DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

Submitted to:

Pinellas County
Purchasing Department
Board of County Commissioners
400 South Fort Harrison Avenue
Clearwater, FL 33756

Submitted by:

Janicki Environmental, Inc.
1155 Eden Isle Drive NE
St. Petersburg, FL 33704

31 March 2009

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RFP Number
089-0222-P (AM)

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1. COVER LETTER

Pinellas County

Southwest Florida Water Management District

Janicki Environmental, Inc.

PBS&J

31 March 2009

Janicki Environmental, Inc.

March 31, 2009

Pinellas County Board of County Commissioners
400 South Fort Harrison Avenue
Annex Building – 6th Floor
Clearwater, FL 33756

Dear Commissioners:

Janicki Environmental, Inc. and its subconsultants PBS&J, Inc. and the Environmental Protection Commission of Hillsborough County are pleased to submit the attached proposal to Pinellas County in response to its Request for Proposal No. 089-0222-P (AM) ***Development of Conservation Management Plan for Clearwater Harbor & St. Joseph Sound.*** These estuarine waters occupy the northernmost portions of Pinellas County's Gulf Coast shoreline and contain some of the most extensive seagrass beds and most significantly physically altered areas within the Southwest Florida Water Management District. This project, jointly funded by the District, has as its major goal the characterization of these estuaries and their watersheds and the development of watershed goals and objectives. It has been expressed that this project will follow a National Estuary Program approach and will build on existing management plans. Stakeholder involvement will be a critical element of this project and will facilitate the dissemination of information on the economic and natural resource value of the project area to the public and decision makers.

We have assembled a team whose members collectively have more than 100 years of experience as either technical consultants or in some cases employees of a number of National Estuary Programs, including the Tampa Bay Estuary Program, Sarasota Bay Estuary Program, Charlotte Harbor National Estuary Program, and Indian River Lagoon National Estuary Program. Most notably, our Project Manager, **Dr. Anthony Janicki**, has managed and directed more than 20 Florida NEP projects and has made contributions to a number of symposia and workshops where this work has been presented. In particular, Dr. Janicki made major contributions to the development of seagrass and water quality targets and the nitrogen management strategy for Tampa Bay and recently for Charlotte Harbor and Sarasota Bay.

There are several other team members whose NEP experience is unmatched:

Mr. Doug Robison of PBS&J made major contributions to setting habitat restoration targets for Tampa Bay including the "Restoring the Balance" strategy.

1155 Eden Isle Dr. N.E. St. Petersburg, FL 33704 • Office (727) 895-7722 • Fax (727) 895-4333

Dr. Ray Pribble of Janicki Environmental has over the last 15 years contributed to the estimation of nitrogen loads, particularly via atmospheric deposition, and the establishment of sediment quality targets for Tampa Bay.

Dr. David Tomasko of PBS&J was Senior Scientist for the Sarasota Bay Estuary Program for more than 4 years and made major contributions to the monitoring of seagrasses and water quality in estuarine and freshwaters along Florida's southwest coast.

Other key members of our team include **Ms. Susan Janicki** who developed the Tampa Bay Action Plan Database, **Dr. Ralph Montgomery** who developed quantifiable targets for the Charlotte Harbor National Estuary Program, **Mr. Michael Wessel** who is developing water clarity and seagrass targets for the Charlotte Harbor National Estuary Program, and **Dr. Pam Latham** who has contributed to the recent refinements to the Tampa Bay habitat restoration plan.

In addition to this exemplary team of professionals, our approach to the characterization of the benthic macroinvertebrate community and sediment quality in the project area is unique. Our team includes individuals responsible for the original design and continued implementation of the Tampa Bay Estuary Program Benthic Monitoring Program. We also have published peer-reviewed papers dealing with the establishment of a benthic index and sediment quality targets for Tampa Bay. This expertise and experience ensures that the characterization of the benthic macroinvertebrate community and sediment quality in the project area will be technically robust and cost-efficient.

Another critical demonstration of our team's expertise comes from the work completed by both Janicki Environmental and PBS&J for the Florida Department of Environmental Protection in support of its impaired waters and TMDL programs. PBS&J is one of three FDEP prime consultants and has dealt with issues associated with impaired waters delisting, and TMDL and BMAP development in both estuarine and freshwaters. Janicki Environmental is a subconsultant for each of the three prime consultants and has reviewed the SAS code used to identify impaired waters and most notably developed the estuarine chlorophyll threshold that is incorporated in the Florida Impaired Waters Rule.

Clearly, our team's experience is proven and widely recognized in Florida and nationally. There are several additional reasons why our team is uniquely suited to provide the County a CCMP that is technically superior and achievable. Our firm has done business in Pinellas County since its founding in 1999. Each principal in Janicki Environmental is a long-standing resident of the county. Janicki Environmental is certified as a Small Business Enterprise (SBE) with Pinellas County's Small Business Enterprise Program (SBEP) and as a Minority Business Enterprise (MBE) by the State of Florida. Since this is "our backyard" our commitment to the project is sincere and complete. Being a local firm we offer to the County that there will be **no billing for travel expenses** during this project. PBS&J has also agreed to waive any travel expenses.

Our proposal demonstrates our wealth of experience and knowledge in the project area. Because our team has this local knowledge and experience dealing with issues critical to southwest Florida ecosystem management issues, we are offering the County a compressed completion schedule of 24 months. As our proposal demonstrates, our team is ready to begin the critical steps of developing this CCMP on Day One.

The County's choice of the contractor to develop the St. Joseph Sound/Clearwater Harbor CCMP depends upon many selection criteria. We are confident that we have demonstrated in our proposal that we meet or exceed all of these criteria. Very importantly, we reaffirm our corporate and individual commitments to provide the highest quality service to Pinellas County and the Southwest Florida Water Management District. If awarded this contract, we can assure you that this project will receive the full attention of all of the principals in Janicki Environmental and PBS&J.

Dr. Anthony Janicki is authorized to make representations for and bind Janicki Environmental.

If there are any questions regarding our submittal please do not hesitate to call me at (727) 895-7722.

Respectfully,

Susan S. Janicki

Susan S. Janicki
Director

RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

2. CREDENTIALS & EXPERIENCE

Pinellas County

Southwest Florida Water Management District

Janicki Environmental, Inc.

PBS&J

31 March 2009

2.0 CREDENTIALS AND EXPERIENCE

This section of our proposal presents the corporate and individual credentials and experience, including a corporate overview, key personnel, related project experience, and a proposed organizational scheme.

2.1 Janicki Environmental, Inc.

Founded in 1999, Janicki Environmental provides services in ecological and environmental analysis and assessment. We have recognized expertise in the areas of estuarine and freshwater ecology, watershed management, water quality modeling and assessments, hydrodynamic modeling, monitoring program design, limnology and lake restoration, and data management and analysis. Our clients represent a wide spectrum of environmental interests including local, state, and federal government agencies as well as private-sector groups. Most relevant to this project, many of our team has worked with each of the four national estuary programs since the early 1990's. From our office in St. Petersburg we can provide effective support to the County and SWFWMD during this project. Currently, our staff is comprised of ten professionals, including part-time and associate staff.

We have proven expertise and experience in the areas of watershed assessment and management. Most notably, our ability to identify and obtain data from a variety of data sources and to work these data into a manageable format is widely recognized. In many cases, we have been called upon to develop statistically robust monitoring programs to enhance data availability for many water bodies including Tampa Bay and its tributaries, Charlotte Harbor and its tributaries, several rivers with the Suwannee River Water Management District, as well as contributing to the design of the DEP Integrated Water Resource Monitoring Program.

We have been involved in the establishment of the Florida Impaired Waters Rule (IWR) and technical support of the development of TMDLs and providing reasonable assurance to the Department and EPA regarding management of nutrient loadings. Specifically, we developed the chlorophyll thresholds for estuarine waters that have been adopted as part of the IWR. The principals at Janicki Environmental have also worked over the past 15 years to develop appropriate water quality and nutrient loading targets for Tampa Bay and other major Florida water bodies. Currently, we are providing technical support to the Tampa Bay Nitrogen Management Consortium in the development of both federal TMDLs and Reasonable Assurance for the Florida DEP.

Water quality assessment requires the ability to apply innovative and defensible data analysis techniques to the available data. We have shown our expertise in water quality assessments in many projects ranging from estuarine waters (e.g., Suwannee River, Tampa Bay, Sarasota Bay, Charlotte Harbor, Estero Bay) and freshwater bodies (e.g., tributaries to Tampa Bay, Peace River, Myakka River, Caloosahatchee River, Loxahatchee River, Winter Haven Chain of Lakes). Water quality assessment often requires establishment of appropriate and achievable water quality targets and we have demonstrated uniquely the ability to establish such water quality targets for many of these same water bodies. The use of biological data (e.g., benthic macroinvertebrates, finfish, and aquatic vegetation) to establish water quality targets has also been a critical element in many waterbodies.

Watershed assessment builds on water quality assessments. Identification of pollutant sources, estimation of the pollutant loading, and identification of practical approaches to managing these sources are essential elements of an effective watershed management strategy. We again have proven experience in this area.

2.2 Key Personnel

The following presents the key project personnel from Janicki Environmental. Full resumes are provided at the end of this section.

Dr. Anthony Janicki, President of Janicki Environmental, Dr. Janicki has contributed to the Tampa Bay Estuary Program (TBEP) since 1991. His work included support of the monitoring program design and implementation, data management strategy, seagrass and emergent habitat target setting, sediment quality mapping, development of the Tampa Bay empirical model, development of the TBEP Optimization Model, nitrogen loading and chlorophyll target setting, support of the Tampa Bay Nitrogen Management Consortium, and support of the TBEP Comprehensive Conservation and Management Plan. He was Project Manager for the TBEP contract that involved characterization and evaluation of Tampa Bay indicators, including water quality targets, seagrass restoration and quality targets, and emergent habitat targets. Recently he oversaw the development of estimates of nutrient loading directly to Tampa Bay from atmospheric deposition and ground water loads as well as development of loading estimates from the Tampa Bay watershed to the bay for years 2004-2007. He is also currently providing support to the Southwest Florida Water Management District in its efforts to establish minimum flows in the Lower Hillsborough River, Alafia River, and Sulphur Springs. Dr. Janicki has contributed over the past several years in the redesign of the statewide surface and ground water monitoring programs and developing an estuarine trophic state index for the Florida Department of Environmental Protection (FDEP).

Dr. Raymond Pribble, Senior Vice-President of Janicki Environmental, is an ecosystem modeler and analyst with twenty-two years of experience in physical and biological systems modeling and data analysis. His areas of expertise include watershed pollutant loading development, hydrodynamic and water quality modeling, ecosystem analysis, biochemical cycling systems, atmospheric deposition of nutrients, habitat delineation, and stormwater management practices. His principal responsibilities are to direct and participate in project planning and day-to-day activities focused on providing clients with timely technical analysis to aid in development of management decisions. He contributes to most aspects of work efforts performed for the Tampa Bay Estuary Program, including pollutant loading development, Nitrogen Management Consortium support in loading allocation development for the Reasonable Assurance Update, Action Plan Database maintenance and utilization, and analysis of water quality and seagrass data relationships.

Mr. Michael Wessel, Vice-President of Janicki Environmental, is a quantitative ecologist with eighteen years of experience in the environmental sciences. Mr. Wessel's area of expertise includes watershed management planning, fisheries ecology and the design, implementation and analysis of long-term ecological monitoring programs. Recently, Mr. Wessel managed an analysis of the status and trends in flows and water quality for the Charlotte Harbor National Estuary Program. His principal responsibilities are to provide

consultation and statistical support to clients involved in natural resource issues in Florida. His background includes statistical analyses of environmental data, optimization of sampling designs, project management and publication in the environmental and health science fields. Prior to joining Janicki Environmental in 2004, Mr. Wessel received a master's degree in Biostatistics for the University of South Florida's College of Public Health where he co- wrote two manuscripts and developed a technical guidance document for the United States Environmental Protection Agency's ecological risk assessment division. Prior to graduate school, Mr. Wessel worked as a fisheries biologist for the Florida Fish and Wildlife Conversation Commission and on Alaskan groundfish vessels in the Bering Sea. He has also worked as a sea turtle biologist in coastal North Carolina, and as an educator and charter boat captain in the Florida Keys and Bahamas.

Ms. Susan Janicki, Senior Programmer and Director of Janicki Environmental, has provided overall database management support, programming, and graphical presentations support for the TBEP. She also contributed to the development of the data management strategy for TBEP. She contributed to the development of the Action Plan and Bibliography of Freshwater Inflows and Effects databases. Currently, she is also responsible for the TBEP technical website development. Ms. Janicki has been responsible for data management on several projects that required acquisition and analysis of extensive historical data sets. She has contributed to the data management and analyses for Tampa Bay Water's water use permit, the Peace River/Manasota Regional Water Supply Authority's annual data reports, and the *TBNEP Models: Loading, Empirical, and Optimization* compact disc. Ms. Janicki will assist in all aspects of this project, including database development and management for nitrogen credits and debits and general programmatic database management.

Mr. Keith Hackett, Vice President of Janicki Environmental, Inc., is an ecosystem modeler and consultant with seventeen years of experience in modeling of physical and biological systems, statistical analysis, and data management. Mr. Hackett's areas of expertise include watershed pollutant loading development, hydrodynamic and water quality modeling, ecosystem analysis and assessment, and water and sanitation engineering. Mr. Hackett's principal responsibilities include project management and interacting with clients to provide management solutions that are protective of the environment while also being economically efficient. Mr. Hackett is actively involved with most tasks undertaken for the Tampa Bay Estuary Program, including the development of pollutant loading estimates, allocation of loadings pertaining to the Reasonable Assurance Update for the Nitrogen Management Consortium, development of the Action Plan Database, and evaluation of alternative methods to achieve sediment quality targets.

Dr. Amy Poe, Senior Scientist, Janicki Environmental, has worked on numerous estuary program projects. Major contributions include primary author on the 1999-2003 Estimates of Total Nitrogen, Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay and the Decision Rules Analysis for assessing management responses to chlorophyll a and light attenuation in Tampa Bay. Her areas of expertise include planning and implementation of water quality monitoring programs and data assessment and analysis and her work spans a wide variety of coastal and estuarine systems to include the Chesapeake Bay, the Albemarle Pamlico Sound, and the Tampa Bay and surrounding water bodies. Prior to joining the Janicki Environmental team in 2003, Dr. Poe was awarded her doctorate in Environmental Science from the University of North Carolina

at Chapel Hill, where she evaluated and published on the effectiveness of nitrogen removal from agricultural runoff by a constructed wetland. Dr. Poe served on an interdisciplinary research team to design and implement a constructed wetland and she participated in the Neuse River Monitoring Program.

Dr. Pauline Vaas is an environmental analyst at Janicki Environmental, Inc. with 23 years of experience in the field of environmental sciences. Dr. Vaas' area of expertise includes empirical water quality modeling and water quality assessment; statistical analysis of long-term ecological monitoring programs and estuarine ecology. Her background includes statistical analysis of environmental data; marine and estuarine ecosystem analysis; environmental management, public policy analysis, cost benefit analysis and economic evaluation of natural resources. Prior to joining Janicki Environmental in 2007, Dr. Vaas worked for the engineering consulting group, CH2M Hill, Inc., where she provided statistical support for environmental engineering projects, and analyzed data for wastewater discharge permit compliance monitoring programs. Prior to entering the field of consulting, Dr. Vaas completed a Ph.D. program at the Nicholas School of Environmental Science at Duke University, and an M.S. degree at the Duke University School of Statistics and Decision Science. During her Ph.D. program, Dr. Vaas was supported by a grant from the U.S. Environmental Protection Agency to develop an index of ecosystem integrity for the Chesapeake Bay. Prior to the Ph.D. program, she worked as an environmental analyst for the Chesapeake Bay National Estuary Program water quality monitoring program at the Maryland Department of the Environment.

Mr. Michael Dema joined Janicki Environmental, Inc. in November 2004. Mr. Dema is an environmental scientist with seven years of experience in the field. His background includes Geographic Information Systems (GIS), SAS programming, hydrodynamic and water quality modeling, ecological modeling, statistical analysis, and environmental policy. He has contributed to watershed plans for Roberts and Lemon bays for Sarasota County. Recently, he has performed the GIS analyses used to develop seagrass restoration targets for both the Sarasota Bay and Charlotte Harbor NEPs. He also contributed to the recent updates to the nutrient loading estimates from the Tampa Bay watershed. Mr. Dema has been responsible for the application of the PHABSIM model to examine the effects of river flow on habitat suitability for fishes and benthic macroinvertebrates. Prior to joining Janicki Environmental, Mr. Dema received a master's degree in Environmental Studies from Brown University, where he studied the impacts of urbanization in the Narragansett Bay watershed on recreation and fishery resources. While attending Brown, Mr. Dema worked at the University of Rhode Island's Graduate School of Oceanography Sea Grant office and earned the Rhode Island Senate Policy Office Narragansett Bay Fellowship.

Mr. Stephen Grabe, Associate, Janicki Environmental – Mr. Grabe supervised the Environmental Protection Commission's contributions to the Tampa Bay Estuary Program's Bay-wide Benthic and Sediment Contaminant Monitoring Program from 1995 to 2004. Mr. Grabe has also been a member of both the Tampa Bay Estuary Program's Technical Advisory Committee and the Sediment Quality Assessment Group. Mr. Grab co-authored the Benthic Index for Tampa Bay Estuary Program and ran the Benthic Monitoring Program with funding from TBEP. Mr. Grabe also ran the Benthic Monitoring Program portion of the HIMP.

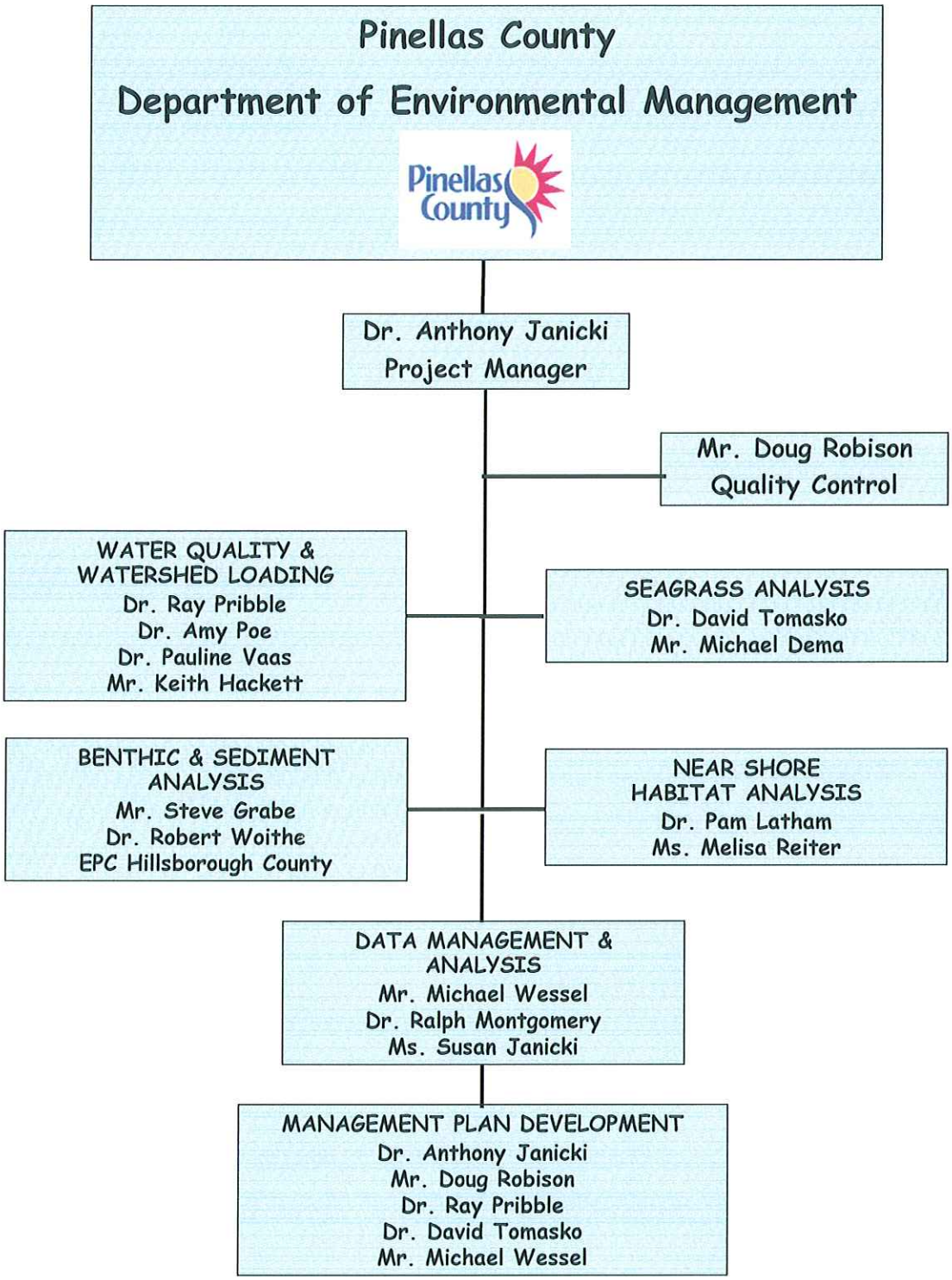

Figure 2-1. Proposed Organizational Scheme.

2.3 Related Project Experience

Projects:	***Technical Support and Data Management Services***
Client:	***Tampa Bay Estuary Program***
Contact:	***Mr. Dick Eckenrod***
	Tampa Bay Conservancy
	P.O. Box 178
	Ellenton, FL 34222
Duration:	***See below***
Email:	***eckenrodtbc@verizon.net***
Phone:	**941-776-178**

The Tampa Bay estuary was recognized as an estuary of national significance in 1991 by the US Environmental Protection Agency. The Tampa Bay Estuary Program was established to coordinate the efforts of its management conference whose primary goal was to restore and protect the Bay's natural resources. The TBEP developed a Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay that outlines the management actions to be taken to meet its goal.

The Tampa Bay Estuary Program (TBEP) is a non-profit organization developed by the original cooperators from the TBEP. They include local municipalities, Environmental Protection Agency, Southwest Florida Water Management District, and Florida Department of Environmental Protection. The purpose of the TBEP is to implement the CCMP, which addresses concerns regarding Tampa Bay and its surrounding watershed. The goals set forth in the CCMP address issues such as water and sediment quality, fish and wildlife habitats, spill prevention and response, and dredging and dredged material management.

The TBEP has required technical support in a variety of areas to satisfy its programmatic needs. The following are some examples of the technical support provided to the program by Janicki Environmental.

- **Tampa Bay Estuary Program Models: User's Guide to Programs (April-June 1999)** - We provided technical transfer of the nutrient loading, empirical chlorophyll-loading, and BMP optimization models developed by the TBEP. A compact disc was created that included instructions for model application, documentation of program codes, and the input data sets for each of these three models used to develop the nitrogen management strategy for Tampa Bay.

- **Development of a Sediment Quality Database (April-June 1999)** - One of the major goals defined by the CCMP was to restore and protect sediment quality in Tampa Bay. To this end, TBEP has initiated efforts to establish sediment quality criteria for the bay. We assisted in the development of a sediment quality database that was to be used in these efforts. The database included sediment quality data (sediment size and contaminant concentration data), sediment toxicity data, and benthic invertebrate data. We developed an Access database that incorporates data generated by the Tampa Bay Benthic Monitoring Program. We also provided database management procedures and training for the Hillsborough County Environmental Protection Commission that gives them the capability to update its database, given the disparate formats of the data from the various monitoring programs it receives. We also provided quality control review of the existing data.

• **Assessment of Progress Toward Restoration Goals for Seagrass and Emergent Habitats (June 1999-October 2001)** – The CCMP for Tampa Bay established numerical goals for seagrass restoration and protection to 1950's levels. Recognizing that restoring the spatial coverage of emergent habitats to historical levels was not feasible, TBNEP adopted a goal for restoring the proportions of emergent habitats to those found during the early 1950's. The progress toward achieving the seagrass goals was assessed using GIS coverages of seagrass extent for 1950, 1990, 1992, 1994, and 1996. Seagrass extent increased bay-wide from 1990 to 1996, with half the increase occurring in Boca Ciega Bay. However, losses were observed most notably in Old Tampa Bay between 1992 and 1996. The progress toward achieving the emergent habitat goal was assessed using GIS coverages of emergent habitat for 1950, 1990, and 1995. The relative proportions of Mangrove-*Spartina* Marsh : *Juncus* Marsh : Salt Barren have changed from 67:28:5 in 1950 to 73:22:5 in 1990 to 76:22:2 in 1995. Thus, the disproportionate loss of oligohaline habitats characterized by *Juncus* marsh is still apparent. We prepared a compact disc that contains copies of the reports that summarize the results of the GIS analyses, digital versions of the seagrass and emergent vegetation maps, and GIS files that can be imported into ArcExplorer to allow user-defined customized mapping.

• **Assessment of Ambient Water Quality Conditions in Tampa Bay (June 1999-October 2001)** - The CCMP requires TBEP to evaluate the ambient water quality conditions in Tampa Bay and assess these conditions relative to the targets previously established. This requires that the most recent water quality data be obtained and analyzed. To this end, we compiled data from the four local government agencies that monitor ambient water quality in the bay: Environmental Protection Commission of Hillsborough County, City of Tampa Bay Study Group, Pinellas County Department of Environmental Management, and Manatee County Environmental Management Department. We developed an Access database containing data from 1974 through 1998. This database was provided to the TBEP on a compact disk that included: an Access database of the monthly ambient water quality data and the late summer Hydrolab data collected by the Benthic Monitoring Program; a user's guide on how to use the database; a summary of the field and laboratory and field data collection methods; and maps of sampling site locations by bay segment.

We applied the database to examine long-term trends in ambient water quality. Using parametric and non-parametric methods, we examined the following data: nutrients (N and P), algal biomass, water clarity, biochemical oxygen demand, bottom dissolved oxygen, salinity, and turbidity. The results of the trend tests indicated significant declining trends in algal biomass, total phosphorus, inorganic nitrogen, and biochemical oxygen demand, and significant increasing trends in Secchi disc depth in most segments. No significant trends were found in total nitrogen concentrations. Statistically-significant declines in bottom dissolved oxygen has been detected in Hillsborough Bay and appears to be due to the reduction in the DO maxima that has occurred due to lower nitrogen loading and resultant algal biomass declines.

• **Evaluation of the Extent and Severity of Hypoxia (June 1999-October 2001)** – The TBEP requested this evaluation following concerns expressed regarding the potential expansion of the area of hypoxic waters in Tampa Bay, as well as an increase in the severity of hypoxia, possibly as a result of over-enrichment of coastal waters. Oxygen depletion results when the oxidation needs of the biological processes outstrip the supply of dissolved oxygen to

the water. Anoxic conditions occur where no dissolved oxygen is found, and can result in death of estuarine organisms subjected to the condition. Hypoxic conditions occur where dissolved oxygen (DO) concentrations fall below 2 mg/L. Hypoxia can significantly affect the distribution and abundance of fish and benthic invertebrates.

