES Permitting for Stormwater Discharges, Tampa Electric**—Prepared the Part I and Part II NPDES permit application for the stormwater discharges at the selected Tampa Electric power stations.

The group application included five facilities: Big Bend, Gannon, and Hookers Point Power Stations in Tampa, and Phillips and Dinner Lake power stations in Sebring, Florida. Stormwater sampling was conducted to characterize the stormwater quality at the outfall.

**Task Manager; Drainage Canal Design at Alborada Power Plant, Tampa Centro Americana de Electricidad, Ltda**—Conducted field investigation and hydraulic design to prevent potential flooding at the Alborada Power Plant in Escuintla, Guatemala. Directed topographic survey to gather information required for the design of a perimeter canal. Completed hydraulic design and plan and specification for the canal.

**Task Manager; Thermal and Chemical Mixing Zone Analysis, Delmarva Power & Light Company**—Conducted hydraulic and water quality impact assessment for the cooling tower blowdown to the Nanticoke River near Vienna, Maryland. CORMIX1 model was used to determine the size of the nearfield mixing zone to conform with Maryland's water quality regulations. ECT investigated three candidate sites to determine the most favorable site location. In addition to the nearfield mixing zone, the farfield water quality impacts for each candidate site was also assessed. Conducted ship wave and screw race analyses to assess the bank erosion and sediment re-suspension due to the propeller and vessel motion of the coal transport barges.

**Project Manager; Circulation and Dispersion Study in Little Lake Harris, Lake County Water Authority**—Conducted dispersion study to assess the water quality impacts of a proposed public boat launching, mooring, and recreation facilities at Little Lake Harris. Dispersion modeling was conducted to quantify the impacts of boat discharges. Two dye studies were conducted to verify the dispersion characteristics and the zone of water quality impacts due to potential pollutant discharges. Historical hydrologic data were analyzed to evaluate the extent of far-field and long-term water quality impacts in the lake. Made design changes for the dock layout to minimize the hydraulic and water quality impacts.

**Task Manager; Bridge Scouring Analysis, FDOT**—Conducted hydraulic analysis to evaluate the scour depth of the Ortiz Bridge over Billy Creek in Lee County, Florida. Hydraulic model HEC-RAS was used for the analysis. Assisted with the preparation of a bridge hydraulic report.

**Task Manager; Bridge Hydraulic Analysis, FDOT**—Conducted hydraulic analysis to determine the flood stage and scour depth at a bridge over Eau Gallie River in Brevard County, Florida. Hydraulic model HEC-RAS and pier scour procedure HEC-18 were used for the analysis.

**Discipline Manager; Surface Water Assessment for Polk Power Station, Tampa Electric**—Conducted water resources investigations in preparation of site certification application for the Polk Power Station in Polk County, Florida. Prepared and implemented a 6-month surface water monitoring plan to characterize the baseline condition at the project area, including continuous water level recording, flow measurements, and water quality analysis. Responsibility also included thermal analysis and water budget analysis for the cooling pond, prepared stormwater management plan, conducted hydraulic and hydrologic impact assessment, and conducted water quality assessment to determine cooling pond water quality and receiving water quality. Computer models, HEC-1 and QUAL2E, were used to simulate the surface runoff hydrograph and the water quality in the cooling pond. Testified in an administrative hearing as an expert witness.

**Project Engineer; Stormwater Management Plan, Caribe General Electric Products, Inc.**—Conducted a water quality compliance survey at a plastic molding facility at Palmer, Puerto Rico. Prepared and implemented a stormwater management plan to remove process water and potentially contaminated runoff from offsite stormwater discharge. Implemented a stormwater monitoring program to monitor rainfall, runoff quantity, and runoff quality at three stations where flow measurement devices were installed. Prepared operation and maintenance manual for stormwater monitoring; also prepared monthly monitoring reports for permit compliance.

**Project Manager; Nutrient Budget Assessment for Big Bend Station, Tampa Electric**—Tampa Electric proposed to install a selective catalytic reduction system to reduce nitrogen oxides emissions from the Big Bend Station in Hillsborough County, Florida. ECT conducted nutrient budget analysis to evaluate the reduction of nitrogen deposition from the atmosphere to Tampa Bay/Hillsborough Bay, evaluate the potential increase of nitrogen load from the FGD blowdown, and to assess the total nitrogen balance and net nitrogen loads to Hillsborough Bay.

**Task Manager; Berm Failure Analysis for Cooling Water Reservoir, Tampa Electric**—Conducted hydraulic modeling to assess the flooding impact in an event of a catastrophic failure of the cooling water reservoir berm at Polk Power Station. An emergency response plan was also prepared.

**Project Manager; Thermal Plume Modeling for FPL**—Conducted hydraulic and thermal impact studies for the FPL repower project in Fort Lauderdale, Florida. RECEIVII model was modified to simulate the heat transfer and dispersion of the thermal plume in the cooling pond and receiving waters. Extensive field monitoring and a dye study were conducted to calibrate the model. The modified model also simulated the potential recirculation of the cooling water intake and discharge system. The salinity impacts of the plant repowering were evaluated. Expert witness at administrative hearing.

**Task Manager; Hydrologic and Hydraulic Analysis for Payne Creek, SECI**—Conducted storm runoff and routing analysis for Payne Creek in Hardee County, Florida. Also simulated the discharges from the cooling pond and the adjacent watershed to determine the effects of runoff dilution under a 10-year, 24-hour storm. HEC1 model was used for the analysis.

**Project Manager; Hydraulic and Water Quality Assessment for Savannah Harbour Development, LJ Hooker Developments**—Conducted environmental impact assessment for a proposed harbor and canal system at Hutchinson Island, Savannah, Georgia, which connects the Savannah River with the Back River. Hydraulic calculations, sedimentation assessment, and water quality analysis were performed to determine the impacts of the proposed project; which includes marina facilities, cruise ship terminal, and an aquarium.

**Project Engineer; Water Resources Studies for Jacksonville Port Authority Spoil Site Evaluation**—Evaluated the hydrodynamics and water quality impacts of maintenance dredging, channel deepening, and dredged material disposal in St. Johns River near Jacksonville, Florida. A disposal corridor for maintenance dredging was established based on water quality, hydraulics, ecology, archeology, and socioeconomic impacts. The favorable sites for dredged material disposal were recommended based on the ranking matrix.

**Project Engineer; Design and Planning of a Harbor/Airport Complex at Kasae Island, Trust Territory of Pacific Islands**—Conducted harbor planning and design, reef runway design, drainage design, causeway and highway design, and structural design of breakwater and harbor facilities for a harbor/airport complex in Kasae Island, TTPI.

**Project Engineer; Marine Construction/Permitting, Southern Monitoring and Environmental, LLC**—Responsible for all modeling and marine permitting for dredging of Keystone Properties' 44 ft-MLLW basin, and construction of a seawall at a bulk materials unloading terminal on the St. Johns River in Jacksonville, Florida. Designed a 12-acre confined dredge material disposal facility.

**Principal Investigator; Water Quality Modeling, Willbrook Plantation, Waccamaw River**—RECEIVII model was used to assess the water quality impact of the proposed docking facilities and the dredged canals in a proposed waterfront resort development at Waccamaw River, South Carolina. The model was used as a design tool to optimize the channel configuration and to maximize the tidal flushing efficiency. Conducted water quality monitoring for model calibration. Testified at the administrative hearing as expert witness.

**Project Manager; Salinity Intrusion Modeling, ACE**—MIT Salinity Intrusion Model (SIM) was used to assess the consumptive use impact of proposed coal-fired power plant on the Maurice River in New Jersey. The model simulated the potential salinity intrusion caused by the cooling water withdrawal from the river and cooling tower blowdown to the river.

**Task Manager; Fate of Dredged Material Disposal, The Landings Marina**—Conducted sedimentation analysis to assess the water quality impacts from the dredging activities in an existing marina on Skidaway Island, Georgia. A 3-dimensional finite difference model (MIT Transient Plume Model) was used to determine the mixing zone and dispersion of the disposed material. Provided recommendations to minimize future shoaling in the marina.

**Task Manager; Water Quality Modeling, Kiawah Island Marina Development**—Evaluated water quality impacts of a lock harbor system in Kiawah River, South Carolina. Water quality model QUALII was used to

simulate algae growth in the marina. Transient Plume Model was used to simulate the farfield dispersion impacts in Kiawah River.

**Task Manager; Dredged Material Disposal Modeling, Harbortown Marina**—Model DMFJ was used to predict transport, dispersion, and fate of dredged material discharged into open water through a pipeline near Hilton Head Island, South Carolina.

**Task Manager; Thermal Impact Study for a Liquid Natural Gas Plant, Southern Natural Gas**—Conducted model simulation to assess the impacts of a cold water discharge into Savannah River, Georgia, from a LNG facility. Circulation and dispersion model DIFF2 was used to assess the water quality impacts.

**Project Manager; Wetland Modeling of the Cabbage Head Swamp, Occidental Chemical**—Conducted hydrological modeling for Four Mile Branch and its headwater area, Cabbage Head, to evaluate the hydrological impacts and wetland hydroperiod changes resulting from the proposed dredging and filling activities in Suwannee County, Florida. The hydrological model HSPF was used for the simulations. In order to adequately represent the watershed characteristics for the wetlands, an in-depth experimentation and sensitivity analysis of the model parameters in the PERLND module was conducted.

**Project Manager; Mixing Zone Analysis and Dye Study for Suntree Marina**—Conducted a dye study at the proposed marina site in Indian River, Florida, using continuous injection method. Subsurface drouges were also used to verify the current velocity and flow path. Developed a 2-dimensional numeric model to simulate the dispersion of the pollutants from boat discharges. The dye study data was used to calibrate the model.

**Project Manager; Dye Study for Mixing Zone Analyses, Port St. Joe Waste Treatment Plant**—Conducted two dye studies to determine the mixing zone of the plant discharge. Rhodamine dye was continuously injected into the Gulf County Canal for 24 hours. Continuous measurement of the dye concentration was conducted for 4 days in the Gulf County Canal and St. Joseph Bay in Florida. Studies were conducted for both spring tide and neap tide conditions. Performed data analysis to determine the mixing zone.

**Project Manager; Hydrological Study, City of Sanford**—Evaluated a proposed wastewater effluent disposal site near Yankee Lake and Lake Monroe, Florida. The proposed land application system included a rapid infiltration network, exfiltration trench, and overland flow through low hammock and wetlands. The nutrient removal rate of the wetland was evaluated. The hydrological and water quality impacts on the receiving wetlands was assessed.

**Task Manager; Floodplain Analysis for AMAX Chemical Company**—Performed flood frequency analysis and delineated the floodplain of Big Slough and Horse Creek near AMAX Chemical Company's proposed phosphate mine site in DeSoto County, Florida. Model E431 was used to perform floodplain analysis.

**Project Manager; St. Lucie Estuary Hydrodynamic Modeling**—Provided consulting services to South Florida Water Management District (SFWMD) for the setup of a Dynamic Estuary Model on St. Lucie Estuary, Florida. Assisted SFWMD with calibrating the model and produced bathymetric map of the estuary using hydrographic survey data and SURFACEII mapping software.

**Task Manager; Hydrodynamic Modeling, Baptist Medical Center**—Used finite element model CAFE1 to assess the St. Johns River circulation impacts due to the proposed hospital construction in Jacksonville, Florida. Effects of the hospital caisson structure on sediment transport and tidal flushing characteristics were also evaluated.

**Project Manager; McCoys Creek Stormwater Improvement, Jacksonville Downtown Development Authority**—Prepared study to determine feasibility of rechannelizing McCoys Creek to (1) improve water quality of the Creek, (2) improve stormwater runoff conditions of the area, and (3) improve the aesthetic qualities of the Creek. A stormwater model was used to evaluate the existing drainage system and make recommendations for improvements to stormwater handling capacity and water quality. A flushing study was also conducted using the RECEIVII model to determine the residence time of the existing Creek and the proposed dredging requirements. Based on the results of the stormwater and flushing studies, recommendations were developed to modify the hydraulic system to allow boat navigation, improve water circulation, decrease hydraulic residence time, and enhance flushing.

**Project Manager; Stormwater Management System Design**—Stormwater management system design for the development of a 12 square-mile citrus farm near Gannet Slough in Highland County, Florida. Designed a master drainage plan, including drainage canals, irrigation reservoir, retention pond, and pump stations.

**Project Manager; Hydrographical, Hydrological, and Stormwater Studies near Sulphur Point**—Conducted dye study at a proposed marina site in St. Andrew Bay, Florida, to determine the flushing and dispersion characteristics of the project site. Nearfield and farfield water quality impacts were assessed. A stormwater management system was designed to retain the runoff from the upland development.

**Project Manager; Comprehensive Shorefront Management Plan for Horry and Georgetown County, South Carolina Coastal Council**—Conducted beach erosion assessment for 27 miles of shoreline in Horry and Georgetown Counties, South Carolina. The study program included beach data survey and analysis, sediment analysis, long term and short term erosion trends, future beach nourishment needs, and development of shorefront management plan. Participated in public hearings.

**Principal Investigator; Beach Nourishment Project Design and Engineering for Captiva Erosion Prevention District**—Conducted a coastal engineering evaluation for the design of a 5-mile beach restoration project in Captiva, Florida. Performed technical engineering evaluations in support of USACE requirements including analyses of physical coastal data, engineering and design of a rock revetment, submerged breakwater, and terminal groin structure. Prepared the final engineering and design for the beach restoration project based on a technical and economic evaluation of alternative project design level. Conducted wave refraction model to assess the impacts of dredging.

**Principal Investigator; Coastal Engineering Analysis and Management of 15 years of Beach Profile data along 26 miles of North Carolina Beaches for USACE, Coastal Engineering Research Center**—The data was used to compute the sediment volumetric rate of change, sediment transport rate, shoreline excursion rate, and to set up a wave refraction model for the study area. The wave refraction model was used to predict wave shoaling and compute longshore energy flux. Historical beach fills and storm events were investigated to evaluate beach fill performance.

**Project Manager; Revetment Design and Beach Erosion Assessment of Forrest Beach, Sea Crest Motel**—Assessed the long- and short-term, and storm-induced beach erosion near Sea Crest Motel, Hilton Head Island, South Carolina. Evaluated the potential erosion/accretion impacts of the proposed erosion control structure. Provided design of a composite concrete revetment. Expert witness for public hearing.

**Principal Investigator; Shoreline Stabilization Design, Ft. George Island Development**—Investigation of the shoreline planeform changes and erosion pattern near a proposed marina on Ft. George Island, Florida. The cause of the erosion and the sedimentation near the project site was determined and a shoreline stabilization plan was recommended. Provided engineering design of a revetment.

**Project Manager; Southern Isle of Palms Coastal Construction Baseline Determination, The Beach Company, Isle of Palms**—Conducted shoreline study to establish the coastal construction baseline and setback line for the Southern Isle of Palms from Breach Inlet to 10th Avenue, in accordance with the South Carolina Coastal Council Beach Bill. The study included historic aerial photo analysis, shoreline movement, storm impacts, and beach profile surveys. The revised baseline and setback lines were field verified and were successfully approved by the South Carolina Coastal Council. Expert witness at public hearing.

**Task Manager; Beach Nourishment Planning and Design, Town of Longboat Key**—Designed terminal groin as an element of the comprehensive beach nourishment plan for the Town of Longboat Key, Florida. The groin was designed to minimize the spreading and dispersion loss of sand from the project area.

**Task Manager; Marina Design, Leeward Limited, Providenciales, B.W.I.**—Conducted hydrographic and geotechnical investigation at Leeward GoingThrough. Prepared alternative structural design for the proposed marina.

**Project Manager; Bulkhead and Marina Design, HarbourGate Marina**—Designed an 86-slip marina on North Myrtle Beach, South Carolina, with 1,250-ft timber bulkhead and a fuel dock. Performed structural

design of the wooden bulkhead and the adjacent walkway. Alternative concrete and steel designs were also conducted. Prepared bid documents for marina and bulkhead construction.

**Project Manager; Channel Stability and Sediment Transport Analysis, Rose Hill Plantation**—Assessed channel stability and sediment transport of an existing channel at Colleton River. Conducted hydrographic field investigation to assess the feasibility, engineering alternatives, maintenance dredging requirements, and environmental impacts for a proposed channel stabilization project in Hilton Head, South Carolina.

**Project Engineer; Beach Nourishment Study of North Shore Park, St. Petersburg, Florida**—Performed sediment transport analysis to evaluate the fate of beach fill material and assess the environmental impact on the grass bed caused by beach fill operation and the littoral processes. A preferred borrow site for beach fill material was recommended.

**Project Manager; Beach Erosion and Shoreline Protection Study, Pelican Watch Villas**—Identified long and short-term erosion trends and recommended immediate and long-term shoreline protection method. Provided stabilization protection method. Provided stabilization alternatives along an existing wooden seawall and beach dunes on Seabrook Island, South Carolina.

**Project Manager; Marina Planning, Design, and Permitting, Patriots Point Marina**—Conducted the design and environmental assessment for a proposed 616-slip marina in Charleston Harbor, Mt. Pleasant, South Carolina. Work included hydrological analysis, dredge/disposal plan, water quality analysis, and coastal marina report. Performed engineering analyses for a proposed floating breakwater. Conducted comprehensive wind analysis, wave forecasts, and established the design criteria for the breakwater. Provided construction services such as bid document preparation and site inspection. Participated in public hearings.

**Task Manager; Sediment Transport Study for Daufuskie Island/Webb Tract Marina, International Paper Realty Corp.**—Conducted water quality, sedimentation, and sediment transport studies for the proposed 420-slip lock harbor on Cooper River on Hilton Head Island, South Carolina. Vertical current profiles, suspended solid profiles, and bottom sediment samples were taken and analyzed to predict sedimentation and future maintenance requirement. Conducted dye study to assess the pollutant dispersion and mixing.

**Task Manager; Marina Assessment for Queen's Harbour, The Bullard Group**—Prepared engineering studies to evaluate a lock harbor marina associated with a waterfront development in Jacksonville, Florida. Studies included stormwater drainage plan, water quality impact assessment, dredge/disposal plan, and long-term maintenance requirement.

**Principal Investigator; Dye Study and Environmental Assessment, Moss Creek Marina, Moss Creek Plantation**—Performed dye study to evaluate the longitudinal mixing, dispersion, and tidal flushing in the vicinity of a proposed marina expansion in Hilton Head, South Carolina. Potential pollutant impacts was evaluated based on anticipated marina use and occupancy. Study results were used to assess the compliance with the shellfish harvesting water quality criteria, and the shellfish buffer zone needed to protect public health. Boat wake impacts were assessed.

**Project Manager, Water Quality and Stormwater Assessment, Kiawah Island, Center Island**—Responsible for water quality impact assessment of 50 individual dock facilities and a community boat launching facility along the Kiawah River at Kiawah Island, South Carolina. Provided dock design guidelines to project planners and architects, assessment of impacts of the project on surrounding water quality, and recommendations on methods for minimization or avoidance of significant impacts. Studied the feasibility of stormwater design to retain all stormwater in the project area up to and including the 100-year 24-hour storm.

**Project Manager; Environmental Impact Assessment, Porter, Inc.**—Assessed the impacts of a proposed boat manufacturing facility on the Colleton River, South Carolina. The boat wake impacts and the water quality impacts from antifouling paint were determined. Developed a dispersion and entrainment model to assess the impacts from a hypothetical fuel spill. Testified as an expert witness in an administrative hearing.