We used the water quality database developed for the TBEB to address a series of questions regarding hypoxia in Tampa Bay. For example, we used an inverse-distance squared method to map the hypoxic areas and estimate their spatial extent during critical summer months for each year from 1974 through 1998 to address the question regarding the potential expansion of hypoxic areas in Tampa Bay. We also examined the factors that affect the extent and temporal duration of hypoxia in the bay.

- **Estimation of Water Quality Responses to Reductions in Atmospheric Emissions of Nitrogen (January 2001-September 2003)** – Recent plans for reductions in emissions of nitrogenous materials have led to the need to assess the impacts of these changes on water quality conditions in the bay. Atmospheric deposition of nitrogen to the surface of the bay comprises a significant portion of the total nitrogen load from external sources. Evaluation of the changes in nitrogen loadings to the bay is an important part of developing strategies for meeting the goals of the CCMP, which include water quality and nitrogen loading goals.

- **Decision Matrix for 2003 (November 2003-February 2005)** – The purpose of this task was to track the status of seagrass, chlorophyll *a* concentrations, and light attenuation for the most recent years' data. We assisted TBEP in the development of a tracking process to assess the degree to which chlorophyll *a* concentration and light attenuation targets are being met in Tampa Bay. The process involves two steps; the first utilizes a framework to evaluate differences in mean annual ambient conditions from the target, and the second step incorporates the results from the framework into a decision matrix that identifies possible management outcomes that are commensurate with the magnitude and duration of the deviations from the targets.

- **Sediment Quality Management Strategy (June 2005-June 2007)** – The TBEP partners and a national advisory group have worked cooperatively on the development of narrative and numerical sediment quality targets for key indicators of sediment quality conditions, including sediment chemistry, sediment toxicity, benthic invertebrate community structure, and bioaccumulation-related variables. The final step in the process involved the development, in conjunction with stakeholders, of sediment quality management strategies for each type of sediment management area in the bay.

- **Support for 2006-2010 Action Plans (October 2007-present)** – The purpose of this task is to assist the TBEP partners and TBEP staff in completing their Action Plans for 2006-2010. This includes maintaining and refining an existing formal tracking process for management actions undertaken to meet CCMP targets to protect water quality, and to protect and restore bay habitats. This also includes providing as-needed technical support to the TBEP staff with respect to interpretation and presentation of the Action Plans. The Action Plan tracking process has taken on an increasingly greater importance with respect to state and federal regulatory compliance, and it was to be an important cornerstone in documenting "reasonable assurance" that the TBEP pollutant load management goals are being met.

• **Assist TBEP and Nitrogen Management Consortium (October 2007-present)** – This task is to assist in developing documentation necessary to meet FDEP and EPA requirements for meeting water quality targets in Tampa Bay. This effort includes 1) development and maintenance of a "credits and debits" tracking system; 2) documentation of effectiveness of reduction actions; 3) development of a localized tracking system for point source (domestic and industrial) nutrient loads; and 4) assistance for local governments in estimating nutrient loads from MS4 areas throughout the Tampa Bay watershed.

Project:	***Water Quality Data Analysis and Report for the Charlotte Harbor National Estuary Program***
Client:	***Charlotte Harbor National Estuary Program***
Contact:	***Dr. Lisa Beever, Director***
	Charlotte Harbor National Estuary Program
	1926 Victoria Avenue
	Fort Myers, FL 33901
Duration:	***February 2006-May 2007***
Email:	***LBeever@swfrpc.org***
Phone:	***239-338-2556***

This study entailed a comprehensive analysis of water quality status and trends including surface water, groundwater, streamflow and rainfall using data collected throughout the Charlotte Harbor National Estuary Program (CHNEP) study area. The purpose of the study was to: 1) describe time series trends in water quality using fixed station water quality data; 2) establish baseline characterizations water quality conditions in the estuarine portions of the study area using water quality data collected with a probabilistic design, and 3) perform a validation exercise of the CHNEP numerical water quality model to assess the validity and reliability of the model with respect to identifying water clarity target exceedances.

These analyses incorporated the preponderance of data collected within the study area. Two periods of record were reported for the analyses. The first was the entire period of record of data collection. For rainfall and streamflow these records may date back to 1940's while for water quality, the initial collection dates tended to be in the late 1970's or after.

The results of the rainfall analyses indicated that there were only a few significant trends for the rainfall data period of record (approximately 1950's to 2005) or for the CHNEP period of record. The results of the stream flow trend analyses, however, indicated that significant trends in stream flow patterns were prevalent for many of the rivers and streams throughout the CHNEP study area. Analysis of water quality data indicated that many of the water quality changes in these areas were related to increased nutrients and suspended materials which tend to correlate with higher inflows and generally represent declining water quality condition. Incorporation of recently initiated sampling collected with a probabilistic design was used to establish an expectation for water quality against which to compare future data.

The tools developed for this project, provide valuable information to scientist and managers to support science-based decision making to identify areas where water quality conditions have improved throughout the region and identify areas where actions may be necessary to ameliorate further declines in water quality as well as identify potential areas for restoration

activities. The results of this project aid the CHNEP in promoting the effective long-term management of estuaries within its program area.

Project:	***Sarasota County Watershed Management Plan***
Client:	***Sarasota County***
Contact:	***Mr. Jack Merriam***
	Sarasota County Environmental Services
	1001 Sarasota Center Blvd.
	Sarasota, FL 34240
Duration:	***7/2007-Ongoing***
Email:	***JMerriam@scgov.net***
Phone:	***941-861-0804***

Sarasota County has embarked on a project to develop a comprehensive watershed management plan for Roberts Bay and Lemon Bay within the jurisdictional boundaries of Sarasota County. This is a regional initiative that promotes and furthers the implementation of several management plan objectives within the region. The main objectives of this plan are to:

- improve and protect existing water quality by developing a water quality level of service;
- develop Basin Management Action Plans (BMAPs) to address any adopted Total Maximum Daily Loads (TMDLs);
- provide a more natural hydrologic regime;
- protect existing and future property owners from flood damage;
- develop ecosystem goals and targets based on the requirements of environmental and biological indicators, and
- develop potential alternative surface water supply options that are consistent with and support other plan objectives.

Janicki Environmental, Inc. is responsible for reviewing the natural resources of these watersheds to assess the current status of the resources and identify environmental requirements necessary for their protection. As part of this work Janicki Environmental has evaluated Sarasota County's strategic monitoring design for all environmental and biological data collection within the study area to maximize the utility of collected information in managing the County's valued natural resources. Janicki Environmental is also using the empirical data along with pollutant loading model output to evaluate responses from nutrient loading on estuarine response processes which will allow for quantitative assessments of the nutrient load requirements necessary to achieve targets levels for estuarine health indicators. Janicki is developing a mechanism for reporting monitoring results in the form of a "report card" to inform natural resource managers and community stakeholders on the status of Sarasota County waters with respect to aquatic health indicators. The final product of this work will be a roadmap for Sarasota County in their planning and monitoring programs to protect, maintain and restore their valued natural resources in the face of ever increasing burden on the waterbodies.

2.4 Resumes

Anthony Janicki, Ph.D.

President
Janicki Environmental, Inc.

Dr. Janicki is President and Founder of Janicki Environmental, Inc. His expertise is recognized in the areas of aquatic ecology, watershed management, water quality modeling and assessments, monitoring program design, limnology, estuarine ecology, and biological assessments. His clients include the Tampa Bay, Sarasota Bay, and Charlotte Harbor NEPs, the Florida Department of Environmental Protection, and the Southwest Florida, South Florida, St. Johns River, and Suwannee River water management districts. He also has worked with a number of local government agencies to develop watershed management plans and to address alternative water supply and TMDL issues.

EDUCATION

Ph.D., Biology,
West Virginia University, 1980
M.S., Biology,
West Virginia University, 1976
B.S., General Science,
Gannon University, 1973

PROJECT EXPERIENCE

Tampa Bay Estuary Program Technical Support – Nitrogen Management Consortium:
Dr. Janicki is currently working with the Tampa Bay Estuary Program to provide technical support for the Tampa Bay Nitrogen Management Consortium in development of total nitrogen (TN) loading allocations as part of the Tampa Bay Reasonable Assurance Update. This effort includes working closely with stakeholders from both public and private entities to develop TN loading estimates and partition loads to entities consistent with the baseline period loadings used for TMDL establishment in mainstem Tampa Bay.

Tampa Bay Estuary Program Technical Support – Action Plan Database:
Dr. Janicki has been assisting the Tampa Bay Estuary Program and Nitrogen Management Consortium in development and maintenance of the Tampa Bay Action Plan Database. The database contains habitat protection, restoration, and preservation projects as well as nutrient load reduction projects completed and anticipated by participating stakeholders. The database was originally developed to support the Tampa Bay Nitrogen Management Strategy, directed towards reducing and/or precluding loads necessary to maintain TN loadings to the bay commensurate with improving water quality and seagrass conditions. The database is currently serving as a convenient and efficient vehicle for tracking TN load reduction projects for inclusion in the Tampa Bay Reasonable Assurance Update effort.

Florida Department of Environmental Protection – Loadings Development for Tampa Bay:
Dr. Janicki recently managed the development of pollutant loading estimates for Tampa Bay for the period 2004-2007, and development of future loadings for 2020. These efforts were similar to past efforts he assisted in for the Tampa Bay Estuary Program, developing loading estimates for Tampa Bay for the periods 1992-1994, 1995-1998, and 1999-2003, and future loading estimates for 2010. These efforts included meeting with county and state personnel

to access point source loading data, discussing future plans for public wastewater treatment facility expansion, treatment, and disposal methods, and meeting with public and private entities to obtain data and information necessary for loading development.

Tampa Bay Estuary Program – Pinellas County Environmental Fund Seagrass Model:
Dr. Janicki assisted in a project performed for the Tampa Bay Estuary Program under the Pinellas County Environmental Fund program to develop a seagrass presence prediction model as a function of water depth and ambient water quality. This effort was undertaken to provide more understanding of the dynamics of the interaction between water quality and light along the southwestern shore of Old Tampa Bay, where seagrass extent has not responded to water quality improvements in a similar manner to that observed in other portions of Tampa Bay. The model utilized water quality and seagrass extents for the period 1992-2004 to predict the probability of occurrence of seagrass in the bay segment.

Tampa Bay Estuary Program – Evaluation and Update of Nitrogen Load-Chlorophyll and Chlorophyll-Light Models:
Dr. Janicki utilized updated water quality data and nitrogen loading estimates to evaluate and update, if necessary, the previously developed relationships between external nitrogen loadings and chlorophyll concentrations, and between chlorophyll concentrations and light conditions. These relationships serve as the foundation for the Tampa Bay Nitrogen Management strategy relating external loadings to seagrass extent, and were originally developed in the mid-1990s. This evaluation found that the relationships as originally developed remained appropriate.

Tampa Bay Water – Gulf Coast Desalination Hydrodynamic Model:
Dr. Janicki managed the development and implementation of a hydrodynamic model for the Anclote Anchorage and surrounding area, as part of the permitting effort for the Tampa Bay Water Gulf Coast Desalination Project. Using a three-dimensional time-dependent model, the ramifications of concentrate discharge location were examined, including the effects of concentrate discharge on circulation and salinity in the area. He also developed and implemented a CORMIX model of the Anclote Power plant cooling water discharge canal as part of the effort. The CORMIX model was used to examine the likely effects on salinity of various discharge rates, salinity concentrations, diffuser port locations, port dimensions and port orientations.

Southwest Florida Water Management District – Withlacoochee River Flow Scenario Evaluation and Minimum Flows and Levels:
Dr. Janicki managed the development and of an EFDC hydrodynamic model for the northwestern Gulf of Mexico and the Withlacoochee River to assess the relationship between freshwater inflow and salinity in the Lower Withlacoochee River as part of the Watershed Management program for the western terminus of the Cross Florida Greenway. The model was used to examine the potential effects of modifying freshwater inflows to the lower portion of the river, and is currently being used as a tool for minimum flow evaluation.

Southwest Florida Water Management District: Quantitative Analytical Tools To Evaluate Relationships Between Benthic Infauna and Salinity, Sediment Characteristics, Dissolved Oxygen and Freshwater Inflow.
Dr. Janicki managed this project that included the development of a suite of quantitative analytical tools to evaluate relationships between benthic infauna and salinity, sediment characteristics, dissolved oxygen and freshwater inflow. This project required the compilation of an extensive (>2500 observations) regional (12 tidal rivers) database and development of quantitative prediction tools that could be used by the District to assist in the development of "Minimum Flows" for their tidal rivers. The recommended analytical approaches included linear, logistic and multivariate models and included the development of a regional classification system for salinity and dissolved oxygen based on the distribution of benthos.

Tampa Bay Water – Downstream Augmentation:
Dr. Janicki supervised the development of a hydrodynamic model (CE-QUAL-W2) and developed a water quality model (CE-QUAL-ICM) for the Lower Hillsborough River in support of the Downstream Augmentation project for Tampa Bay Water. In addition, he developed of a water quality model (CE-QUAL-ICM) for McKay Bay/Palm River/Tampa Bypass Canal for the same effort. He has also developed a water quality model of Hillsborough Bay in order to evaluate the cumulative impacts of the proposed project.

Florida Department of Environmental Protection – Bishop Harbor/Piney Point:
Dr. Janicki developed a water quality model to evaluate the effects of discharge of treated process wastewater from a former mining operation system on chlorophyll concentrations and light conditions in Bishop Harbor and Tampa Bay. This effort also involved the use of the modeling package CE-QUAL-W2. The model was used to evaluate potential discharge scenarios for nutrient-enriched process water to Bishop Harbor, with the selected scenario successfully implemented to complete the disposal of the remaining water.

South Florida Water Management District – Analysis of Freshwater Inflows and Nutrient Loading on Chlorophyll in the Caloosahatchee River:
Dr. Janicki managed this study whose objectives were to describe and quantify the relationship between the rate of freshwater input and the behavior of chlorophyll *a* and nutrients in the Caloosahatchee Estuary and San Carlos Bay. Using freshwater flows and residence times, mixing diagrams and a box model were used to determine how freshwater flows and residence time affect the retention and export of nutrients in the Caloosahatchee Estuary. The models were applied to determine the extent to which nutrients are taken up or released in the estuary and to relate the position and magnitude of chlorophyll *a* accumulation to freshwater inflow and residence time.

RECENT REPORTS AND PUBLICATIONS

Greening, H. and A. Janicki. 2006. Reversal of Eutrophic Conditions in a Subtropical Estuary: Water Quality and Seagrass Response to Nitrogen Loading Reductions in Tampa Bay, Florida, USA. Environmental Management 38:163-178.

Janicki Environmental, Inc. 2008. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 2004-2007. Prepared for Florida Department of Environmental Protection. Contributing authors: A. Janicki, K. Hackett, R. Pribble, M. Dema & S. Janicki.

Janicki Environmental, Inc. 2004. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida, 1999-2003. Prepared for Tampa Bay Estuary Program. Contributing Authors: A. Poe, K. Hackett, S. Janicki, R. Pribble, and A. Janicki.

Janicki Environmental, Inc. 2004. Technical Memorandum: Predicted Water Quality Responses in Bishop Harbor to Potential Discharge Scenarios. Prepared for Florida Department of Environmental Protection. Contributing authors: R. Pribble, K. Hackett, and A. Janicki.

Janicki Environmental, Inc. 2003. A Hydrodynamic Model of the Nearshore and Offshore Waters Adjacent to the Proposed Tampa Bay Water Gulf Coast Desalination Facility. Prepared for Tampa Bay Water. Contributing authors: R. Pribble, A. Janicki, and K. Hackett.

Janicki, A.J., J.R. Pribble, and S. Janicki. 2001. Tampa Bay Estuary Program model evaluation and update: Chlorophyll a – light attenuation relationship. Prepared for Tampa Bay Estuary Program. Prepared by: Janicki Environmental, Inc.

Janicki Environmental, Inc. 2003. A Design of a Surface Water Quality Monitoring Program for Pinellas County, Florida. Prepared for Environmental Resources Management Division, Pinellas County Department of Environmental Management.

Janicki, A.J., J.R. Pribble, and S. Janicki. 2001. Tampa Bay Estuary Program model evaluation and update: Nitrogen load - chlorophyll a relationship. Prepared for Tampa Bay Estuary Program. Prepared by: Janicki Environmental, Inc.

Pribble, R., A. Janicki, and D. Wade. 2007. Pinellas County Environmental Fund Tasks B-1 and B-2 Technical Report: A Method to Predict the Occurrence and Distribution of Seagrasses in Old Tampa Bay Using Ambient Water Quality Data. Prepared for Tampa Bay Estuary Program.

Malloy, K., D. Wade, A. Janicki, and S. Grabe. 2007. Development of a Benthic Index to Establish Sediment Quality Targets for the Tampa Bay Estuary. Marine Pollution Bulletin. 54:22-31.

Janicki Environmental, Inc. 2003. An ecological characterization of aquatic and wetland habitats in the Anclote River Estuary and adjacent inshore and offshore waters of West-Central Florida. Prepared for Tampa Bay Water. Contributing authors: A. Janicki, R. Pribble, K. Malloy, H. Crevison, and M. Winowitch.

Poe, A., J. Janicki, and H. Greening, eds. 2006. Baywide Environmental Monitoring Report 2002-2005. Tampa Bay Estuary Program.

J. Raymond Pribble, Ph.D.
Senior Vice President
Janicki Environmental, Inc.

Dr. Pribble is an ecosystem modeler and analyst, with twenty-two years of experience in physical and biological systems modeling and data analysis. His areas of expertise include watershed pollutant loading development, hydrodynamic and water quality modeling, ecosystem analysis, biochemical cycling systems, atmospheric deposition of nutrients, habitat delineation, and stormwater management practices. His principal responsibilities are to direct and participate in project planning and day-to-day activities focused on providing clients with timely technical analysis to aid in development of management decisions.

EDUCATION

Ph.D., Marine Science,
University of South Florida, 1994
B.S., Physics (Minor in Mathematics),
Centre College, Danville, Kentucky, 1987

PROJECT EXPERIENCE

Tampa Bay Estuary Program Technical Support – Nitrogen Management Consortium:
Dr. Pribble is currently working with the Tampa Bay Estuary Program to provide technical support for the Tampa Bay Nitrogen Management Consortium in development of total nitrogen (TN) loading allocations as part of the Tampa Bay Reasonable Assurance Update. This effort includes working closely with stakeholders from both public and private entities to develop TN loading estimates and partition loads to entities consistent with the baseline period loadings used for TMDL establishment in mainstem Tampa Bay.

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Dr. Pribble has been assisting the Tampa Bay Estuary Program and Nitrogen Management Consortium in development and maintenance of the Tampa Bay Action Plan Database. The database contains habitat protection, restoration, and preservation projects as well as nutrient load reduction projects completed and anticipated by participating stakeholders. The database was originally developed to support the Tampa Bay Nitrogen Management Strategy, directed towards reducing and/or precluding loads necessary to maintain TN loadings to the bay commensurate with improving water quality and seagrass conditions. The database is currently serving as a convenient and efficient vehicle for tracking TN load reduction projects for inclusion in the Tampa Bay Reasonable Assurance Update effort.

Florida Department of Environmental Protection – Loadings Development for Tampa Bay:
Dr. Pribble recently participated in the development of pollutant loading estimates for Tampa Bay for the period 2004-2007, and development of future loadings for 2020. These efforts were similar to past efforts he assisted in for the Tampa Bay Estuary Program, developing loading estimates for Tampa Bay for the periods 1992-1994, 1995-1998, and 1999-2003, and future loading estimates for 2010. These efforts included meeting with county and state personnel to access point source loading data, discussing future plans for public wastewater treatment facility expansion, treatment, and disposal methods, and

meeting with public and private entities to obtain data and information necessary for loading development.

Tampa Bay Estuary Program – Pinellas County Environmental Fund Seagrass Model:
Dr. Pribble assisted in a project performed for the Tampa Bay Estuary Program under the Pinellas County Environmental Fund program to develop a seagrass presence prediction model as a function of water depth and ambient water quality. This effort was undertaken to provide more understanding of the dynamics of the interaction between water quality and light along the southwestern shore of Old Tampa Bay, where seagrass extent has not responded to water quality improvements in a similar manner to that observed in other portions of Tampa Bay. The model utilized water quality and seagrass extents for the period 1992-2004 to predict the probability of occurrence of seagrass in the bay segment.

Tampa Bay Estuary Program – Evaluation and Update of Nitrogen Load-Chlorophyll and Chlorophyll-Light Models:
Dr. Pribble utilized updated water quality data and nitrogen loading estimates to evaluate and update, if necessary, the previously developed relationships between external nitrogen loadings and chlorophyll concentrations, and between chlorophyll concentrations and light conditions. These relationships serve as the foundation for the Tampa Bay Nitrogen Management strategy relating external loadings to seagrass extent, and were originally developed in the mid-1990s. This evaluation found that the relationships as originally developed remained appropriate.

Tampa Bay Water – Gulf Coast Desalination Hydrodynamic Model:
Dr. Pribble completed the development and implementation of a hydrodynamic model for the Anclote Anchorage and surrounding area, as part of the permitting effort for the Tampa Bay Water Gulf Coast Desalination Project. Using a three-dimensional time-dependent model, the ramifications of concentrate discharge location were examined, including the effects of concentrate discharge on circulation and salinity in the area. He also developed and implemented a CORMIX model of the Anclote Power plant cooling water discharge canal as part of the effort. The CORMIX model was used to examine the likely effects on salinity of various discharge rates, salinity concentrations, diffuser port locations, port dimensions and port orientations.

Southwest Florida Water Management District – Withlacoochee River Flow Scenario Evaluation and Minimum Flows and Levels:
Dr. Pribble developed and implemented an EFDC hydrodynamic model application for the northwestern Gulf of Mexico and the Withlacoochee River to assess the relationship between freshwater inflow and salinity in the Lower Withlacoochee River as part of the Watershed Management program for the western terminus of the Cross Florida Greenway. The model was used to examine the potential effects of modifying freshwater inflows to the lower portion of the river, and is currently being used as a tool for minimum flow evaluation.

Southwest Florida Water Management District – Sulphur Springs Minimum Flows and Levels:
Dr. Pribble developed a river temperature model for the Lower Hillsborough River which served as an aid to developing a minimum flow for Sulphur Springs, addressing the

potential effects on river temperature of rerouting spring water from the spring upstream to either the reservoir, the base of the dam, or for City of Tampa potable water supply. The temperature model specifically examined the effects on temperature near the mouth of the spring, where a thermal refuge for manatees may exist during certain periods of the year. This temperature model was developed using the CE-QUAL-W2 model, a two-dimensional, laterally averaged hydrodynamic and water quality model.

Tampa Bay Water – Downstream Augmentation:
Dr. Pribble supervised the development of a hydrodynamic model (CE-QUAL-W2) and developed a water quality model (CE-QUAL-ICM) for the Lower Hillsborough River in support of the Downstream Augmentation project for Tampa Bay Water. In addition, he developed of a water quality model (CE-QUAL-ICM) for McKay Bay/Palm River/Tampa Bypass Canal for the same effort. He has also developed a water quality model of Hillsborough Bay in order to evaluate the cumulative impacts of the proposed project.

Florida Department of Environmental Protection – Bishop Harbor/Piney Point:
Dr. Pribble developed a water quality model to evaluate the effects of discharge of treated process wastewater from a former mining operation system on chlorophyll concentrations and light conditions in Bishop Harbor and Tampa Bay. This effort also involved the use of the modeling package CE-QUAL-W2. The model was used to evaluate potential discharge scenarios for nutrient-enriched process water to Bishop Harbor, with the selected scenario successfully implemented to complete the disposal of the remaining water.

RECENT REPORTS AND PUBLICATIONS

Janicki Environmental, Inc. 2008. Cross Florida Greenway: Watershed Evaluation – Evaluation of Alternative Flow Scenarios Using Hydrodynamic Models. Prepared for Southwest Florida Water Management District. Contributing authors: R. Pribble & A. Janicki.

Janicki Environmental, Inc. 2008. Draft Technical Memorandum: Tampa Bay Estuary Program Action Plan Database Status Evaluation, January 2008. Prepared for Tampa Bay Estuary Program. Contributing authors: R. Pribble, S. Janicki & A. Janicki.

Janicki Environmental, Inc. 2008. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 2004-2007. Prepared for Florida Department of Environmental Protection. Contributing authors: A. Janicki, K. Hackett, R. Pribble, M. Dema & S. Janicki.

Janicki Environmental, Inc. 2004. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida, 1999-2003. Prepared for Tampa Bay Estuary Program. Contributing Authors: A. Poe, K. Hackett, S. Janicki, R. Pribble, and A. Janicki.

Janicki Environmental, Inc. 2004. Technical Memorandum: Predicted Water Quality Responses in Bishop Harbor to Potential Discharge Scenarios. Prepared for Florida Department of Environmental Protection. Contributing authors: R. Pribble, K. Hackett, and A. Janicki.

Janicki Environmental, Inc. 2003. A Hydrodynamic Model of the Nearshore and Offshore Waters Adjacent to the Proposed Tampa Bay Water Gulf Coast Desalination Facility. Prepared for Tampa Bay Water. Contributing authors: R. Pribble, A. Janicki, and K. Hackett.

Janicki, A.J., J.R. Pribble, and S. Janicki. 2001. Tampa Bay Estuary Program model evaluation and update: Chlorophyll a – light attenuation relationship. Prepared for Tampa Bay Estuary Program. Prepared by: Janicki Environmental, Inc.

Janicki, A.J., J.R. Pribble, and S. Janicki. 2001. Tampa Bay Estuary Program model evaluation and update: Nitrogen load - chlorophyll a relationship. Prepared for Tampa Bay Estuary Program. Prepared by: Janicki Environmental, Inc.

Pribble, R., A. Janicki, and D. Wade. 2007. Pinellas County Environmental Fund Tasks B-1 and B-2 Technical Report: A Method to Predict the Occurrence and Distribution of Seagrasses in Old Tampa Bay Using Ambient Water Quality Data. Prepared for Tampa Bay Estuary Program.

SDI Environmental Services, Inc. and Janicki Environmental, Inc. 2005. Sulphur Springs Run Minimum Flow Study. Prepared for The City of Tampa Water Department. Contributing authors from Janicki Environmental: R. Pribble, and R. Nijbroek.

Michael R. Wessel, MSPH

Vice President
Janicki Environmental, Inc.