**Task Manager; Power Plant Feasibility Study, Wärtsilä NSD North America, Inc.**—Conducted surface water resources assessment for the siting and feasibility study of a 55-MW power-plant-on-barge facility near

Manzanillo, Dominican Republic. Investigation included freshwater sources, water quality, navigation, currents, exposure to wind-waves, storm surge, and mixing zone evaluation.

**Principal Investigator; Marina Assessment, Cape Charles Marina**—Planning, design, and flushing analysis for a 600-slip marina in Cape Charles, Virginia. RECEIVII model was used to determine the flushing time and the water quality in the marina basin.

**Principal Investigator; Environmental Assessment**—Wind/wave analysis was conducted to determine the wave impacts on a proposed marina in Narragansett Bay, Rhode Island. Diffraction analysis was conducted to assess the proposed breakwater efficiency. The hydraulic impacts of the breakwater construction were also analyzed.

**Project Manager; Shoreline Erosion Evaluations**—Performed analyses of extensive beach/offshore profile data to evaluate the sediment transport and shoreline erosion impacts resulting from the construction of the Little River Inlet jetties in Waites Island, South Carolina, in support of USACE - Section 111 proposal.

**Project Manager; Wave Refraction Modeling, Redfish Pass**—Studied effect of dredging on wave propagation and coastal processes on Captiva Island, Florida. Wave refraction model was used to perform the analysis.

**Project Manager; InletBay-Waterway Modeling**—Developed nonlinear model for inletbay-waterway system to evaluate the estuary flushing capability.

**Project Hydrologist; Stormwater Management System Design and Permitting for 790-MW Integrated Gasification Combined-Cycle (IGCC) Power Plant at Polk Power Station, Tampa Electric**—Conducted stormwater runoff modeling, designed stormwater management system, and prepared permit application for IGCC Unit 6 at Polk Power Station in Polk County, Florida.

**Task Manager; Power Plant Feasibility Study, Wärtsilä NSD North America, Inc.**—Conducted surface water resources assessment for the siting and feasibility study of a 55-MW power-plant-on-barge facility near Manzanillo, Dominican Republic. Investigation included freshwater sources, water quality, navigation, currents, exposure to wind-waves, storm surge, and mixing zone evaluation.

**Project Manager; Environmental Assessment, Park West Development**—Performed an environmental assessment of residential docks and an access bridge for a residential development in Park Island near Mt. Pleasant, South Carolina. Served as an expert witness.

**Project Manager; pH Mixing Zone Study, SECI and TPS**—Conducted pH mixing zone study in Payne Creek for the intermittent discharge from a cooling water reservoir operated by Hardee Power Station (TPS) and Payne Creek Generating Station (SECI). Conducted statistical analysis of reservoir discharge and river flow. Developed flow correlation and stage discharge relation in Payne Creek. Mixing zone models CORMIX and pH kinetics model PHMIX2 were used to determine the size of the pH mixing zone.

**Project Manager; Mixing Zone Analysis for Hillabee Energy Center, Calpine**—Conducted thermal mixing zone analysis for a proposed power plant near Alexander City, Alabama. Computed 7Q10 critical flow at the receiving water, the Oaktasasi Creek. Provided diffuser design to minimize the thermal mixing zone.

**Project Manager; Mixing Zone Analysis for Lone Oak Energy Center, Calpine**—Conducted thermal and chemical mixing zone analysis for a 0.7 MGD discharge from the proposed Lone Oak Energy Center near Columbus, Mississippi. CORMIX model was used for the analysis.

**Task Manager; Diffuser Design Panda Energy International (PEI)**—Conducted mixing zone analysis and diffuser design for the proposed 1,190-MW Tallmadge Generating Station at Grand River near Grand Rapids, Michigan. Mixing zone model V-Plume was used to determine the size of the mixing zone.

**Task Manager; NPDES Permitting and Mixing Zone Analysis for Stormwater and Power Plant Discharges, U.S. Generating Company**—Conducted water quality assessment for the preparation of NPDES permit for wastewater and stormwater discharges from the Indiantown Station in Martin County, Florida.

Determined the discharge water quality during extreme storm event and determined the size of the chemical mixing zone.

**Project Engineer; Stormwater Management, PEI**—Coordinated the stormwater management and pollutant prevention activities at Union Power Station's construction site in El Dorado, Arkansas. Conducted site assessment to devise and implement emergency remediation actions to control runoff quantity and quality during extreme storm events. Managed the water quality monitoring program and conducted periodic site inspections to ensure the best management practices onsite. As a result of the successful water management actions, the water quality in the receiving river and Lake Anthony was dramatically improved and complied with state standards.

**Project Manager; Stormwater Assessment and Stormwater Pollution Prevention Plan (SWPPP), PCR, Inc.**—Conducted stormwater assessment for a chemical manufacturing facility in Gainesville, Florida. Prepared a SWPPP to support an NPDES stormwater multi-sector general permit application.

**Task Manager; Cooling Reservoir Assessment, SECI**—Conducted thermal assessment to evaluate the potential impacts of Hardee Unit 3 design modification on the existing cooling reservoir at SECI's Hardee Power Station.

**Project Engineer; Dye Dispersion Study, SJRWMD**—Conducted a comprehensive dye dispersion study to assess the mixing zone characteristics of the Buckman Outfall from JEA's domestic WWTP. Rodamine WT fluorescent dye was continuously injected into the outfall as tracer for 3 days. Longitudinal, lateral, and vertical profiles of salinity and fluorescence were measured, analyzed, and interpreted.

**Project Engineer; Hydrologic Evaluation for Wetland Mitigation Banking, City Management, Inc.**—Conducted hydrologic study to evaluate the feasibility of creating wetland for the purpose of mitigation banking in Wayne County, Michigan. Determined the surface runoff pattern in the project area and established hydraulic design scheme to maintain the hydroperiod in the wetlands.

**Task Manager; Water Quality Evaluation for Slag/Sluice Conversion at Gannon Station, Tampa Electric—**Conducted water balance and water quality studies to evaluate the project design to convert an existing saltwater slag tank into a recycling freshwater slag tank at the F.J. Gannon Station, Tampa Florida. Plant water use was modified to maximize wastewater recycle, reduce groundwater quality impacts, and to improve the treatment efficiency of a reverse osmosis system.

**Task Manager; Water Quality Evaluation for Slag Pond Conversion at Big Bend Station, Tampa Electric**—Conducted water balance, heat balance, and water quality studies to evaluate the project design to convert an existing once-through saltwater slag pond into a recycling freshwater slag pond in Tampa, Florida. Plant water use was modified to maximize wastewater reuse. The water quality at the converted slag pond was computed.

**Task Manager; Hydraulic Modeling, Williams Farm**—Conducted hydrologic and hydraulic modeling to determine the effects of canal maintenance, or lack of it, on the flood event at Williams Farm during Hurricane Wilma. Hydraulic model ICPR was used to simulate flood hydrographs. Testified as expert witness during a trial.

**Project Engineer; ERP Application Reviews, Northwest Florida Water Management District (NWFWMD)**—Conducted permit reviews on behalf of NWFWMD for various ERP applications associated with stormwater management design for commercial, residential, and institutional development. Conducted site investigations and prepared review reports.

**Project Manager; Stormwater Pollution Prevention Plan for T. Eston Marchant Headquarters Complex, South Carolina Army National Guard (SCARNG)**—Prepared a stormwater pollution prevention plan and best management practices for the T. Eston Marchant Headquarters Complex in Columbia, South Carolina, according to the requirement of the SCDHEC NPDES General Permit for stormwater discharges associated with industrial activity. Conducted field investigation to verify drainage pattern and to identify non-stormwater discharges.

**Project Engineer; Mixing Zone Analysis, Tampa Electric**—Conducted nearfield chemical mixing analysis to re-evaluate the size of the iron and copper mixing zones according to recent regulation changes regarding water quality standard. The mixing zones for the outfalls at the Big Bend and Gannon stations in Tampa, Florida, were evaluated.

**Project Engineer; Water Quality Assessment for Proposed Residential Docks in Kiawah River, Kiawah Resort Associates**—Conducted hydraulic and water quality assessment to determine the potential environmental impacts of private residential docks in Kiawah River and the adjacent unnamed tributary on Kiawah Island, South Carolina. The long-term effects of potential boat discharges on water quality were evaluated. Expert witness at the administrative hearing.

**Project Manager; Drainage Plan, Leesburg Training Site, SCARNG**—Prepared a master drainage plan for a military tank parking area. Conducted soil percolation test to support a non-discharge design. Prepared grading plan, ditching plan, and paving plan for the motor pool.

**Project Manager; SWPPP, SCARNG**—Prepared SWPPP for 14 South Carolina National Guard OMS facilities. Conducted field reconnaissance to determine drainage pattern, identify potential source of stormwater pollution, and non-stormwater discharges. Prepared best management plan for each facility.

**Principal Investigator; Mixing Zone Analysis for SECI**—Conducted a thermal mixing zone analysis for the cooling water discharge from two coalfired steam electric generating units on the St. Johns River near Palatka, Florida. Initial mixing models PLUME and OUTPLM were used to determine the extent of the thermal mixing zone.

**Task Manager; Stormwater Management for Kathleen Mine, Lane Construction**—Conducted stormwater management and hydrologic/hydraulic modeling, using ICPR to assess the potential hydrologic impact of a limestone mine in Polk County, Florida. Assisted in the preparation of an ERP application.

**Project Engineer; Water Resources Study for a 3,200-MW Coal-Fired Power Plant, Florida Power Corporation (FPC)**—Conducted flow and tidal study in St. Joseph Bay and Lake Wimico in Gulf County, Florida. Performed spectrum and harmonic analysis for tide data recorded at five gauges to establish the tidal and flow pattern in the receiving water system. Applied RECEIVII model to assess the water quality impacts of the plant discharge.

**Project Engineer; Structural Investigation of Old Shands Bridge**—Inspected the remnant of the Old Shands Bridge in St. Johns County, Florida, to determine its structural integrity. Feasibility study was conducted to evaluate the design alternatives of repairing or rebuilding the existing structure into a fishing pier. Conducted preliminary design, cost analysis, and environmental permit for the demolition and refurbishing of the old structure.

**Project Engineer; Navigation Channel and Basin Improvement for Vilano Boat Basin, City of St. Augustine, Florida**—Designed dredging plan for the Vilano boat basin and the entrance channel improvement. Designed terminal groin at the channel entrance to prevent siltation and sediment accumulation in the basin. Also designed the dredged material disposal plan.

**Project Engineer; Carrabelle Wharf, City of Carrabelle**—Prepared conceptual design and marina slip layout for the Carrabelle Wharf in the Florida Panhandle. Also conducted conceptual design of a boat ramp and parking area at the project site. Conducted water quality assessment to evaluate turbidity impact of the dredging activity, using DREDGE model. Assisted in the preparation of an ERP application.

**Task Manager; Thermal Plume Study for a Coal-Fired Power Plant, FPC**—Conducted thermal plume study to assess the nearfield mixing zone and farfield thermal dispersion resulting from the cooling tower blowdown from Crystal River Unit 4 and 5 plants. Three dimensional model PDS and Transient Plume Model was used to determine the farfield impacts. PLUME and OUTPLUM models was used to assess the nearfield and initial mixing.

**Project Manager; Flushing Study for Proposed River Bay Waterfront Development, Sarasota, Florida**—Water quality model RECEIVII was used to simulate basin flushing under various design conditions.

**Task Manager; Canal Flushing Assessment, Placido Bayou**—SWMMII model was used to predict flushing time of a proposed boat basin and the canals system in a residential development in St. Petersburg, Florida.

**Project Manager; Hydraulic Analysis, Seminole Expressway**—Conducted hydraulic and hydrological analysis to assess the impacts of a proposed cross lake expressway over Lake Jessup in Seminole County, Florida. The analyses included current modification, flooding, sediment transport, and wind induced mixing.

**Task Manager; Wetland Nutrient Uptake Study for Poinciana New Township**—Collected the water quality data in Florida's Reedy Creek Swamp and Lake Russell to determine the nutrient assimilation capacity of the swamp and to evaluate the feasibility of utilizing the swamp for secondarily treated wastewater disposal.

**Project Manager; Master Drainage Plan Design, Nassau County**—Designed the master drainage plan for Annie Pines, a single-family residential community near Callahan, Florida. This development included two large manmade lakes which serve as an amenity as well as stormwater retention ponds. The drainage system (road, lakes, outfall structures) was designed for 25-year, 24-hour storm in compliance with SJRWMD requirements. Lakes were designed to provide detention with filtration to satisfy stormwater quality provisions of FDEP 6225 stormwater rules. Designed the outfall channel with significant tailwater constraints to drain into Big Funk Creek swamp. Performed drainage calculation and channel sizing necessary for preparation for the dredge and field permit.

**Principal Investigator; Environmental Assessment for Marina Expansion, Golden Isle Marina**—Conducted water quality impact assessment for the expansion of Golden Isle Marina in Brunswick, Georgia. Water quality and oyster sampling was conducted to assess the potential impact to shellfish resources. Erosion and sedimentation impacts were also determined.

**Principal Investigator; Permitting and Construction Services, Naples City Dock**—Design and permitting for the expansion of the City Marina, including the electric upgrade, replacement of underground fuel tanks, and addition of slips in Naples, Florida. Prepared bid documents and provided field services.

**Principal Investigator; Planning and Permitting, Armada Marina**—Planning, design, and permitting for a proposed marina at Bob Sikes Cut, Apalachicola Bay, Florida.

**Task Manager; Myrtle Beach Farms Marina**—Conducted preliminary feasibility study for marina along the Intracoastal Waterway in Myrtle Beach, South Carolina. Study included evaluation of water quality and flushing of the marina; preliminary design and planning studies were completed following the feasibility study.

**Project Manager; Water Quality Assessment, Christenbury Marina**—Conducted hydrological, water quality, and coastal engineering assessment for a proposed marina in Little River, Myrtle Beach, South Carolina.

**Project Manager; Sediment Transport Analysis, Belle Isle Marina**—Conducted sediment transport analysis for Bell Isle Marina in Winyah Bay, South Carolina, which has severe silting problem. Structural alternatives were recommended to prevent future shoaling.

**Principal Investigator; Bay Creek Village Marina, Edens and Avant Inc.**—Conducted engineering and environmental studies for development of a coastal marina on the South Edisto River, South Carolina.

**Project Manager; Lowrie's Canal Hydraulic and Flushing Analysis, St. Johns River**—Conducted hydraulic analysis to assess the water quality and flushing of a proposed canal at a residential community in Astor, Florida The effects of surface runoff, current, and wind-induced circulation were considered.

**Project Manager; Marina Permitting for Lighthouse Harbor, Pringle Development**—Conducted marina planning, design, and environmental permitting services for a 60-slip commercial docking facility on Little Lake Harris in Lake County, Florida. Conducted an environmental assessment to address potential water quality impacts, endangered species, archaeological resources, wetland impacts, and mitigation. A hydrographical and dispersion study was conducted to evaluate water quality impacts. An ERP application was prepared.

**Project Manager; Thermal Mixing Zone Study, Nebraska Public Power District**—Conducted thermal mixing zone study for the Canaday Station on Tri-County Canal near Lexington, Nebraska. CORMIX-GT was used to simulate the thermal mixing. Water temperature profile data collected in 2 years were used to calibrate the model.

**Task Manager; Hydraulic Assessment, FPL Energy**—Conducted hydraulic analysis to determine the potential hydraulic and flooding impacts of a 1.2-MGD cooling tower blowdown from Lamar Energy Center near Paris, Texas, on a small receiving stream.

**Project Manager; Quality Assurance/Quality Control (QA/QC) of Flow Measurement Data at Hydraulic Structures, SFWMD**—Responsible for preparation of QA/QC plan to ensure the quality of flow measurement data (QMEAS) collected at hydraulic structures. Prepared standard operating procedures to evaluate the flow data quality, identify invalid data, and correct data entry errors. Implemented the QA plan and evaluated 2,326 data records in QMEAS collected at 219 locations including spillways, culverts, and pump stations within the District. The quality of the QMEAS data is instrumental to the integrity of the District's corporate database, DBHYDRO. Responsible for the mentoring of an ECT employee providing QA/QC of flow measurement data while assigned to the SFMWD offices located in West Palm Beach, Florida.

**Task Manager; Drainage Assessment, Navasota Energy**—Conducted site investigation and hydraulic evaluation to provide solution to the flooding problem at the Colorado Bend Energy Center at Wharton, Texas. Evaluated the existing drainage design and recommended potential solutions.

**Task Manager; Evaporation Pond Analysis, Navasota Energy**—Conducted hydrologic and thermal balance analysis to evaluate the design of an evaporation pond at the Odessa Power Plant in Odessa, Texas. Used CE-QUAL-W2 model to conduct evaporation and thermal balance analysis.

**Research Assistant; Flow Field and Turbulence Analysis**—Performed model studies for ocean thermal energy conversion plant to investigate the flow field and turbulence characteristics near the OTEC plant. Conducted experimental studies for internal waves and stratified flow, and field investigation for a tidal inlet. Operated and calibrated constant temperature hot-film anemometry and various electronic instruments.

**Research Assistant; Floating Power Plant Wave Analysis, Coastal and Oceanographic Engineering Research Laboratory**—Performed physical model studies for the response of an offshore floating nuclear power plant to long waves. The added mass of the floating platform and the resonant mechanism in the breakwater structure were investigated.

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## *Education*

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| M.E. | Coastal and Oceanographic Engineering<br>University of Florida | 1975 |
| B.S. | River and Harbor Engineering<br>National Taiwan Ocean University | 1971 |

## *Registrations/Certifications*

Professional Engineer, Florida, Civil, No. PE0030688
Professional Engineer, Florida, Structural, No. PE0030688
Professional Engineer, South Carolina, Civil, No. 9979
Professional Engineer, Georgia, Civil, No. 14794
Professional Engineer, North Carolina, Civil, No. 16897
Professional Engineer, Texas, No. 98830
Professional Engineer, Virginia, No. 0402 045296

## *Affiliations*

American Society of Civil Engineers
Member of Stormwater Management Model User's Group

## *Publications*

Chou, I.B. 1975. An experimental investigation to the interfacial waves generated by lower frequency internal waves. M.E. thesis, University of Florida.

Chou, I.B. 1975. Interfacial waves generated by finite amplitude internal waves. Transaction, American Geophysical Union, 56(12):1005.

Chou, I.B. 1976. Flow field near an ocean thermal energy conversion plant. Coastal Engineering Conference, 4:3068.

Chou, I.B. 1976. Flow field near an OTEC plant. Report 76/006, Coastal and Oceanographic Engineering Archives, University of Florida.

Chou, I.B. 1977. The instability of internal gravity waves. Technical Report No. 32, Coastal and Oceanographic Engineering Archives, University of Florida.

Chou, I.B. 1981. Calibration of the RECEIV model for a well mixed tidal estuary using equilibrium procedure. Proc. Stormwater and Water Quality Management Modeling Group Meeting, Niagara Falls, Canada.

Winton, T.C., Chou, I.B., Powell, G.M., and Crane. J.D. 1981 Analysis of coastal sediment transport processes from Wrightsville Beach to Fort Fisher, North Carolina. Miscellaneous Rep. No. 81-6, Coastal Engineering Research Center.

Chou, I.B., Powell, G.M., and Winton, T.C. 1983. Assessment of beach fill performance by excursion analysis. Proc. of the Third Symposium on Coastal and Ocean Management, ASCE, San Diego, California.

Chou, I.B. and Danek, L.J. 1985. Hydrodynamics and Water Quality Modeling in An Estuary with Multiple Boundaries. Proc. Stormwater Management Models Users Group Meeting, Gainesville, Florida, 1985.

Dickinson, R.E., Chou, I.B., and Ramsey, F.V. 1986. A RECEIV-II expert system in Turbo Pascal. Proceedings of Stormwater and Water Quality Model Users Group Meeting.

# Curriculum Vitae (Brief)

**Jeffrey E. Hill**
Tropical Aquaculture Laboratory, University of Florida
Ruskin, FL 33570

## Education:

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| 2003 | PhD | UF Department of Fisheries and Aquatic Sciences |
| 1998 | MS | UF Department of Fisheries and Aquatic Sciences |
| 1991 | BS | Department of Biology, University of North Alabama |

**Years of Experience:** UF: 10 Other Firms: 5

Dr. Hill will conduct fish collections, identification, and photography. He has extensive experience with fish sampling and boat electrofishing. Since 1996, he has regularly sampled south Florida canals with boat electrofishing. Dr. Hill has considerable expertise in fish identification and identifies on average 30-45 fish lots (one or more individual fish) for state and federal agencies, county extension faculty, and Sea Grant faculty each year. Dr. Hill has taken over 4,000 digital photographs of native and non-native fishes, aquatic habitats, and fish sampling in the last 6 years.

## Professional Experience:

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| 2012-present | Associate Professor and Extension Specialist, SFRC Program in Fisheries and Aquatic Sciences, University of Florida |
| 2006-2012 | Assistant Professor and Extension Specialist, SFRC Program in Fisheries and Aquatic Sciences, University of Florida |

## Professional Services Provided

Biological Monitoring and Assessments

- Fish surveys

## Selected Publications (of 63 publications):

Hardin S, JE Hill. 2012. Risk analysis of barramundi aquaculture in Florida. North American Journal of Fisheries Management 32:577-585.

Lawson LL Jr, JE **Hill**, L Vilizzi, S Hardin, GH Copp. 2012. Revisions of the Fish Invasiveness Scoring Kit (FISK) for its application in warmer climatic zones, with particular reference to peninsular Florida. Risk Analysis DOI: 10.1111/j.1539-6924.2012.01896.x

Thompson KA, JE Hill, LG Nico. 2012. Eastern mosquitofish resists invasion by nonindigenous poeciliids through agonistic behaviors. Biological Invasions 14:1515-1529.

Hill JE 2011. Emerging non-native species issues for aquaculture. USDA-Southern Regional Aquaculture Center, Stoneville, Mississippi.

Hill JE, AR Kapuscinski, T Pavlowich. 2011. Fluorescent transgenic zebra danio more vulnerable to predators than wild-type. Transactions of the American Fisheries Society 140:1001-1005.

Hill JE 2009. Risk analysis for non-native species in aquaculture. USDA-Southern Regional Aquaculture Center, Stoneville, Mississippi.

Hill JE 2008. Non-native species in aquaculture: terminology, potential impacts, and the invasion process. USDA-Southern Regional Aquaculture Center, Stoneville, Mississippi.

Hill JE, P Zajicek. 2007. National aquatic species risk analysis: a call for improved implementation. Fisheries 32:530-538.

**Select Professional Service:**

President, Introduced Fish Section of the American Fisheries Society (2009-2012)
Member, Governing Board, American Fisheries Society (2009-2012)
Associate Editor, Biological Invasions
Associate Science Editor, Fisheries

**Louis H. Motz, PhD, PE, D.WRE** UNIVERSITY OF FLORIDA

**ASSOCIATE PROFESSOR, DEPARTMENT OF CIVIL AND COASTAL ENGINEERING**

## Education

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|---|---|---|---|
| PhD | 1970 | Water Resources Engineering | Vanderbilt University |
| MS | 1969 | Water Resources Engineering | Vanderbilt University |
| BE | 1966 | Civil Engineering | Vanderbilt University |

Registration: Professional Engineer in Florida
Certification: Diplomate, Water Resources Engineer (D.WRE), American Academy of Water Resources Engineers (American Society of Civil Engineers)

## Specialization:

Analytical and Numerical Modeling of Groundwater Systems, including Variable-Density Groundwater Flow and Transport and Saltwater Intrusion in Coastal Aquifers

## Professional Services Provided:

Environmental Monitoring and Assessments

- Groundwater (levels and quality)
- Hydrogeologic Characterizations (geophysical logging, aquifer testing, formation interpretation)

Technical Analysis (MFLs, Water Reservations, etc.)
Assessment of Ecosystem Responses to Hydrologic and Nutrient Inputs Using Empirical Data and Mechanistic Modeling
Statistical Analysis and Water Use Permitting Database Assistance for the Completion of the Annual Estimated Water Use Report
Statistical Modeling
Expert Witness and Independent Peer Review
Public Notification, Public Meetings and Presentations to the Governing Board

## Selected Project Experience:

**Florida as a Laboratory for Global Urbanization, Sea Level Rise, and Future Health Risks of Drinking Water Sources. 2012-2013.** Using SEAWAT to develop a variable-density groundwater model as a planning tool in Broward County to evaluate changes in chloride, TDS, and bromide concentrations due to projected sea-level rise, pumping increases, and changes in aquifer recharge resulting from urbanization and climate change.

**Pilot Study of Groundwater-Level Monitoring Network Design for the Upper Floridan Aquifer. 2012. South Florida Water Management District, West Palm Beach, FL.** Designed a groundwater-level monitoring network for the Upper Floridan aquifer within the boundaries of the South Florida Water Management District that recommends the number and locations of monitoring wells that will provide equivalent or better quality data compared to the existing monitoring network.

**Groundwater Flow Model for Flagler and Parts of Adjacent Counties. 2010. Palm Coast Utilities, Palm Coast, FL.** Developed a groundwater flow model for Flagler County and adjacent counties using MODFLOW-2000, utilizing Groundwater Vistas to prepare input and output files and to run MODFLOW. The model, which represents seven aquifer and confining units in the study area, was calibrated for average 1995 conditions and used to simulate pre-development conditions and to predict the impacts of pumping in four regulatory scenarios requested by the St. Johns River Water Management District.

**Lake Wimauma: A Hydrologic Evaluation to Investigate the Minimum Lake Level. 2008-2009. Water & Air Research, Inc., Gainesville, FL.** As part of investigation of Lakes Wimauma and Carlton in Hillsborough County conducted for the Southwest Florida Water Management District, Brooksville, Florida, compiled long-term lake-level, groundwater, rainfall, and potential evapotranspiration data and developed polynomial approximations for lake-surface area and volume versus stage relations. Also determined monthly water-budget components for changes in lake storage and inflows and outflows as part of water-budget calculations performed for both lakes.

**Drawdown Impacts Due to Proposed Pumping at Well TP-1 at the Tampa Bay Water Regional Surface Water Treatment Plant. 2009. Tampa Bay Water, Clearwater, FL.** Investigated the mitigating effect that the Tampa Bypass Canal will have on drawdowns in the Upper Floridan aquifer adjacent to the Hillsborough River Groundwater Basin due to proposed pumping at the Tampa Bay Water Regional Surface Water Treatment Plant. The investigation included simulating the hydraulic connection between the Tampa Bypass Canal and the underlying Upper Floridan aquifer by an increased vertical hydraulic conductivity in the confining unit between the canal and the aquifer and using analytical and numerical modeling techniques to estimate drawdowns for four pumping scenarios.

**Screening Level Evaluation of the Potential Influence of Proposed Surface-Water Withdrawals on Groundwater Discharge, 2008. St. Johns River Water Management District, Palatka, FL.** Calculated changes in groundwater discharge and chloride flux that will occur into the St. Johns River (SJR) and Lower Ocklawaha River (LOR) due to proposed surface-water withdrawals. Simulations were performed using existing MODFLOW groundwater flow models to calculate net groundwater discharge and chloride flux that will occur from the Upper Florida aquifer into relevant segments of the SJR and LOR including both diffuse upward leakage and point discharges into major springs and also to estimate base-flow reductions that have occurred due to groundwater pumping in the study area.

# E. Lynn Mosura-Bliss, MA, PWS

## SENIOR SCIENTIST

## EDUCATION

MA, Zoology, University of South Florida
BA, Zoology, University of South Florida

## CREDENTIALS/ORGANIZATIONS

- Professional Wetland Scientist, Society of Wetland Scientists
- American Planning Association
- Wetland Assessment Procedure (WAP)
- FDEP Qualified Stormwater Management Inspector

**YEARS OF EXPERIENCE** With Water & Air: 31 With Other Firms: 5

## CAREER SUMMARY

Ms. Mosura-Bliss is an ecologist with experience conducting biological assessments and wildlife habitat characterizations throughout the Southeast. She has conducted over 250 initial and secondary assessments of vegetation communities and wildlife conditions on sites from Nassau County to Dade County, Florida. She is skilled in upland and wetland mapping and endangered and threatened species surveys. She has assisted with the ecological inventory and development of nature-based parks in north and central Florida. She has performed monitoring of State of Florida conservation lands, prepared master plans for city and county parks, developed interpretative materials for nature trails, and conducted numerous gopher tortoise surveys and relocations.

## PROFESSIONAL SERVICES PROVIDED

Environmental Monitoring and Assessments

- Surface Water (levels, discharge, and quality)
- Collection and/or Analysis of Hydrologic, Piezometer, or Other Types of Data

Biological Monitoring and Assessments

- Fish, Avian, and Herpetofauna Surveys
- Habitat Mapping and Assessments
- Specific Species Surveys
- Jurisdictional Delineations
- Submersed, Emergent, Wetland and Riparian Vegetation Surveys

Soils Assessment
Cultural Resource Assessments
Development of Effective Water Quality Monitoring Plans
Univariate and Multivariate Statistical Analysis and Modeling
Environmental Permitting Support
Expert Witness and Independent Peer Review
Public Notification, Public Meetings and Presentations to the Governing Board
Project Management and Quality Assurance/Control

## SELECTED PROJECT EXPERIENCE

**Ecological Monitoring of Potable Water Wellfields, Hillsborough, Pasco, Pinellas Counties, FL, Tampa Bay Water.** Project Biologist responsibilities included establishing monitoring stations, performing wetland monitoring, analyzing wildlife data, and preparing annual reports.

**Wetland Assessment Procedures (WAP) Transect Setup, Pasco and Hillsborough County, FL, SWFWMD.** Project Biologist responsibilities included establishing elevation controls for vegetation transects, documenting site specific conditions, conducting wetland monitoring and preparing reports.

**Minimum Flows and Levels and Benthic Macroinvertebrate Spatial Distribution Evaluation of the Crystal River and Kings Bay, FL, Citrus County, FL, SWFWMD**. Project Biologist responsibilities included conducting literature search and synthesis, performing data analysis and report preparation.

**Minimum Flows and Levels and Benthic Macroinvertebrate Spatial Distribution Evaluation for the Pithlachascotee River, SWFWMD.** Project Biologist responsibilities include conducting literature search and synthesis, performing data analysis and report preparation.

**Management Plan for Lake Frances Preserve, Hillsborough County, FL, Hillsborough County Parks, Recreation and Conservation Services.** Project Manager and Planner responsibilities included field site inspection, coordination and communications with staff, and plan preparation for a 1,664-acre preserve in northwest Hillsborough County.

**Lake Dan Preserve Land Management Plan, Location: Hillsborough County, FL, Hillsborough County Parks, Parks, Recreation and Conservation Department.** Project Manager/Biologist responsibilities included client communication and coordination, field survey work, data analysis and report preparation.

**Restoration and Landscape Plan Implementation for Circle B-Bar Reserve, Polk County, FL, Polk County Natural Resources Division**. Project Manager responsibilities included client communication; subcontract administration and oversight of contractors providing plants, mulch, aerial herbicide application, and mechanical planters. Ms. Mosura-Bliss also organized planting teams, provided on-site supervision of field crews, planned for field logistics , prepared a safety and contingency plans.

**Endangered and Threatened Species Survey for North Belle Terre Park, Flagler County, FL, Bellomo-Herbert & Company, Inc.** Project Manager responsibilities included conducting reconnaissance and gopher tortoise burrow survey, mapping gopher tortoise burrow locations with GPS, and report preparation.

## David L. Evans, PhD, PWS

### Senior Scientist

### Education

PhD, Environmental Engineering Sciences, University of Florida
MS, Biology (Fisheries Management), Tennessee Tech. University
BS, Biology, Earlham College

### Credentials/Organizations

- Professional Wetland Scientist, Society of Wetland Scientists
- FDEP-certified in SCI, LCI, and Bioreconnaissance (Biorecon)
- OSHA Health and Safety Training
- Florida Lakes Management Society
- N. American Lakes Management Society
- North American Benthological Society
- Founder, Past President, Past Executive Committee Member, Florida Association of Benthologists
- Florida Entomological Society

### Years of Experience

With Water & Air: 32 With Other Firms: 5

### Career Summary

Dr. Evans has experience in the field of aquatic and wetland ecology. His areas of expertise include water quality compliance monitoring and documentation, fish and macroinvertebrate surveys, mapping and quantitative characterization of aquatic macrophyte communities, wetland mitigation design and evaluation, natural resource audits, contamination audits, and biological inventories. He has also participated in developing biological aspects of environmental documentation for numerous Environmental Assessments, Environmental Impact Statements, Planned Unit Developments, and Developments of Regional Impact. Dr. Evans has presented numerous technical workshops and scientific papers related to wetland permitting and biological monitoring in aquatic and wetland systems. He has authored or co-authored over 100 technical reports, articles, and scientific papers.

### Professional Services Provided

**Environmental Monitoring and Assessments**

- Surface Water (levels, discharge, and quality)
- Collection and/or Analysis of Hydrologic, Piezometer, or Other Types of Data

**Biological Monitoring and Assessments**

- Fish, Avian, Herpetofauna, and Macroinvertebrate Surveys
- Habitat Mapping and Assessments
- Specific Species Surveys
- Submersed, Emergent, Wetland and Riparian Vegetation Surveys

Development of Effective Water Quality Monitoring Plans
Univariate and Multivariate Statistical Analysis and Modeling
Environmental Permitting Support
Expert Witness and Independent Peer Review
Public Notification, Public Meetings and presentations to the Governing Board

Project Management and Quality Assurance/Control

## SELECTED PROJECT EXPERIENCE

**Ecological Monitoring of Potable Water Wellfields, Hillsborough, Pasco, Pinellas Counties, FL, Tampa Bay Water.** Project Biologist responsibilities included performing fieldwork, analyzing hydrobiological data, and preparing reports.

**Environmental Water Sampling and Analysis, 11-County North Florida Area, SRWMD.** Benthic Invertebrate Identification Expert responsibilities included benthic invertebrate enumeration for samples collected within the project area.

**Minimum Flows and Levels and Benthic Macroinvertebrate Spatial Distribution Evaluation of the Crystal River and Kings Bay, FL, Citrus County, FL, SWFWMD**. Project Manager responsibilities included client communication, project coordination, data analysis, and report preparation.

**Minimum Flows and Levels and Benthic Macroinvertebrate Spatial Distribution Evaluation for the Pithlachascotee River, Pasco County, FL, SWFWMD.** Project Manager responsibilities included client communication, project coordination, data analysis, and report preparation.

**Minimum Flows and Levels and Mollusc Survey for the Homosassa River, FL, Citrus County, FL, SWFWMD.** Project Manager responsibilities included client communication, project coordination, data analysis, and report preparation.

**Biological Assessment for Determining Minimum Flows and Levels, Shell Creek, Charlotte County, FL, Mote Marine Laboratory.** Project Manager responsibilities included supervision of core and sweep sample identification and enumeration and taxonomic QA/QC, client communication, project coordination, data review, and report preparation.

**Minimum Flow Determination of the Alafia River, Hillsborough County, FL, Mote Marine Laboratory.** Project Manager responsibilities included invertebrate counts and identifications, QA checks, data analysis and interpretation, client communication, project coordination, and report preparation.

**Determination of Submerged Aquatic Vegetation Light Requirements in the Lower St. Johns River, Various Locations in East Florida, SJRWMD.** Project Manager responsibilities included planning and design, use of Li-Cor instruments to measure light attenuation, overall management of data collection, analysis evaluation, client communication, project coordination, and reporting.

# Kirk M. Stage, BS, PWS

## SENIOR SCIENTIST

## EDUCATION

BS, Botany, University of Florida

## CREDENTIALS/ORGANIZATIONS

- Professional Wetland Scientist
- Certified Wetland Delineator
- FWC Gopher Tortoise Authorized Agent
- Stormwater Management Inspector-FDEP
- Wetland Assessment Procedure Training (WAP)

## YEARS OF EXPERIENCE

Years with Water & Air: 32 Years with Other Firms: 4

## CAREER SUMMARY

Since 1978 Mr. Stage has worked as a biologist in Florida and the southeastern United States environments. While fieldwork is a significant portion of his professional work, he also has served as manager on numerous projects. He has performed biological site evaluations on small and large tracts of land. His field experience, aerial photographic interpretation skills, and land-use mapping capabilities provide an excellent foundation for biological projects. He has also performed site-specific surveys for protected plant and animal species; designed and implemented cost-effective environmental monitoring programs for permit compliance; and managed numerous Environmental Assessments and Environmental Impact Statements for compliance with the National Environmental Policy Act (NEPA).

## PROFESSIONAL SERVICES PROVIDED

**Environmental Monitoring and Assessments**

- Surface Water (levels, discharge, and quality)
- Collection and/or Analysis of Hydrologic, Piezometer, or Other Types of Data

**Biological Monitoring and Assessments**

- Fish, Avian, Herpetofauna and Phytoplankton Surveys
- Habitat Mapping and Assessments
- Specific Species Surveys
- Jurisdictional Delineations
- Submersed and Emergent Wetland and Riparian Vegetation Surveys

Soils Assessment
Development of Effective Water Quality Monitoring Plans
Environmental Permitting Support
Expert Witness and Independent Peer Review
Public Notification, Public Meetings and Presentations to the Governing Board
Project Management and Quality Assurance/Control

## SELECTED PROJECT EXPERIENCE

**Ecological Monitoring of Potable Water Wellfields, Tampa Bay Water, Hillsborough, Pasco, Pinellas Counties, FL.** Project Manager responsibilities included managing the project, performing wetland vegetation surveys, analyzing hydrologic data, preparing reports, habitat mapping, expert witness for administrative hearings and supported the client in permit applications.

**Consumptive Use Permit Renewal for Brooker Creek Preserve Environmental Augmentation, Tampa Bay Water, Hillsborough and Pinellas Counties, FL.** Project Manager responsibilities included preparing CUP permit preparation, South Florida Water Management District correspondence and meetings, and public meeting participation.

**Wetland Assessment Procedure (WAP) Transect Setup, Southwest Florida Water Management District (SWFWMD), Pasco and Hillsborough Counties, FL.** Project Manager/Field Biologist responsibilities included wetland survey, agency meetings, data analysis, quality assurance, and report preparation.

**Aquatic Habitat Survey for Jacksonville Harbor, USACE- Jacksonville District, Jacksonville FL.** Project Manager responsibilities involved mapping submersed, emergent, and riparian habitats in the 595-acre study area, jurisdictional delineations, environmental permitting support through calculating mitigation acreages for proposed impacts using GIS analysis of field data.

**NEPA Environmental Impact Statement for the Continued Use of the Pinecastle Range (Ocala National Forest) as a Live-Fire Bombing Range, US Navy Southern Division, Marion and Lake Counties, FL.** Project Manager and Biologist responsibilities included project management, data compilation and analysis, report writing, public notification, public meetings, and agency meetings.

**District-wide Mitigation Services Contract, Florida Department of Transportation (FDOT) District V, throughout Florida.** Project Biologist responsibilities included wetland vegetation surveys, data analysis, permit support, maintenance recommendations, and report preparation.