Mr. Wessel is a quantitative ecologist with eighteen years of experience in the environmental sciences. Mr. Wessel's area of expertise includes watershed management planning, fisheries ecology and the design, implementation and analysis of long-term ecological monitoring programs. His principal responsibilities are to provide consultation and statistical support to clients involved in natural resource issues in Florida. His background includes statistical analyses of environmental data, optimization of sampling designs, project management and publication in the environmental and health science fields. Prior to joining Janicki Environmental in 2004, Mr. Wessel received a master's degree in Biostatistics for the University of South Florida's College of Public Health where he co- wrote two manuscripts and developed a technical guidance document for the United States Environmental Protection Agency's ecological risk assessment division. Prior to graduate school, Mr. Wessel worked as a fisheries biologist for the Florida Fish and Wildlife Conversation Commission and on Alaskan groundfish vessels in the Bering Sea. He has also worked as a sea turtle biologist in coastal North Carolina, and as an educator and charter boat captain in the Florida Keys and Bahamas.

EDUCATION

MSPH, Biostatistics,
University of South Florida, 2005
B.S., Marine Biology,
University of North Carolina, Wilmington, 1989

PROJECT EXPERIENCE

Sarasota County – Sarasota County Watershed Management Plans:
Mr. Wessel is currently working with Sarasota County in developing watershed management plans for two County waterbodies; Roberts Bay North and Lemon Bay. This work entails a detailed description of historic conditions in these waterbodies and application of quantitative analytical techniques of ecosystem data to derive best management practices that will contribute to appropriate stewardship of Sarasota Counties valued natural resources. Mr. Wessel's contribution to this project will included a review of Sarasota County's strategic monitoring design, Assessment of natural systems, and water quality and the development of an ecosystem report card for annual reporting on ecosystem health.

Charlotte Harbor National Estuary Program – Status and Trends of Surface Water, Ground Water and Rainfall in the Charlotte Harbor NEP Watersheds:
Mr. Wessel recently completed analysis on the status and trends of surface water, ground water and rainfall data collected within the entire Charlotte Harbor Basin for the National Estuary Program. This project involved a large data collation effort along with application of sophisticated analytical techniques to assess the time series trends in water quality throughout the basin. This work serves to inform water resource managers on the level of service necessary to protect and restore water resources within their management areas and provides valuable information to the scientific community for goal setting agendas.

Southwest Florida Water Management District – Quantitative Analytical Tools To Evaluate Relationships Between Benthic Infauna and Salinity, Sediment Characteristics, Dissolved Oxygen and Freshwater Inflow:
This project included the development of a suite of quantitative analytical tools to evaluate relationships between benthic infuana and salinity, sediment characteristics, dissolved oxygen and freshwater inflow. This project required the compilation of an extensive (>2500 observations) regional (12 tidal rivers) database and development of quantitative prediction tools that could be used by the District to assist in the development of "Minimum Flows" for their tidal rivers. The recommended analytical approaches included linear, logistic and multivariate models and included the development of a regional classification system for salinity and dissolved oxygen based on the distribution of benthos.

Tampa Bay Water – HBMP Statistical Support:
Mr. Wessel contributed statistical support to assessment of Tampa Bay Waters HBMP programs Year Six report. This work included developing empirically based logistic regression models to estimate the effects of Tampa Bay Water withdrawals on dissolved oxygen and chlorophyll a levels in the Hillsborough River and Tampa Bypass Canal.

South Florida Water Management District – Optimizing The Predictive Power Of The Comprehensive Everglades Restoration Project's South Florida Water Quality Monitoring Network:
Mr. Wessel has worked on an extensive project assessing and optimizing the predictive power of the Comprehensive Everglades Restoration Project's South Florida Water Quality Monitoring Network. Analysis included using time series analyses including Kendall Tau trend test and covariance patterns models and autoregressive moving average models to identify trends in water quality parameters and estimate uncertainty in trend estimates. Monte Carlo simulation was also used to identify power and sample size necessary to meet project goals given uncertainty in observed data and recommendations were given on ways to optimize sampling designs to maximize power and efficiency in sampling effort.

South Florida Water Management District – Southwest Florida Feasibility Study:
Mr. Wessel completed a project with the Everglades Protection Joint Partnership assessing relationships between nutrient inputs and chlorophyll a and dissolved oxygen responses in Estero Bay, Naples Bay, and the tidal Caloosahatchee River as part of a technical group attempting to set water quality targets for these areas.

Tampa Bay Water – Assessment of The Effects Of Tampa Bay Water Withdrawals On Surface Water Elevations In The Alafia River:
Mr. Wessel used an autoregressive moving average (ARMA) timeseries regression model to assess the effects of Tampa Bay Water withdrawals on surface water elevations in the Alafia River. This effort used empirical data on withdrawals and gage heights at Bell Shoals Road to compare with deterministic model estimates of the effects of withdrawals as part of an arbitration settlement agreement for Tampa Bay Waters Water Use Permit.

Suwannee River Water Management District – Minimum Flow Support:
Mr. Wessel has worked with the Suwannee River Water Management District in support for establishing a Minimum Flow and Level (MFL) for the Lower Suwannee and Waccasassa Rivers. This analysis entailed predicting salinity-flow relationships by developing linear

regression models to predict isohaline locations, salinities at fixed station locations, and salinities throughout the Lower Suwannee River as a function of freshwater inflows. The project also considered the effects of fluctuations in freshwater inflows on the biotic community through analysis of several large and complex datasets. Results of these analyses are helping the SRWMD establish a physically and biologically integrated approach to MFL establishment for these important rivers in Florida.

Tampa Bay Estuary Program – Neural Network Analysis of Freshwater Inflow Effects on the Alafia River:
Mr. Wessel completed a project using a neural network model to assess the effects of freshwater inflow on nutrient loadings, abundance, and distribution of phytoplankton, zooplankton and juvenile and adult fish communities in the Alafia River. This project utilizes the pattern recognition techniques available with the neural network approach to describe the complex relationships among the Alafia riverine and estuarine biota related to variations in environmental condition. The project required pooling large datasets from multiple resource agencies and the use of advanced statistical techniques for proper testing and validation of derived models. Contributions from this project include predictive models which may prove useful for estimating the freshwater inflow requirements necessary for maintaining the biological integrity of the Alafia River.

Tampa Bay Estuary Program – Feather Sound Study:
Mr. Wessel has also worked as part of a consortium of scientists studying spatial differences in water quality measures and their relationship to the distribution and health of seagrass beds in Old Tampa Bay, Florida. He conducted analysis based on two years of data collection and found significant relationships between location of the collection site within Old Tampa Bay and distributional aspects of water quality parameters such as turbidity, transmittance, color and chlorophyll. Preliminary results suggest that these differences in water quality may be affecting the distribution and health of seagrass within Old Tampa Bay.

RECENT REPORTS AND PUBLICATIONS

Wessel, M. R., A. Janicki, and R. G. McConnell. 2008. Fish community response to inflow variation in two impounded and one unimpounded tidal tributary to Tampa Bay, Florida. Reported submitted to Tampa Bay Water. *In Review: Ecological Indicators.*

Wessel, M., A. Janicki, A. Poe and S. Grabe. 2008. Examining the relationship between freshwater inflows, nutrient loads, chlorophyll concentrations and the distribution of benthic macroinvertebrates in the lower Alafia River. Report submitted to Tampa Bay Water.

Wessel, M. and A. Janicki. 2008. Examination of the power of the HBMP sampling design to detect changes in fish and benthos populations in the Alafia River, Lower Hillsborough River, McKay Bay and the Tampa Bypass Canal. Report submitted to Tampa Bay Water.

Wessel, M. 2008. Sarasota County Strategic Monitoring Design Review: Review of existing monitoring and recommendations for continued stewardship of Sarasota County's

valued natural resources. Report submitted to Sarasota County Planning and Regulatory.

Wessel, M.R., A. Janicki and R. Nijbroek. 2007. Technical Report: Establishing water clarity targets for Sarasota County Estuarine waters. Report submitted to Sarasota County Environmental Services.

Janicki Environmental, Inc. 2007. Water quality data analysis and report for the Charlotte Harbor National Estuary Program. Report submitted to Charlotte Harbor National Estuary Program.

Janicki Environmental, Inc. 2007. Development of analytical tools for the establishment of Minimum Flows based upon benthic macroinvertebrate communities of southwest Florida tidal rivers. Report submitted to Southwest Florida Water Management District.

Janicki Environmental, Inc. 2005. Exploring Neural Networks as a Predictive Tool for Modeling Estuarine Tributaries. Report submitted to Tampa Bay Estuary Program.

Wessel, M. and D. Wade. 2005. Time Series Modeling of Water Surface Elevations as a Function of Tampa Bay Water Withdrawals. Report submitted to Tampa Bay Water.

Janicki Environmental Inc. 2005. Optimization of a Caloosahatchee Estuary Water Quality Monitoring Network. Prepared for South Florida Water Management District. Contributing authors: A. Janicki, M. Wessel, and D. Wade.

Keith Hackett, Ph.D. Candidate

Vice President
Janicki Environmental, Inc.

Mr. Hackett is a modeler with seventeen years of experience in environmental science and water supply. Mr. Hackett's areas of expertise include includes hydrodynamic and water quality modeling, statistical analysis, physical estuarine and oceanographic processes, numerical modeling, image analysis, database management, and water and sanitation engineering. Mr. Hackett's principal responsibilities are to provide consulting services to clients involved in natural resource protection and restoration. Prior to joining Janicki Environmental, Inc. in 2003, Mr. Hackett received a M.S. in Marine Science from the University of South Florida's College of Marine Science. Mr. Hackett is currently a PhD candidate, majoring in statistics and marine science at the University of South Florida. Mr. Hackett worked as a coral reef biologist and data manager for the Florida Fish and Wildlife Conservation Commission. Mr. Hackett also has seven years of international experience, working on water and sanitation related issues in several African countries, including Mali, Sudan, Ghana, Ivory Coast, and Benin.

EDUCATION

PhD. Student, Statistics and Marine Science,
University of South Florida
M.S., Marine Science,
University of South Florida, 2002
B.S., Civil Engineering,
Washington University, 1992
B.A., Mathematics,
St. Louis University, 1992

PROJECT EXPERIENCE

Tampa Bay Estuary Program – Tampa Bay Loadings:
Mr. Hackett led the development of model based pollutant loading estimates of total nitrogen, total phosphorus, total suspended solids, and biological oxygen demand to the Tampa Bay watershed for 1999 to 2003 (and 2004 to 2007). Loadings were estimated for industrial and domestic point sources, nonpoint source runoff, atmospheric deposition, groundwater, springs, and fugitive emissions.

South Florida Water Management District– C-43 Caloosahatchee River Nutrient Loadings:
Mr. Hackett assisted in the development of model based pollutant loading estimates for the C-43 basin. These estimates were used to relate nitrogen loads to chlorophyll levels in the establishment of chlorophyll targets.

Southwest Florida Water Management District – Lower Peace River and Shell Creek Minimum Flows and Levels:
Mr. Hackett is currently developing minimum flows and levels for Shell Creek and the Lower Peace River. This work is being performed for the Southwest Florida Water Management District. A regression model is being applied to develop minimum flows in Shell Creek. A hydrodynamic model developed by Southwest Florida Water Management District staff is being applied in order to develop minimum flows for the Lower Peace River.

Southwest Florida Water Management District – Dona and Roberts Bays Minimum Flows and Levels:
Mr. Hackett is currently developing minimum flows and levels for Dona Bay. This work is being performed for the Southwest Florida Water Management District. A hydrodynamic model is being applied in order to develop minimum flows for the Dona Bay.

Southwest Florida Water Management District – Withlacoochee River Hydrodynamic Model:
Mr. Hackett is currently contributing to the development of a hydrodynamic model of the Lower Withlacoochee River for the Southwest Florida Water Management District. The model is being developed to assess the relationship between freshwater inflow and salinity in the Lower Withlacoochee River as part of the Watershed Management program for the western terminus of the Cross Florida Greenway. The model is being used to examine the potential effects of modifying freshwater inflows to the lower portion of the river. This model will also be used as a tool for minimum flow development.

Tampa Bay Water – Lower Hillsborough River Water Quality Model:
Mr. Hackett has developed a hydrodynamic model and assisted with the development of a water quality model for the Lower Hillsborough River in support of the Downstream Augmentation project for Tampa Bay Water. The hydrodynamic model was developed using the CE-QUAL-W2 model, a two-dimensional, laterally averaged hydrodynamic and water quality model developed and supported by the US Army Corps of Engineers. In addition, he has assisted with the development of a water quality model (CE-QUAL-ICM) for McKay Bay/Palm River/Tampa Bypass Canal for the same effort. He assisted with the application of these models as tools for evaluating Minimum Flows and Levels and Total Maximum Daily Loads for both systems. He has also assisted with the development of a water quality model of Hillsborough Bay in order to evaluate the cumulative impacts of the proposed project.

City of Tampa – Lower Hillsborough River Hydrodynamic Model:
The Hillsborough River hydrodynamic model served as an aid to assess potential minimum flow scenarios for the Lower Hillsborough River, addressing the potential effects on salinity of combinations of Sulphur Springs and other freshwater sources to comprise the minimum flow. This work was performed for the City of Tampa.

Florida Department of Environmental Protection – Bishop Harbor Water Quality Model:
Mr. Hackett assisted with the development of a water quality model to evaluate the effects of discharge of treated process wastewater from a former mining operation system on chlorophyll concentrations and light in Bishop Harbor. This project was performed for the FDEP. The effort involved use of the hydrodynamic and water quality modeling package CE-QUAL-W2.

Tampa Bay Water – Anclote Anchorage Hydrodynamic Model:
Mr. Hackett contributed to the development and implementation of a hydrodynamic model of the Anclote Anchorage and surrounding area, as part of the permitting effort for the Tampa Bay Water Gulf Coast Desalination Project. The model is an application of the Princeton Ocean Model, which was recently used to examine the effects of a desalination facility in Tampa Bay. Using the three-dimensional time-dependent model, the

ramifications of concentrate discharge location were examined, as well as the effects of concentrate discharge on circulation, and salinity in the area.

Charlotte County – Peace River Hydrodynamic Model:
Mr. Hackett contributed to the development of a hydrodynamic model of the estuarine Peace River and the Charlotte Harbor Estuary for Charlotte County, utilizing the three-dimensional EFDC modeling package. The Peace River is a highly braided system supplying the majority of freshwater to Charlotte Harbor. The model was used to examine the potential affects on salinity of changes in freshwater inflow resulting from planned mining activities in the watershed of the Peace River.

Southwest Florida Water Management District – Sulphur Springs Minimum Flows and Levels:
Mr. Hackett assisted in the application of a river temperature model for the Lower Hillsborough River for establishment of a minimum flow for Sulphur Springs. This work was performed for the Southwest Florida Water Management District. The Hillsborough River Temperature Model served as an aid to developing a minimum flow for Sulphur Springs, addressing the potential effects on river temperature of rerouting spring water from the spring upstream to either the reservoir, the base of the dam, or for City of Tampa potable water supply. The temperature model specifically examined the effects on temperature near the mouth of the spring, where a thermal refuge for manatees may exist during certain periods of the year.

Southwest Florida Water Management District – Lake Hunter TMDL:
Mr. Hackett performed a review of the Lake Hunter TMDL completed by FDEP, including review of data and analytical methods and models used by the FDEP in establishment of the TMDL. This included review of water quality, flow, rainfall, and GIS data (land use, soils, watershed boundaries, etc.) that were critical to the listing of Lake Hunter as impaired. All models and analytical tools used in the development of the TMDL were reviewed. Specifically, watershed loading calculations were reviewed as well as methods for predicting water quality responses to varying loadings. Critical assumptions were identified and the sensitivity of the model predictions to these assumptions was assessed.

RECENT REPORTS AND PUBLICATIONS

Janicki Environmental, Inc. 2009. Proposed Minimum Flows and Levels for Dona Bay (Draft). Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2008. Proposed Minimum Flows and Levels for the Lower Peace River and Shell Creek DRAFT. Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2008. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 2004-2007. Prepared for Florida Department of Environmental Protection.

Janicki Environmental, Inc. 2008. Model-Based Estimates of Total Nitrogen Loading to Tampa Bay: Current Conditions and 2020 Conditions. Prepared for Florida Department of Environmental Protection.

Janicki Environmental, Inc. 2006. Lower Hillsborough River Minimum Flows Re-evaluation Report. Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2005. Evaluation of Lake Hunter Nutrient Total Maximum Daily Load. Prepared for City of Lakeland.

Janicki Environmental, Inc. 2005. Evaluation of the Efficacy of Using Howard F. Curren Reclaimed Water to Provide the Minimum Flow Requirements on the Lower Hillsborough River. Prepared for City of Tampa.

SDI Environmental Services, Inc. and Janicki Environmental, Inc. 2005. Sulphur Springs Run Minimum Flow Study. Prepared for City of Tampa.

Janicki Environmental, Inc. 2005. Draft Water Quality Model Report for the Hillsborough River. Prepared for Tampa Bay Water.

Janicki Environmental, Inc. 2005. Plan of Study Water Quality Based Effluent Limitation II. Assessment of Downstream Augmentation Project Potential Discharge to the Tampa Bypass Canal. Prepared for Tampa Bay Water.

Janicki Environmental, Inc. 2005. Plan of Study Water Quality Based Effluent Limitation II. Assessment of Downstream Augmentation Project Potential Discharge to the Lower Hillsborough River. Prepared for Tampa Bay Water.

Janicki Environmental, Inc. 2004. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida, 1999-2003. Prepared for Tampa Bay Estuary Program.

Janicki Environmental, Inc. 2004. Technical Memorandum: Predicted Water Quality Responses in Bishop Harbor to Potential Discharge Scenarios. Prepared for Florida Department of Environmental Protection.

Janicki Environmental, Inc. 2003. Nitrogen loadings to Tampa Bay: Model based estimates of 1998 and 2010 loads to major basins, and TN load reduction/preclusion apportionment. Prepared for Tampa Bay Estuary Program.

Janicki Environmental, Inc. 2003. A hydrodynamic model of the nearshore and offshore waters adjacent to the proposed Tampa Bay Water Gulf Coast Desalination facility. Prepared for Tampa Bay Water. Contributing authors: R. Pribble, A.J. Janicki, and K. Hackett.

Janicki Environmental, Inc. 2003. Technical Memorandum: Predicted water quality responses in Bishop Harbor to interim nutrient loading limits. Prepared for Florida Department of Environmental Protection. Contributing authors: J.R. Pribble, K. Hackett, and A.J. Janicki.

Susan S. Janicki
Scientist/Programmer
Janicki Environmental, Inc.

Ms. Janicki has 25 years of experience in data management and analysis. Her areas of expertise include programming, statistical analysis, database development and maintenance, data quality assurance and quality control, and development of graphical data presentation.

EDUCATION

B.A., Mathematics,
University of Maryland Baltimore County, 1984

PROJECT EXPERIENCE

Tampa Bay Estuary Program Technical Support – Action Plan Database:
Ms. Janicki has been assisting the Tampa Bay Estuary Program and Nitrogen Management Consortium in development and maintenance of the Tampa Bay Action Plan Database. The database contains habitat protection, restoration, and preservation projects as well as nutrient load reduction projects completed and anticipated by participating stakeholders. The database was originally developed to support the Tampa Bay Nitrogen Management Strategy, directed towards reducing and/or precluding loads necessary to maintain TN loadings to the bay commensurate with improving water quality and seagrass conditions. The database is currently serving as a convenient and efficient vehicle for tracking TN load reduction projects for inclusion in the Tampa Bay Reasonable Assurance Update effort.

Florida Department of Environmental Protection – Loadings Development for Tampa Bay:
Ms. Janicki recently participated in the development of pollutant loading estimates for Tampa Bay for the period 2004-2007 and future loading estimates for 2020. These efforts were similar to past efforts she assisted in for the Tampa Bay Estuary Program, developing loading estimates for Tampa Bay for the periods 1985-2003 and future loading estimates for 2010. Ms. Janicki performed analyses of loadings based on land use, soil types, flows, water quality and rainfall. She helped compile and QC the input data for the model runs, as well as running the models and creating graphical output of the results.

Tampa Bay Estuary Program Decision Rule – Chlorophyll-a and Light Attenuation in Tampa Bay:
Ms. Janicki performed the data management and quality control of the input data for the TBEP Decision Rule. She performed the decision matrix analysis and created the graphical output used in the 2001, 2002, and 2003 assessments. These calculations compared chlorophyll-a and light attenuation in the segments of Tampa Bay.

Pinellas County DEM – Cross Bayou Watershed Benthos/Sediment Assessment:
Ms. Janicki performed data management and graphical support for the two sediment quality assessment surveys (2005 and 2006) of the Cross Bayou Canal & Joes Creek watersheds.

Pinellas County DEM - Development of a Design of a Surface Water Quality Monitoring Program:
Ms. Janicki contributed to the review and analysis of the existing water quality data used to define the new water quality monitoring program design. She reviewed the existing water quality data, and provided quality control and review of the computer programs that were delivered to the county to support sampling design and analysis.

Charlotte Harbor National Estuary Program - Evaluation of Status & Trends in Water Quality and Hydrologic Conditions:
Ms. Janicki recently completed analysis on the status and trends of surface water, ground water and rainfall data collected within the entire Charlotte Harbor Basin for the National Estuary Program. This project involved a large data collation effort along with application of sophisticated analytical techniques to assess the time series trends in water quality throughout the basin. This work serves to inform water resource managers on the level of service necessary to protect and restore water resources within their management areas and provides valuable information to the scientific community for goal setting agendas.

Southwest Florida Water Management District – Lower Hillsborough River, Sulphur Springs, and Alafia River Minimum Flows and Levels Support:
Ms. Janicki contributed to the effort to conduct statistical analyses of flow records from a series of rivers within the District to aid in estimation of allowable surface water withdrawal rates from the rivers. The results of this project are being used by the District to develop acceptable withdrawal schedules from surface waters in the District. A series of flow-related metrics was examined, and the resultant changes in these metrics resulting from various withdrawal scenarios were estimated. She provided technical analysis and data management in the development of the minimum flows.

Tampa Bay Water – OROP Stewardship Plan:
Ms. Janicki obtained historical data for the rivers examined. She performed QA/QC on the datasets, and analyzed the data for relative abundance and dominance of juvenile and adult fishes and benthic organisms. Ms. Janicki provided graphical assistance for the report.

Tampa Bay Water – Downstream Augmentation:
Ms. Janicki served as the data manager and data analyst for the hydrodynamic model (CE-QUAL-W2) and water quality model (CE-QUAL-ICM) developed for the Lower Hillsborough River in support of the Downstream Augmentation project for Tampa Bay Water. Ms. Janicki provided statistical and graphical support for the project.

Peace River/Manasota River Water Supply Authority – HBMP Interpretive and Data Report Support:
Ms. Janicki compiled data and developed graphics and tabular inputs to the 1996, 1997, and 1999 annual data reports for the Peace River/Manasota Regional Water Supply Authority, and for the 2000 Year 3 Interpretative Report for the Authority. These reports presented hydrology, primary productivity, water chemistry, zooplankton, and vegetation data.

RECENT REPORTS AND PUBLICATIONS

Janicki Environmental, Inc. 2008. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 2004-2007. Prepared for Florida Department of Environmental Protection. Contributing authors: A. Janicki, K. Hackett, R. Pribble, M. Dema & S. Janicki.

Janicki Environmental, Inc. 2008. Model-Based Estimates of Total Nitrogen Loading to Tampa Bay: Current Conditions and 2020 Conditions. Prepared for Florida Department of Environmental Protection. Contributing authors: A. Janicki, K. Hackett, R. Pribble, M. Dema & S. Janicki.

Janicki Environmental, Inc. 2007. Water quality data analysis and report for the Charlotte Harbor National Estuary Program. Prepared for Charlotte Harbor National Estuary Program.

Janicki Environmental, Inc. 2005. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 1999-2003. Prepared for Tampa Bay Estuary Program. Contributing authors: A. Poe, K. Hackett, S. Janicki, R. Pribble, and A. Janicki.

Janicki Environmental, Inc. 2004. Tracking Chlorophyll-a and Light Attenuation in Tampa Bay: Application to 2003 Data. Prepared for Tampa Bay Estuary Program. Contributing authors: A. Poe, S. Janicki, and A. Janicki.

Janicki Environmental, Inc. 2003. Water quality data analysis and report for the Charlotte Harbor National Estuary Program. Prepared for Charlotte Harbor National Estuary Program. Contributing authors: D. Wade, A. Janicki, S. Janicki, and M. Winowitch.

Janicki Environmental, Inc. 2001. Estimates of total nitrogen, total phosphorus, total suspended solids, and biochemical oxygen demand loadings to Tampa Bay, Florida: 1995-1998. Prepared for Tampa Bay Estuary Program. Contributing authors: R. Pribble, R., A. Janicki, H. Zarbock, S. Janicki, and M. Winowitch.

Janicki, A.J., J.R. Pribble, S. Janicki, and M. Winowitch. 2001. An analysis of long-term trends in Tampa Bay water quality. Prepared for Tampa Bay Estuary Program. Prepared by: Janicki Environmental, Inc.

Janicki, A.J., J.R. Pribble, H. Zarbock, S. Janicki, and M. Winowitch. 2001. Model-based estimates of total nitrogen loading to Tampa Bay: Updated current and 2010 conditions. Prepared for Tampa Bay Estuary Program.

Janicki, A.J., J.R. Pribble, and S. Janicki. 2001. Tampa Bay Estuary Program model evaluation and update: Chlorophyll a – light attenuation relationship. Prepared for Tampa Bay Estuary Program. Prepared by: Janicki Environmental, Inc.

Janicki, A.J., J.R. Pribble, and S. Janicki. 2001. Tampa Bay Estuary Program model evaluation and update: Nitrogen load - chlorophyll a relationship. Prepared for: Tampa Bay Estuary Program. Prepared by: Janicki Environmental, Inc.

Pauline A. Vaas, Ph.D.
Environmental Analyst
Janicki Environmental, Inc.

Dr. Vaas is an environmental analyst at Janicki Environmental, Inc. with 23 years of experience in the field of environmental sciences. Dr. Vaas' area of expertise includes empirical water quality modeling and water quality assessment; statistical analysis of long-term ecological monitoring programs and estuarine ecology. Her principal responsibilities are to provide consultation and statistical support to clients involved in natural resource issues in Florida. Her background includes statistical analysis of environmental data; marine and estuarine ecosystem analysis; environmental management, public policy analysis, cost benefit analysis and economic evaluation of natural resources. Prior to joining Janicki Environmental in 2007, Dr. Vaas worked for the engineering consulting group, CH2M Hill, Inc., where she provided statistical support for environmental engineering projects, and analyzed data for wastewater discharge permit compliance monitoring programs. Prior to entering the field of consulting, Dr. Vaas completed a Ph.D. program at the Nicholas School of Environmental Science at Duke University, and an M.S. degree at the Duke University School of Statistics and Decision Science. During her Ph.D. program, Dr. Vaas was supported by a grant from the U.S. Environmental Protection Agency to develop an index of ecosystem integrity for the Chesapeake Bay. Prior to the Ph.D. program, she worked as an environmental analyst for the Chesapeake Bay National Estuary Program water quality monitoring program at the Maryland Department of the Environment. She also volunteered as a docent at the National Aquarium in Baltimore for four years. She worked as a biologist at the Narragansett Bay U.S.EPA Laboratory in Rhode Island, and at the University of Rhode Island Marine Ecosystem Research Laboratory.