**Wetland Evaluation for Mitigation Determination and Support Services, St. Johns River State College, St. Johns County, FL.** Project Biologist responsibilities included field work, habitat mapping and assessments, permit support, UMAM evaluations, agency meetings, and planting plan preparation.

**Ecological Site Characterization of Smith and Little Ranch for NRCS, Jones Edmunds & Associates, Inc., Okeechobee County, FL.** Field Biologist responsibilities included field work and report and map preparation. The large-scale habitat mapping and assessment information was collected to assist in the development of a restoration plan to restore degraded wetlands.

# Douglas G. Strom, BS

## SENIOR SCIENTIST

## EDUCATION

BS, Applied Biology, Georgia Institute of Technology

## CREDENTIALS/ORGANIZATIONS

- Society of Wetland Scientists
- FDEP-certified for Plecoptera, Megaloptera, Neuroptera, and Trichoptera identification
- FDEP Riparian Habitat Certification
- FDEP-certified for SCI, LCI, and Bioreconnaissance (Biorecon)
- First Aid, CPR, and Bloodborne Pathogen Training/Certification
- OSHA Health and Safety Act Training "Hazwoper" training
- OSHA RCRA Hazardous Waste training
- Florida Wetlands: Successful Creation, Restoration & Enhancement Training Course

**YEARS OF EXPERIENCE** With Water & Air: 13 With Other Firms: 23

## CAREER SUMMARY

Mr. Strom is an aquatic ecologist specializing in estuarine benthic macroinvertebrate taxonomy. He is skilled in performing data analysis, including statistical analysis, and writing reports including articles for submission to peer-reviewed literature; biological and water quality sampling, and sample processing. He has experience in environmental monitoring, research and assessment, involving aquatic biological monitoring using macroinvertebrates, fish, plants, and other organisms in relation to physico-chemical, biological, and water quality conditions. He has participated in planning and implementing multi-disciplinary water quality studies involving integrated biological and water quality sampling, and supervised technician teams working on these projects. He is also experienced in regulatory enforcement and permitting, especially as it relates to water quality, water quality regulations, and biological monitoring.

## PROFESSIONAL SERVICES PROVIDED

Environmental Monitoring and Assessments

- Surface Water (levels, discharge, and quality)

Biological Monitoring and Assessments

- Fish, Avian, Herpetofauna, Phytoplankton, and Macroinvertebrate Surveys
- Habitat Mapping and Assessments
- Specific Species Surveys

Development of Effective Water Quality Monitoring Plans
Univariate and Multivariate Statistical Analysis and Modeling
Environmental Permitting Support
Public Notification, Public Meetings and Presentations to the Governing Board
Project Management and Quality Assurance/Control

## SELECTED PROJECT EXPERIENCE

**Ecological Monitoring of Potable Water Wellfields, Hillsborough, Pasco, Pinellas Counties, FL, Tampa Bay Water.** Project Environmental Scientist responsibilities included statistical analysis of wildlife observation data.

**Environmental Water Sampling and Analysis, 11-County North Florida Area, SRWMD.** Project Biologist responsibilities included data entry and automated statistical index calculation for benthic invertebrate data from samples collected within the project area.

**Benthic Macroinvertebrate Spatial Distribution and Minimum Flows and Levels Evaluation of the Crystal River and Kings Bay, Citrus County, FL, SWFWMD**. Project Scientist responsibilities included macroinvertebrate identification, QA, data management, statistical analysis, including univariate and multivariate procedures, data interpretation, and report writing.

**Benthic Macroinvertebrate Spatial Distribution and Minimum Flows and Levels Evaluation of the Pithlachascotee River, Pasco County, FL, SWFWMD.** Project Scientist responsibilities included macroinvertebrate identification, QA, data management, statistical analysis, including univariate and multivariate procedures, data interpretation, and report writing.

**Mollusc Survey for Establishing and Maintaining Minimum Flows and Levels in the Homosassa River, Citrus County, FL, SWFWMD**. Project Taxonomist responsibilities included macroinvertebrate identification, QA, and data management.

**Minimum Flows and Levels Evaluation of the Chassahowitzka, Manatee, and Braden Rivers, Citrus and Manatee Counties, FL, Mote Marine Laboratory.** Project Biologist responsibilities included performing benthic invertebrate identifications and QA/QC checks.

**Biological Assessment for Determining Minimum Flows and Levels, Shell Creek, Charlotte County, FL, Mote Marine Laboratory.** Project Biologist responsibilities included taxonomic identification and QA/QC.

**Assessment of the Impact of Lead Pellets Upon Benthos in a Saline Environment, St. Augustine, FL, St. Augustine Rod and Gun Club (Sid Ansbacher).** Project Biologist/Field Team Leader responsibilities included project planning, leading fieldwork, macroinvertebrate identification, data analysis, and report preparation.

**Aquatic Species Diversity List for Seminole Tribe of Florida, Broward and Glades County, FL, Seminole Tribe of Florida**. Project Manager responsibilities included leading field work, aquatic species identification, data analyses, and report preparation.

**Biological Assessment of a Citrus Concentrate Plant Wastewater Discharge, St. Joseph Sound, Panama City, FL, Grove Scientific.** Project Biologist responsibilities included macroinvertebrate identification, quality assurance, and data management.

# Charles R. Fellows, MS

## QAO/Environmental Chemist

### Education

MS, Water Chemistry, University of Florida
BS, Biology, Eckerd College

### Credentials/Organizations

- Health and Safety Training: OSHA (29 CFR 1910.120) Supervisor Training
- Ecological and Human Health Risk Assessment Course (U.S. Army Corps of Engineers--DOTS)
- Member, Society of Environmental Toxicology and Chemistry

**Years of Experience** With Water & Air: 33 With Other Firms: 2

### Career Summary

Mr. Fellows is an environmental chemist with experience in chemical analytical laboratory supervision and coordination; contamination assessments; surface and groundwater quality assessments; monitoring plan design; data review and interpretation for waters, sediments, soils, wastes, and biological tissues; collection of water, soils, sediments, and biological samples for chemical, physical, and bioassay testing; project management, and report preparation. He is the corporate Quality Assurance Officer (QAO) for Water & Air and has served as a project QAO under contracts for other firms.

### Professional Services Provided

Environmental Monitoring and Assessments

- Groundwater (levels and quality)
- Surface water (levels, discharge, and quality)
- Collection and/or analysis of hydrologic, piezometer, or other types of data
- Laboratory analysis (sediment)

Soils Assessment
Development of Effective Water Quality Monitoring Plans
Environmental Permitting Support
Expert Witness and Independent Peer Review
Public Notification, Public Meetings and Presentations to the Government
Evaluation of historic, current and future water budgeting
Project Management and Quality Assurance/Control

### Selected Project Experience

**Lake Wimauma Hydrologic Evaluation for Minimum Lake Level Determination, Hillsborough County, FL, SWFWMD.** Project Manager responsibilities included fieldwork, data analysis, and report preparation.

**Ecological Monitoring of Potable Water Wellfields, Hillsborough, Pasco, Pinellas Counties, FL, Tampa Bay Water.** Project Environmental Chemist responsibilities included performing QA/QC, and preparing reports.

**Environmental Water Sampling and Analysis, 11-County North Florida Area, SRWMD**. Quality Assurance Officer responsibilities included review and evaluation of in-situ and chemical data.

**Determination of Submerged Aquatic Vegetation Light Requirements in the Lower St. Johns River, Various Locations in East Florida, SJRWMD, Quality Assurance Officer**. Project responsibilities include experimental design and quality control/assurance review of the data.

**Predredging Sediment Evaluation of Tampa Harbor, Tampa, FL, USACE**. Project Manager responsibilities included field work, data analysis, subcontractor coordination and report preparation.

**Hydrographic, Bathymetric, and Limn logical Investigation at Lake Harris, Florida, for Proposed Dock, Leesburg, FL, Atlanta Housing Partnership, LLP.** Project Manager responsibilities included developing work scope after discussion with regulatory personnel; designing and constructing drogues; collecting field data collection and water samples; interpreting dye monitoring and water quality measurement data; and writing final report.

**Florida Statewide Stream Condition Index Evaluation and Water Quality Monitoring, Florida Peninsula, FDEP, Assistant Project Manager/Quality Assurance Officer.** Project responsibilities included leading field teams, review and auditing of procedures by Water & Air field personnel, and instrument maintenance.

**Key West Background Turbidity Monitoring, City of Key West, FL**. Project Manager and Field Team Leader responsibilities included mobilizing the multiple field teams; coordinating with Naval Base security, Coast Guard, and the City of Key West; constructing, servicing, and removing monitoring stations and instrumentation; reducing, evaluating, and transmitting collected data; maintaining all field documentation; providing the client with interim reports and photographs from the field; measuring water current speed and direction; overseeing preparation of the graphical presentation of data; and writing the final report.

**Predredging Sediment Evaluation for Alafia River, Tampa, FL, PPB Environmental Laboratories, Inc.** Project Manager responsibilities field work, data analysis, subcontractor coordination and report preparation.

**Florida Statewide Stream Condition Index Evaluation and Water Quality Monitoring, Florida Peninsula, FDEP.** Assistant Project Manager/Quality Assurance Officer responsibilities included leading field teams, review and auditing of procedures by Water & Air field personnel, and instrument maintenance.

# APPENDIX B

# PEER REVIEW COMMENTS

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Name and Affiliation of Reviewer: Ivan B. Chou, IBC Consulting**

**Discipline specialty covered by this review: Water Resources and Coastal Engineering**

This document is for the use of project peer reviewers retained by the Suwannee River Water Management District (District) for the purpose of providing a technical peer review of a District report, including manuscripts prepared by District staff and consultants.

SCOPE OF REVIEW REQUIRED BY THE DISTRICT:

***Task 1.*** **Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

A. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The reviewer shall assume the following:

1. The data and information used were properly collected;
2. Reasonable quality assurance assessments were performed on the data and information;

*Note: The reviewers are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.*

B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:

1. If the assumptions are clearly stated, reasonable and consistent with the best information available; and
2. Assumptions were eliminated to the extent possible, based on available information.

C. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:

1. The procedures and analyses were appropriate and reasonable, based on the best information available;
2. The procedures and analyses incorporate appropriate factors;
3. The procedures and analyses were correctly applied;
4. Limitations and imprecision in the information were reasonably handled;
5. The procedures and analyses are repeatable;
6. Conclusions based on the procedures and analyses are supported by the data.

***Task 2.*** **If a proposed method used in the MFL report is not scientifically reasonable, the CONTRACTOR shall:**

A. Deficiencies: List and describe scientific deficiencies;
B. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
C. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of time and effort required to develop and implement; and
D. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.

REVIEW CONSTRAINTS

CONTRACTOR and Peer Reviewers shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes) affecting the DISTRICT's development of MFLs. CONTRACTOR and Peer Reviewers shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board (hereinafter referred to as "givens") is not included in the scope of work. These givens include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels are to be set;
2. The determination of the baseline from which "significant harm" is to be determined;
3. The definition of what constitutes "significant harm" to the water resources or ecology of the area

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Instructions:**

1. The results of this review are for the use of the District and they are not to be revealed to others without the express permission of the District.
2. By signing this form, the reviewer certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042(5), in the discipline noted above.
3. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

| Signature of Reviewer: | Date of Peer Review: 11/17/2015 |
|---|---|

**Responders Certification:** The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

| **Name and Affiliation of Responder to Peer Review Comments:**<br>Steven J. Peene, Applied Technology and Management, Inc. / Anthony Janicki, Janicki Environmental, Inc. | |
|---|---|
| **Signature of Responder:** | **Date of Response:** January 8, 2016 |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 1 | p. 2-1, 2nd par, line 4 | No | It stated that limited reach was selected for the study because of the lack of the existing information further upriver. However, the data presented in Sections 2.1.2, 2.1.4, 2.1.6, 2.1.7, and 2.1.9 were mostly from upriver. | Please be specific about the essential information that was lacking in the upriver. | The listing of generalized data (e.g. rainfall) in subsequent report sections is intended to "set the stage for the reader; not to imply that data was useful in establishing the MFL, as noted in the follow-on context of page 2-1. Bathymetry data was limited to below R.M. 3.6 and as such defined the river reach that was studied. The report text has been clarified. |
| 2 | p. 2-1, Section 2.1 | No | The study area is strongly influenced by tides. However, there is no discussion about tide, current, and water level. | Include tides, currents, and water level in the physical setting. Relate MSL, MLW, MHW, MLLW to NAVD elevation. Additionally, a discussion somewhere in the report about | The tides in the area and the relationship of the various datums in the comment versus NAVD88 are |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| | | | | the water level changes due to flow reduction, compared to the tidal fluctuation, may be relevant. | presented within the Appendix A report. |
| 3 | p. 2-7, Section 2.1.3 | No | Water depth is dependent on tide. However there was no discussion on tidal motion. | When the "water depth" is referenced, the water level from which the depth was measured should be stated (e.g., MSL, MHW, MLW, MLLW, etc.) | Done |
| 4 | p. 2-8, 3rd par, | No | Does the author mean the bottom elevation ranged from 1 to 10 feet-NAVD? In the context of MFLs, the depths at MLW or MLLW probably is more useful. | Please clarify. Also see Comment 3. | Done |
| 5 | p. 2-8, Figure 2-5 | No | Volume is dependent on water level. The water surface elevation should be defined. | Please add footnote about the water/tide level. Please consider including the cumulative volume curves at MHHL and MLLW. | Done |
| 6 | p. 2-9, Figures 2-6 and 2-7 | No | Bottom and shoreline length are dependent on water level. The water surface elevation should be defined. | Please add footnote about the water/tide level. Please consider including the cumulative bottom | Done |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| | | | | area and shoreline length curves at MHHL and MLLW. | |
| 7 | p. 2-7, Section 2.1.3 | No | Cumulated water body volume (Figure 2-5) is good information. However, the waterbody volume is dependent on water level, which can be significantly reduced when large area of marsh and floodplain were exposed at low tide. The tidal prism (the upstream volume between high and low tides) offers valuable information. For example, the ratio between the tidal prism is an indicator of tidal flushing, and the ratio of daily freshwater flow volume and tidal prism can be an indicator of the classification of an estuary (saline, brackish, fresh, stratified, partially stratified, or well mixed). | A discuss on tidal prism and a presentation of the tidal prism versus river miles are recommended. It can be compared to the river flow volume during a tidal cycle. | The waterbody volume at a specified salinity and the change in that volume represents the change in habitat that species see. As the model accounts for all of the volume changes listed in the comments, i.e. tidal fluctuation, flooding and drying, the volumes are the appropriate parameter to be presented and analyzed in the MFL. The tidal prism varies over time and is not a static parameter versus river mile. Since average daily values of flows and volumes are |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| | | | | | what were used in the MFL analysis, the suggestion does not add needed information for the MFL analysis. Therefore no changes were made. |
| 8 | p. 2-10, Figure 2-8 | No | This figure seems to be a presentation poster, which contains too much information that yields no discernible data on a letter size paper. | Recommend reducing the amount of information and presenting on tablet size paper. An x-y graph of the cross-section average depth or maximum depth at MLW or MLLW would be useful information. | Formatting change noted for future revision of MFL document. |
| 9 | p.2-11, Figure 2-9 | No | There is no information about the monitoring program that was implemented during the study (tide, flow, water quality). | The monitoring stations established for this study along with historical water level and tide stations should be presented. | This information is given in Appendix A. |

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| 10 | p.3-1, 3rd par, 1st bullet | No | editorial | Change "boundaries of and shape" to "boundaries and shape of" | Done. |
| 11 | p.3-2, Section 3.1, 3rd line | No | Where is USGS 02326000? | Please show this station location on a map. | This is shown in Figure 2-9. USGS number added. |
| 12 | p.3-2, last par, line 4 | No | Searcy (1959) is not in the reference list. | Include the reference in Section 6.0. | Added. |
| 13 | p.3-2, last par, line 12 | No | Vogel & Fennessey (1994) is not in the reference list. | Include the reference in Section 6.0. | Done |
| 14 | p. 3-4, Figure 3-2 | No | How do you compare the FDC with the flow timeseries? | Please explain the usefulness of overlaying these two graphs. Otherwise, make them into two figures for clearer presentations. | Figure has been used in previous MFL documents and is recommended in peer-reviewed articles like Vogel & Fennessey (1994). |
| 15 | p. 3-6, Section 3.2.4 | No | How does the authors conclude that WRV4 is of less importance for the Econfina River? | Please explain. | There are no data to allow further analysis and this is based on best professional judgement. |

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| 16 | p. 3-7, Section 3.2.8 | No | Sediment loads are dependent on particle characteristics and flow velocity. "Low turbidity" may be indicative of low suspended load, not necessarily the bed load. What is the importance of sediment loads in the context of MFLs? | Please clarify "low turbidity" with numeric values (how low). Stream and tidal velocity should be discussed to evaluate sediment loads. Pleases explain the significance of the sediment loads. | Wording is clarified. |
| 17 | p. 3-7, Section 3.2.8, line 4 | No | FDEP (2003) has no title in the reference section. | Please include the document title in section 6.0. | This reference was removed from the text. |
| 18 | p. 3-8, Table 3-1 | Yes | What was the basis for assigning the specific scores for each WRV? | Please elaborate for each WRV to explain/justify the scores. | These scores are based on best professional judgement and best available information. From HSW, Inc. and Janicki Environmental (2015). |
| 19 | P. 3-8, 2nd par | Yes | Why do you choose a score of 7 as the threshold of being relevant? Why is a WRV with a score of 6 considered irrelevant while the one with a score of 7 is considered relevant? | Please explain the criteria for scoring. | These scores are based on best professional judgement and best available information. |

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| | | | | | From HSW, Inc. and Janicki Environmental (2015). |
| 20 | P3-9, 2nd par, line 3. | No | Recreational users are affected by water level changes, not necessarily the flow reduction, because depths of the study area are strongly influenced by the tides. | Please clarify. | All factors (tides, winds, etc.) that affect water level changes are implemented in the model. The purpose of an MFL is to ascertain whether flow reductions would cause significant harm. |
| 21 | P3-9, 3rd par, | Yes | Here, five WRVs with a score of 6 or higher were selected. It seems to be inconsistent with the statement in page 3-8 (three WRVs with a score of 7 are potentially relevant). | Please clarify. | These scores are based on best professional judgement and best available information. Reference to Table 3-1 was corrected. |
| 22 | P. 3-10, Table 3-2 | No | The table headings should be defined/explained in the text or footnotes. | Please explain/define each heading (indicator, relevance, response function, metric, and key source). Please consider moving Table 3-2 to the | This table was derived from the HSW and Janicki Environmental report. The table headings are self-explanatory. |

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| | | | | beginning of Section 3.2 for clarity and include all 10 WRVs, which can then be used to determine the scores. | |
| 23 | p. 3-10, Table 3-2, 1st WRV, last column | No | HSW (2012) is not included in Section 6.0. | Please include reference in Section 6.0. | Added. |
| 24 | p. 3-10, Table 3-2, 2nd WRV | No | SRWMD (2014) is not included in Section 6.0 | Please include reference in Section 6.0. | Added. |
| 25 | p. 3-10, Table 3-2, 2nd WRV, 3rd column | No | Habitat in terms of vegetation cover should be mentioned. | Include vegetation/wetland in relevance. | Wetland relevance is identified. |
| 26 | p. 3-10, Table 3-2, 3rd WRV, 2nd column | No | The indicator of 0.5 to 35 ppt salinity range is not consistent in the analysis subsequently presented in Section 4-2, where a threshold of 0 ppt, instead of 0.5 ppt was used (page 4-5, 4th line) | The analysis should be consistent with the criteria stated in Table 3-2. | Text revised. |

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| 27 | p. 3-10, Table 3-2, 3rd WRV, 5th column | No | Should salinity and estuarine volume also be part of the metrics? | Add salinity and waterbody volume to the metrics. | Revised. |
| 28 | p. 3-11, 1st sentence | Yes | "a 15 percent reduction in the river volume less than a critical salinity" probably should be reworded. This sentence seems to imply that the river flow can be reduced by 15 percent from the level that supports a critical salinity. If that is what the author meant, significant harm would occur. | Please reevaluate this statement. | A 15% reduction in flow does not necessarily result in a 15% reduction in habitat. This should not be inferred. Rather, many critical flows that result in a 15% reduction in habitat can be much smaller or greater that 15% and are dependent upon the specific waterbody and baseline conditions. |
| 29 | P3-11, 2nd par, 1st sentence | No | "15 percent loss of habitat" is not clear. Is it by volume, bottom area, or shoreline length? Also, 15 percent loss from what condition? Is it from MSL, MLW, MLLW, or average condition? | Please clarify. A discussion on tidal influence may put the manmade changes (flow reduction) in perspective. | The analysis evaluates the degree of habitat reduction in terms of all three metrics – |

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| | | | Again, the tides would become important in this context. The author should establish what the volume, area, or shoreline changes are by naturally occurring tidal fluctuations. | | volume, bottom area, and shoreline length. |
| 30 | P4-3, 1st bullet, 6th line | No | The author should present the total permitted flow, compared to the stream flow to support the statement that there is little water use in the Econfina River watershed. | Please provide essential information to support the statement. | There are no data. |
| 31 | p.4-3, 1st bullet, last line. | No | The stated information was not found in Section 2.1.3. It seems that the information may be in Sections 2.1.4 and 2.1.6. | Please make correction where applicable. | Revised. |
| 32 | p.4-3, last par, 2nd sentence. | No | Yes, the behavior of salinity response to changes in freshwater inflow are well known. However, the tidal influence on salinity distribution is also important. There was no discussion of the tidal effect of estuarine salinity. | Please consider adding discussion on tidal effect on salinity. | All factors (tides, winds, etc.) that affect water level changes are implemented in the model. The purpose of an MFL is to ascertain whether flow |

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| | | | | | reductions would cause significant harm. |
| 33 | p.4-3, last par, last line. | No | The references SWFWMD (2008a) and SWFWD (2008b) were not in the reference list. | Please provide references in Section 6.0. | Done. |
| 34 | p.4-4, 2nd par, line 5 | No | It may not be true that the salinity concentrations are expected to be lower near the water surface and higher near the bottom for **any** particular location in the lower river. Some estuary can be well-mixed, depending on the relative value of the freshwater flow and tidal flow, or tidal prism. | Please consider reevaluating this statement. | Text revised. |
| 35 | p.4-4, 4th par, 4th line | No | The author should clearly define "oligohaline." | According to the Venice system for marine water classification, the oligohaline zone has a salinity between 0.5 and 5.0 ppt. | Oligohaline generally refers to low salinity habitats. |
| 36 | p.4-4, last par, 8th line | No | Beck et al. 2000 was not found in Section 6.0 | Please include the reference. | Added. |

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| 37 | p.4-4, last par, 10th line | No | The references SWFWMD (2008a) and SWFWD (2008b) were not in the reference list. | Please provide references in Section 6.0. | Revised. |
| 38 | p.4-5, 1st par | No | According to most estuarine scientists and the Venice system of marine water classification, the freshwater is defined as less than 0.5 ppt. | Please consider using 0.5 ppt as the threshold. | The salinity ranges were operationally defined for this analysis. Using 0.0 or 0.4 will not materially affect the results. |
| 39 | p.4-5, 2nd par | No | Shellfish and submerged aquatic vegetation are stationary and may be most susceptible to salinity changes. | Please consider including discussion on salinity effects on shellfish and SAV. | These metrics were not used for this analysis. |
| 40 | P.4-5, 4th par, 4th line | No | SWFWMD (2009) was not found in the reference section. | Please add reference in Section 6.0. | Added. |
| 41 | p.4-6, 1st line | No | See Comment 38. | Recommend using 0.5 ppt instead of 0 ppt. | The salinity ranges were operationally defined for this analysis. Using 0.0 or 0.4 will not materially affect the results. |

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| 42 | p.4-6, 1st par, last sentence | No | The isohaline positions also change with the tides. Are the upstream-most, downstream-most, or other positions (such as daily or tidal cycle average) considered in this report? | Please clarify. | All factors (tides, winds, etc.) that affect water level changes are implemented in the model. The purpose of an MFL is to ascertain whether flow reductions would cause significant harm. |
| 43 | p. 4-6, Section 4.2.1 | No | Water depth changes with natural tidal fluctuation, in addition to flow reduction. The water depth changes by flow reduction could be less than the changes by tides in some of the study area. | Recommend including a discussion on tides, so the reader can compare the depth changes by flow reduction with the depth changes by astronomical tides. | All factors (tides, winds, etc.) that affect water level changes are implemented in the model. The purpose of an MFL is to ascertain whether flow reductions would cause significant harm |
| 44 | p.4-6, last par, 2nd second sentence | No | With this method of determining thalweg, the thalweg could consist of isolated deep pools, which does not allow fish passage. Thalweg is a continuous line that joins the lowest | Please better define thalweg and how it was determined for this study. | Thalweg is acommon term in hydrology and in context is self-explanatory. In addition, the purpose of the resulting MFL |

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| | | | points along the entire length of a stream bed (a valley). | | analysis in this case is to make sure that sufficient water levels are maintained along the thalweg such that isolated pooling will not occur. No changes made to text. . |
| 45 | p.4-6, last par, 9th line | No | The sentence gave a false impression that the model grid elevation was raised by 0.8 ft. | Please rephrase it to indicate that the flow was determined by allowing a minimum water depth of 0.8 ft along the thalweg (if it was the author's intention). | Revised. |
| 46 | p.4-8, 2nd line | No | What is the elevation of the floodplain? How was it determined? | Please explain. | The floodplain elevation was not explicitly used in this analysis. The "out-of-bank" elevation derived from LiDAR data was used as a reasonable estimate of the top of bank as |

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| | | | | | described in Sections 4.22, 4.3 and 5.3.2 |
| 47 | p.4-8, 2nd par | No | Was the duration of inundation considered for the analysis? | Please clarify. | No. |
| 48 | p.4-8, 4th par, 4th line | No | The report did not present any evidence that the upstream limit of the model is above the expected tidal influence. In fact, Figure 5-6 shows that at RM 3.1 (near the upstream limit of the model) the river is influenced by the tides. | Please verify. | The text in the document was refined in order to identify that the upper extent of the model was above the extent of salinity intrusion into the system. The primary purpose of the hydrodynamic model was to simulate the intrusion of salinity into the estuarine portions of the Econfina. In order to properly simulate this intrusion, it is not necessary to extend the model to the full extent |

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| | | | | | of tidal intrusion, but rather include sufficient area so that the tidal prism, passing the uppermost point of salinity intrusion, is accurately simulated. This was done for this model. There are other examples of hydrodynamic models utilized for MFL development (Suwannee River) where the model extents do not extend to the full extent of tidal intrusion. Additionally, the model went to the upper end of available bathymetric information. |

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| 49 | p.4-8, last par | No | Was the model grid 2-D or 3-D. | Please clarify. | 3D |
| 50 | p.4-8, last par, 4th line | No | Should the last word "extent" be deleted? | Please consider rewording. | Done. |
| 51 | p.4-10, 2nd par | No | What were the dimensions of the smallest and the largest grid cell? What was the lowest elevation of the grid cells? | Please consider providing information. | Information is provided in Appendix A. |
| 52 | p.4-10, last par, 1st sentence | No | Why was it stated that the selected 2-year period was an appropriate match for the period of record? Figure 4-4 seemed to show that the 2001-2003 data did not have sufficient low flows when compared to the period of record. | Please explain. | This period was used as it best reflected the long-term flow record given the best available information. Some discrepancies are expected, but Figure 4-4, in the authors professional judgement, indicates sufficient correspondence with the long-term record for MFL purposes. |

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| 53 | p.4-11, Figure 4-3 | No | "WY & WY-1" in the legend were not defined. | Please define. | Done. |
| 54 | p. 4-13, Figure 4-5 | No | It was not clear if the "Mid-River Site" values were predicted or actual measurement. | Please clarify. | Measured as stated in the figure caption. |
| 55 | p.5-1, 4th line | No | Water quality (WRV9) has a total score of 7 (Table 3-1). Why it was not selected for MFL establishment? | Please clarify. | It was considered for MFL establishment. However, based on the available data, there is no significant relationship between river flow and water quality. Therefore its utility in establishing the MFL is very limited. |
| 56 | p. 5-1, Section 5.0 | No | Salinity is strongly influenced by tides, especially during low stream flows. The evidence can be seen in Figures 5-7 through 5-12. And yet, there is no discussion on the tidal influence. All results presented were daily average | Recommend including some discussion on tidal influence, compared to freshwater flow influence. It may strengthen the conclusion that the recommended MFL flow regime | All factors (tides, winds, etc.) that affect water level changes are implemented in the model. The purpose of an MFL is to ascertain whether flow |

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| | | | values. The salinity changes by tides at a fixed point during a tidal cycle could be greater than the salinity changes by 15% flow reduction. The change in isohaline position during a tidal cycle could be also greater than the change in isohaline position by 15% flow reduction. | will prevent the resources from significant harm. | reductions would cause significant harm |
| 57 | p.5-2, 2nd line | Yes | Could "40 cfs" be a typographical error? | Please correct when applicable. | Revised. |
| 58 | p.5-2, 3rd par | No | Daily mean values were presented in Figures 5-1 through 5-12. Why did Figures 5-13 through 5-15 use monthly average values. | Please explain. | The authors deemed it helpful for readers to present data at several time scales. |
| 59 | p. 5-8, Figure 5-13 | No | In the legend, what was the definition of the salinity range (e.g., 0-5 ppt)? Is it the instantaneous values at each cell, is it an average value over some time period, or is it an average value over some space and time? | Please explain. | Daily averages for each model cell. |
| 60 | p. 5-9, Figure 5-14 | No | In the legend, what was the definition of the salinity range (e.g., 0-5 ppt)? Is | Please explain. | Daily averages for each model cell. |

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| | | | it the instantaneous values at each bottom cell, is it an average value over some time period, or is it an average value over some space and time? | | |
| 61 | p. 5-9, Figure 5-15 | No | In the legend, what was the definition of the salinity range (e.g., 0-5 ppt)? Is it the instantaneous values at each vertical cell, bottom cell, or shoreline cell; is it an average value over some time period; or is it an average value over some space and time? | Please explain. | Daily averages for each model cell. |
| 61a | p. 5-10, 2nd par, 1st line | No | "four percent reduction scenarios" can be misunderstood as "4% reduction scenarios". | Please consider rewording (e.g., "four flow reduction scenarios"). | Done. |
| 62 | p.5-10, 2nd par, 2nd sentence | No | Is "the mean daily salinity over the simulation period" simply a 2-year average? If that is the case, a simpler definition probably is better. | Please consider rewording. | Yes, this is a 2-year average. |
| 63 | p.5-10, 2nd par, 7th line | No | Which day was the daily mean computed on? Or was it the 2-year average? | Please define clearly. | This is a 2-year average. |

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| 64 | p.5-10, last par, 1st line. | No | What are the salinities of 0 ppt, 0-2 ppt, and 0-5 ppt? Are they the average salinity values at the shoreline cells? | Please clarify. | If a cell had a mean daily salinity=0 then it fell into the 0 ppt category. If a cell had a mean daily salinity either less than 2 ppt or less than 5 ppt then that cell would fall into the 0-2 ppt or 0-5 ppt category, respectively. |
| 65 | p. 5-11, Figure 5-16 | No | The figure title says "mean monthly river volume." Which month was it? There is no definition of the vertical axis. Is it the elevation in ft-NAVD or something else? There was no definition on 5% reduction. Was it 5% reduction in stream flow? There was no definition on percent difference. Was it percent reduction in some kind of volume, or else? | Please clarify. | This is cross sectional representation of the differences in salinity. The y-axis therefore is depth. The percent flow reductions are defined at the top of each panel. |
| 66 | p.5-12, Figures 5-17 and 5-18 | No | There was no definition of 5% reduction. Was it flow reduction? A | Please clarify. | Yes, it is a 5% flow reduction. The y-axes are defined. |

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| | | | uniform vertical scale on all figures probably is a clearer presentation. | | |
| 67 | p.5-13 | No | See Comment 66. | Please clarify. | Yes, it is a 5% flow reduction. The y-axes are defined. |
| 68 | p.5-14 | No | See Comment 66. | Please clarify. | Yes, it is a 5% flow reduction. The y-axes are defined. |
| 69 | p.5-15 | No | See Comment 66. | Please clarify. | Yes, it is a 5% flow reduction. The y-axes are defined. |
| 70 | p.5-16, Figure 5-25 | No | See Comment 66. | Please clarify. | Yes, it is a 5% flow reduction. The y-axes are defined. |
| 71 | p.5-16, 1st par, 1st sentence | No | "Response" is simulated. "Reductions" is not simulated (it is an assigned scenario). | Please consider rewording. | "The responses in the river volume, bottom area, and shoreline length at the three critical salinities to the simulated reductions" |
| 72 | p.5-16, 7th line | No | "comparison of the time series results" was not found. Do you mean | Please correct, if applicable. Please refer to a figure. | Figures 5-17 through 5-25 are all time series plots |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
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| | | | frequency distribution of the timeseries, or something else? | | |
| 73 | p.5-17, Figures 5-26 and 5-27 | No | See Comment 66. Are they non-exceedance or exceedance probability? | Please clarify. | These are not probabilities but rather simply the % of time a value was exceeded. The authors purposely chose to avoid use of "exceedance" due to its use in describing the characteristics of long-term flow records elsewhere in the report. |
| 74 | p.5-18, Figure 5-28 | No | See Comment 73. The figure title says "mean monthly". Should it be "mean daily" | Please clarify. | Corrected. |
| 75 | p.5-18, 2nd line | No | "four percent flow reduction scenarios" is confusing. It can be misunderstood as 4% flow reduction. | Please reword (e.g., "four flow reduction scenarios" instead of "four percent reduction scenarios). | There are four (4) scenarios which are each a percent flow reduction. Text has been added to clarify any misinterpretations |

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**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 76 | p.5-18, 3rd line | No | See Comment 72. | Please correct, if applicable. Please refer to a figure. | These are time series. |
| 77 | p.5-18, 1st and 2nd par, 4th and 7th lines | No | What are "small" and "moderate" differences? | Please provide numerical value (range, or maximum value, etc.). | There are no numerical values. Small and moderate are terms of comparison of results based on best professional judgement of the author. |
| 78 | p.5-19, 5-20, and 5-21 | No | See Comment 74. | Please clarify. | Done. |
| 79 | p.5-22, 2nd line | No | See Comment 75. | See Comment 75. | There are four (4) scenarios which are each a percent flow reduction. Text has been added to clarify any misinterpretations |
| 80 | p.5-22, 2nd par, first sentence | No | This doesn't seem to be a complete sentence. | Please rephrase. | Done. |
| 81 | p.5-22, 3rd par, 3rd line. | No | See Comment 75. | See Comment 75. | There are four (4) scenarios which are |

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| | | | | | each a percent flow reduction. Text has been added to clarify any misinterpretations |
| 82 | p.5-22, 4th par, last line | No | 15 percent difference of what? | Please clarify. | Reduction in river volume |
| 83 | p.5-22, last par, 1st line | No | 15 percent difference of what? | Please clarify. | Reduction in river volume within specified salinity ranges. Text added. |
| 84 | p.5-22, last sentence | No | Was the result sensitive to the selection of cumulative frequency (e.g., using 90th percentile, instead of the median value), and how will it affect the MFL? | Please evaluate. | Clearly, changing the statistic will give a somewhat different result but not to the point where the proposed MFL is affected. |
| 85 | p.5-23 | No | There should be a note about all values being the median values (according to the text on p.5-22). | Please clarify. | From page 5-22: "For example, the statistics compared in these tables were calculated by estimating the daily |

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| | | | | | river volume for a given salinity or salinity range for each day in the simulation period and deriving the median of those values for each model scenario." Text added. |
| 86 | p.5-24, 3rd par, 2nd line | No | See Comment 75. | See Comment 75. | There are four (4) scenarios which are each a percent flow reduction. Text has been added to clarify any misinterpretations |
| 87 | p.5-24, 3rd par | No | Isohaline shifts continuously with tides and flows. Please define "isohaline position." Was it the 2-year average position, or else? | Please clarify. | Yes, a 2-year average. |
| 88 | p.5-24, Table 5-4 | No | Percent difference in RM probably is not the best indicator of habitat change because the river width is not uniform. A better indicator is the actual area swept by the isohaline movement | Please consider the area difference. | The biological relevance is on the position of the isohaline. River volume is also |

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| | | | (acres), which then can be compared to the total habitat area. | | examined in this report. |
| 89 | p.5-25, Section 5.3.1, 3rd line | No | Why use the word "estimated" while EFDC was used for the computation? | Please reword where applicable. | The model results are estimates. |
| 90 | p.5-25, Section 5.3.1 | No | Water depth is affected by tides. However, there is no discussion on tidal effects. What depths were used for the assessment (daily average, daily low, or others)? The conclusion was made without presenting numeric values when they were available from EFDC model results. More specific information should be presented (e.g., the minimum water depth along the thalweg, the water depth changes by flow reduction, etc.) | Please elaborate, numerically, why the conclusion is justified. | There is no need for further elaboration. This discussion is similar to that presented in previous MFL documents |
| 91 | p.5-25, last par, 4th line | No | See Comment 75. | See Comment 75. | There are four (4) scenarios which are each a percent flow reduction. Text has |

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| | | | | | been added to clarify any misinterpretations |
| 92 | p.5-26, 2nd par, 2nd par, lines 4 and 5 | No | Vertical datum was not specified (1.92 ft-NAVD?). | Please provide datum information. | NAVD 88 |
| 93 | p.5-26, Section 5.3.2 | Yes | The bank elevation at RM 3.4 (the upper reach of the study area) was used for the out-of-bank flows analysis. The lower reaches of the river have different vegetation cover and topography. Would the conclusion be different if the bank elevations of the lower reaches were considered? | Please discuss the bank elevation of other reaches in additional to RM 3.4. | The area chosen for analysis is affected by both river flow and tides. The lower river is primarily affected by tides and much less so by tides. |
| 94 | p.5-26, Section 5.3.2 | No | The analysis seemed to use daily values. The water depth changes within a day because of tides. Which daily values were used (daily average, daily high, or others)? | Please clarify. | All daily values are means. |
| 95 | p.5-26, 4th par, 1st line | No | 88 days in what period? One year? | Please clarify. | 88 days over the entire model simulation period |

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| 96 | p.5-26, 4th par, last line | No | See Comment 95. | Please clarify. | days over the entire model simulation period |
| 97 | p.5-26, last par, 2nd line | No | See Comment 92. | Please clarify | All elevations are NAVD 88. |
| 98 | p.5-26 last par, 4th line | No | Why were the low flows in those 2 days not used in the analysis? According to the data presented, even lower flows were recorded during the period of record. | Please explain. | Those 2 days had spurious flow data. |
| 99 | p.5-26, last par, 5th line | No | The water versus flow relations were not established in the report. In fact, the water level is strongly influenced by tide. How was the threshold of 211 cfs derived? | Please explain. | Based on the relationship between river flow and water elevation. |
| 100 | p.5-26, last sentence | No | What if the stream flow is less than 211 cfs? | Please clarify. | Below 211 cfs a 23% flow reduction is proposed. |
| 101 | p.5-27, 2nd bullet | No | What resource is this MFL meant to protect? | Please describe. | Fish habitat in the floodplain vegetation |