EDUCATION

Ph.D., Environmental Science,
Duke University, Durham, North Carolina, 1997
M.S., Statistics and Decision Science,
Duke University, 1997
M.E.M, Environmental Management (Water Resources),
Duke University, 1986
M.A. Policy Science and Public Affairs,
Duke University, 1986
B.S., Zoology (with a Minor in Mathematics),
University of Rhode Island, 1982

PROJECT EXPERIENCE

St. Johns River Water Management District – Silver Spring MFL Development:
Dr. Vaas is currently working with the SJRWD in support of a project to develop minimum flows and levels regulations for the spring system. This work involves analyzing the effects of flow on water quality and on fish and wildlife habitat in the Silver Springs system. The work also includes writing literature reviews on the effects of flow on water quality and fish and wildlife habitat.

Southwest Florida Water Management District – Dona and Roberts Bays MFL Development:
Dr. Vaas has analyzed water quality and flow data from Dona Bay, Roberts Bay and Cow Pen Slough in support of the development of minimum flows and levels for Dona Bay. She provided technical support in data summary, development of report graphics and wrote a technical report on the analyses.

Tampa Bay Estuary Program – Water Quality Trends and Relationship of Nitrogen Loading and Chlorophyll Levels in Tampa Bay:
Dr. Vaas has worked extensively with Tampa Bay Estuary Program monitoring data to provide technical assistance to the Tampa Bay Estuary Program. She has analyzed long-term trends in water quality parameters and nutrient load estimates in Tampa Bay. She is currently working on a technical report on her analyses of the long-term trends in water quality to update the report on water quality trends in Tampa Bay published by JEI in 2001. Dr. Vaas has developed water quality models of the relationships between nutrient loads and receiving water body water quality in the Tampa Bay to predict summer mean chlorophyll concentrations from winter nitrogen loads. She also assisted with the 2008 effort to update the Tampa Bay Action Plan database, by compiling information on nutrient reduction projects implemented throughout the Tampa Bay watershed.

Dr. Vaas has applied steady-state, mass-balance water quality modeling techniques combined with empirical modeling to update and extend the boundary of the Tampa Bay Nutrient Model to the Gulf of Mexico to predict total nitrogen concentration and chlorophyll concentration in the lower Tampa Bay segment using internal and external nitrogen loading data. These techniques were used to estimate internal metabolism of nitrogen in the estuary and exchange of internal nitrogen loads between segments of Tampa Bay. She is currently writing a technical report on her analyses that will update the Tampa Bay Nutrient Model report by JEI, published in 1996.

South Florida Water Management District – Chemical Phosphorus Removal in Managed Wetland Treatment Systems:
While working for CH2M Hill, Inc., Dr. Vaas performed statistical analysis and assisted with experimental design in the research and demonstration study of chemical phosphorus removal in Managed Wetland Treatment Systems in the South Florida stormwater treatment areas south of Lake Okeechobee. The purpose of the study was to determine if chemical removal combined with constructed wetlands can serve as a supplemental technology to sustainably remove excess phosphorus from agricultural wastewater prior to discharge to the Everglades National Park. The experimental mesocosms were arranged in a paired watershed design which allowed statistical analysis without replication of the experimental units. Dr. Vaas performed statistical analysis using robust regression of the experimental mesocosm results.

Puerto Rico – NPDES Permitting:
While working for CH2M Hill, Inc., Dr. Vaas performed water quality data analysis to support a NPDES discharge permit compliance monitoring program for several wastewater treatment plants discharging effluent to the marine environment surrounding Puerto Rico. This work extended from 1999 through 2007, under contracts with the Puerto Rico Aqueduct and Sewer Authority during. The analysis also supported a marine mixing zone

analysis and waiver application under the 301(h) waiver program for WWTP plants with primary treated wastewater. Dr. Vaas analyzed marine chlorophyll concentrations, water toxicity, and fish population measurements. She also analyzed the ecological integrity of fish community using species diversity indices applied to data collected in the proximity of the ocean discharge pipes.

U.S. Environmental Protection Agency – Chesapeake Bay Program:
During her Ph.D. program, Dr. Vaas developed an index of ecosystem integrity for the Chesapeake Bay while working on a research grant from the U.S. EPA. This involved merging data from many of the separate data bases in the Chesapeake Bay monitoring programs, including both water quality and biological components. She developed an extensive data base that combined data records from separate monitoring programs and developed algorithms that allowed analysis of data from different monitoring programs.

Chesapeake Bay National Estuary Program
While working for the Maryland Department of Natural Resources (MDNR), Dr. Vaas performed the statistical analysis to develop the first index of biotic integrity applied to characterize the health and integrity of fish communities in Chesapeake Bay. The index was calibrated for use in the wide range of salinity regimes found in the Maryland portion of the Bay, by substituting metrics for species adapted to specific salinity ranges. The index is used as a biological indicator of water quality, and is used to comply with the USEPA mandated monitoring of biological integrity of water bodies under the Clean Water Act.

While working for the Maryland Department of the Environment (MDE), Dr. Vaas worked in the U.S. EPA/Maryland Chesapeake Bay Water Quality Monitoring Program. She performed statistical analyses, generated report graphics and developed computer graphics programs in support of the production of four of the annual water quality characterization reports for the Maryland portion of the Chesapeake Bay National Estuary Program. She participated in database management for the program and performed quality assurance and quality control analyses of water quality data. This monitoring program was the foundation for management actions for the Bay and was the model for development of monitoring programs mandated under the National Estuarine Protection Act.

Dr. Vaas conducted statistical analysis to characterize the geographic extent, seasonality and characterization of limiting nutrients for phytoplankton in Chesapeake Bay, using levels of concentration of nitrogen and phosphorus established in marine biology literature. This work was part of a technical synthesis report written for scientific input to develop management goals mandated by the Governors' Nutrient Reduction Agreement of 1987.

Dr. Vaas conducted statistical power analyses of the Maryland Chesapeake Bay Water Quality Monitoring Program to determine whether the sampling program was adequate to provide data suitable for detecting trends in water quality. The work was used to refine the Maryland sampling program. Dr. Vaas wrote the technical report describing these results, which was then presented to the Chesapeake Bay Scientific and Technical Advisory Committee by Dr. Robert Magnien.

Dr. Vaas conducted a statistical meta-analysis of nutrient uptake rate coefficients of phosphorus and nitrogen by marine phytoplankton species for input to mechanistic models of phytoplankton growth in Chesapeake Bay. The work involved an extensive literature search and review of more than 50 journal articles and reports, and statistical analyses on the resulting data set of rate coefficients. The statistical analysis involved modeling the relationships between the rater coefficients and the environmental data to determine what environmental and experimental conditions explained the variance.

Dr. Vaas analyzed experimental bioassay data on nutrient limitation of estuarine phytoplankton in microcosms using logistic regression analysis to develop empirical models to predict limiting levels of nitrogen and phosphorus in Chesapeake Bay, and nutrient ratios of N/P that cause a switch between nitrogen and phosphorus limitation. The work formed the basis for an expanded effort to characterize nutrient limitation in the Bay using empirical modeling applied to these and other experimental data.

RECENT REPORTS AND PUBLICATIONS

Janicki Environmental, Inc. 2009. Proposed Minimum Flows and Levels for Dona Bay (Draft). Prepared for Southwest Florida Water Management District. Contributing authors: K. Hackett, A. Janicki, R. Pribble & P. Vaas.

Vaas, P.A., W. Dunn and G. Coffelt. 2002. Application of a paired watershed experimental design to phosphorus removal testing at the Everglades Nutrient Removal (ENR) project. Unpublished manuscript, prepared by the South Florida Water Management District.

Vaas, P.A. 2001. Section 4.7 Results of Testing and Evaluations at MWTS Test Cells and Seminole Reservation Wetland Site: Paired Watershed Analysis. *chapter in:* Managed Wetlands Treatment System Project Report Vol.1.pp.4-73 to 4-88, and Appendix H Paired Watershed Regression Analysis. Vol.II 38 pp. Technical report prepared by CH2M Hill, Inc., for the South Florida Water Management District. http://www.sfwmd.gov/org/erd/ecp/etweb/main_template/mwtsrep.html

Jordan, S.J. and P.A. Vaas. 2000. An Index of Ecosystem Integrity for Northern Chesapeake Bay. Environmental Science and Policy 3: 559-588.

Vaas, P. A., Jordan, S. J., and W. Van Heukelem. 1997. Targeting watershed management based on the integrity of aquatic living resources and their habitats. Technical Report prepared for the U.S. Environmental Protection Agency. Maryland Department of Natural Resources, Cooperative Oxford Laboratory, Oxford, MD.

Vaas, P.A., R.E. Magnien and T.R. Fisher. 1993. Logistic regression model of nutrient addition bioassay data to predict nutrient limitation in the Chesapeake Bay. Technical memorandum prepared for the Maryland Department of the Environment, Chesapeake Bay Program, Baltimore.

Reckhow, K.H. and P.A. Vaas. 1992. Evaluation of Robust Estimators for Water Quality Assessment. Presentation paper for the Spring meeting of the Biometrics Society, Cincinnati, OH.

Vaas, P.A. and S.J. Jordan. 1990. Long term trends in abundance indices for 19 species of Chesapeake Bay fishes: Reflections of trends in the bay ecosystem. Proceedings of New Perspectives in the Chesapeake System: A Research and Management Partnership. Chesapeake Research Consortium Publication No. 137, pp. 539-546.

Jordan, S.J., P. A. Vaas and J. Uphoff. 1990. Fish assemblages as indicators of environmental quality in Chesapeake Bay. Proceedings, Biological Criteria: Research and Regulation. US Environmental Protection Agency, Office of Water, Washington, DC.

Vaas, P. A. and R. E. Magnien. 1988. Statistical Power Analysis of the Maryland Chesapeake Bay Water Quality Monitoring Program. Technical Report prepared by the Maryland Department of the Environment, Chesapeake Bay Program, Baltimore.

Amy C. Poe, Ph.D.
Senior Scientist
Janicki Environmental, Inc.

Dr. Poe is a senior scientist with Janicki Environmental, Inc, with ten years' experience in the environmental sciences, specializing in wetland ecology, biogeochemistry, and water quality assessments. Her areas of expertise include planning and implementation of water quality monitoring programs and data assessment and analysis and her work spans a wide variety of coastal and estuarine systems to include the Chesapeake Bay, the Albemarle Pamlico Sound, and the Tampa Bay and surrounding water bodies. She holds a BS in Biology from Salisbury State University, a BS in Marine/Environmental Sciences from the University of Maryland and a Ph. D. from the University of North Carolina-Chapel Hill. Prior to joining the Janicki Environmental team in 2003, Dr. Poe was awarded her doctorate in Environmental Science from the University of North Carolina at Chapel Hill, where she evaluated and published on the effectiveness of nitrogen removal from agricultural runoff by a constructed wetland. As a graduate Research Technician, Dr. Poe served on an interdisciplinary research team to design and implement a constructed wetland and she participated in the Neuse River Monitoring Program. Prior to graduate school, Dr. Poe conducted estuarine research at the Horn Point Environmental Laboratory in Cambridge, Maryland as a Summer Fellow from the State of Maryland Sea Grant and National Science Foundation and she also worked at the Estuarine Research Center's Academy of Natural Sciences in St. Leonard, Maryland.

EDUCATION

Ph.D., Marine Sciences
University of North Carolina at Chapel Hill, 2004
B.S., Biology, minor in Chemistry
Salisbury State University, 1997
B.S., Marine/Environmental Science
University of Maryland, 1997

PROJECT EXPERIENCE

Tampa Bay Estuary Program

Dr. Poe has contributed to a variety of projects for the Tampa Bay Estuary Program. Dr. Poe served as editor for the five-year Tampa Bay Estuary Baywide Environmental Monitoring Report for the Tampa Bay Estuary Program published in 2006. Over the last five years Dr. Poe has aided in the development of pollutant loading estimates for total nitrogen, total phosphorus, and total suspended solids loadings to Tampa Bay. Estimated pollutant loadings were reported for each bay segment and from each major drainage basin to Tampa Bay. In the Tampa Bay region this work has been keystone in setting and achieving management and research goals towards improving water quality in the region. Dr. Poe's work has also included support of the monitoring program design and implementation, data management strategy, seagrass and emergent habitat target setting, seagrass restoration and quality targets, and emergent habitat targets, including water quality targets, and establishment of a process for tracking chlorophyll a and light attenuation. Lastly, Dr. Poe contributed to the analysis of understanding the effects of freshwater inflows on the biological integrity of Tampa Bay by investigating changes in community structure. Dr. Poe

assisted in compiling and analyzing a comprehensive database of existing data to produce general characterization assessments (status and trends) for freshwater inflow, fish species, benthic species, and communities. Based on the available data, a neural network model was employed to assess patterns of abundance and distribution of fish species utilizing the Alafia River relative to hydrologic condition.

South Florida Water Management District – Analysis of Freshwater Inflows and Nutrient Loading on Chlorophyll in the Caloosahatchee River:
The objectives of this study were to describe and quantify the relationship between the rate of freshwater input and the behavior of chlorophyll *a* and nutrients in the Caloosahatchee Estuary and San Carlos Bay. Using freshwater flows and residence times, mixing diagrams and a box model were used to determine how freshwater flows and residence time affect the retention and export of nutrients in the Caloosahatchee Estuary. Dr. Poe applied the models to determine the extent to which nutrients are taken up or released in the estuary and to relate the position and magnitude of chlorophyll *a* accumulation to freshwater inflow and residence time.

Tampa Bay Water – Hydrobiological Monitoring Program (HBMP):
Dr. Poe provided analytical and editorial support to assessment of the Year Six report produced by Tampa Bay Water's HBMP. This work included developing empirically based logistic regression models to estimate the effects of Tampa Bay Water withdrawals on dissolved oxygen and chlorophyll *a* levels in the Hillsborough River and Tampa Bypass Canal.

Charlotte Harbor National Estuary Program – Evaluation of Status & Trends in Water Quality and Hydrologic Conditions:
Dr. Poe contributed in assessing the status and trends of water quality conditions within the CHNEP study area. Dr. Poe was responsible for collecting and compiling data sets for surface and ground water quality, hydrology, and rainfall. She also assisted in production, review and publication of the final report.

Suwannee River Water Management District
Dr. Poe was involved in establishing ecological criteria on multiple water bodies throughout the District, as part of a multi-disciplinary team led by Water Research and Associates. As part of this team, Dr. Poe was responsible for collecting, analyzing and assessing ecological components of these projects.

Army Corps of Engineers
Dr. Poe supported a team effort to describe known recent and historic alterations and changes to the Withlacoochee River watershed from a hydrologic and geomorphic perspective that have affected the river's behavior and response to high and low flow conditions. Dr. Poe researched extensively to provide historical data from multiple agencies in order to derive a timeline of alterations in order to understand episodic and cumulative impacts upon the river.

University of North Carolina at Chapel Hill Graduate Research
Dr. Poe was awarded her Ph.D. from the University of North Carolina at Chapel Hill. Her thesis research, funded by the Clean Water Management Trust Fund and through a

fellowship awarded by North Carolina State University's Department for Transportation and the Environment, focused on measuring and evaluating the effectiveness of a constructed wetland in removing nitrogen from agricultural runoff. A nitrogen budget was calculated for the newly constructed wetland through measurements of denitrification, macrophytes, microalgae, and phytoplankton to determine the possible nitrogen storage and removal pathways and their overall importance. Incorporated as a subordinate element of the thesis research, Dr. Poe evaluated survival rates and effectiveness of four plant species native to the local area of the constructed wetland. The data collected through extensive ecological monitoring over four years was measured against a natural wetland in order to build a data set to determine timescales in which constructed wetlands are able to approximate the functions of natural systems. This research is directly facilitating the development of a long-term planning and execution guide for the restoration and creation of wetlands in eastern North Carolina.

Neuse River Estuary Monitoring Program

Dr. Poe participated in the Neuse River Estuary Monitoring Program, she collected weekly water samples, analyzed samples for may water quality parameters including chlorophyll a, nutrients and, total suspended solids. This program, a cooperative effort between the University of North Carolina at Chapel Hill Institute of Marine Sciences and the North Carolina Department of Natural Resources, is establishing a long-term data set through weekly water monitoring to evaluate state mandated reductions in nitrogen and phosphorus loading.

RECENT REPORTS AND PUBLICATIONS

Janicki Environmental, Inc. 2008. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 2004-2007. Prepared for: Florida Department of Environmental Protection

Poe, A. J. Janicki, and H. Greening, eds. 2006. Baywide Environmental Monitoring Report 2002-2005. Tampa Bay Estuary Program.

Janicki Environmental, Inc. 2007. Tracking Chlorophyll-a and Light Attenuation in Tampa Bay: Application to 2003 Data. Prepared for: Tampa Bay Estuary Program, St. Petersburg, Florida.

Janicki Environmental, Inc. 2006. Tracking Chlorophyll-a and Light Attenuation in Tampa Bay: Application to 2003 Data. Prepared for: Tampa Bay Estuary Program, St. Petersburg, Florida.

Janicki Environmental, Inc. 2005. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 1999-2003. Prepared for: Tampa Bay Estuary Program, St. Petersburg, Florida.

Janicki Environmental, Inc. 2005. Tracking Chlorophyll-a and Light Attenuation in Tampa Bay: Application to 2003 Data. Prepared for: Tampa Bay Estuary Program, St. Petersburg, Florida.

Janicki Environmental, Inc. 2005. Water Quality Analysis in the Caloosahatchee Estuary. Prepared for South Florida Water Management District, West Palm Beach Florida. Contributing authors: A. Janicki, A. Poe, R, Pribble, and D. Wade.

Janicki Environmental, Inc. 2004. Tracking Chlorophyll-a and Light Attenuation in Tampa Bay: Application to 2003 Data. Prepared for: Tampa Bay Estuary Program, St. Petersburg, Florida.

Tetra Tech Inc., and Janicki Environmental, Inc. 2004. Withlacoochee River Basin Feasibility Study: Hydrology and Hydraulics Data Collection and Review. Prepared for U. S. Army Corps of Engineers.

Poe, A. C. 2004. Denitrification dynamics in constructed wetland receiving agricultural drainage. Ph. D. Dissertation. University of North Carolina, Chapel Hill, NC.

Poe, A.C., M.F. Piehler, S.P. Thompson, and H.W. Paerl. 2003. Denitrification in a Constructed Wetland Receiving Agricultural Runoff. *Wetlands*. 23: 817-826.

Stephen A. Grabe, M.S.

Associate
Janicki Environmental, Inc.

Mr. Grabe has more than 30 years experience as a Marine/Aquatic Ecologist and is an Associate with Janicki Environmental, Inc. A primary area of expertise is the ecology of estuarine and freshwater benthic macroinvertebrates, including effects of streamflow modifications and sediment contaminants on benthic communities. Mr. Grabe also has an extensive background in sediment contaminant and water quality assessments of Florida estuarine and inland waterways.

Mr. Grabe previously coordinated the Environmental Protection Commission of Hillsborough County's contributions to benthic and sediment contaminant monitoring for the Tampa Bay Estuary Program, supervised that agency's Benthic Laboratory, and designed and implemented the benthic monitoring element of Hillsborough County's Independent Monitoring Program. Prior to that Mr. Grabe was responsible for the design and implementation of water quality, sediment contaminant, and benthic monitoring programs required to meet Collier County's (Naples, FL) Growth Management Plan.

EDUCATION

M.S., Exercise Physiology,
Purdue University, Indiana, 1989.
M.S., Biology,
Fordham University, Bronx, N.Y., 1978
B.S., Biology,
Brooklyn College, City University of New York, Brooklyn, N.Y., 1973

PROJECT EXPERIENCE

Pinellas County Department of Environmental Management
Mr. Grabe was the Project Manager for two sediment quality assessment surveys (2005 and 2006) of the Cross Bayou Canal & Joes Creek watersheds. This project entailed collaboration with PCDEM on the study design and field sampling. Mr. Grabe was also responsible for securing qualified subcontracting laboratories to perform the chemical analyses.

Southwest Florida water Management District
Mr. Grabe managed benthic surveys of a number of tidal rivers District's development of "minimum flows and levels". Responsibilities have included study design, field sampling, hiring and management of subcontractors for field collection and laboratory analyses, data analysis, and interpretation. The rivers have included the Little Manatee, Anclote, Weeki Wachee/Mud, Chassahowitzka, and Homosassa rivers. Mr. contributed to a project whose objective was to develop analytical tools to quantify benthic community responses to altered freshwater inflows to Gulf coast tidal rivers as well as the application of these to setting MFLs. Finally, Mr. Grabe contributed to the Lower Hillsborough River MFL revisions, as well as to providing technical support for the setting of MFLs for Shell Creek, the Lower Peace River, and Cow Pen Slough/Dona and Roberts Bay.

Tampa Bay Water

Mr. Grabe has worked on Tampa Bay Water Master Plan projects on the Tampa By-Pass Canal, the Lower Hillsborough and Alafia rivers, including the Downstream Augmentation Project, and Tampa Bay Desalination Facility. These have included analyses of benthic community composition and structure and water quality characteristics. In 2007, Mr. Grabe conducted a survey of mollusc communities, with particular emphasis on oysters, in the McKay Bay-Tampa Bypass Canal system.

Suwannee River Water Management District

As part of the Suwannee River Water Management District's MFL process, Mr. Grabe has assessed the responses of freshwater macroinvertebrate assemblages to different riverine flow regimes. These analyses have quantified alterations in community structure due to variations in cumulative freshwater inflows as well as NOAA's Multivariate ENSO Index. Mr. Grabe has contributed to the ecological analyses used in setting MFLs for the Lower Suwannee River/Suwannee Sound, Waccasassa, Upper Santa Fe, and Alapaha rivers. Mr. Grabe was trained by Dr. James A. Gore (University of South Florida) in the techniques of Physical Habitat Simulation Modeling (PHABSIM), an instream flow management tool. He aided in the design of salinity-benthic infauna surveys of the Steinhatchee, Econfina, and Auclilla rivers.

RECENT REPORTS AND PUBLICATIONS

Janicki Environmental, Inc. 2008. Survey of Oysters and Other Molluscs in McKay Bay & the Tampa Bypass Canal, September 2008. Prepared for Tampa Bay Water.

Janicki Environmental, Inc. 2008. Characterization of Macroinvertebrate Communities of the Homosassa & Halls Rivers. Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2008. Analysis of Benthic Community Structure in Tributaries to the Chassahowitzka River. Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2007. Development of Analytical Tools for the Establishment of Minimum Flows Based Upon Benthic Macroinvertebrate Communities of Southwest Florida Tidal Rivers. Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2007. Analysis of Benthic Community Structure in the Manatee River. Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2007. Analysis of Benthic Community Structure in the Little Manatee River. Prepared for Southwest Florida Water Management District

Janicki Environmental, Inc. 2006. Analysis of Benthic Community Structure in the Anclote River. Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2006. Analysis of Benthic Community Structure the Weeki Wachee and Chassahowitzka Rivers. Prepared for Southwest Florida Water Management District.

Janicki Environmental, Inc. 2006. Sediment Quality and Contaminant Source Assessment of the Cross Bayou Canal and Joe's Creek, Pinellas County, Florida, June 2005 and August 2006. Prepared for: Pinellas County Department of Environmental Management. Clearwater.

Janicki Environmental, Inc. 2006. Analysis of Benthic Community Response to freshwater inflow in the Weeki Wachee and Chassahowitzka Rivers. Prepared for: Southwest Florida Water Management District, Brooksville.

Janicki Environmental, Inc. 2005. Sediment Quality and Contaminant Source Assessment of the Cross Bayou Canal and Joe's Creek, Pinellas County, Florida. Prepared for: Pinellas County Department of Environmental Management. Clearwater.

Janicki Environmental, Inc. 2005. Development of Analytical Tools for the Establishment of Minimum Flows Based Upon Macroinvertebrate Communities of Southwest Florida Tidal Rivers. Prepared for: Southwest Florida Water Management District. Brooksville. In revision.

Janicki Environmental, Inc. 2005. Design of Sampling Events for a Statistical Analysis of Relationships of Benthic Macroinvertebrates with Substrate and Water Quality in Five Gulf Coast Tidal Rivers. Prepared for: Southwest Florida Water Management District. Brooksville.

RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

3. SUB-CONSULTANTS

Pinellas County

Southwest Florida Water Management District

Janicki Environmental, Inc.

PBS&J

31 March 2009

3.0 SUBCONSULTANTS

This section of our proposal presents the corporate and individual credentials and experience, including a corporate overview, key personnel, and related project experience for PBS&J, Inc.

3.1 PBS&J Inc.

Established in 1960, Post, Buckley, Schuh, and Jernigan, (d/b/a PBS&J), continues to promote the philosophy of our founding principals by stressing the relentless pursuit of quality and excellence in the services we provide. As one of the nation's largest multidisciplinary firms, PBS&J offers core services in the areas of engineering, planning, construction management, program management, scientific disciplines, surveying and mapping, architecture, landscape architecture, and information technologies. Our vision is to be recognized by clients as the consultant of choice, a goal we strive for by maintaining several core values:

- Belief in the virtues of integrity, hard work, and loyalty
- Relentless pursuit of quality and excellence
- Honoring our promises and contracts
- Belief in open, honest, and respectful communications
- Active support of our professions
- Personal investment in our communities

Ranked 29th on *Engineering News-Record's* annual list of the largest engineering firms in the nation, PBS&J has 3,800 employees in 80 offices nationwide. Our clients represent a mix of both the public and private sectors. We aim to be a single-source solution for clients through the provision of world-class technology and personal service on all of our projects, both small and large.

PBS&J is an employee-owned firm with a matrix organization structured around technical services and geographic regions. This organization has allowed us to successfully combine our technical strengths with the advantages of local presence and experience.

Our six technical service lines include:

- Environmental sciences
- Water
- Transportation
- Facilities
- Construction management
- Federal

To accommodate today's changing markets and emerging technologies, PBS&J has also created national market sector programs that consolidate our expertise and resources to best meet client needs. These programs include architecture, aviation, energy, federal, information solutions, intelligent transportation systems, land acquisition/right-of-way, risk and emergency management, surveying, and transit.

PBS&J's high volume of repeat business—nearly 90 percent—is a reflection of our sincere commitment to client service. Our professional experts, many of whom are recognized nationally and internationally as technical leaders in their areas of specialty, work together to provide complete services to clients from

project initiation to project closeout. Using proven communications strategies, our staff members seek to clearly understand all client objectives and goals to achieve success on every project. The strong rapport and strategic partnerships we form with clients result in maximum efficiency, productivity, and long-term benefits during project assignments and, as needed, in future endeavors.

3.2 Key Personnel

The following presents the key project personnel from PBS&J. Full resumes are provided at the end of this section.

Mr. Doug Robison - Southeast Sciences Division Manager, is a PBS&J vice president and manager of the firm's Southeast/East Sciences division. He has 32 years of professional experience in environmental science and planning, including 18 years of experience as a consultant to government and private industry. His areas of expertise include marine and freshwater ecology; water quality, hydrologic, and biological monitoring; wetland delineation and assessment; wetland mitigation and habitat restoration; watershed management; National Environmental Policy Act (NEPA) document preparation; and environmental regulatory analysis and permitting. Mr. Robison has served as the project manager and/or lead technical professional on numerous challenging projects and is responsible for all program management activities associated with the design, implementation, and production of environmental studies, documents, and management plans. In addition, he has been qualified as an expert in the areas of wetland science, estuarine and freshwater ecology, water quality, and environmental monitoring; and he has provided legal testimony and technical support on behalf of numerous public agencies and private concerns.

Dr. David A. Tomasko, Ph.D.- Senior Environmental Scientist serves as a senior environmental scientist and manager of the watershed sciences and assessment program in PBS&J's southeast/east sciences division. An eminent scientist, he has an extensive 23-year ecological sciences background involving marine and freshwater ecology, wetland habitat evaluation and delineation, restoration design, development of estuary and lake management plans, environmental monitoring design, and water quality analysis and modeling. He has also been published widely and has made numerous presentations in his technical fields. Dr. Tomasko's current general duties at PBS&J include project management and administration services for ecological/environmental projects.

Dr. Ralph T. Montgomery, Ph.D. - Senior Scientist Dr. Montgomery has 31 years of professional experience working with numerous government agencies and private sector clients. His responsibilities have included environmental consulting services regarding watershed studies; water quality and estuarine issues; experimental design; data reduction; statistical analysis (SAS); designing statistical sound studies to determine impacts in estuarine, freshwater, and terrestrial environments; and threatened and endangered (T&E) species studies. He has also provided technical assistance and expert services in specific environmental areas including hydrology, water quality, stormwater, hazardous waste, groundwater, and has assisted/taught college level courses biology, botany, zoology, bacteriology, marine biology, oceanography, and marine sciences.

Robert D. Woithe, Ph.D., PWS, CSE - Dr. Woithe serves as a systems ecologist and an estuarine and wetland scientist. His expertise encompasses estuaries, wetlands, corals, and seagrasses. He is also experienced in the design and implementation of environmental monitoring studies and natural resource damage assessment particularly for water quality issues, wetlands, estuarine benthos, seagrass, intertidal, coral reef and hardbottom systems. Dr. Woithe designs habitat and wetland restoration projects; develops environmental management plans; performs reviews of proposed regulations; and manages projects and staff conducting environmental monitoring, mapping, and assessment activities.

Dr. Woithe is currently project scientist for several large monitoring programs in the Tampa Bay and Big Bend areas. In this role, he oversees field staff conducting water quality, vegetation, wildlife surveys, and benthic macroinvertebrate monitoring, and maintaining a system of continuously deployed water quality and hydrologic sensors and recorders. Dr. Woithe also oversees data validation and quality control as well as data base management for these and similar projects.

Pam Latham, Ph.D., PWS, CSE -Senior Scientist - Dr. Latham has 23 years of experience working in ecological systems. Her experience includes studies of potential impacts of water diversions to river systems, technical support for minimum flows and levels (MFLs), development of watershed management plans, and preparation of National Environmental Policy Act (NEPA) compliance documents. Dr. Latham has peer-reviewed publications in scientific journals, including *Wetlands, Estuaries,* and the *Water Resource Bulletin.*

Dr. Latham is the project manager for several Southwest Florida Water Management District (SWFWMD) projects in support of MFL development for the Braden, Myakka, Anclote, Little Manatee, Manatee, and Rainbow rivers. She has recently completed similar projects in support of MFLs for the Suwannee River, as well as the upper Peace River and the Alafia River. Other water resource projects with which she is associated include the Little Manatee River Watershed Management Plan, Charlotte Harbor, and Tampa Bay estuary programs in west Florida; potential impact studies of Tampa Bay Water; Peace River Manasota Water Supply Authority surface water projects and water supply projects; and the Peace River Cumulative Impact Study for the Florida Department of Environmental Protection and SWFWMD. Dr. Latham recently completed a programmatic environmental impact statement (EIS) for the Florida Keys water quality improvements project for the U.S. Army Corps of Engineers (USACE) and several subsequent environmental assessments (EAs). Additional NEPA documentation experience includes EISs for essential fish habitat for the Gulf of Mexico and for the Ocklawaha River Restoration project, as well as NEPA documentation for reuse projects for Manatee County, and the City of Tampa, and Clearwater. Dr. Latham has prepared a habitat conservation plan (HCP) for the Choctawhatchee beach mouse and is currently working on an HCP for the St. Andrew beach mouse.

Melisa L. Reiter, PWS - Environmental Permitting Group Manager - Ms Reiter is a group manager in west Florida sciences, Ms. Reiter has19 years of experience in terrestrial, vegetative, and aquatic ecology. Her specialized expertise includes dredge and fill permitting; marine studies; habitat assessment, evaluation, and classification; water quality studies; seagrass mapping; aerial photo-interpretation; land use mapping; ecological assessments; threatened and endangered species studies, and wetland mitigation design and monitoring. She also has extensive experience determining biological indicators of seasonal high-water and normal pool elevations and wetland jurisdictional delineation. State and federal regulatory permitting experience includes roadway and pipeline corridors, large-scale subdivision permitting, and project development and environment (PD&E) studies. Her expertise with marine-related projects includes single-family home docks, residential canal dredge projects, and large-scale marinas. Components of all of these projects involve field sampling, agency coordination, and permit package/application preparation.

3.3 Related Project Experience

Lake Seminole Watershed Management Plan

Pinellas County, Florida

Environmental Sciences

PBS&J prepared a comprehensive lake and watershed management plan for Lake Seminole, a 650-acre lake located in west central Pinellas County, Florida. The lake management plan included hydrologic/hydraulic and water quality analysis, pollutant and nutrient budgets, flora and fauna inventories, lake dredging assessment, and determination of applicable management practices.

Diagnostic work included the development of water and nutrient budgets, development and calibration of a linked watershed/waterbody model to evaluate nutrient load reduction strategies; the updating of the existing floodplain delineation for the watershed; and the development of a feasibility study for a major lake sediment removal project. Lake and watershed planning activities included development of defensible lake and watershed goals and objectives; characterization of upland and wetland habitats; review of applicable local ordinances and state laws; quantification of pollutant loading sources; priority drainage area modeling; review of applicable local and state resource management programs, enforcement programs and policy guidance documents; evaluation of social benefits and uses; development of recommended lake and watershed management strategies; development of recommended operations and maintenance programs; design of monitoring programs; and development of recommended potential funding mechanisms for plan implementation.

The plan addressed multiple lake and watershed management issues including water quality, aquatic vegetation, fisheries, wildlife and associated habitat, flood control, recreation and aesthetics, and public education. Planning activities started with diagnostic work that included the development of water and nutrient budgets; the development and calibration of a linked watershed/waterbody model to be used to evaluate nutrient load reduction strategies; the updating of the existing floodplain delineation for the watershed; and the development of a feasibility study for a major lake sediment removal project.

The hydrodynamic/water quality in-lake analysis was conducted by developing a full eutrophication study based on the Environmental Protection Agency (EPA) Water Quality Analysis Program (WASP-S). Runoff and associated pollutant loads were determined by creating a hydrologic/hydraulic/water quality model of the watershed based on the EPA Stormwater Management Model (SWMM). Input hydrographs and pollutographs for each inflow point were calibrated by conducting field measurements of water flows and water quality characteristics.

Lake and watershed planning activities included development of defensible lake and watershed goals and objectives; characterization of upland and wetland habitats; review of applicable local ordinances and state laws; quantification of pollutant loading sources; priority drainage area modeling; review of applicable local and state resource management programs; review of applicable existing enforcement programs; review of applicable policy guidance documents; evaluation of social benefits and uses; development of recommended lake and watershed management strategies; development of recommended operations and maintenance programs; design of monitoring programs; and development of recommended potential funding mechanisms for plan implementation.

The Lake Tarpon Management Plan also included an assessment of the existing stormwater runoff treatment capacity of the watershed, as well as recommendations for new facilities necessary to maximize pollutant removal. Recommended new facilities included detention ponds and alum treatment facilities.

Client/Owner:
Pinellas County
315 Court Street, Clearwater, FL 33756-5165

Completion Date:
2001

Project Cost:
$450,000

Client Reference:
David Talhouk, Program Administrator, 727.464.3780

PBS&J

Tampa Bay Habitat Master Plan Update

St. Petersburg, Florida

Environmental Sciences

PBS&J was selected by Tampa Bay Estuary Protection (TBEP) to conduct technical analyses and prepare a ten-year update to the program's original Habitat Master Plan, completed in 1996. The project involved the following: a description of Tampa Bay habitats; an assessment of habitat threats; a status and trends analysis of critical habitats; an evaluation of various habitat restoration paradigms; the development of quantitative habitat restoration and protection targets; the delineation of priority acquisition and restoration sites; the development of mitigation criteria for Tampa Bay; and the design of a habitat monitoring and assessment plan.

Technical analyses included the performance of a tidal wetland change analysis for the periods 1950, 1990, 1995, 1999, 2004, and 2007 using photointerpretation and GIS tools. Critical tidal wetlands addressed in this analysis included mangrove forests, salt marshes, salt barrens, and oligohaline habitats. In addition, trend analyses were conducted for coastal uplands and flatwoods marshes. Another major deliverable included the development of a comprehensive GIS database of all publicly-funded habitat restoration projects in the Tampa Bay watershed. The project also involved an extensive analysis of wetland regulations and mitigation policies and the development of recommendations for future land acquisition and a watershed-based strategy to integrate regulatory mitigation with publicly funded habitat restoration activities.

It should be noted that completion of this project was delayed by approximately one year due to scope changes and illness of the original project manager as well as changes to the scope of work.

Client/Owner:
TBEP
100 8th Avenue S.E., MS I-1/NEP
St. Petersburg, FL 33701

Completion Date:
Ongoing

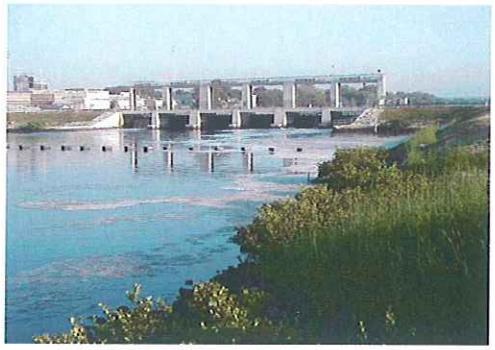
Project Cost:
$88,962 (fees)

Client Reference:
Holly Greening
727.893.2765

Tampa Bypass Canal/Alafia River Hydrobiological Monitoring Program

Tampa, Florida

Environmental Sciences



The development and implementation of a comprehensive hydrobiological monitoring program (HBMP) was required as a condition of approval in the water use permits issued to Tampa Bay Water by the Southwest Florida Water Management District for both the Alafia River and the Tampa Bypass Canal Water Supply projects. Since May 1999, for two consecutive five-year contracts, PBS&J has provided HBMP design and implementation services to Tampa Bay Water.

A consensus-based process was developed and implemented for the HBMP design phase. This approach created a coordinated, interactive forum from which critical input was provided by a team of consultants and university experts, as well as representatives of federal, state, and local environmental regulatory and resource management agencies and various environmental activist organizations.

The HBMP defined three monitoring program elements including hydrology/water quality, biota, and habitat/vegetation. For each program element, a list of critical indicators was specified. Critical hydrology/water quality indicators include flow, water level, salinity, conductivity, dissolved oxygen, temperature, Secchi disk depth, light transmission, chlorophyll-a, color, total and dissolved organic carbon, and total suspended solids. Critical biotic indicators include benthic macroinvertebrate infauna, benthic macroinvertebrate epifauna, ichthyoplankton and zooplankton, adult and juvenile fishes, and water-dependent birds. Critical habitat/vegetation indicators include emergent aquatic vegetation, submerged aquatic vegetation, sediment grain size, and sediment total organic matter.

Since April 2000, PBS&J has served as the prime contractor and program manager for implementation of the HBMP. In addition to being responsible for the collection of all hydrologic, water quality, and benthic invertebrate samples, PBS&J also provides the following services in this role:

- Overall quality assurance and review of each project element.
- Collection, review, documentation, and standardization of results and databases provided by each subconsultant.
- Statistical analyses of each project element in relation to both seasonal variability and potential long-term patterns and changes.
- Preparation of annual data reports and biannual interpretive reports.
- Overall financial management of the HBMP.
- Other as-needed services.

The HBMP design is unique in that it defines a process by which adverse impacts can be determined and mitigated. This process includes a hierarchy of management and regulatory actions to be implemented in response to detected hydrobiological changes in the affected waterbodies to avoid or minimize any adverse impacts resulting from the permitted surface water withdrawals.

At the end of the initial contract in 2004, PBS&J was reselected for this project.

Client/Owner:
Tampa Bay Water
2575 Enterprise Road,
Clearwater, FL 33763-1102

Est. Completion Date:
2012

Project Cost:
$5,236,183 (fees)

Client Reference:
Mike Coates, E&P Projects Supervisor, 727.791.2337

3.4 Resumes

Douglas E. Robison, PWS

Southeast Sciences Division Manager
PBS&J

Education

M.S., Marine Science, University of South Florida, 1982
B.S., Environmental Science, University of Maryland, 1976

Certifications

Professional Wetland Scientist (001013), 02/14/96
Certified Lake Manager, North American Lake Management Society (NALMS)

Professional Affiliations

American Water Resources Association (AWRA)
Estuarine Research Federation (ERS)
Florida Earth Foundation (FEF), Board of Directors
Florida Lake Management Society (FLMS)
North American Lake Management Society (NALMS)
Sigma Xi Honorary Scientific Research Society
Society of Wetland Scientists (SWS)
Tampa Bay Regional Planning Council, Agency on Bay Management (ABM)
St. Petersburg Area Chamber of Commerce

Mr. Robison is a PBS&J vice president and manager of the firm's Southeast/East Sciences division. He has 32 years of professional experience in environmental science and planning, including 18 years of experience as a consultant to government and private industry. His areas of expertise include marine and freshwater ecology; water quality, hydrologic, and biological monitoring; wetland delineation and assessment; wetland mitigation and habitat restoration; watershed management; National Environmental Policy Act (NEPA) document preparation; and environmental regulatory analysis and permitting.

Mr. Robison has served as the project manager and/or lead technical professional on numerous challenging projects and is responsible for all program management activities associated with the design, implementation, and production of environmental studies, documents, and management plans. In addition, he has been qualified as an expert in the areas of wetland science, estuarine and freshwater ecology, water quality, and environmental monitoring; and he has provided legal testimony and technical support on behalf of numerous public agencies and private concerns.

Experience Highlights
Mr. Robison's technical and management experience covers a wide spectrum of environmental services. He has served as project manager and/or lead technical professional on several projects, some of which are highlighted in the following text:

Tampa Bay Water, Hydrobiological Monitoring Program (HBMP) for Tampa Bypass Canal and Alafia River, Tampa Bay, Florida. Project manager and lead technical professional for design of the HBMP for the Tampa Bypass Canal and Alafia River surface water withdrawals. Currently serves as project manager for ongoing implementation of the HBMP, including field data collection, data management, data analysis, and reporting. The cost of this multidisciplined estuarine monitoring program is approximately $1 million per year.

Peace River/Manasota Regional Water Supply Authority, HBMP for Peace River, West Florida. Lead technical professional for the ongoing implementation of the HBMP for the Peace River surface water withdrawal. Activities include management of field data collection as well as data management, data analysis, and reporting.

Tampa Bay Water, Tampa Bay Desalination Plant Services, Tampa Bay, Florida. Project manager for the ongoing water quality and biological monitoring of the permitted Tampa Bay Desalination Plant. This project includes field data collection, data management and analysis, and reporting required under the National Pollutant Discharge Elimination System (NPDES) permit for a 20-mgd desalination plant on Hillsborough Bay.

Florida Department of Environmental Protection, Ocklawaha River Restoration, Putnam County, Florida. Co-project manager and lead technical professional for the preparation of an environmental impact statement and state (ERP and CUP) permit applications, as well as construction and monitoring plans to restore the ecological functions of 9,000 acres of the Ocklawaha River floodplain following the proposed removal of the Rodman Dam and reservoir in Putnam County, Florida.

Douglas E. Robison, PWS
Page 2

Florida Department of Environmental Protection, Hurricane Opal Dune Restoration, Florida Panhandle. Lead technical professional for the assessment of damaged coastal habitats and the planting of more than three million sea oats sprigs covering approximately 100 miles of beach.

Pinellas County, St. Petersburg-Clearwater International Airport Habitat Restoration and Shoreline Protection, St. Petersburg, Florida. Project manager for the restoration of over one-half-mile of eroded and degraded estuarine shoreline, as well as the restoration and creation of over three acres of intertidal wetland habitat. Completed in 1997, this project was designated as the "Environmental Project of the Year" by the Florida Chapter of the American Public Works Association.

Southwest Florida Water Management District (SWFWMD), Flatford Swamp Tree Mortality Study, Florida. Project manager for the assessment of hydrological and ecological factors involved in the mass mortality of hardwood swamp trees in the upper Myakka River watershed and the development of mitigation measures to restore the swamp.

Pinellas County, Lake Tarpon Drainage Basin Management Plan and Lake Seminole Watershed Management Plan, Pinellas County, Florida. Project manager of these major watershed management projects, which involved floodplain and water quality modeling, habitat assessments, and socioeconomic analyses with the objective of developing comprehensive watershed management plans with defensible goals and strategies for pollutant load reduction, habitat improvement, and recreational use optimization.

San Juan Bay National Estuary Program, San Juan Bay Ecological Assessment, San Juan, Puerto Rico. Lead technical professional in contributions to the development of living resource targets and habitat restoration strategies.

Tampa Bay National Estuary Program, Ecological Assessment and Planning, Tampa Bay, Florida. Lead technical professional on numerous ecological assessment and planning projects for the Tampa Bay National Estuary Program. Conducted wetland trend analyses and developed defensible habitat restoration goals and strategies. Contributed substantially to the Tampa Bay Comprehensive Conservation and Management Plan.

City of Tampa, Tampa Water Resource Recover, Tampa, Florida. Lead technical professional for the preparation of an EIS to relocate the major point source discharge from Tampa Bay to the Tampa Bypass Canal and the potable reuse of highly treated wastewater. Assisted in the facilitation of a series of technical workshops utilizing the state ecosystem team permitting approach.

Tampa Bay Water, Anclote Desalination Water Supply, Pasco County, Florida. Project manager and lead technical professional for the preparation of an environmental assessment for the construction and operation of a proposed seawater desalination plant at the Anclote Power Plant site in Pasco County, Florida.

PBSJ

David A. Tomasko, Ph.D.

Senior Environmental Scientist
PBS&J

Education

Ph.D., Biology, University of South Florida, 1989
M.S., Biology, Florida Institute of Technology, 1985
B.S., Biology, Old Dominion University, 1982

Professional Affiliations

Estuarine Research Federation (ERF)
Southeastern Estuarine Research Society
American Society of Limnologists and Oceanographers (ASLO)

Dr. Tomasko serves as a senior environmental scientist and manager of the watershed sciences and assessment program in PBS&J's southeast/east sciences division. An eminent scientist, he has an extensive 23-year ecological sciences background involving marine and freshwater ecology, wetland habitat evaluation and delineation, restoration design, development of estuary and lake management plans, environmental monitoring design, and water quality analysis and modeling. He has also been published widely and has made numerous presentations in his technical fields. Dr. Tomasko's current general duties at PBS&J include project management and administration services for ecological/environmental projects.

Dr. Tomasko's PBS&J experience includes:

Investigation of Algal Bloom Dynamics in the Florida Keys. This project for the Florida Department of Transportation involved an assessment of the factors potentially involved with the development of a large (approx. 30 square miles) algal bloom in the vicinity of Key Largo. The project intent was to determine the relative impact of various factors (e.g., road construction, freshwater inflow, hurricane impacts) that could have contributed to a massive algal bloom in eastern Florida Bay. Served as project manager, responsible for contract and project management, coordinating and conducting field work and data analysis efforts, pollutant load model development, invoicing and report writing.

Investigation of Impacts of Stormwater Pond Discharges on Salinity Levels and Biological Communities in the Lower Caloosahatchee River. This project for the Florida Department of Transportation involved an assessment of the potential impacts of non-attenuated discharges from stormwater ponds associated with road construction activities associated with the Caloosahatchee River crossing of Interstate 75. The project intent was to determine the relative impact of non-attenuated discharges from these ponds, both in terms of expected frequency of occurrence, volumes of discharge expected, and the probable impacts to water chemistry and biological communities in the Lower Caloosahatchee River. Served as project manager, responsible for contract and project management, coordinating and conducting data analysis efforts, invoicing, and report writing.

Nutrient Effects on Attached Algae in the Wekiva River and Rock Springs Run. This project for the St. Johns River Water Management District involved the development of a draft pollutant load reduction goal (PLRG) for the Wekiva River and Rock Springs Run. The project intent was to determine relationships between gradients in nitrogen and phosphorus availability in the Wekiva River and Rock Springs Run (near Orlando) and the abundance of periphytic algae. Served as project manager, responsible for contract and project management, coordination of data collection efforts, data analysis, invoicing, and report writing.

Wagner Creek Total Maximum Daily Load (TMDL) Report, Miami, Florida. This project for the City of Miami involved the development of a TMDL for fecal coliform bacteria for Wagner Creek, a highly contaminated tributary of the Miami River. The project quantified the load reductions necessary for Wagner Creek to meet state water quality standards for total and fecal coliform bacteria. Served as task manager, responsible for data analysis,

PBSJ

field collection of water quality data, coordination of source identification assessments, budget tracking and data analysis and interpretation.

Dona and Roberts Bay Watershed Plan, Sarasota County, Florida. This project for Sarasota County and the Southwest Florida Water Management District involved compilation of water quality data, production of geographic information system (GIS)-based shoreline data layers, and water quality modeling and analysis. The project intent was to develop a water budget and environmental restoration goals for the watershed of Dona and Roberts Bays. Served as project manager responsible for coordinating data collection efforts, tracking progress on other project tasks, invoicing, and data analysis and report writing.

Sarasota Bay Stormwater Outfall Prioritization Project, Sarasota and Manatee Counties, Florida. This project for the Sarasota Bay National Estuary Program involved the development of a conceptual plan for identifying priority stormwater retrofit projects within the Sarasota Bay watershed. The project intent was to develop high priority projects for reduction of nutrient and toxin loads to Sarasota Bay. Served as task manager responsible for data collection and analysis and final report compilation and editing.

Peace River Cumulative Impact Assessment, Florida. This project for the Florida Department of Environmental Protection involved an assessment of the impacts to hydrology and water quality of the Peace River associated with land use changes, point sources, and climatic phenomena. The project intent was to determine the relative contribution to observed changes in flows and water quality due to various land uses, as well as short- and long-term variation in rainfall patters. Served as task manager responsible for data collection, and analysis and report writing on various components of the report.

Lake Jessup TMDL Project, Seminole County, Florida. This project for Seminole County involved the review and potential refinement of the existing nutrient TMDL for Lake Jessup. Served as task manager, coordinating field work for assessing the role of nitrogen fixation in Lake Jessup by blue-green algae, a research need outlined in the existing TMDL.

Lake Hancock TMDL Project, Polk County, Florida. This project, jointly funded by Polk County and the Florida Department of Environmental Protection, involved two main projects, a manipulative *in situ* experiment to determine potential responses of water quality to sediment removal, and a linked study to determine threshold values for phosphorus and nitrogen for water quality improvement. Serve as project manager, responsible for coordinating logistics, field work, data compilation and analysis, as well as invoicing and report writing.

Ralph T. Montgomery, Ph.D.

Senior Scientist
PBS&J

Education

Ph.D., Biology, Florida State University, 1978
B.S., Biology/Zoology, University of California at Davis, 1970

Dr. Montgomery has 31 years of professional experience working with numerous government agencies and private sector clients. His responsibilities have included environmental consulting services regarding watershed studies; water quality and estuarine issues; experimental design; data reduction; statistical analysis (SAS); designing statistical sound studies to determine impacts in estuarine, freshwater, and terrestrial environments; and threatened and endangered (T&E) species studies. He has also provided technical assistance and expert services in specific environmental areas including hydrology, water quality, stormwater, hazardous waste, groundwater, and has assisted/taught college level courses biology, botany, zoology, bacteriology, marine biology, oceanography, and marine sciences.

Examples of Dr. Montgomery's experience record are provided in the following paragraphs.

St. Johns River Consumptive Use Permit (CUP). This work included providing technical analysis of potential biological, water quality, and hydrological downstream impacts of a proposed 5.5-mgd withdrawal from the St. Johns River by Seminole County. Analyses were conducted of the potential magnitude of hydrological changes, impacts to riparian and floodplain communities, spatial distribution of submerged aquatic vegetation (SAV), relationships between changes in water quality and flows, and potential entrainment impacts. This included developing exhibits and providing expert testimony in support of Seminole County's application and the St. Johns River Water Management District's (SJRWMD) issuance of the permit.

Source Water Feasibility Study. This project for the Peace River/Manasota Regional Water Supply Authority water use permit (WUP) involved investigation of the water supply potential for Cow Pen Slough/Dona Bay, Upper Myakka River, and Shell Creek. The project involved an assessment of the flows, hydrologic yields, and water quality of each system. Determinations were made of the water supply yield, environmental benefits and/or concerns, treatment requirements associated with water quality conditions, and probable costs of water diversion, reservoir construction, treatment options, etc. Responsible for efforts to collect, analyze, and interpret information related to water quality and ecological benefits, and provided overall expertise in assessing relative ranking of alternatives.

Peace River/Manasota Regional Water Supply Authority (WUP). Project manager (1980-2008) overseeing the extensive Peace River Hydrobiological Monitoring Program (HBMP) designed to describe changes in various physical, chemical, and biological characteristics of the tidal Charlotte Harbor estuary potentially resulting from potable freshwater withdrawals. Prepared major annual and summary reports analyzing and statistically comparing physical, chemical, and biological data collected during the historic period (1976-2008) of the monitoring program. SAS statistical software has been utilized to assess long-term trend and seasonal patterns of both physical and biological parameters. Developed statistically based predictive models as to potential long-term effects of freshwater withdrawals on salinity and nutrient inputs to the estuary.