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| 102 | p.5-27, Section 5.4 | No | Is the recommended MFLs protective of water quality? If yes, the reasons should be summarized. For completeness, Appendix D should be introduced and discussed in Section 2.1.9 (Water Quality) | Please elaborate. | There were no significant relationship between river flow and water quality that could be defensibly used to establish an MFL |
| 103 | p.5-27, last par | No | How were the MFL FDCs derived? What is the definition of "fitted MFL values"? | Please elaborate. | Text revised |
| 104 | p.5-27, Section 5.4 | No | The effects of sea level rise were not presented in the report. | Please consider including the sea level rise model results. | The effects of sea level rise are presented in Appendix B. |
| 105 | p.5-27, Section 5.4 | Yes | Was the effects of sea level rise considered for the MFL development? | Please clarify. | No. |
| 106 | p.5-28, Table 5-6 | No | The difference and percent difference between the baseline and MFL discharge should be included in the table. | Please add differences. | Done. |
| 107 | Appendix A, p.1-1, 1st sentence | Yes | The upstream limit of the model should start at the limit of tidal influence on water level, not the influence on | Please make sure the model domain includes all tidally influenced water bodies. If all | The primary purpose of the hydrodynamic model was to simulate |

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| | | | salinity. Some upper portion of an estuary may be beyond the reach of the salinity intrusion from the ocean, but it may still be affected by tidal motion. It is important to include all water bodies with tidal influence in the model because the tidal prism drives the hydrodynamics and affects the tidal flows and salinity transport. According to Figure 4-1 of the MFL report, the bottom elevation of the thalweg is lower than -2 ft-NAVD; therefore, it is most likely that some stretch of the river upstream of RM 3.6 is tidally influenced. | tidally influenced water bodies were not included, please at lease compute the tidal prism that was left out of the model and assess the potential error of the model predictions. | the intrusion of salinity into the estuarine portions of the Econfina. In order to properly simulate this intrusion, it is not necessary to extend the model to the full extent of tidal intrusion, but rather include sufficient area so that the tidal prism, passing the uppermost point of salinity intrusion, is accurately simulated. This was done for this model. There are other examples of hydrodynamic models utilized for MFL development (Suwannee River) where the model extents do not extend |

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| | | | | | to the full extent of tidal intrusion. Additionally, the model went to the upper end of available bathymetric information. |
| 108 | Appendix A, p.1-1, 2nd par, 3rd line | No | What is "apex" of the tidal prism? There ought to be a better word than "apex". | Please consider rewording. | Will change "apex" to "magnitude." |
| 109 | Appendix A, p.1-4, Figure 1-1b | No. | USGS 0232600 location was not marked on the map. | Please mark the station. | Will add this station to Figure 1-1b. |
| 110 | Appendix A, p.2-1, 1st par, 2nd sentence | No | What is the grid size of the GCSM Model in this area? Is the selected EFDC model boundary far enough offshore to account for the nearshore effects mixing? | Please verify. | The cells are on the order of 4 km per side at the outside boundary conditions. The offshore area was developed to allow accurate simulation of the interaction between the river flow and the nearshore/offshore |

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| | | | | | tidal dynamics at the mouth. The boundary matching at the mouth, which showed good agreement between the model and the data for salinity, reflects that this area was sufficient. |
| 111 | Appendix A, p.2-1, 2nd par, 4th line | No | Reference(s) about EFDC should be provided. | Please provide reference. | Done. |
| 112 | Appendix A, p.2-1, last par, 2nd line | No | Reference(s) about Blumberg-Mellor model should be provided. | Please provide reference. | Done. |
| 113 | Appendix A, p.2-2, Section 2.2 | No | More information should be presented about the model grid, such as the number of horizontal grid cells, number of vertical grids, minimum and maximum grid dimensions, maximum depth, simulation time step, etc. | Please consider providing information. | These specific information requests were added to the text in the Appendix A report. |

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| 114 | Appendix A, p.2-3, 1st line | No | What is the elevation of MSL, MHL, MLW, MHHW, and MLLW in NAVD at the mouth and/or other part of the Econfina River? | Please consider including the information in the report. | A table was added to the Appendix A report that shows the relationship locally between the various tidal stages and NAVD88 at a long-term NOAA station (8727956) titled Econfina River, Inside. Additionally the text was modified to add discussion of this table. The table and text were added to Section 2.3.1. The location of the tidal station was added to Figure 2-2. |
| 115 | Appendix A, p.2-3, 1st par | No | Were the floodplains in the upper reach of the system included in the model (as storage)? Can the model simulate wetting and drying of the marsh and floodplain dynamically? | Please clarify. | Floodplains in portions of the upper reach were included as shown on Figure 2-2 of the grid. Sufficient "storage areas" which |

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| | | | | | represent the impacts of the floodplain areas, were included so as to accurately simulate the tidal prism moving into the system. The model does simulate the wetting and drying anywhere in the model grid where cells would go dry based on the assigned bottom elevations. |
| 116 | Appendix A, p.2-3, last par, 6th line | No | What is the relationship between MLLW and NAVD88? | Please provide. | See response to comment 114 |
| 117 | Appendix A, p.2-7, 2nd sentence | No | Do you mean the "calibration period"? | Please clarify. Throughout this report, "calibration" and "MFL simulation" should be clearly differentiated. | The document was modified to clearly state in the Appendix A report when the calibration versus the MFL simulation period is being discussed. |

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| 118 | Appendix A, p.2-7, Section 2.3.1 | No | Section 1.1 indicated the boundary conditions were obtained from GCSM, which is in contradiction with the boundary matching process stated here. | Please clarify. | Section 1.1 was modified to clearly identify that the GCSM model was only used for the MFL simulations, not for the model calibration. |
| 119 | Appendix A, p.2-9, last par, 1st 2 sentences | No | The second sentence may not be correct. One of the reasons to have a model boundary offshore from the river mouth was that even if inaccurate conditions, including salinity profile, were used at the boundary, the hydrodynamic process might adjust the salinity distribution so that when the salinity "propagates" to the river mouth, the simulated salinity profile would be close to the reality. This does not necessarily prove that the offshore salinity was actually not stratified. | Please consider rephrasing or deleting the second sentence. | Text was reworded. |

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| 120 | Appendix A, p.2-9, last par, 3rd line. | No | Is this statement correct? Should it be EFDC instead of GCSM? | Please clarify. | No, GCSM is correct. But based on this comment, the text was modified to be clearer in referring to the GCSM model inputs to the EFDC model. |
| 121 | Appendix A, p.2-9, last sentence. | No | "important areas"? Do you mean the areas where the model simulation results were considered valid? | Please consider rephrasing. | This sentence was reworded. |
| 122 | Appendix A, p.2-10, 1st par | No | Using filtered ADCP data at Station 02326100 to represent upstream freshwater flow seemed to be a lot of effort and yet may introduce processing error. The noise (tidal velocity) can be significant compared to the signal (stream flow velocity). Why not install a flow meter at or near the model boundary? Or use the data at Station 023326090 for filtering. How about the freshwater flow contribution between the upstream model boundary and Station | Please clarify. | The 02326100 data were specifically collected to allow the development of the total freshwater inflow to the model boundary given the area between the upstream USGS gage and the estuarine portion of the Econfina. Filtering of tidal data is a common practice and (based on |

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| | | | 02326100? Was it considered for the model input (subtracted from the data at 0236100? A different method was described in the MFL report (page 4-12), which seems to be a reasonable approach. Which method was used when constructing the freshwater flow input at the model boundary? | | correlation with the upstream data from the USGS gage) did not appear to introduce significant error, but rather provided a more robust definition of the freshwater inflow. Additionally, the data measured at this location also allowed comparison of the tidally driven flows to assure the model captured the total tidal prism, an important aspect of the model performance. As such the data played a dual role. The methods used were the same and the wording was changed in Section 4-1 to further clarify. |

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| 123 | Appendix A, p.2-10, 1st par, last line | No | Where is SRWMD Station 02326550? | Please show it on a map. | This is a typo in the report. Station 02326550 was from the Aucilla River dataset. This was fixed in the report. |
| 124 | Appendix A, p.2-11, Section 2.3.4 | No | Were atmospheric and water temperature data used for the model boundary condition? | Please clarify. | Water temperature was not utilized. Generally it was found that temperature did not have a significant impact on the overall salinity intrusion (the parameter of interest) as its impact on density was limited in comparison to salinity. It is not believed that the inclusion would alter the results especially the relative comparisons of changes in salinity due to flow changes. |

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| 125 | Appendix A, p.3-6, Section 3.3 | No | It is confusing to use the term "calculated." It can be misunderstood as the model calculated. In this section, the "calculated" values seemed to be essentially flow data. | Recommend using "flow data" or "reconstructed flow data", instead of "calculated." | The text was reworded to reflect the comment. |
| 126 | Appendix A, p. 3-7, Figures 3-3a through 3-3f | No | "Observation" probably is a more intuitive word to use than "Discrete" | Please consider change. | Discrete was changed to direct in the text. |
| 127 | Appendix A, p.3-4, Sections 3.2 through 3.4 | No | Figures 3-2a through 3-4c, although look fine, did not reveal useful information because of the scale. Some correlation plots (simulated versus data) will be quite informative. | Please consider adding correlation plots for water level, flow, and salinity calibration. | Consideration will be given to this in future work efforts. |
| 128 | Appendix A, p.3-10, 9th line | No | Under the same freshwater flow conditions, usually the greatest level of salinity intrusion occurs during spring tide, not neap tide, because the spring tide pushes the salt farther upstream with stronger flood current. | Please check the model results against tides and flows to verify. | The data show that the maximum intrusion does occur during neap tide. This is a relatively common phenomena in systems that are strongly stratified. The |

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| | | | | | mechanism is that, during neap tide conditions, the reduced velocities and therefore reduced turbulent mixing allows stronger stratification to occur and the "tongue" of saline water "slides" further up the system driven by the stronger stratification. The author has measured this same phenomena in the Savannah River estuary and has been found in other riverine estuaries. |
| 129 | Appendix A, p.4-1, 1st par, last bullet | No | 5.1 inches in what duration? | Please clarify. | The 5.1 inches of sea level rise was based upon direction by SRWMD staff and was simply added as a constant to the |

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| | | | | | offshore water level forcing function. As such, it represents some static water level under a future condition and does not have a duration. |
| 130 | Appendix A, p.4-1 | No | The report jumped from MFL scenarios to summary and conclusion without any presentation of the results. | To make a stand-alone report, it is recommended that the results presented in the MFL report be presented in Appendix A. | Per instruction from the SRWMD, the Modeling Report only contained a description of the MFL scenario runs with their input conditions and not the results. Any results and analyses presented were to be included in the primary MFL document. |
| 131 | Appendix A, p.5-1, 4th paragraph | No | The boundary condition development seemed to use different methods for model calibration and application (boundary matching and GCSM | Please make it clear that the boundary matching was used just for the model calibration. | The text was modified to provide clarification. |

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| | | | model). This should be made clear to the readers and why different methods were used should be explained. | | |
| 132 | Appendix A, p.5-1 | No | The pertinent essential summary and conclusions presented in the MFL report should also be included here. | Please consider including the pertinent summary and conclusions presented in the MFL report. | The purpose of the Appendix A report was to provide a detailed discussion and presentation of the model calibration along with introducing the model runs used for the MFL analyses. The summary and conclusions presented in the MFL report therefore are not pertinent to the Appendix A report. |
| 133 | Appendix B, 1st page, 4th line | No | 5.1 inches rise in what period? | Please clarify; also present the rate of sea level rise (inch per year). | This sea level change is static, meaning the model did not simulate a change over time. |

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| 134 | Appendix B, 1st bullet | No | "volum e" | Please correct. | No space was found in the document. No change made. |
| 135 | Appendix B, 3rd bullet | No | "ris e" | Please correct. | No space was found in the document. No change made. |
| 136 | Appendix B, 1st page, 4th bullet | No | "volum e" and "ris e" | Please correct. | No space was found in the document. No change made. |
| 137 | Appendix B, 1st page, 5th bullet | No | "botto m" | Please correct. | No space was found in the document. No change made. |
| 138 | Appendix B, 1st page, 5th bullet | No | "relatively largest" | Please change it to "relatively large" or "largest," or something else. | These differences are the largest. |
| 139 | Appendix B, 2nd page | No | The figures on this page were not given a figure number. In addition, the page numbers were not provided. For easy interpretation by the readers, it is recommended that the vertical scale of all similar figures be the same. | Please provide figure numbers and page numbers. Please consider using uniform vertical scale. | The appendix is simply included to provide additional information |

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| 140 | Appendix B, Figures 1 through 3 | No | For a clear presentation and easy interpretation, it is recommended that uniform vertical scale be used for all three graphs. | Please consider using uniform vertical scale. | The appendix is simply included to provide additional information |
| 141 | Appendix B, Figure 4 | No | Figure 4 was not presented. | Please provide Figure 4. | The appendix is simply included to provide additional information |
| 142 | Appendix B, Tables 1 through 5 | No | The heading "Statistic" should be "Parameter". Were all values some kind of averages or something else? It should also be specified in the text on page 1. | Please clarify. | Done. |
| 143 | Appendix B, Figure 5 | No | Figure 5 was not referenced in the text. This figure is not self-explanatory and should be explained in the text. Also see Comment 65. | Please introduce Figure 5 in the text and provide interpretation. Also see Comment 65. | The appendix is simply included to provide additional information. |
| 144 | Appendix C, title page | No | "four percent flow reduction" can be misinterpreted as "4% flow reduction" | Please use "four flow reduction" or another clear term. | There are 4 scenarios which are each percent flow reductions. |
| 145 | Appendix C | No | A brief text should be provided to introduce and explain the figures. | Please provide brief text, pagination and figure number. | The appendix is simply included to provide additional information. |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| | | | Pagination and figure numbers should be provided. | | |
| 146 | Appendix C | No | "% Reduction" in the figures should be defined. Perhaps use "% Flow Reduction" to be specific. Also, see Comment 139. | Please consider making changes. | The appendix is simply included to provide additional information. |
| 147 | Appendix D | No | A brief text should be provided to introduce and interpret the figures. Figure number and page number should be assigned. Vertical scale and horizontal scale parameter should be defined. A map showing the water quality station should be provided. | Please consider providing the information. | The appendix is simply included to provide additional information. |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Name and Affiliation of Reviewer: Jeffrey E. Hill, PhD. University of Florida, School of Forest Resources and Conservation, Program in Fisheries and Aquatic Sciences**

**Discipline specialty covered by this review: Fish Ecology**

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2. Reasonable quality assurance assessments were performed on the data and information;

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B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:

1. If the assumptions are clearly stated, reasonable and consistent with the best information available; and
2. Assumptions were eliminated to the extent possible, based on available information.

C. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:

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2. The procedures and analyses incorporate appropriate factors;
3. The procedures and analyses were correctly applied;
4. Limitations and imprecision in the information were reasonably handled;
5. The procedures and analyses are repeatable;
6. Conclusions based on the procedures and analyses are supported by the data.

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C. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of time and effort required to develop and implement; and
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3. The definition of what constitutes "significant harm" to the water resources or ecology of the area

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Instructions:**

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| | |
|---|---|
| **Signature of Reviewer:** | **Date of Peer Review: 11/16/15** |

**Responders Certification:** The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

| | |
|---|---|
| **Name and Affiliation of Responder to Peer Review Comments:**<br>Steven J. Peene, Applied Technology and Management, Inc. / Anthony Janicki, Janicki Environmental, Inc. | |
| **Signature of Responder:** | **Date of Response:** January 8, 2016 |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 1 | Sec 2.1.8, pages 2-20 to 2-25 | No | No information on freshwater fish found in the basin. No mention if listed/imperiled species occur (none occur in the system). Historic collections of the rare Blackbanded Sunfish (*Enneacanthus chaetodon*) in the basin. | Add brief section on freshwater fishes including important species. | The focus of the MFL is on the habitat for estuarine fishes. |
| 2 | Sec 3.2.2, page 3-5 | No | No information on fish (besides a brief mention that low water can impede fish passage) in a section on fish and wildlife habitat. Wildlife species, primarily birds and mammals are mentioned. | Add brief section on fish and fish habitat. | Birds and mammals are not resources of concern for this MFL. |
| 3 | Sec 4.2.1, page 4-6 | No | American Shad is not native to the Gulf of Mexico coastal rivers of Florida. Widely introduced into rivers of entering the Gulf of Mexico in the late 1800s but not known to have established reproducing populations in this region. Therefore, American Shad would not be expected to use the Econfina River. | Remove mention of this species as a potential anadromous fish in the Econfina River | The text says it is not known for this river. |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Name and Affiliation of Reviewer: Louis H. Motz, Ph.D., P.E., D.WRE**

**Discipline specialty covered by this review: Hydrology and MFL Development**

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2. The procedures and analyses incorporate appropriate factors;
3. The procedures and analyses were correctly applied;
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3. The definition of what constitutes "significant harm" to the water resources or ecology of the area

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9. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

| **Signature of Reviewer:** | **Date of Peer Review: November 22, 2015** |
|---|---|
|  | |

**Responders Certification:** The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

| **Name and Affiliation of Responder to Peer Review Comments:**<br>Steven J. Peene, Applied Technology and Management, Inc. / Anthony Janicki, Janicki Environmental, Inc. | |
|---|---|
| **Signature of Responder:** | **Date of Response:** January 8, 2016 |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 1 | Fig. 2-1, p. 2-3 | No | Typo: Figure title indicates *cross-section* is shown. | Change *cross-section* to *profile*. | Done. |
| 2 | Section 2.1.3 | No | p. 2-7, line 26: "cross-section" is incorrect. | Change *cross-section* to *profile*. | Done. |
| 3 | Section 2.1.4 | No | Why is *median* rainfall reported instead of *mean* rainfall? | Report *mean* rainfall. | This is a simple descriptive statistic that is not biased by extreme events. |
| 4 | Section 2.1.4 | No | Typo on p. 2-12, line 4 | Change *emerges* to *emerging*. | Done. |
| 5 | Section 2.1.5 | No | Typo on p. 2-16, line 5 | Change *withlow* to *with low*. | Done. |
| 6 | Section 2.1.5 | No | The section "Seasonal Flow Patterns" describes a "northern river" pattern characterized by spring flooding, a "southern river" pattern characterized by fall flooding, and a transitional zone with a "bimodal" pattern characterized by both spring and fall flooding. It is inferred that this explains the bimodal pattern of the mean monthly flows for the Econfina River | Establish the validity of the explanation for the bimodal pattern of discharge of the Econfina River (Figure 2-16), i.e., is the Econfina River located in the transition zone between the northern and southern river patterns? How wide is the transition zone and | This is a generally accepted explanation for the observed patterns. |