Tampa Bypass Canal and Alafia River Hydrobiological Monitoring Program (WUP). This ongoing monitoring effort for Tampa Bay Water is being

conducted to determine potential effects of potable freshwater withdrawals on the physical, chemical water quality characteristics and estuarine communities of the Hillsborough River, Palm River/McKay Bay, Alafia River, and Hillsborough Bay. This project uses both fixed, continuous measurements of physical in situ water quality, as well as additional statistically based sampling, to directly establish long-term relationships between freshwater inflows and ambient estuarine characteristics. In addition, elements of the study include sampling of benthic invertebrates, zooplankton and juvenile/larval fishes, adult fish habitat utilization, riparian vegetation patterns, and bird utilization within specific areas of upper Hillsborough Bay. Report preparation includes extensive annual and summary documents based on both statistical and non-statistical analyses of the collected data.

Minimal Negative Impact Assessment for the City of Punta Gorda's Wastewater Treatment Facility, Punta Gorda, Florida. The City of Punta Gorda needed to determine potential impacts of various potential discharge points within the Myrtle Slough/Shell Creek system for discharges from a proposed advanced wastewater treatment facility. The City's goal in seeking a surface discharge permit is, in part, to augment flows below the Shell Creek Reservoir to mitigate for consumptive withdrawals. The primary goal and specific objectives of the minimal negative impact assessment were to collect the necessary additional physical and chemical data needed to construct water quality models necessary to evaluate projected discharge volumes at a number of potential discharge points.

Peace River Cumulative Impact Assessment, Florida Department of Environmental Protection/Southwest Florida Water Management District (FDEP/SWFWMD). Project manager. This cumulative impact study of the Peace River basin was mandated in December 2003 by the Florida Legislature. In consultation with SWFWMD, FDEP was instructed to study cumulative impacts of changes in landforms and hydrology in the Peace River basin. The study's primary objective is to evaluate cumulative impacts of activities conducted in the Peace River basin on water resources of the basin, including surface waters, ground waters, fisheries, aquatic and estuarine habitat, and water supplies. The primary activities to be evaluated include mining, intense agriculture, and urban development. In addition, the study is to evaluate the environmental benefits, legal issues, and economic impacts of limiting certain activities within environmentally sensitive areas. The results of the study are to be used by FDEP to prepare and adopt a resource management plan for the Peace River basin to minimize any identified existing and future adverse cumulative impacts to water resources of the basin. A goal of this study is to assess long-term changes, as well as the current status of subbasin water quality characteristics and total maximum daily load (TMDL) issues.

Technical Support for the Development of Minimum Flows and Levels for the Upper Peace River and an Investigation of the Hydrologic Relations of Vegetation Communities and Hydric Soils in the Upper Peace and Alafia River Corridors. These two projects were undertaken for SWFWMD in conjunction with the District's work on establishing minimum flows in the upper reaches of the Peace River watershed. The first project included summarizing existing information and presenting it in workshop format to build consensus. In addition, statistical technical assistance was provided in analyzing long-term spatial and temporal changes in seasonal hydrologic patterns within the river's upper watershed. Analyses were conducted to determine the influences of changing flows on selected in-stream habitats. The second study entailed

determining relationships between river elevations (flows), zonation of floodplain vegetation assemblage communities, and historic hydric soil profiles. Long-term changes in both the frequency and duration of water levels were compared and contrasted among associated floodplain communities.

Peace River/Manasota Regional Water Supply Authority, Charlotte Harbor Zooplankton Summary Study for the Peace River/Manasota Regional Water Supply Authority, Charlotte County, Florida. This study graphically and statistically summarized the long-term and seasonal distributions of zooplankton samples collected between 1989 and 1996 at four isohaline locations in the upper Charlotte Harbor estuarine system. Potential relationships between dominant zooplankton taxa and community structure and other measured parameters such as freshwater inflows, physical and chemical water quality characteristics, and phytoplankton production and biomass were investigated.

Monitoring and Assessment Plan (MAP) Implementation Options Analysis. This comprehensive report was conducted for the U.S. Army Corps of Engineers (USACE) and provided to the Comprehensive Everglades Restoration Plan (CERP) Recover Leadership Group. The primary objectives of the study were to determine each of the various types and levels of technical expertise required to implement the draft CERP MAP. Initial study tasks included a detailed technical review of all monitoring elements within the draft MAP; interviewing federal, state, and local government agencies regarding both existing and projected technical expertise; and assessing relative strengths in hydrology, field and wildlife biology, taxonomy, field sampling, water quality, database management, statistical data reduction, and technical report preparation. The final report made specific implementation recommendations based on the relative strengths of both the implementing agencies and potential governmental and private partners.

South Florida Water Management District (SFWMD), Estero Bay, and Watershed Management Improvement Plan, South Florida. Project manager for what is envisioned as a multi-year project. This multidisciplinary study includes assessments of both Estero Bay and the surrounding watershed. The Estero Bay assessment will define water quality and freshwater quantity objectives, and will evaluate pollutant load reduction goals for the bay. During the study, procedures and mechanisms will be developed to evaluate the effects of both existing and potential future watershed management techniques. The Estero Bay assessment involves the application of a logical protocol for designing study and management plans to identify the types of pollutants and their impacts on estuarine environments. A primary focus will be to develop a comprehensive Estero Bay research plan based on developed management goals for the estuary. The Estero Bay watershed assessment will develop land and water management strategies to achieve the water quality and quantity objectives for the bay. The watershed assessment will characterize the watershed and provide tools to evaluate existing conditions and predict the effectiveness of various management scenarios needed to meet the goals developed under the Estero Bay assessment. Estero Bay watershed assessment activities involve the physical description of major features and current management practices, identification of water quality trends, identification and ranking of potential pollution problem areas, development and compilation of input data for a watershed model to evaluate management scenarios, and recommendations of basin-specific management strategies to achieve water quality improvements.

Robert D. Woithe, Ph.D., PWS, CSE

Senior Scientist
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Education

Ph.D., Environmental Science & Ecology, University of Florida, 1994
M.S., Environmental Science & Ecology, University of Florida, 1992
B.A., Biology, Middlebury College, 1988

Certifications

Certified Senior Ecologist, Ecological Society of America
Professional Wetland Scientist (1160)
NAUI Nitrox
SCUBA Certification (829973)

Professional Affiliations

Ecological Society of America (ESA)
Estuarine Research Federation (ERF)
Society of Wetland Scientists (SWS)

Dr. Woithe serves as a systems ecologist and an estuarine and wetland scientist. His expertise encompasses estuaries, wetlands, corals, and seagrasses. He is also experienced in the design and implementation of environmental monitoring studies and natural resource damage assessment particularly for water quality issues, wetlands, estuarine benthos, seagrass, intertidal, coral reef and hardbottom systems. Dr. Woithe designs habitat and wetland restoration projects; develops environmental management plans; performs reviews of proposed regulations; and manages projects and staff conducting environmental monitoring, mapping, and assessment activities.

Dr. Woithe is currently project scientist for several large monitoring programs in the Tampa Bay and Big Bend areas. In this role, he oversees field staff conducting water quality, vegetation, wildlife surveys, and benthic macroinvertebrate monitoring, and maintaining a system of continuously deployed water quality and hydrologic sensors and recorders. Dr. Woithe also oversees data validation and quality control as well as data base management for these and similar projects.

His representative project experience includes:

Myakkahatchee Creek Hydrobiological Monitoring Program Northport, Florida. Project manager and chief scientist for continuous water quality monitoring program for the City of Northport, Florida. Program operates several continuous, water quality recorders in the Myakkahatchee Creek/Big Slough tributary of the Myakka River. Monitoring program supports City's Water Use Permitting process and developed and implements statistical models for salinity, dissolved oxygen (DO), and flow to analyze the effect of water diversions.

Peace River/Manasota Regional Water Supply Authority, Hydrobiological Monitoring Program Continuous Recorders Program, Desoto County, Florida. Principal scientist for continuous, water quality monitoring in the Peace River. Monitoring is in support of continued freshwater diversions by water supply authority. Parameters monitored include specific conductivity, salinity, temperature, DO, and water level. Also performing river-long, continuous transects measuring chlorophyll concentrations using continuous flow fluorometers.

Tampa Bay Water, Hydrobiological Monitoring Program for the Alafia, Palm, and Hillsborough Rivers, Hillsborough County, Florida. Lead scientist for $5 million, five-year, water quality, hydrologic, and biological monitoring project to determine effect of fresh water withdrawals on the Tampa Bay estuary. Management of hydrologic, water chemistry, benthic, fish, plankton, wildlife, and vegetation sampling and monitoring efforts. Data interpretation, review, analysis, and management as well as quality assurance and control reviews.

Apollo Bay Monitoring Program/Tampa Bay Desalination Facility, Hillsborough County, Florida. Project management and lead scientist for $250,000, two-year, water quality and biological monitoring project to measure the effect of desalination brine discharge on the Big Bend area of the Tampa Bay estuary. Management of water chemistry, hydrologic, and benthic sampling and monitoring efforts. Data interpretation, review, analysis, and management as well as quality assurance and control reviews.

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Ecological Baseline Study, Gulf Coast Desalination Facility, Pasco County, Florida. Project scientist for $350,000, two-year, water quality and biological monitoring project to establish baseline conditions in the Anclote Estuary prior to the construction and operation of a desalination facility. Management of water chemistry, hydrologic, and benthic sampling and monitoring efforts. Data interpretation, review, analysis, and management as well as quality assurance and control reviews.

Long-Term Mineral Management Service (MMS) Monitoring, Flower Garden Banks National Marine Sanctuary, Texas. Project scientist for water quality and fish monitoring tasks in a long-term MMS program to test effects of natural gas and petroleum facilities on the coral reef communities of the Flower Garden Banks. Management of deployed water quality monitoring equipment program and fish population studies. Data interpretation, review, analysis, management, quality assurance and quality control (QA/QC).

Peace River/Manasota Regional Water Supply Authority, Existing Scientific-Literature Review for the Peace River and Upper Charlotte Harbor, Southwest Florida. Review existing literature and scientific studies regarding zooplankton and phytoplankton and their relationship to freshwater inflow. Produce existing-literature review document for Peace River Technical Advisory Committee.

South Florida Water Management District (SFWMD), Estero Bay Watershed Assessment, Lee, Collier, and Hendry Counties, Florida. Developed and wrote watershed management plan which included water quality management techniques, and wetland, habitat, wildlife evaluations as part of watershed evaluation project.

Coral Reef Damage Assessment and Restoration, ARCOS Telecommunications Cable, North Miami Beach, Florida. Provided expert review of ecological sampling techniques used by similar studies. Marine biologist and scientific diver for project assessing and restoring the damage to Atlantic coral reefs caused by installation of undersea fiberoptic cables

Coral Reef Damage Assessment and Restoration, Americus and MAC Telecommunications Cables, Hollywood, Florida. Marine biologist and scientific diver for project assessing and restoring the damage to Atlantic coral reefs caused by installation of multiple undersea fiberoptic cables and monitoring the condition of coral restored during previous years.

The Cousteau Society, Exxon Valdez Oil Spill, Prince William Sound, Alaska. Designed and conducted oil spill natural resource damage assessments. Developed and analyzed models of the Gulf of Alaska trophic web and developed and analyzed models of oil spill impacts on the Gulf of Alaska ecosystem.

Estero Park Mangrove Dieoff Assessment, Lee County, Florida. Using historical and current aerial photographs, stereographic infrared aerial photographs, topographic surveys, and field data, analyzed the factors driving the death of an expanding area of dead mangrove swamp and designed a monitoring program.

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Pam Latham, Ph.D., PWS, CSE

Senior Scientist
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Education

Ph.D., Environmental Engineering Sciences, University of Florida, 1990
M.S., Biology, University of Central Florida, 1985
B.S., Biology, University of Central Florida, 1979

Certifications

Certified Senior Ecologist, Ecological Society of America (CSE)
Professional Wetland Scientist (00001381)

Professional Affiliations

Ecological Society of America (ESA)
Estuarine Research Federation (ERF)
Society of Wetland Scientists (SWS)

Dr. Latham has 23 years of experience working in ecological systems. Her experience includes studies of potential impacts of water diversions to river systems, technical support for minimum flows and levels (MFLs), development of watershed management plans, and preparation of National Environmental Policy Act (NEPA) compliance documents. Dr. Latham has peer-reviewed publications in scientific journals, including *Wetlands, Estuaries,* and the *Water Resource Bulletin.*

Dr. Latham is the project manager for several Southwest Florida Water Management District (SWFWMD) projects in support of MFL development for the Braden, Myakka, Anclote, Little Manatee, Manatee, and Rainbow rivers. She has recently completed similar projects in support of MFLs for the Suwannee River, as well as the upper Peace River and the Alafia River. Other water resource projects with which she is associated include the Little Manatee River Watershed Management Plan, Charlotte Harbor, and Tampa Bay estuary programs in west Florida; potential impact studies of Tampa Bay Water; Peace River Manasota Water Supply Authority surface water projects and water supply projects; and the Peace River Cumulative Impact Study for the Florida Department of Environmental Protection and SWFWMD.

Dr. Latham recently completed a programmatic environmental impact statement (EIS) for the Florida Keys water quality improvements project for the U.S. Army Corps of Engineers (USACE) and several subsequent environmental assessments (EAs). Additional NEPA documentation experience includes EISs for essential fish habitat for the Gulf of Mexico and for the Ocklawaha River Restoration project, as well as NEPA documentation for reuse projects for Manatee County, and the City of Tampa, and Clearwater. Dr. Latham has prepared a habitat conservation plan (HCP) for the Choctawhatchee beach mouse and is currently working on an HCP for the St. Andrew beach mouse.

Before joining PBS&J, Dr. Latham served as an associate environmental engineer at the Northwest Florida Water Management District (NWFWMD) in Havana, Florida. Her work included preacquisition assessments for purchase of lands under P2000 and Save Our Rivers programs; vegetation sampling, design, monitoring, and statistical analysis of water quality constituents; and study of potential impacts of nonpoint source pollution to surface water improvement and management water bodies, including the Apalachicola River.

At the University of Florida, Dr. Latham conducted graduate and post-doctoral research in wetlands ecology at the Florida Cooperative Fish and Wildlife Research Unit with the support of the U.S. Fish and Wildlife Service. Her responsibilities included vegetation and hydrologic research design, monitoring, statistical analysis, and modeling of tidal marsh systems of the lower Savannah River in Georgia and South Carolina related to freshwater diversions.

Dr. Latham's previous career included several years of teaching high school biology and chemistry in Seminole County school system (Florida), as well as several semesters instructing at Tallahassee Community College.

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Melisa L. Reiter, PWS

Environmental Permitting Group Manager
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Education

B.S., Marine Biology, Eckerd College, 1989

Professional Affiliations

Ecological Society of America (ESA)
Florida Association of Environmental Professionals (FAEP)
Society for Wetland Scientists (SWS)
Tampa Bay Association for Environmental Professionals (TBAEP)
Women Inspiring Leadership (WIL)

A group manager in west Florida sciences, Ms. Reiter has 19 years of experience in terrestrial, vegetative, and aquatic ecology. Her specialized expertise includes dredge and fill permitting; marine studies; habitat assessment, evaluation, and classification; water quality studies; seagrass mapping; aerial photo-interpretation; land use mapping; ecological assessments; threatened and endangered species studies, and wetland mitigation design and monitoring. She also has extensive experience determining biological indicators of seasonal high-water and normal pool elevations and wetland jurisdictional delineation. State and federal regulatory permitting experience includes roadway and pipeline corridors, large-scale subdivision permitting, and project development and environment (PD&E) studies. Her expertise with marine-related projects includes single-family home docks, residential canal dredge projects, and large-scale marinas. Components of all of these projects involve field sampling, agency coordination, and permit package/application preparation.

Wetland Permitting

- Project manager on large-scale, long-term wetland monitoring project for Seminole Electric Cooperative, Inc., in the Webb Wildlife Management Area.
- Currently working on the Riverdale/Inlets residential development in Manatee County. Project involves freshwater and estuarine wetlands, mitigation design, planting, and monitoring. A manatee protection plan was prepared specifically for this development.
- Regulatory permitting and design for a Pasco County park, including boat launch facilities, kayaking trails, parking areas, a fishing pier, temporary docking, swimming beaches, and interpretative nature/recreational trails. On-site mitigation area design will include seagrass transplant areas, macroalgae, and marsh plants.
- SunWest Harbourtowne. Permitting, design, and project coordination for a joint public/private sector venture with portions of the permitting shared between Pasco County, Southwest Florida Water Management District (SWFWMD), and SunWest Acquisitions. Permitting includes a Development of Regional Impact (DRI), a Conceptual Site Plan from SWFWMD, and a Joint Individual Environmental Resources Permit from the U.S. Army Corps of Engineers (USACE). The 2,350-acre project includes residential, commercial, marina village, recreational (golf), and preservation land use components.

Habitat Assessment

- Involved in various projects for the Tampa Bay National Estuary Program. These studies have included various aspects of water quality, habitat assessment, and management options associated with the preparation of the Comprehensive Conservation and Management Plan.
- Habitat restoration experience, which includes work on the St. Petersburg-Clearwater International Airport Shoreline Restoration and the Lake

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Maggiore Restoration projects, as well as the Safety Harbor Stormwater Rehabilitation project on Mullet Creek and Picnic Island.

- Task manager for comprehensive biological and vegetative inventory of Moccasin Lake Nature Park prior to making final recommendations for a management plan.
- Provided habitat classification of the San Juan Bay Estuary using geographic information system (GIS) photoimagery for the San Juan Bay National Estuary Program.
- Provided a GIS land use layer update of the St. Lucie Estuary Watershed for the South Florida Water Management District.
- Ecological task manager for the Lake Tarpon Watershed Habitat Assessment and Mapping project.
- Ecological task manager for the Lake Seminole Watershed Management Plan.

Marine Permitting

Permitting expertise in marine-related projects includes single-family home docks, canal dredge projects, large-scale marinas, seagrass assessments, and coral reef natural resource damage assessments. These projects normally involve field sampling, agency coordination (county, Florida Department of Environmental Protection [FDEP], and USACE), and permit package/application preparation. Issues such as sovereign submerged land leases, negotiating dredge depth and technique, and establishing previous history of the project site are key elements to effective permitting.

- Participated in the coral reef restoration project on the grounding site of the CONTSHIP HOUSTON in the Florida Keys. Conducted damage assessment surveys via an integrated video mapping system, coordinated field crews of scuba and surface supply divers, conducted monitoring events, and provided quality control of field efforts. Also delineated restoration sites, cemented corals, and consolidated excess rubble.
- Project manager for permitting and monitoring of the Bradenton Municipal Marina/Twin Dolphin Marina.
- Task manager on the City of Largo's Church Creek Dredging project. This residential marine canal project involved a feasibility study, agency coordination, and plans/permit preparation.
- Camlin Homes/Riverdale marine permitting. This long-term project has included dredging an extensive network of residential canals, along with dock permitting and the preparation of a manatee protection plan.
- Marine biologist on the restoration and mitigation of impacts from a telecommunication cable installation over coral reef in southeastern Florida. Project involved damage assessment, coral restoration and monitoring, and artificial reef deployment and monitoring.

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- Staff scientist on the seagrass study of the Sanibel Bridge PD&E study for FDOT. Essential fish habitat (EFH) coordination was required on this project.

- Responsible for the base data collection, ecological assessment and permitting of Chesnut Park Water Quality Improvement project.

Corridor Permitting

Ms. Reiter's program provides support to all permitting of linear and corridor projects in the Tampa office. She and her staff provide support to the roadway, structures, drainage, water resources, water/wastewater, and design disciplines involved with wetland impacts. She works closely with FDOT Districts One, Four, and Seven, along with local government including the City of Tampa, as well as Pinellas, Pasco, Hillsborough, Polk, Lee, and Manatee Counties.

Some of the most recent roadway projects she has been involved with include:

- Florida High Speed Rail
- State Road 31
- Corkscrew Interchange (I-75)
- County Road 721
- State Road 72
- 40th Street Bridge and Pipeline (mitigation design)
- Dark Hammock Road
- Koreshan Boulevard (over I-75)
- Arbuckle Creek
- Medulla Road (permitting and mitigation design)
- State Road 70
- State Road 60/Memorial/Links
- US 19 Sidewalk (design-build)

Corridor studies have been prepared for Florida Gas Transmission (FGT) and Tampa Bay Water (TBW). Ms. Reiter has been responsible for all aspects of permitting including field surveys, wetland delineations, mitigation design and negotiations, as well as alternatives assessment.

Site Assessments

Ms. Reiter has also been trained in the preparation of Phase I and II environmental audits. These audits have involved tracing historical site records for prior enforcement contamination, interpreting historical aerial photographs, reviewing past site ownership, performing visual inspections of site conditions, and summarizing findings in written reports. Many of these audits have included asbestos and radon surveys. Phase II audits, conducted to determine the presence of contaminants in groundwater, surface water, and soil, were recommended due to the detection or knowledge of previous spills, unusual odors, or stained soil. Project locations have included office parks, undeveloped tracts, landfill property, a phosphate mining site to be used for wetland mitigation, roadways, gas stations, and numerous commercial sites. Sizes of the properties have ranged from 1 to 6,700 acres. These studies have been completed for public and private sector clients including banks, realtors, FDIC, RTC, and government agencies (Pinellas County, City of Clearwater, and Hillsborough County).

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3.5 Environmental Protection Commission Hillsborough County

The Environmental Protection Commission of Hillsborough County (EPCHC) has agreed to provide the services necessary for the collection and laboratory analysis of benthic macroinvertebrate and sediment quality samples from St. Joseph Sound and Clearwater Harbor. EPCHC's commitment to this project team, as well as the objectives, methods, deliverables, and budget are expressed in the March 25, 2009 letter from Mr. Richard Boler presented in Section 6.

Mr. Richard Boler, General Manager of the Environmental Monitoring Department, currently provides the collection and laboratory analysis of the of benthic macroinvertebrate and sediment quality samples for the Tampa Bay Benthic Monitoring Program.

RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

4. PROJECT PLAN

Pinellas County

Southwest Florida Water Management District

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Janicki Environmental, Inc.

SCOPE OF WORK

Our proposal outlines the specific tasks required to develop an effective, complete, and actionable Comprehensive Conservation and Management Plan (CCMP) for Clearwater Harbor/ St. Joseph Sound. In this section we present, based on our previous experience, the essential project elements that will lead to the successful completion of this project. These elements are:

- the process for establishing project goals and priorities for resource protection, preservation, and restoration that meet the expectations of both Pinellas County and the Southwest Florida Water Management District (SWFWMD);
- the project approach and rationale that
    - outlines how, through the use of the best available data and tools, a technically robust management plan will be achieved;
    - identifies stakeholders and their roles in developing this plan;
    - defines the potential role of a Technical Advisory Committee (TAC);
    - assures effective identification of management options; and
    - defines how progress toward fulfillment of the goals established for the CCMP, and
- the definition of the contents of the final CCMP document and how the results of this project can be most effectively communicated to an audience that includes decision makers, scientists and engineers, and the citizens of Pinellas County.

While others have developed watershed management plans, our experience demonstrates how using objective, scientifically sound, and technically defensible criteria to make science based management decisions has provided our clients meaningful and feasible action plans. We have a proven track record in establishing objective criteria for evaluating management actions based on ecosystem function and mechanisms for judging the effectiveness of those actions through time. For example, in Tampa Bay, we established a relationship between nutrient loadings and chlorophyll that allowed for criteria to be established protecting the light requirements of seagrass. This work has served as the foundation for a multi-million dollar effort to reduce nitrogen loadings into Tampa Bay and has demonstrated the effectiveness of our science based approach to address management issues in southwest Florida. We have developed or are currently developing similar quantifiable targets in the following estuaries:

- Charlotte Harbor and associated waters for the Charlotte Harbor NEP,
- Sarasota Bay for the Sarasota Bay Estuary Program,
- Roberts Bay and Lemon Bay for Sarasota County,
- Caloosahatchee River and Loxahatchee River estuaries for Florida Department of Environmental Protection (FDEP), and
- The coastal waters from Estero Bay south to Ten Thousand Islands for the South Florida Water Management District (SFWMD) and the Army Corps of Engineers (COE).

The following provides detailed insight into how we view the challenges facing the Clearwater Harbor/St. Joseph Sound project area and our approach to meet those challenges to ensure the proper stewardship of natural resources in this area for years to come.

4.1 Project Overview

Our generalized view as to how this project should proceed is shown in Figure 4-1. In following sections, specific project tasks will be proposed.

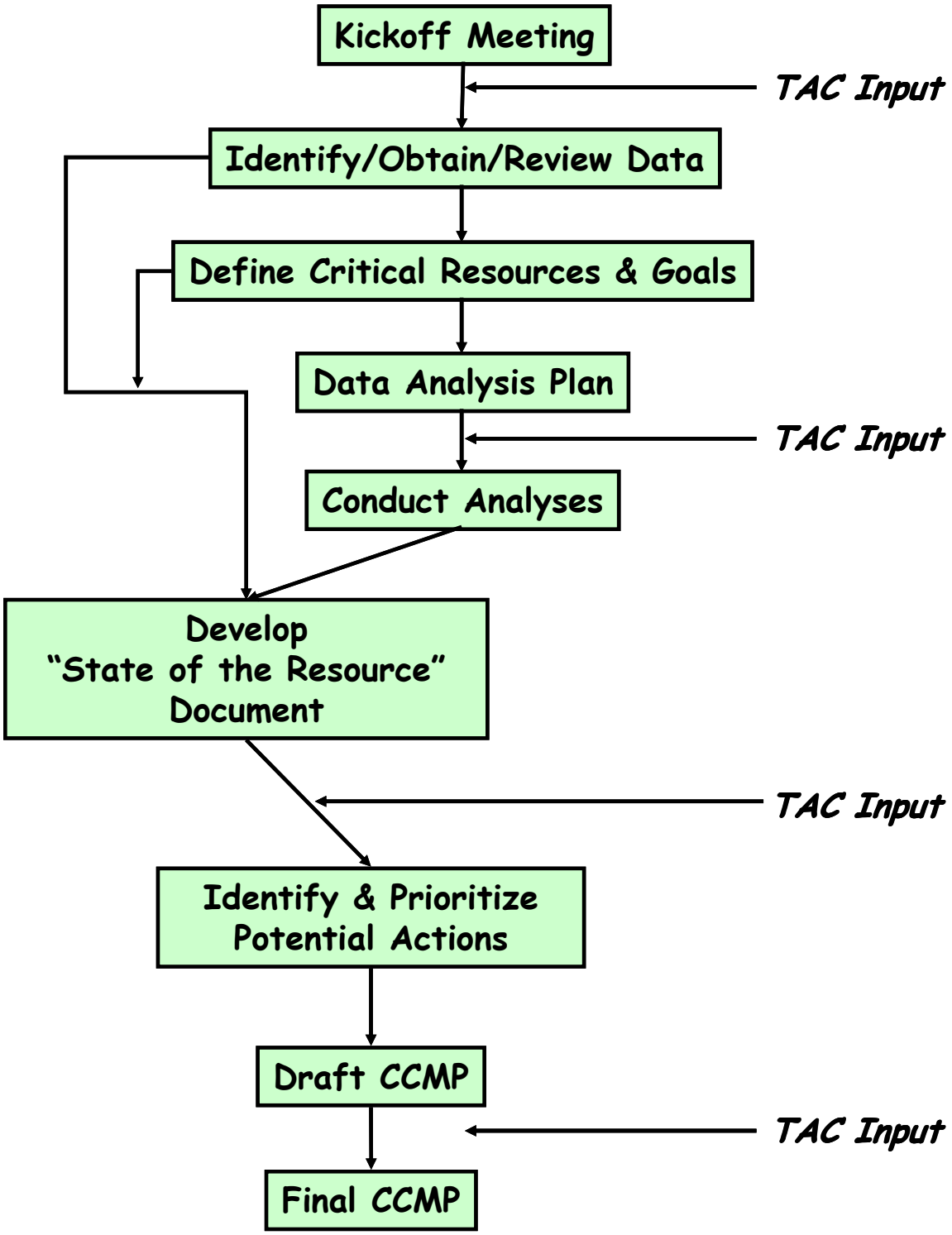

Figure 4-1. Overview of the project approach.

Initially, given the complexity of this project and its aggressive schedule, a kick-off meeting will be essential. We offer that this meeting be held prior to the project scope, budget, and schedule being finalized. We recognize that to do so will require our participation without compensation, but we also recognize that if we are to provide the County and SWFWMD a meaningful and defensible plan that this initial interaction is significant. This meeting will offer both the County and SWFWMD an opportunity to define their expectations and allow us to develop an effective project plan. It is important that the project roles are fully understood by all and the means by which communications among project participants will occur be defined. The benefits of establishing a TAC will be defined. Our experience has led us to recommend establishing a TAC which will help facilitate participation by key stakeholders and lead to better "buy-in" to the project process and results.

Following the execution of the contract for this project, we will identify, obtain, and review all potential data sources to be used in the development of the CCMP. A comprehensive understanding of the Clearwater Harbor/St. Joseph Sound study area is critical; therefore, the data compilation effort cannot be short-changed. Input from the TAC regarding data sources and their validity can be very helpful at this point in the project. The collection of benthic and sediment quality data will be initiated at this point in the project. *We recommend a project deliverable that summarizes these efforts.*

The next critical project element is the identification of the resources of concern and particularly those for which quantifiable targets will be developed. We anticipate a number of critical habitats, including water quality, sediment quality, seagrasses, and other near shore habitats. *We recommend a project deliverable that identifies the resources of concern and the targets to be developed.*

Based on the results of the identification of the resources of concern, we will develop a data analysis plan for each of the quantifiable targets to be estimated. In some cases, these analyses will be statistical in nature, while others may be more descriptive. Input from the TAC regarding the proposed data analysis plans would be very helpful at this point in the project. *We recommend a project deliverable that summarizes the data analysis plans.*

We propose that the next step will be the execution of the data analysis plans. We anticipate that the results from these data analyses will be carefully scrutinized by the County and SWFWMD and we recommend there be several opportunities for input to our team. This will help ensure that the CCMP will be based on technically defensible targets. *We recommend a project deliverable that summarizes the data analysis results.*

To achieve the project schedule, some of the work towards completion of the "State of the Resource" document can be done on a parallel track with the data analysis efforts. In particular, some of the more descriptive aspects of the document can be completed. The benthic habitat assessment effort will also be done during this time. *We recommend a project deliverable that summarizes the data results of the benthic habitat assessment and draft sections. Further, a draft "State of the Resource" document will provide additional project deliverables.*

4.2 Description of the Project Area

The Clearwater Harbor/St. Joseph Sound study area includes the two estuaries and their watersheds and is located along the west coast of Pinellas County, Florida (Figure 4-2). The two named water bodies are separated by the Dunedin Causeway but share many common features, although differences do exist.

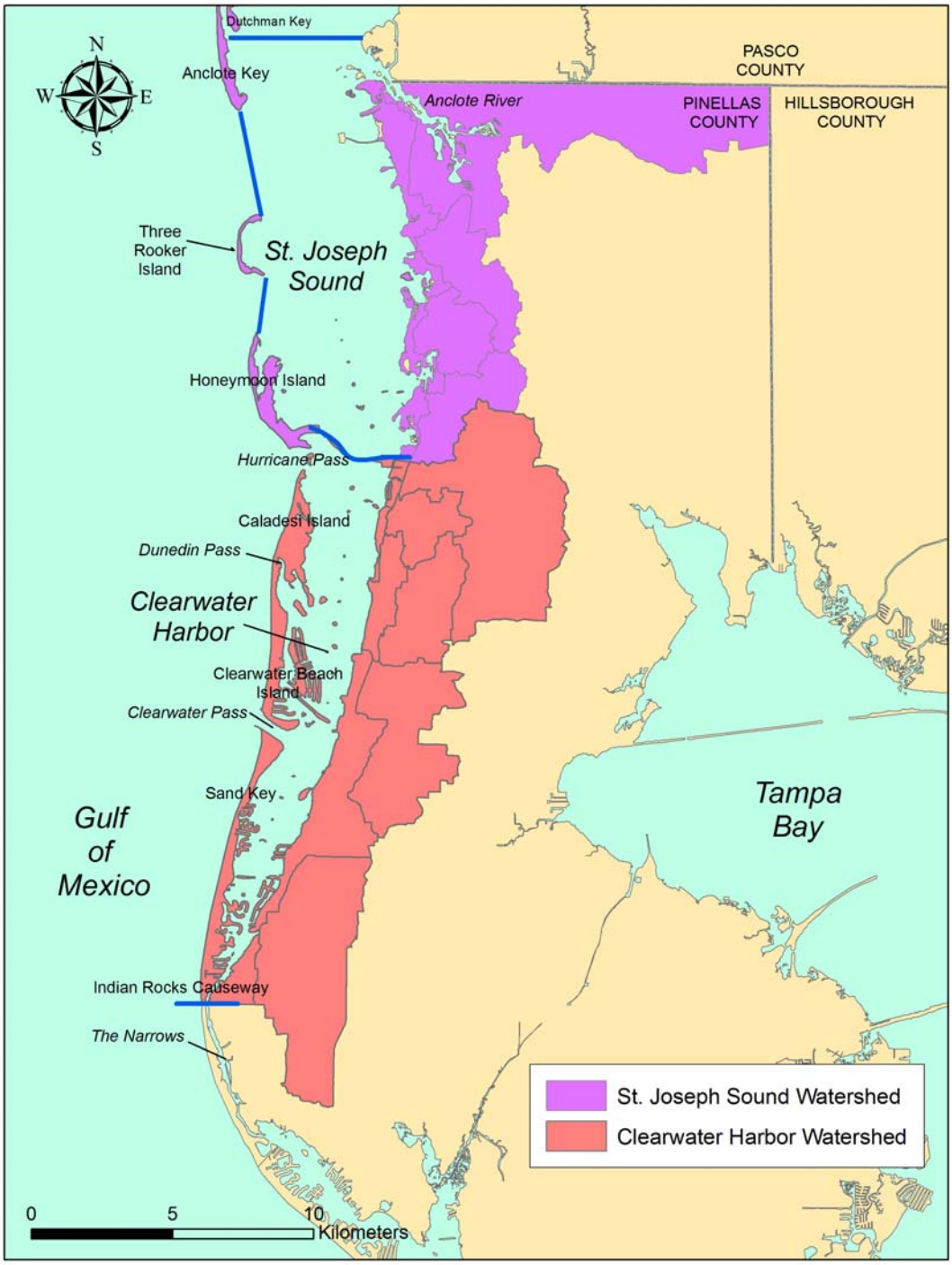

Figure 4-2. Overview of the project area.

4.2.1 St. Joseph Sound

The St. Joseph Sound estuary (Figure 4-2) is bounded to the north by the Anclote Anchorage at the mouth of the Anclote River (Figures 4-3 and 4.4); although for management purposes the study area ends at the Pinellas/Pasco County boundary. Barrier islands - Anclote Key, Three Rooker Key, and Honeymoon Island (Figure 4-5), mark the western boundary. Large gaps between these barrier islands provide significant tidal interaction with the Gulf of Mexico (Figure 4-6). The west coast of mainland Florida is the eastern extent of the St. Joseph Sound estuary and Hurricane Pass delineates the south boundary. Much of the eastern shoreline of the estuary is hardened, such as Klosterman Bayou (Figure 4-7), but the barrier islands have mainly natural shores.

The St. Joseph Sound estuary contains approximately 18,000 acres and is shallow, reaching a maximum depth of around 12 feet (feet MLLW) in the north, although much of the estuary is less than 5 feet deep. The Intracoastal Waterway (ICW) and tributary dredged channels intersect the estuary, providing navigation features for recreational and commercial vessels. Dredged spoil islands provide offshore habitat and recreational destinations (Figure 4-8). Major public recreation features include Honeymoon Island State Recreation Area and Anclote Key Preserve State Park (Figure 4-9). The entire estuary is included in the Pinellas County Aquatic Preserve.

The St. Joseph Sound watershed is approximately 19,000 acres in size and includes portions of mainland Pinellas County and the eastern portions of the barrier islands (Figure 4-10). Part of the St. Joseph Sound watershed extends into Pasco County to the north. A portion of the watershed is within the City of Tarpon Springs. The watershed is bounded to the east by the western boundary of the Lake Tarpon and Tampa Bay watersheds. Existing land use on the mainland is predominantly urban (residential and commercial) with only isolated pockets of natural land (Figure 4-11). The barrier islands are generally undeveloped. The only significant tributary to the estuary is the Anclote River (by far the largest to either estuary). The balance of freshwater inflow is conveyed via overland flow or small coastal channels and ditches. One 2nd magnitude spring – Wall Spring (aka Crystal Beach Spring) (Figure 4-12) and one 3rd magnitude spring (Health Spring) exist in the watershed, as listed in "Springs of Florida" (Florida Geological Survey, Bulletin No. 66, rev 1977). Soils are generally sandy and well drained except in coastal lowlands. High sandy ridges along the Anclote River provide good drainage. Few natural soil drainage patterns exist today due to the area's urbanization (Figure 4-13).

Figure 4-3. Anclote River.

Figure 4-4 Howard Park.

Figure 4-5. Honeymoon Island.

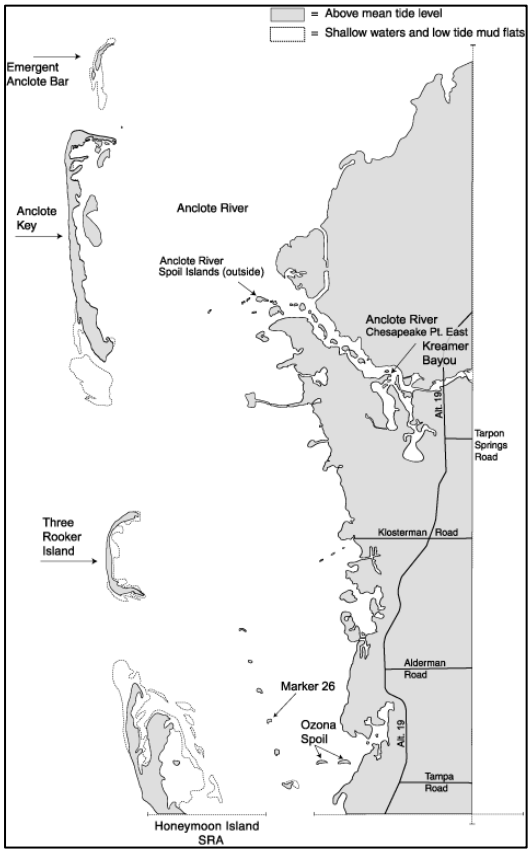

Figure 4-6. Barrier islands of St. Joseph Sound.

Figure 4-7. Klosterman Bayou.

Figure 4-8. St. Joseph Sound dredge spoil islands

Figure 4-9. Anclote Key State Park lighthouse.

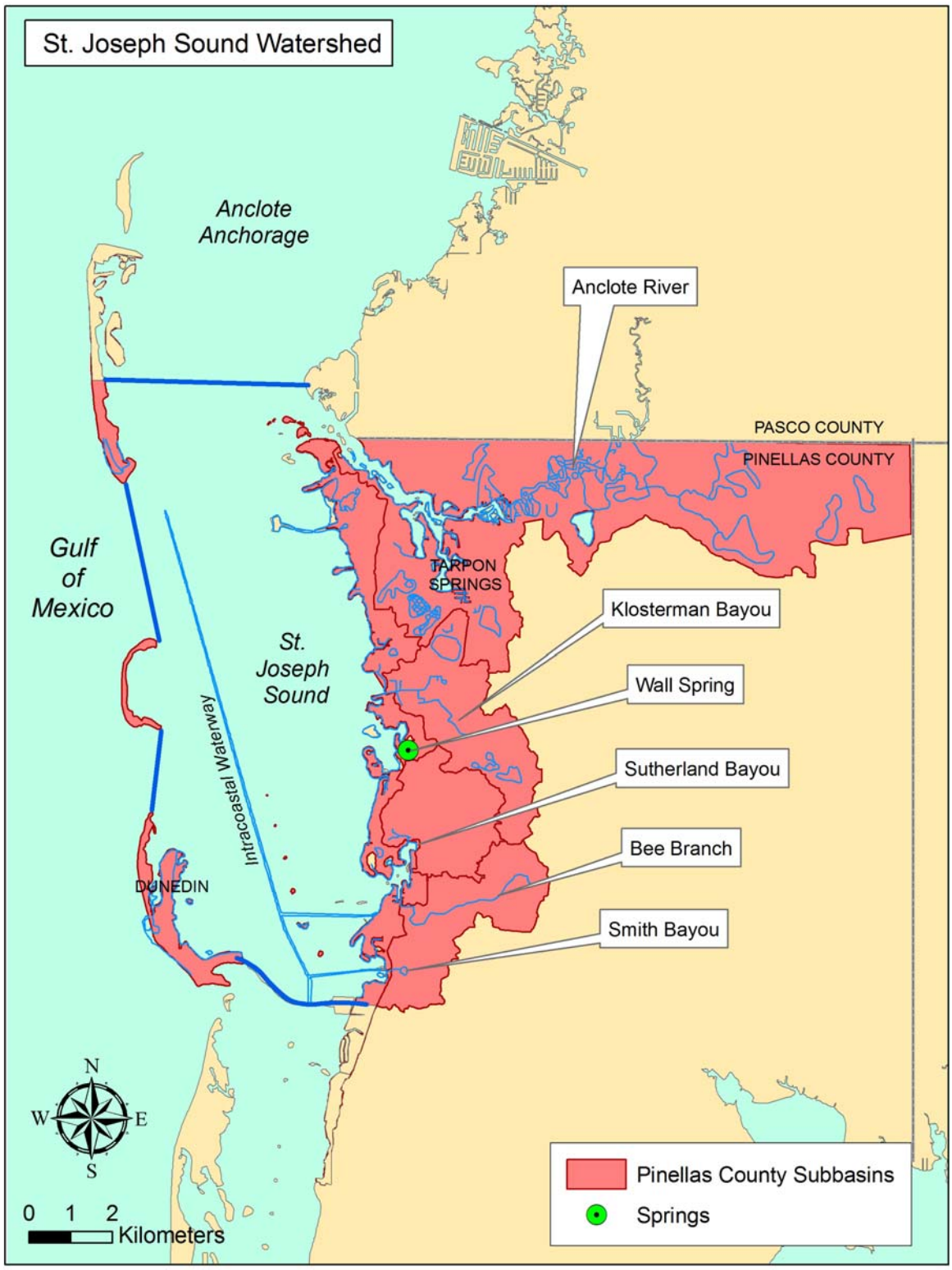

Figure 4-10. St. Joseph Sound watershed.

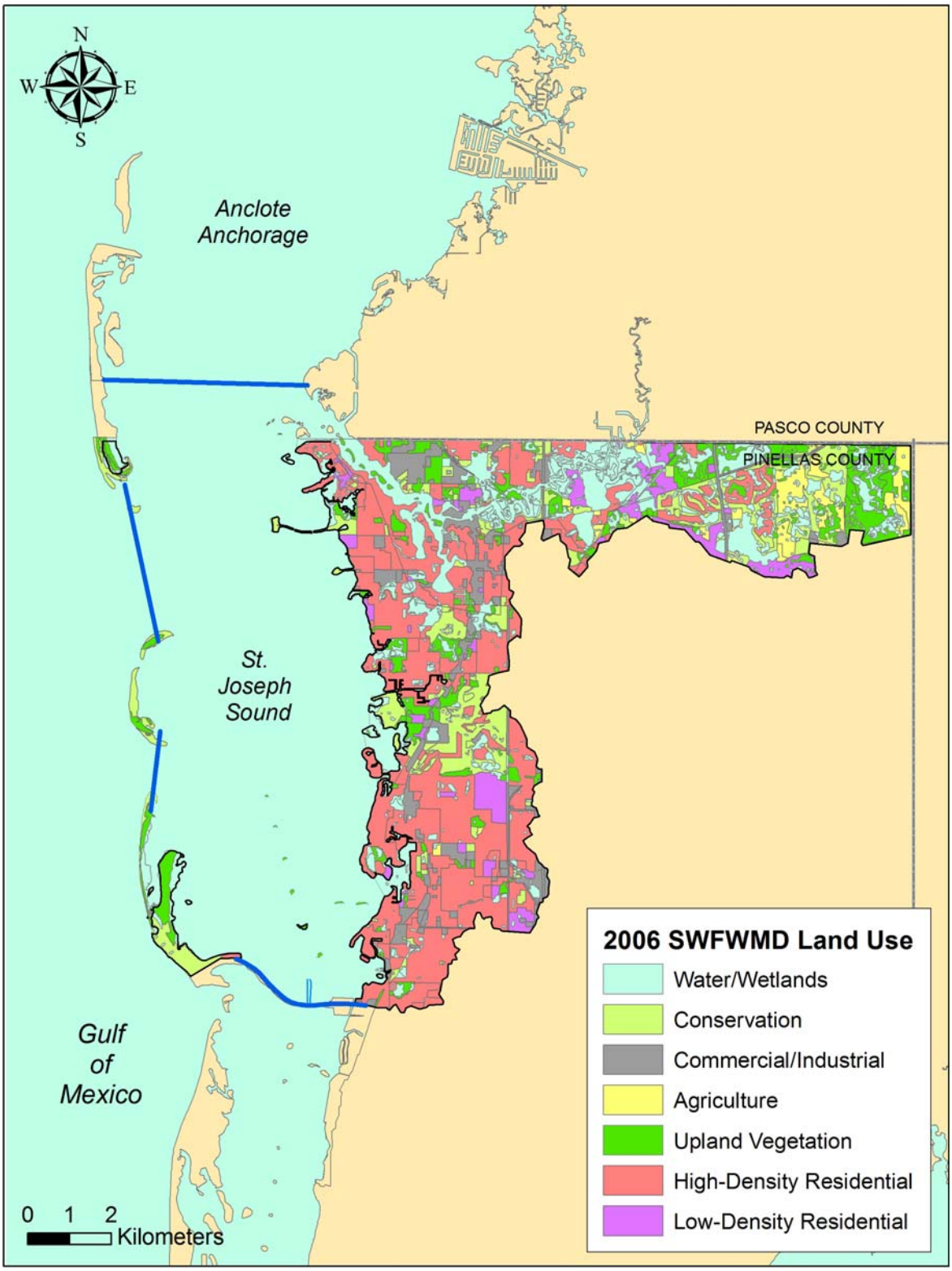

Figure 4-11. St. Joseph Sound watershed land use/cover (Data source: SWFWMD).

Figure 4-12. Wall Spring.

4.2.2 Clearwater Harbor

The Clearwater Harbor estuary to the south is about 10,000 acres in size, and is bounded to the north by Dunedin Causeway (Figure 4-2). Its western boundary includes Caladesi Island, (Figure 4-14), Clearwater Beach Island (Figure 4-15), and Sand Key (Figure 4-16), ending at The Narrows and the Indian Rocks Causeway to the south. The Clearwater Harbor estuary has limited opportunity for tidal interaction with the Gulf of Mexico via Hurricane Pass (Figure 4-17) and Clearwater Pass (Figure 4-18). Dunedin Pass (Figure 4-19) floods only during extreme events. The great majority of the estuary shoreline is hardened, including the barrier islands. Also, large dredge and fill developments extend into the estuary.

The Clearwater Harbor estuary is also shallow, much of the estuary is less than 5 feet in depth, although deeper areas exist including the Intracoastal Waterway (ICW) and tributary dredged channels (Figure 4-20). As in the St. Joseph Sound estuary, dredged spoil islands provide offshore habitat and recreational destinations (Figure 4-21). Major public recreation features include Caladesi Island State Park. The entire estuary is included in the Pinellas County Aquatic Preserve.

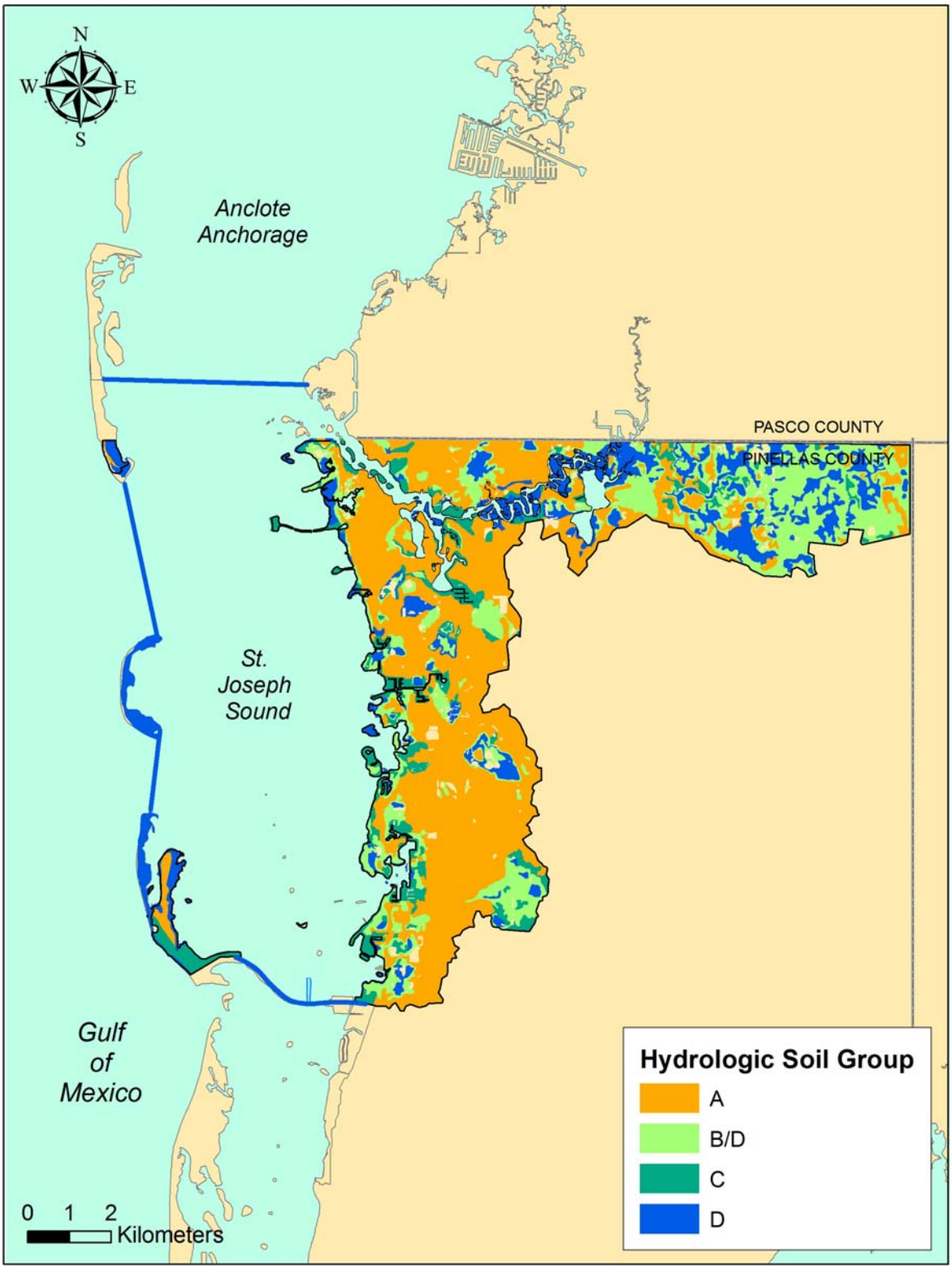

Figure 4-13. St. Joseph Sound watershed soils (Data source: SWFWMD).

The Clearwater Harbor watershed is approximately 27,000 acres in size and like the St. Joseph Sound watershed includes portions of mainland Pinellas County and the eastern portions of the barrier islands (Figure 4-22). Parts of the watershed are within the municipalities of Dunedin, Clearwater, Largo, Belleair, Belleair Bluffs, Belleair Beach, Belleair Shores, and Indian Rocks Beach. In general, the Clearwater Harbor watershed is more intensely urbanized than the St. Joseph Sound watershed, including the barrier islands (Figure 4-23). The watershed is bounded to the east by the western boundary of the Tampa Bay watershed. Existing land use on the mainland is predominantly urban (residential and commercial) with only isolated pockets of natural land. Named tributaries to the estuary include (from north to south) Curlew Creek, Cedar Creek, Stevenson Creek, McKay Creek, and Church Creek. The remaining freshwater inflow is conveyed via overland flow or small coastal channels and ditches. Soils are generally sandy and well drained except in coastal lowlands, however even less natural soil drainage patterns exist today due to the area's intense level of urbanization (Figure 4-24).

Figure 4-14. Caladesi Island.

Figure 4-15. Clearwater Beach Island.

Figure 4-16. Sand Key.

Figure 4-17. Hurricane Pass.

Figure 4-18. Clearwater Pass.