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| | | | near Perry (see Figure 2-16). However, the Econfina River is well to the north and west of this climatic river-basin divide (see Figure 2-15) and thus may not be in the transition zone. Does this explanation of temporal flow patterns accurately explain the bimodal pattern of the mean monthly flows for the Econfina River near Perry that can be seen in Figure 2-16? | does it include the Econfina River? Alternately, if this cannot be established, just make note of the bimodal discharge pattern in Figure 2-16 without using an explanation that may not be consistent with the observed discharge data. | |
| 7 | Section 2.1.6 | No | Is total water use of 4.2 mgd only from groundwater sources or are there also surface-water withdrawals in basin? | Identify source (i.e., groundwater, surface water) for water use. | Only groundwater uses. |
| 8 | Section 2.1.9, p. 2-25, lines 15-16 | No | Water quality has been measured by the District at three stations (Figure 2-22): ECN005C1, ECN010C1, and ECN015C1. These stations are not identified by number in Figure 2-22. | Indicate the locations of stations ECN005C1, ECN010C1, and ECN015C1 in Figure 2-22. | The figure has been revised to include the station locations |
| 9 | Section 2.1.9, pp. 2-28 to 2-33 | No | Gaps in data in Figures 2-23, 2-24, 2-25, 2-26, 2-27, and 2-28 for SRWMD ECN010C1 – Econfina River near Perry should not be connected with horizontal or nearly horizontal straight lines. | Replot these figures without connecting obvious gaps in data. | There are no data points along that line. No need to replot. |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 10 | Section 3.1, p. 3-2, lines 27-28 and p. 3-4, Figure 3-2 | No | Re: The daily mean flow of the Econfina River near Perry (Figure 3-2) was at least 16 cfs 90 percent of the time. | Indicate on Figure 3-2 how this example value can be obtained. | This change was not incorporated into the graphic. The authors attempted to strike a balance between a technical audience and very interested stakeholders who are somewhat familiar with hydrologic representations. |
| 11 | Section 3.1, p. 3-3, lines 9-10 | No | Re: An exceedance probability of 0.5 (*the median*)…. Is exceedance probability of 0.5 the *median* or the *mean?* | Check whether an exceedance probability of 0.5 is the *median* or the *mean.* | Median |
| 12 | Section 3.2.9, p. 3-7, line 23 | No | p. 3-7, line 23: What does *FDER (2003)* refer to? Does this reference provide information about the relation between the Fenholloway River and the Econfina River (p. 3-7, lines 20-23) or is there another reference for this, i.e., FDER (2006) in section 3.2.7? | Identify reference(s) by title and reference/report number in section 6.0 REFERENCES. | This is based on the most recent impaired waters listing published by FDEP in 2014. Reference to FDEP website included |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 13 | Section 3.2.11, p. 3-8 | Yes | The three highest ranked WRV's in Table 3-1 are Fish/Wildlife Habitat and Fish Passage (WRV#2), Estuarine Resources (WRV#3), and Water Quality (WRV# 9). The next two highest ranked WRV's are Recreation (WRV#1) and Maintaining Freshwater Storage (WRV#5). The choices for the weighting factors and the resulting scoring in Table 3-1 are somewhat subjective and arbitrary. Are there peer-reviewed publications that support these values? | Provide reference(s) such as peer-reviewed reports and journal papers supporting the values used in Table 3-1. | The ranking was based on best professional judgement as reported in HSW, Inc. and Janicki Environmental (2015). |

| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
|---|---|---|---|---|---|
| 14 | Section 3.2.12, p. 3-9 | Yes | It is claimed that considering only the five highest ranked WRV's in Table 3-1, | Provide reference(s) such as peer-reviewed reports and | No action required. The authors recognize that the |

| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
|---|---|---|---|---|---|
| | and Table 3-2, p. 3-10 | | i.e., Recreation (WRV#1), Fish/Wildlife Habitat (WRV#2), Estuarine Resources (WRV#3), Maintaining Freshwater Storage (WRV#5), and Water Quality (WRV# 9), will also provide protection for the other five WRV's that are ranked lower in Table 3-1. This result, shown in Table 3-2, is subjective and somewhat arbitrary. | journal papers supporting the selection of the 5 WRV's listed in Table 3-2. | scoring system is qualitative. |
| 15 | Section 3.3, pp. 3-9, 3-11, and 3-12 | No | A 15 percent reduction in river volume is the proposed threshold for the development of the Econfina River MFL. This is justified based on a 15 percent threshold implemented by the Southwest Florida Water Management District and on a literature review of 366 articles by Jones Edmunds and Associates (2012). A five step approach, which consists of setting a goal, identifying the resource to be protected, defining an appropriate unit of measurement, defining a baseline flow regime, and defining a protection standard statistic (e.g., a prescribed percent reduction), is described. Overall, the 15 percent reduction is arbitrary and is based on what SWFWMD has done. | Provide reference(s) such as peer-reviewed reports and journal papers supporting the selection of the 15 percent reduction in river volume (p. 3-11). | Jones Edmunds and Associates (2012) and numerous MFL reports from SWFWMD and SRWMD. |

| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
|---|---|---|---|---|---|
| 16 | Section 4.1, p. 4-3, lines 9-13 | Yes | "WRV 1 Aesthetics [? In Table 3-2, WRV#1 is Recreation] and WRV 5 Freshwater Supply are not included due to lack of data." Also, "The relevant aspect of WRV 9 Water Quality is implicitly addressed by evaluating the relationship between river flow and salinity." | Correct apparent typo and identify WRV#1 correctly as Recreation. Identify what data would be needed to evaluate WRV#1 and WRV#5. Also, establish how plots in Appendix D indicate that the proposed MFL will be protective of the water quality in the Econfina River (see comment no. 17 below pertaining to p. 5-27). | Done.<br>Appendix D shows there are no significant relationships of water quality with river flow. |
| 17 | Section 5.4, p. 5-27, lines 8-10 | Yes | p. 5-27, lines 8-10: "Based on an examination of these plots [in Appendix D], the proposed MFL for the Econfina River will be protective of the water quality in the river." | How was this conclusion arrived at? Please explain this process. | Appendix D shows there are no significant relationships of water quality with river flow. |
| 18 | Section 6.0 | No | p. 6-1, Cichra et al. 2005: For whom was this study conducted?<br>p. 6-2, Florida Department of Environmental Protection 2003: What investigation/report is referred to?<br>p. 6-2, Jacobs and Ripo (2001) "Gainwsvilee" is a typo. | Indicate for whom Cichra et al. (2005) was conducted; indicate the investigation/ report that Florida Department of Environmental Protection (2003) refers to; and correct typo to "Gainesville." | SWFWMD<br>Typo fixed |

| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
|---|---|---|---|---|---|
| 19 | Appen-dix B | No | First page, first paragraph, lines 4-5: "The intermediate projection of 5.1 inches was used in the model…." | Provide equation from USACE (2011) that was used to calculate sea-level rise. | The sea level rise simulated was provided by the District staff and based on the equation listed in the documentation cited in Appendix B. |
| 20 | Appen-dix D | Yes | Is there any text that should accompany these figures? What relations between water quality and river discharge do these plots show (see p. 5-27, lines 8-10)? | Please refer to comment no. 17 above. How was this conclusion arrived at? Please explain this process. | These plots are included for additional information. |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Name and Affiliation of Reviewer: E. Lynn Mosura-Bliss, Water & Air Research, Inc.**

**Discipline specialty covered by this review: Environmental Science and Planning**

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|---|---|
| **Signature of Responder:** | **Date of Response:** January 8, 2016 |

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|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 1 | Page 1-4, 1st paragraph | No | Typo-missed space after "2010". Also, this reference is not listed in Section 6.0. | Correct typo, add reference to Section 6.0 | Fixed and added |
| 2 | P1-4, paragraph 3 | No | States "several existing water use permits" whereas page 2-16, paragraph 4 states "numerous shallow domestic wells". | Revise/clarify the inconsistent passages. | There are few large water use permits but numerous shallow domestic wells. |
| 3 | P1-4, 3rd paragraph | No | Second sentence implies that you can tell from looking at Figure 1-2 that agriculture is not a significant land use, but it is not possible to tell from the map. | Either revise text, or provide a land use map. | Revisions will be considered in future work. |
| 4 | P 2-1 and 2-2 | No | Should cite bathymetry work somewhere in this section. | Add citation for Land & Sea Surveying, 2014 to end of second paragraph of Section 2.1.1. | The work product is shown. |
| 5 | P2-2, first complete | No | Description of the river as "relatively shallow" is very subjective. What is approximate average depth in this section? When referring to depths, we | Provide a little more detail on general river depths. Add citation for source of | Land & Sea Surveying, 2014 |

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| | sentence, and all of Section 2.1.1 | | assume information is from bathymetry map, however it is not referenced in this section. | information (bathymetry map?). | |
| 6 | P2-2, 2nd paragraph | No | The community of Econfina is not depicted on Figure 1-2. | Revise Figure 1-2 and add Econfina location. | Revisions will be considered in future work. |
| 7 | P2-2, 2nd paragraph | No | Location of State Park not shown on Figure 1-2 or other figures. | Revise Figure 1-2. | Revisions will be considered in future work. |
| 8 | Figure 2-1, | No | Map not sourced. In the graph portion of the figure, are the units on vertical axis NGVD? | Provide source, specify elevation reference. | This map is an original prepared for this report. NAVD 88 |
| 9 | P 2-3, first sentence | No | Needs citation | Provide citation, (Paul, 2008?) | There is no such reference. |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 10 | P 2-7 first paragraph and Table 2-2 | No | Have assumed table is correct. Narrative report cites wrong percentages from Table 2-2 for agricultural, urban activities, residential, and commercial/industrial | Revise with correct percentages. | Done. |
| 11 | P 2-7, 2nd paragraph | No | Define acronym "SSAC" | Add "Site Specific Alternative Criteria (SSAC)" | Done. |
| 12 | P 2-8, 2nd paragraph | No | Inconsistent river length units, refer to miles, RM and here "3 km" | Stick to miles for river length/distance measurement. | Done. |
| 13 | P 2-10, Figure 2-8 | No | Important map but not readable. | Use 11 x 17 sheet, if feasible, or split map and show it on two pages at more readable scale. | Revisions will be considered in future work. |
| 14 | P3-4, Section 3.2.1 | No | There is a canoe launch at WMA which may be an important recreational resource, since it may allow river access for downstream paddle trips to | Identify WMA location on map. Need to refer to Estuarine Section 3.2.3 for estuarine recreation. Add | WRV 1 is not used to establish the proposed MFL. |

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| | | | State Park landing. No location map for WMA tract in watershed map. Discusses recreation on the river, but not in estuary. Does not identify part of Econfina as OFW, or part of the Big Bend Saltwater Paddling Trail with campsite on Econfina 1 mile upstream of boat launch. FWC also published a guide Aucilla, Wacissa, Econfina: An Explorers Guide to North Florida Rivers. | information on other recreational resources and designations. | |
| 15 | P 3-8, Table 3-1 | Yes | Do the additional recreation factors warrant a higher score of the recreation WRV for Legislated Environmental protection? | Consider changing recreation score to "3" for legislated environmental protection. | This was the score given by the previous work. |
| 16 | P 3-10, Table 3-2 | No | Key Source for Recreation is "personal communication with local marinas and outfitters" | These should be identified here and cited in references. | No records for these communications |
| 17 | P 3-6, Section 3.2.5, | No | Little if any discussion on regional significance of hydric hammocks noting that "most extensive stands of hydric hammocks are found in Florida along | Add comment on significance, if warranted. | The nature of the floodplain vegetation was not use to establish the MFL |

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| | second paragraph | | the Gulf of Mexico from Aripeka to St. Marks" (Vince et al 1989). Loss of flows and surface groundwater seepage from water withdrawals could significantly affect this resource, as noted in final sentence of this section. | | |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Name and Affiliation of Reviewer: David L. Evans**

**Discipline specialty covered by this review: Biological Response**

This document is for the use of project peer reviewers retained by the Suwannee River Water Management District (District) for the purpose of providing a technical peer review of a District report, including manuscripts prepared by District staff and consultants.

SCOPE OF REVIEW REQUIRED BY THE DISTRICT:

***Task 1.*** **Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

A. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The reviewer shall assume the following:

1. The data and information used were properly collected;
2. Reasonable quality assurance assessments were performed on the data and information;

*Note: The reviewers are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.*

B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:

1. If the assumptions are clearly stated, reasonable and consistent with the best information available; and
2. Assumptions were eliminated to the extent possible, based on available information.

C. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:

1. The procedures and analyses were appropriate and reasonable, based on the best information available;
2. The procedures and analyses incorporate appropriate factors;
3. The procedures and analyses were correctly applied;
4. Limitations and imprecision in the information were reasonably handled;
5. The procedures and analyses are repeatable;
6. Conclusions based on the procedures and analyses are supported by the data.

***Task 6.*** **If a proposed method used in the MFL report is not scientifically reasonable, the CONTRACTOR shall:**

A. Deficiencies: List and describe scientific deficiencies;
B. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
C. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of time and effort required to develop and implement; and
D. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.

REVIEW CONSTRAINTS

CONTRACTOR and Peer Reviewers shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes) affecting the DISTRICT's development of MFLs. CONTRACTOR and Peer Reviewers shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board (hereinafter referred to as "givens") is not included in the scope of work. These givens include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels are to be set;
2. The determination of the baseline from which "significant harm" is to be determined;
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# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Instructions:**

13. The results of this review are for the use of the District and they are not to be revealed to others without the express permission of the District.
14. By signing this form, the reviewer certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042(5), in the discipline noted above.
15. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

| Signature of Reviewer: | Date of Peer Review: |
|---|---|
| David L. Evans | 11/18/15 |

**Responders Certification:** The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

| **Name and Affiliation of Responder to Peer Review Comments:** Steven J. Peene, Applied Technology and Management, Inc. / Anthony Janicki, Janicki Environmental, Inc. | |
|---|---|
| **Signature of Responder:** | **Date of Response:** January 8, 2016 |

# PEER REVIEW FORM
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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 1 | p.2-18, par. 2 | No | Section 2.1.7is almost entirely limited to the coastal study area up to river MP 3.6. It would help the reader to make this intentional limitation more explicit within the section, even though this is explained earlier in the document. | Change section heading to Estuarine Riparian Habitats and add an explanatory sentence regarding limitation of scope to the study area. | Done. |
| 2 | p. 2-18 , par. 2 | No | Inconsistent formatting of citation for (SRWMD, 2011) | Delete comma to read: (SRWMD 2011) | Done. |
| 3 | p. 2-18 , par. 2 and Fig. 2-18 | No | Text referring to Fig 2-18 is a source of some confusion because the figure is on a basin-wide scale that does not exemplify or depict vegetation communities on scale relevant to the 50-ft buffer "shoreline" communities as discussed in the reference sentence. | Introduce Fig 2-18 in a separate sentence that explains the figure content and is consistent with the figure scale. | Done. |
| 4 | p. 2-18 , par. 2 | No | Last sentence lists vegetation communities represented in the SRWMD shape file. To better understand baseline conditions, it would be useful to know either the acreages or percentages of shoreline covered by the communities. | If information is readily available, add relative dominance of vegetation communities to text or construct and insert a table. | This information is not used in establishing the MFL. |

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| 5 | p. 2-19, par. 1 | No | The second citation in the paragraph needs clarification: (2006) It appears that it is the same document as FDEP 2006. | If this reference is the same as FDEP 2006 it should be cited as such. | Done. |
| 6 | p. 2-19, par. 1 | No | Scientific names should be formatted consistently. In other parts of the document scientific names have been italicized and this is a widely used formatting convention. | Italicize all scientific names presented at genus and/or species level. | Done. |
| 7 | p.2-20, par. 2 | No | Section 2.1.8 is limited to the coastal study area up to river MP 3.6. It would help the reader to make this intentional limitation more explicit within the section, even though this is stated earlier in the document. | Change section heading to Coastal Aquatic Biota and add an explanatory sentence regarding limitation of scope to the study area. | Done. |
| 8 | p.2-21, par. 2 | No | There appears to be no specific citation of source for FWC FIM data discussed in this paragraph. | Cite a source and list the cited source in the References section of the report. | These data were obtained from FWC and there is no specific citation. |
| 9 | p.2-21, par. 2 | No | Further clarify the term "abundance" in the second sentence in this paragraph. | Suggested change:" (total number of individuals of a species in the sample) " | Abundance is total number of individuals. |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 10 | p. 2-22, par. 1 | No | First sentence L. rhomboides is spelled incorrectly | Correct typo. | Done. |
| 11 | p. 2-22, Table 2-3 | No | The figure number stated in title of Table 2-3 appears to be incorrect. | Change from Figure 2-19 to Figure 2-20 | Done. |
| 12 | p. 2-22, Table 2-4 | No | The figure number stated in the title of Table 2-4 appears to be incorrect. | Change from Figure 2-19 to Figure 2-20 | Done. |
| 13 | p. 2-22, par. 2 | No | There is no citation of source for the 1999-2010 benthic invertebrate data discussed in this paragraph and no material discuss ion of the data other than to state its qualitative nature. | Add a citation and list the specific source in the References section. Briefly summarize relevant findings. Alternatively, add a sentence explaining further why more than 10 years of benthic invertebrate data are not important to the objectives of this report. | Done.<br>The benthic data were from the river reach above the reach modeled<br>This section of the report is simply descriptive. |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 14 | P.2-23, par. 1 | No | Greening & Livingston 1982 is not listed in References section. This paper was published before period of data collection described in previous sentences. Are the methods used in this publication similar to those described in previous sentences (dip net samples)? | List this publication in the References section. | Done. |
| 15 | p.2-23, par. 2 | No | The word "and" at the end of the fourth sentence should not be italicized. | Change format of "and". | Done. |
| 16 | p.2-23, par.3 | No | Tettlebach and Rhoads (1981) is not listed in the References section. | List this publication in the References section. | Done. |
| 17 | p. 2-24, Last par. | No | Barnes et al. 2007 is not listed in the References section. | List this publication in the References section. | Done. |
| 18 | p. 2-25, Par. 1 | No | Citation in second sentence needs correcting | Either "study by Glancy (2000)" or "study (Glancy 2000) found" | Done. |
| 19 | p. 2-25, Par. 1 | No | Correct punctuation in third sentence. | Move period to follow (Glancy 2000). | Done. |

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| 20 | p.2-25, par.1 | No | Mote Marine Laboratory (1986) is not listed in the References section. | List this publication in the References section. | Reference added |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Name and Affiliation of Reviewer: Kirk Stage**

**Discipline specialty covered by this review: Ecology, Wildlife Habitats**

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1. The selection of waterbodies or aquifers for which minimum flow and/or levels are to be set;
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**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

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18. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

| **Signature of Reviewer:** | **Date of Peer Review:** 11/18/2015 |
|---|---|

**Responders Certification:** The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

| **Name and Affiliation of Responder to Peer Review Comments:**<br>Steven J. Peene, Applied Technology and Management, Inc. / Anthony Janicki, Janicki Environmental, Inc. | |
|---|---|
| **Signature of Responder:** | **Date of Response:** January 8, 2016 |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 1 | Pg 3-2 Par 2 | No | Searcy (1959, pp. 1-2) | Citation not found in references | Done. |
| 2 | Pg 3-2 Par 2 | No | Following sentences are not clear. "They have had "wide-spread application" and a "long history" in a variety of hydrologic studies including in-stream flow assessments (Vogel & Fennessey, 1995, p. 1029). They show the percent of time specified discharges were equaled or exceeded for a continuous record in a given period." | Suggest replace "They" with "the FDC" to clarify subject of discussion. | Done. |
| 3 | Pg 3-3 Par 2 | No | Second sentence does not follow the first sentence without reference to specific Figure. | Suggest referencing "see Figure 3-2" as an example. | No change. |
| 4 | Pg 3-4 Par 1 | No | Is this sentence scientifically supported in other sections or appendices of the report? | Given the characteristics of the rivers and the available flow data, the Econfina River MFL has been developed at the USGS gage near Perry | Based on best available data. |

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| | | | | (Station Number 02326000). | |
| 5 | Pg 4-6, Par 1, Sec 4.2.1 | No | The word "longitudinal" should be clarified or better defined since it is used later to explain the concept importance with fish passage. | Delete longitudinal or clarify use in context with fish passage | No change. |
| 6 | 4-6 paragraph 1 of section 4.2.1 | No | Clarify the term "longitudinal connectivity" along | Clarify use in context with fish passage – "maintenance of minimum water level which provides longitudinal connectivity along…." | No change. |
| 7 | Pg 4-6, Par 2, Sec 4.2.1 | No | Clarify the term thalweg or the use of "this" in the sentence: "This is often referred to as the thalweg and the elevations along the thalweg can be seen in Figure 4-1." | Suggested replacement sentence: The longitudinal axis of the river is referred to as the thalweg. The elevations along the thalweg can be seen in Figure 4-1. | No change. |

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| 8 | Pg 4-6 Par 2, Sec 4.2.1 | No | Wording of "thalweg elevation across a range of flow conditions" | Replace with "thalweg elevation for a range of flow conditions" | No change. |
| 9 | Pg 4-6, Par 2, Sec 4.2.1 | No | "The flows were determined by adding a 0.8-ft depth fish-passage criterion" | Provide reference for the use of 0.8 feet criterion. | Reference condition used in previous MFL reports. |
| 10 | Pg 4-6 Par 2, Sec 4.2.1 | No | Clarify the sentence "The flows were determined by adding a 0.8-ft depth fish-passage criterion to the elevation of the lowest spot in the channel and determining the flow necessary to achieve the resultant elevations." | The sentence contains a lot of information. Rewrite to clarify to clarify "lowest spot", and "resultant elevation." The assumption is a minimum water depth for the river channel is determined and the flow is calculated at that location for a increased water depth 0.8 feet. | Done. |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 11 | Pg 4-7, Par 1, last sentence to Sec 4.2.1. | No | Use of the term "critical flow". | The term "critical flow" is capitalized in section 4.2 when referring to the specific MFL flow. Determine if capitalization of the term is needed in this section for clarification. | No change. |
| 12 | Pg 5-27, Second bullet point | No | Phrase "A 8.6 percent reduction of lows at river flows ≥ 211 cfs" is not clear | Rewrite to clarify | Done. |
| 13 | Pg 5-27 First Sentence | No | Sentence: Both of these MFLs is also protective of fish passage in the Econfina River. | Replace with "are" | Done. |
| 14 | Pg 5-27, First | No | Sentence: Additionally, the relationships between river flows and water quality parameters, other than | Rewrite sentence, suggest two sentences. | Done. |

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| | paragraph in section 5.4 | | salinity, that were discussed earlier in Section 2 have been examined. | | |
| 15 | Pg 5-27, First paragraph in section 5.4 | No | Sentence: The difference between the baseline and fitted MFL values in both Table 5-6 are variable flow reductions ranging from 2.3 cfs to 46.4 cfs. | Suggest rewrite to clarify. | Done. |
| 16 | Pg 3-5 Section 3.2.2. | No | The connection of the first sentence to the second sentence is needed. "Freshwater fish and wildlife are important factors in the Econfina River's appeal to the public. Instream habitat can be characterized by water depth, velocity, and suitable substrate….." | Rewrite sentence to associate wildlife with habitat. | Done. |

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| 17 | Pg 3-6-Par 1 | No | Reference needed for this sentence "….species within the state park include: Florida black bear, white-tailed deer, blue herons and egrets, bald eagle, marsh hawk, otter, bobcat, and manatee." | Add reference or source for list or state less as determined by habitats. | Done. |
| 18 | 3-6 | No | Citations (Reid, J. and others, 2011) and Rouhani et al. (2007) | Add citation in references | Done. |
| 19 | 3-6 | No | Sentence "…lower Suwannee River regarding the hydroperiod and inundation frequencies required to maintain floodplain forests may be transferable to the Econfina River." | Strengthen "may be" with reasons for selecting Suwannee data – proximity, geology, and other relevant factors. | No change. |

# PEER REVIEW FORM
## SUWANNEE RIVER WATER MANAGEMENT DISTRICT

**Project or Report Name:** Technical Report – MFL Establishment for the Econfina River

**Name and Affiliation of Reviewer: Douglas G. Strom – Water & Air Research, Inc.**

**Discipline specialty covered by this review: Biology of the Econfina River**

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4. Limitations and imprecision in the information were reasonably handled;
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***Task 8.*** **If a proposed method used in the MFL report is not scientifically reasonable, the CONTRACTOR shall:**

A. Deficiencies: List and describe scientific deficiencies;
B. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
C. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of time and effort required to develop and implement; and
D. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.

REVIEW CONSTRAINTS

CONTRACTOR and Peer Reviewers shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes) affecting the DISTRICT's development of MFLs. CONTRACTOR and Peer Reviewers shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board (hereinafter referred to as "givens") is not included in the scope of work. These givens include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels are to be set;
2. The determination of the baseline from which "significant harm" is to be determined;
3. The definition of what constitutes "significant harm" to the water resources or ecology of the area

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**Instructions:**

19. The results of this review are for the use of the District and they are not to be revealed to others without the express permission of the District.
20. By signing this form, the reviewer certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042(5), in the discipline noted above.
21. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

| **Signature of Reviewer:** | **Date of Peer Review:** 11/23/2015 |
|---|---|

**Responders Certification:** The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

| **Name and Affiliation of Responder to Peer Review Comments:**<br>Steven J. Peene, Applied Technology and Management, Inc. / Anthony Janicki, Janicki Environmental, Inc. | |
|---|---|
| **Signature of Responder:** | **Date of Response:** January 8, 2016 |

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| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 1 | Page 1-2 | No | In the first paragraph the word Section should be the word Chapter instead. | Replace Section with Chapter. | No change. |
| 2 | Page 1-3 | No | Same comment as above for the second paragraph. | Replace Section with Chapter. | No change. |
| 3 | Page 1-4 | No | The reference "SRWMD 2010" cited in the first paragraph is missing from the References section. | Add this reference to the reference list. | Done. |
| 4 | Page 1-4 | No | There is a space missing cited in the first paragraph between 2010 and "(SRWMD 2010)." | Add a space between those strings. | Done. |
| 5 | Page 2-8 | No | The reference "Land & Sea Surveying, 2014" cited in the second paragraph is missing from the References section. | Add this reference to the reference list, or correct the date of the reference therein that was by this author. | Land & Sea Surveying, 2014 |
| 6 | Figure 2-8; Page 2-10 | No | The reference "Land & Sea Surveying, 2014" cited below the figure is missing from the References section. | Add this reference to the reference list, or correct the date of the reference therein that was by this author. | The map is the work product. |
| 7 | Page 2-16 | No | At the beginning of line 4 on this page the words with and low are run together. | Separate those words. | Done. |

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|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 8 | Page 2-19 | No | References were not cited consistently. In the first paragraph on this page two forms of citation were used – (FDEP 2006) without the comma and – (SRWMD, 2011) with the comma. Choose a format and apply it consistently throughout the document. | Review and correct references cited in the text and make the citation format consistent throughout the report. | Done. |
| 9 | Page 2-19 | No | On the fourth line of the second paragraph "FDEP" is missing from within the parentheses. [continued from above] | Add FDEP to that citation within the parentheses. | Done. |
| 10 | Page 2-19 | No | The genus and species names given in the second paragraph are not italicized as was done elsewhere in the document. | The genus and species names given in the second paragraph should be italicized as was done elsewhere in the document. | Done. |
| 11 | Page 2-23 | No | The acronym "FWRI" was not introduced prior to its use in the second line on this page. | Introduce that acronym earlier in that same paragraph where "Florida Marine Research Institute'" was used. | Done. |

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|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 12 | Page 2-23 | No | The reference "Greening and Livingston (1982)" was not listed in the reference section. | Add the reference "Greening and Livingston (1982)" to the reference section. | Done. |
| 13 | Page 2-23 | No | The reference "(Tettlebach and Rhoads 1981)" was not listed in the reference section. | Add the reference "(Tettlebach and Rhoads 1981)" to the reference section. | Done. |
| 14 | Page 2-24 | No | The web citation at the end of the first paragraph is not in standard format as per other web citations. | The web citation at the end of the first paragraph should be made into a citation in the reference section with a more standard and shorter format as per other web citations. | Done. |
| 15 | Page 2-24 | No | The acronym "FWCC" in the citation at the end of the first paragraph is not the same acronym used earlier in the document. | The acronym "FWCC" at the end of the first paragraph should be replaced by "FWC," the acronym used earlier in the document. | Done. |
| 16 | Page 2-25 | No | In the first paragraph is a quote with ellipse with spacers between the periods. ". . .oyster | Remove the spaces between the three periods of the ellipse. | No change. |

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|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 17 | Page 2-24 | No | In the last paragraph the citation "Barnes et al., (2007)" was not given in the references section. | Add the citation "Barnes et al., (2007)" to the reference section. | Done. |
| 18 | Page 2-24 | No | In the first paragraph the citation "Mote Marine Laboratory (1986)" was not given in the references section or rather, it was given in a corrupted form, where it was combined with Mitsch et al. (1989). | Fix those citations in the reference section. | Done. |
| 19 | Page 3-2 | No | In the last paragraph the citation "Searcy (1959)" was not given in the references section. | Add the citation "Searcy (1959)" to the reference section. | Done. |
| 20 | Page 3-3 | No | In the first line the phrase "a FDC" is given. | Change "a FDC" to "an FDC." | Done. |
| 21 | Figure 3-2; Page 3-4 | No | In this figure decimals are given along the x-axis, but these are labeled "percent exceedences." | Change "percent exceedences" to "decimal exceedences." | No change. |
| 22 | Page 3-5 | No | In the second paragraph the citation "(Reid, J. and others, 2011)" is in a non-standard format. | Put this reference in a standard format e.g., (Reid et al. 2011). Use "et al." consistently throughout the | Done. |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| | | | | document instead of ""and others." | |
| 23 | Page 3-5 | No | In the second paragraph the citation "(Reid et al. 2011)" is not in the reference list. | Add the citation "(Reid et al. 2011)" to the reference list. | Done. |
| 24 | Page 3-5 | No | In the second paragraph the citation "Rouhani et al. (2007)" is not in the reference list. | Add the citation "Rouhani et al. (2007)" to the reference list. | Done. |
| 25 | Page 3-8 | No | On the fifth line the phrase "the risk of adverse consequence attributable" is given. | That phrase should be corrected to the risk of adverse **consequences** attributable… | Done. |
| 26 | Table 3-2; Page 3-10 | No | In the "Example" column, the citation "(HSW 2012)" is not in the reference list. | Add the citation ""(HSW 2012)" to the reference list. | Added. |
| 27 | Table 3-2; Page 3-10 | No | In the "Example" column, the citation "(SRWMD 2014)" is not in the reference list. | Add the citation "(SRWMD 2014)" to the reference list. | Done. |
| 28 | Page 4-1 | No | The sentence in the second paragraph on the third line starting with "USEPA" is confusing. The National Marine fisheries | It is suggested to rewrite that sentence for clarity, and to add a citation to support the | Done. |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) | | To be completed by report author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| | | | Service is under NOAA, not EPA. Should this sentence and its statements be supported by a reference citation? | assertions made, if appropriate (which I believe is the case). | |
| 29 | Page 4-2 | No | In the first sentence "Critical Flows" is capitalized. | Change to "critical flows" – not capitalized to conform to usage elsewhere in the document. | Done. |
| 30 | Page 4-3 | No | In the third and fourth bullets "Critical Flows" is capitalized. | Change to "critical flows" – not capitalized to conform to usage elsewhere in the document. Find and change any other instances not specifically addressed herein. | Done. |
| 31 | Page 4-4 | No | In the last paragraph the citation" (Beck et al. 2000)" is not in the reference list. | Add the citation" (Beck et al. 2000)" to the reference list. | Done. |
| 32 | Page 4-4 | No | In the last paragraph the citation "(SWFWMD 2004)" is not in the reference list. | Add the citation "(SWFWMD 2004)" to the reference list. | Fixed. |
| 33 | Page 4-4 | No | The citation "WRA (2005)" has multiple authors. | Cite it as WRA et al. (2005). Also check if cited elsewhere and correct it. | No change. |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 34 | Page 4-4 | No | The citation "WRA (2006)" has multiple authors. | Cite it as WRA et al. (2006). Also check if cited elsewhere and correct it. | No change. |
| 35 | Page 4-5 | No | On the first line of the third paragraph, the phrase "Code (EFDC) was…" is given. | Change the phrase to "Code (EFDC) **model** was…" is given. | Done. |
| 36 | Page 4-5 | No | In the last paragraph the citation "(SWFWMD 2009)" is not in the reference list. There appears to be two SWFWMD citations with this date; one addressed Sulfur Springs and another Dona Bay. | Add the citation "(SWFWMD 2009)" to the reference list. If there should indeed be two SWFWMD 2009 citations, distinguish them with "a" and "b" designations as a suffix to the date in the text citation and in the reference section. | Done. |
| 37 | Page 4-7 | No | In the last paragraph, several references are given as lists of three authors or more. | Change these citations to standard format of "Author et al. Date" to conform to a standard for citations as used elsewhere in the document. | No change. |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 38 | Page 5-1 | No | The title uses MFL, but multiple MFLs are proposed [Continued from above] | Suggest use "MFLs" in the Chapter title. [Continued from above] | No change. |
| 39 | Page 5-10 | No | In the second to last line the phrase "…under the 305 flow reduction" is given. | Change this to "…under the **30 %** flow reduction" | Done. |
| 40 | Page 5-10 | No | In the second to last line the phrase "Both of these MFLs is also protective…" is given. | Change this to "Both of these MFLs are also protective…" | Done. |
| 41 | Pages 6-1-6-5 | No | The entries to the reference section vary widely in their format and style. | Generally the reference section should be reviewed and each entry made to an accepted format. See the entries for Arnold 2009, Bass and Guillory 1979, and Robins et al. 2007 as acceptable examples. The citations in the text also need to be standardized. If using an acronym to cite the report, it should be given in the citation. [Continued from above.] | Fixed. |

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|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 42 | Page 6-1 | No | The entry for Ainsle et al. 1999 does not give the location for the report. | Add the location of the waterways experiment station. | No change. |
| 43 | Page 6-1 | No | The entry for Bahr et al. 1981 does not give the location for the report. | Add the location of the USFWS office. | No change. |
| 44 | Page 6-1 | No | The entry for Cichra et al. 2005 does not give the location or publisher for the report. | Add the publisher and the location of the publisher's office. | SWFWMD |
| 45 | Page 6-1 | No | The entry for Clewell 2003 does not give the location for the report. | Add the location of the SWFWMD office. | No change. |
| 46 | Page 6-1 | No | The entry for FDEP 2003 does not give the location for the report, nor is the report citation provided. [Continued from above.] | | No change. |
| 47 | Page 6-1 | No | For the reference Copeland 1982, there should be periods after the author and date, not commas, "in" should be capitalized and italicized, and the date 1981 should go after the editor name, not after the book title. Also, why are these dates different? | Please correct this citation. | No change. |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 48 | Page 6-1 | No | The entry for FDEP 2006 does not give the location for the report. | Add the location of the FDEP office that generated that report. | No change. |
| 49 | Page 6-2 | No | The entry for FDEP 2012 does not give the location for the report. [Continued from above.] | Add the location of the FDEP office that generated that report. [Continued from above.] | No change. |
| 50 | Page 6-2 | No | The reference for Florida Geological Survey. (2005) seems incomplete. | Please provide the complete citation. | No change. |
| 51 | Page 6-2 | No | The reference for HSW, Inc. and Janicki Environmental. 2015 seems incomplete. | Please provide the complete citation. | No change. |
| 52 | Page 6-2 | No | In the reference Jacobs, J. M., & Ripo, G. (2001), Gainesville is misspelled. Also we suggest giving the university first, then the city, and add the state for the location of the report source. | Please correct this citation. | Done. |
| 53 | Page 6-2 | No | The reference for Jones Edmunds and Associates. (2012). seems incomplete and is in a non-standard format. | Please provide the complete citation and correct the format. | No change. |

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|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 54 | Page 6-3 | No | The reference for Land & Sea Surveying, 2004 seems incomplete. Also, either the date is wrong, or the date cited in the text (2014) should be corrected. | Please provide the complete and correct citation. | No change. |
| 55 | Page 6-3 | No | The reference Light, H. M., Darst, M. R., & Grubbs, J. W. (1998) is either missing the italicized word "IN" to associate it with the imbedded citation, or these need to be separated. The word aquatic is misspelled. | Please provide the complete and correct citation. | Fixed. |
| 56 | Page 6-3 | No | The reference Mitsch, W. J., & Gosselink, J. G. (1986) for the book Wetlands is incomplete, and that reference was accidentally joined to the Mote Marine Lab 1986 reference. | Please provide the complete and correct citation for both of these entries. | Fixed. |
| 57 | Page 6-3 | No | The reference Richter, B.D., J.V. Baumgartner, J. Powell, and D.P. Braun. 1996. Is missing the period at the end of the citation. | Add the period to the end of the citation. | Fixed. |
| 58 | Page 6-4 | No | If the Southwest Florida Water Management District reports are to be cites | Add the acronym to these citations. | No change. |

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| | | | with an acronym, the acronym should be added to the citation as per FDEP citations. | | |
| 59 | Page 6-4 | No | The entry for Shaw, D. T., Dahm, C. N., & Golladay, S. W. (2005). does not give the location for the report. | Add the location of the SWFWMD office for whom that report was generated. | No change. |
| 60 | Page 6-4 | No | For the reference Stalnaker, C. B. (1990). "In" should be italicized. | Please correct the citation. | No change. |
| 61 | Page 6-5 | No | The reference SRWMD 2011 does not have text explaining what was obtained from the link. [Continued from Above] | Please provide a plain English text string to denote what resource was found from this website. . [Continued from Above] | No change. |
| 62 | Page 6-5 | No | The reference Tsou, T-S. and R. E. Matheson, Jr. 2002. Is missing the period at the end of the date of this citation. Also, the initials for "Tsou" are given in a strange way. | Add the period to the end of the date. Correct the citation for "Tsou" initials. | Fixed. |
| 63 | Page 6-5 | No | The entry for Water Resource Associates, Inc., SDII Global and Janicki Environmental, Inc. 2005 does not give the location for the report. If the report is to be | Add the location of the SRWMD office for whom that report was generated. Add the "WRA' acronym. | No change. |

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|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| | | | cited by WRA for Water Resource Associates, that acronym should be added to the citation. | | |
| 64 | Page 6-5 | No | The entry for Water Resource Associates, Inc., SDII Global, Janicki Environmental, Inc. and Interra, Inc., 2006. does not give the location for the report. If the report is to be cited by WRA for Water Resource Associates, that acronym should be added to the citation. [Continued from Above] | Add the location of the SRWMD office for whom that report was generated. Add the "WRA' acronym. [Continued from Above] | No change. |
| 65 | Page 2-6 | No | The last word in the text on this page – the species name "alterniflora" is misspelled. | Correct the spelling of "alterniflora." | Fixed. |
| 66 | Page 2-7 | No | There is an extra space between the words "SSAC" and "Low" on the second to last line on the second paragraph. | Remove the extra space. | Fixed. |
| 67 | Page 5-10 | | The parenthetical phrase in the first paragraph "(5 percent, 10 percent, 20 percent, 30 percent)" is missing an "and." | Add "and" before 30 percent. | Fixed. |

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|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action | C. Action to be Taken in Response to Comment |
| 68 | Page 6-2 | | In the reference Gosner, K. L. 1978. The words Series. and Houghton are run together. | Separate those words. | Done |