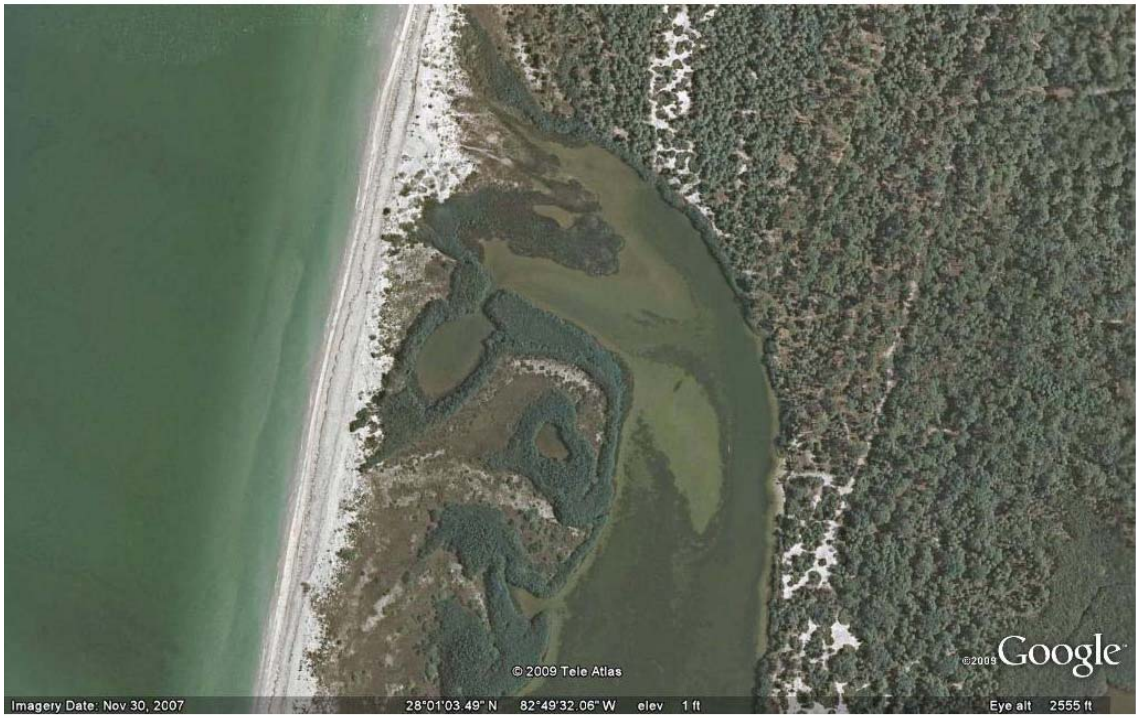

Figure 4-19. Dunedin Pass.

Figure 4-20. Clearwater Harbor.

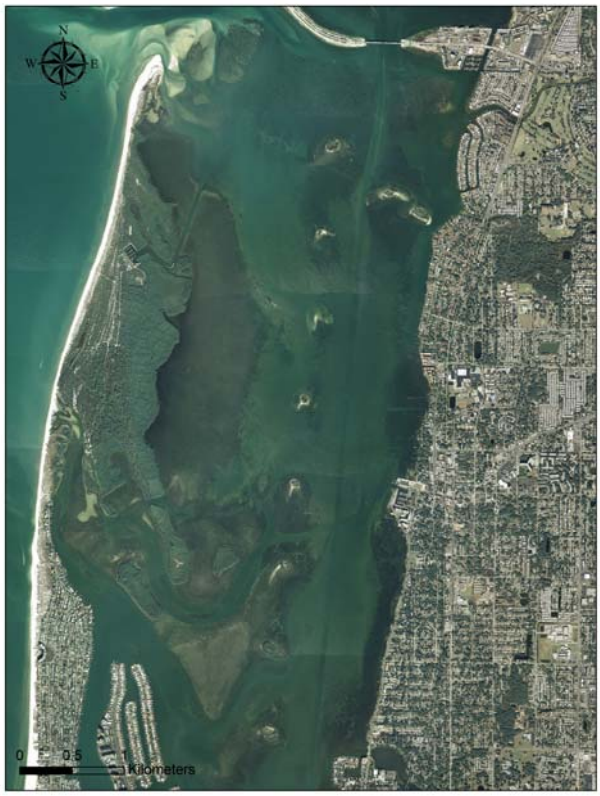

Figure 4-21. Clearwater Harbor dredge spoil islands.

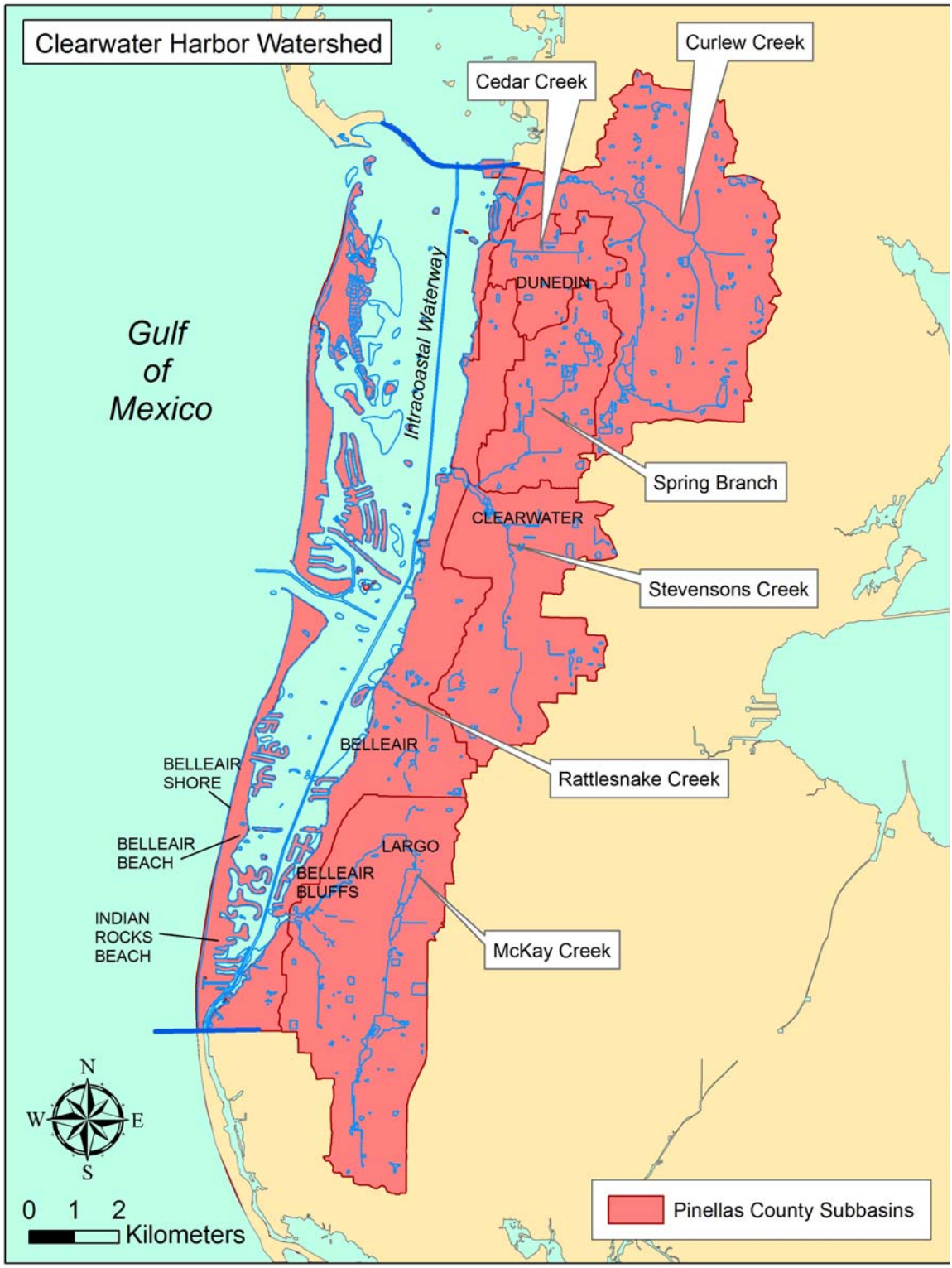

Figure 4-22. Clearwater Harbor watershed.

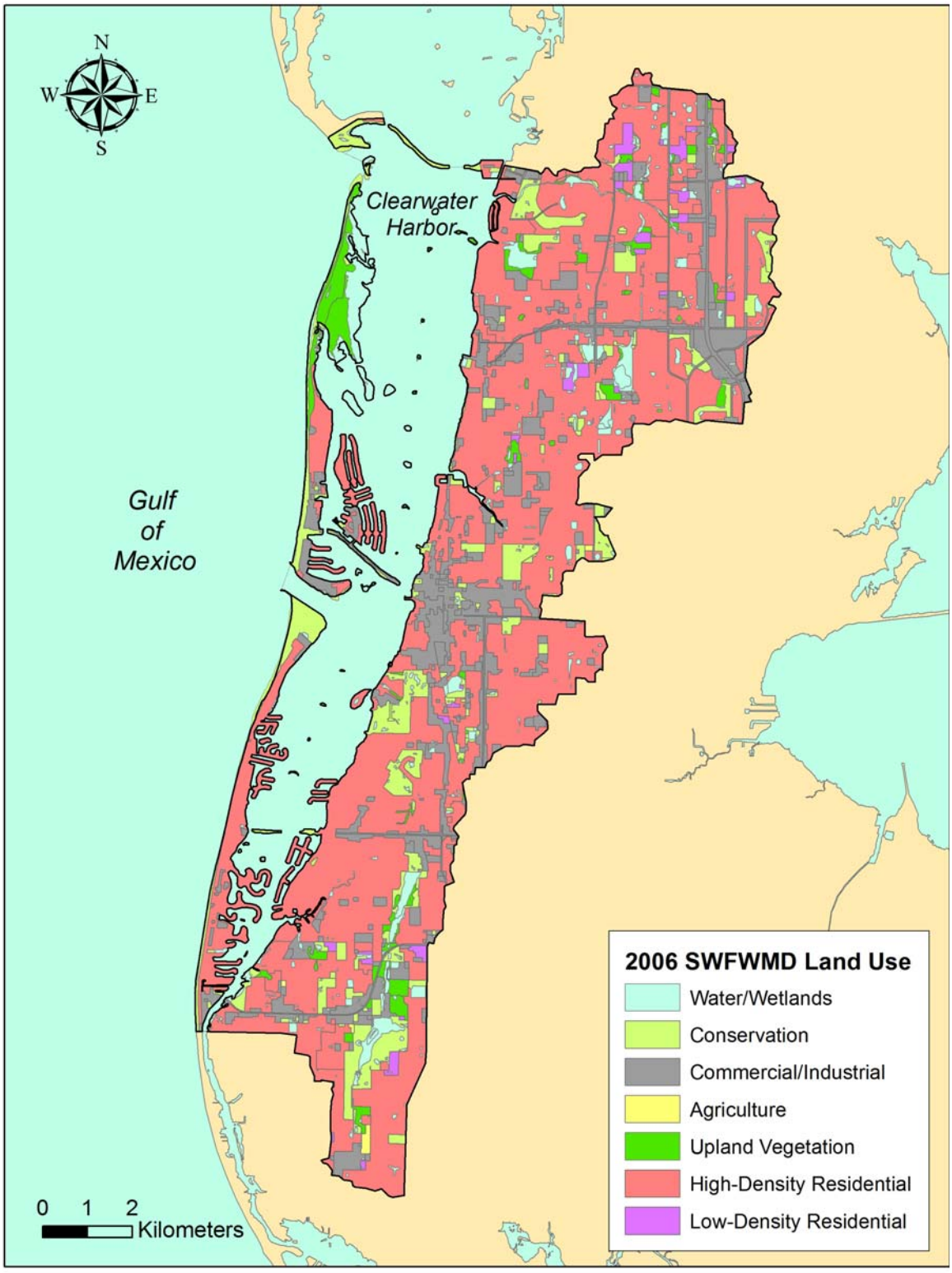

Figure 4-23. Clearwater Harbor watershed land use/cover (Data source: SWFWMD).

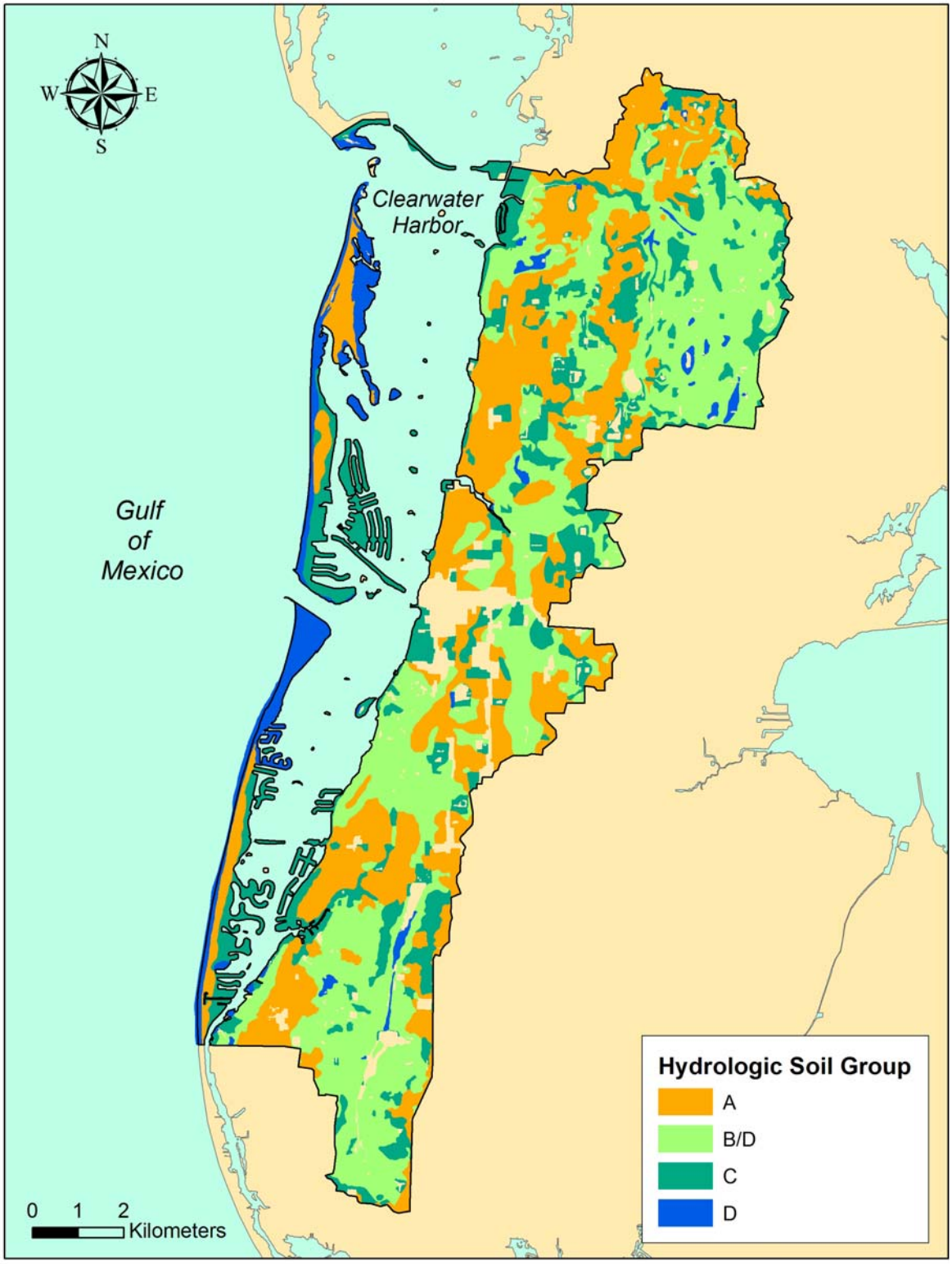

Figure 4-24. Clearwater Harbor watershed soils (Data source: SWFWMD).

4.3 PROJECT TASKS

In this section we discuss the specific tasks to be completed and deliverables produced during this project. The tasks include the following:

- Task 1 – Kick-off
- Task 2 – Identify, obtain, compile, and review data
- Task 3 – Define critical resources and issues
- Task 4 – Develop State of Resource report outline and develop and implement data analysis plans
- Task 5 – Define resource goals/objectives
- Task 6 – Produce "State of the Resource" report
- Task 7 – Identify, review, and prioritize potential action plans
- Task 8 – Develop CCMP implementation plan
- Task 9 – Produce CCMP document
- Task 10 – Project management.

Task 1 – Kick-off

Objective

As discussed above, this Task 1 is essential given the complexity of this project and its aggressive schedule. Again, the expectations for this project will be articulated as well as the roles and responsibilities for our team and the County and SWFWMD staff. At this point it would also be helpful to identify the critical stakeholders and discuss whether formation of a TAC would enhance the conduct of the project and eventual participation in the CCMP implementation. Potential stakeholders include the following:

Pinellas County
Southwest Florida Water Management District
City of Belleair Beach
City of Belleair Shore
City of Clearwater
City of Indian Shores
Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
US Environmental Protection Agency
US Fish and Wildlife Service
Sierra Club
Pinellas County Environmental Foundation
NOAA/National Marine Fisheries
City of Indian Rocks Beach
City of Belleair
City of Belleair Bluffs
City of Tarpon Springs
City of Dunedin
City of Largo
Florida Department of Transportation
US Army Corps of Engineers
US Coast Guard
Audubon Society
Friends of the Island Parks
Tampa Bay Watch
Neighborhood Associations

Technical Approach

Our team will meet with appropriate staff from the County and the District. One member of our team will be responsible for taking a complete set of notes.

Deliverable(s)

A meeting summary will be produced within 5 working days of the meeting. Draft final project scope, budget, and schedule will be completed within 5 working days for County review. The list of project stakeholders, including where possible the names and contact information for each will also be included.

Task 2 – Identify, obtain, compile, and review data

Objective

The objective of Task 2 is to compile and review the data needed for the successful completion of the CCMP.

Technical Approach

Given our team's experience along this portion of Florida's Gulf Coast and on projects similar in scope to this project, we have not only identified many of the potential data sources to be used in this project, but we have used those same data for other projects. These data sources will include primary data such as:

- flow and water quality data,
- land use/cover and habitat coverages, and
- biological data (i.e., population and distribution data).

In addition to the primary data sources, many peer-reviewed and gray literature sources of data relevant to this project exist. These include reports produced for federal, state, and local government agencies as well as reports that supported various permitting activities. We have also identified a number of graduate research publications about the area, including:

- Ballantine (1972),
- Fable (1973),
- Feinstein (1975),
- Hamm (1975),
- Johansson (1975),
- Meyer (2008),
- Moore (1976),
- Rolfes (1974),
- Szedlmayer (1982), and
- Treat (1979).

As discussed above, interaction with stakeholders and potential TAC members will ensure that all data sources that would be useful for completion of the CCMP are identified and obtained.

Deliverable(s)

A summary of all data sources that have been identified, obtained, and reviewed will be produced. It is anticipated that a meeting with technical staff from the stakeholders identified in Task 1 will be held. We will present a summary of the data sources identified and solicit input from the meeting participants.

All data sources will be compiled in a data base that along with appropriate Metadata for each source. All priority data sources will be provided to the County in an appropriate format (e.g., Excel, Access, SAS, text files). We will provide a dedicated ftp site to allow effective sharing of data and other information among the project team members.

Task 3 – Define critical resources and issues

Objective

The objective of Task 3 is to identify the critical resources and issues to be addressed in the development of the CCMP. This is a crucial task as it will serve to provide the much-needed focus for the plan.

Technical Approach

Our team will develop a "straw-man" list of critical resources and issues for the Clearwater Harbor/St. Joseph Sound estuaries and watersheds. Clearly, such issues as water quality impairments, TMDLs, and habitat protection will be included in this list. The preliminary draft list will be provided to staff from the County and the District for an initial review. After approval from County staff, the "straw-man" list will be communicated to the stakeholders for their input. If appropriate, a workshop with the stakeholders will be held where this input can be obtained. After receipt of all comments, a finalized list of critical resources and issues will be developed.

Deliverable(s)

A finalized list of critical resources and issues for the Clearwater Harbor/St. Joseph Sound estuaries and watersheds will be developed. A technical memorandum (that can be incorporated in the CCMP document) that presents how the list was prepared and those entities or individuals that contributed to the creation of the list will be produced.

Task 4 – Develop State of Resource report outline and develop and implement data analysis plans

Objective

The objectives of Task 4, based on the output from Tasks 2 and 3, are:

- to develop the outline for the State of the Resource report outline,
- to develop data analysis plans for each of the critical resources and issues identified in Task 3, and
- to implement those data analysis plans.

The results from these analyses will provide the focus for the development of resource goals and objectives which will be critical elements of the CCMP.

Technical Approach

Our team will develop a "straw-man" outline for the "State of the Resource" report based on the output from Tasks 2 and 3. This outline will be reviewed by County and District staff and revised as needed giving the project team the specific directions to be taken in the development of the report.

Given an outline for the "State of the Resource" report, draft data analysis plans that identify the specific objective question to be addressed, the data to be used in the analysis, the specific analytical approach, and the format of the output from the proposed approach will be developed. Again, these draft plans will be reviewed by County and District staff. Since this is a critical point in this project, a workshop where the data analysis plans can be presented and comments provided on those plans would be extremely useful.

Based on the results of this workshop, we will proceed with the approved data analysis plans. The output from the implementation of the data analysis plans will follow the specific formats defined as part of the "State of the Resource" report outline.

As discussed above, the specific resources and issues to be addressed in the "State of the Resource" report will depend upon the output from Tasks 2 and 3. The RFP identifies a number of these issues and the following summarizes our proposed approach to addressing these issues.

- **PHYSICAL OCEANOGRAPHIC CHARACTERIZATION**

The study area is located on the west central Gulf coast of Florida. The study area is bounded on the south by The Narrows, where Boca Ciega Bay meets Clearwater Harbor, and extends northward into the Anclote Anchorage, just to the north of the mouth of the Anclote River. St. Joseph Sound and Clearwater Harbor are relatively shallow waterbodies (Figures 4-25 and 4-26, respectively). Water depths in Clearwater Harbor are typically less than 2 m, with small areas associated with Clearwater Pass and dredge operations in excess of 5 m deep. St. Joseph Sound has a larger area deeper than 2 m, most notably in the northern portion of the Sound, between Honeymoon Island and Anclote Key. Clearwater Harbor connects to the Gulf of Mexico through Clearwater Pass. Clearwater Pass is the southernmost connection to the Gulf within the study area, with the next pass to the north being Hurricane Pass, between Honeymoon Island and Caladesi Island. Dunedin Pass used to connect Clearwater Harbor to the Gulf between Caladesi Island and Bird Key, but this pass has closed during the last 25 years, due to longshore transport and deposition of sediments. Hurricane Pass opened in the 1920s as the result of a hurricane, and now provides exchange between the northern portion of Clearwater Harbor and the Gulf of Mexico.

The longshore transport of sediments on the Gulf coast in this area contributes to changes in barrier island configuration, as do the effects of large-scale storm events (hurricanes). Sand on the Gulf bottom typically moves northward in response to prevailing longshore currents, and can result in barrier island formation, as has recently occurred north of Anclote Key

(FDEP, 1998). Longshore transport likely played a large role in the closure of Dunedin Pass.

Gulf of Mexico

Gulf of Mexico circulation patterns are dominated by the Loop Current and its related eddy fields. The Loop Current is part of the western boundary current of the North Atlantic Ocean. The Loop Current transports relatively warm water from the South Atlantic Ocean and the Caribbean Sea into the Gulf of Mexico through the Yucatan channel. The Loop Current flows into the eastern Gulf of Mexico, and exits the Gulf of Mexico through the

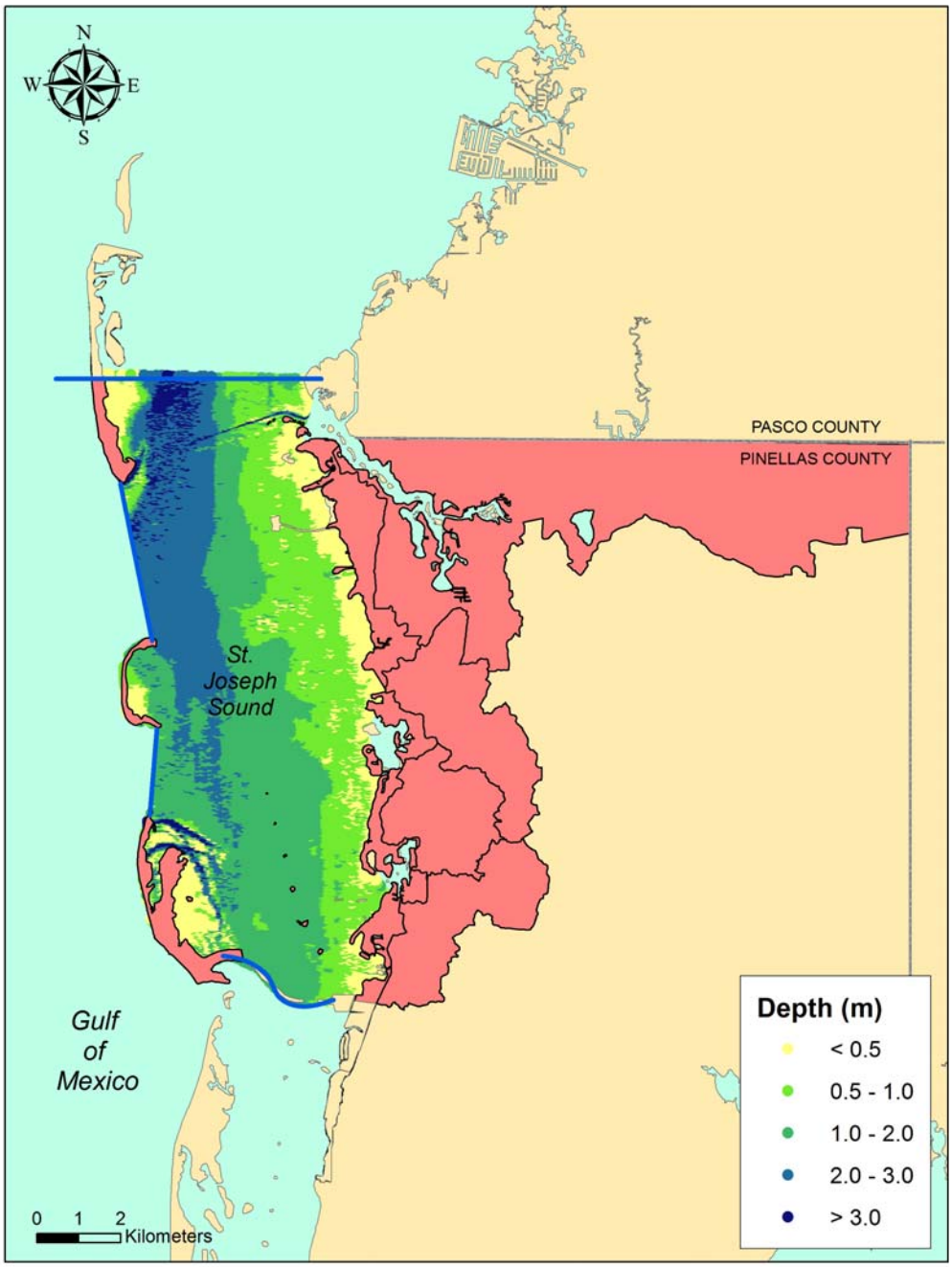

Figure 4-25. St. Joseph Sound bathymetry (Data source: USGS).

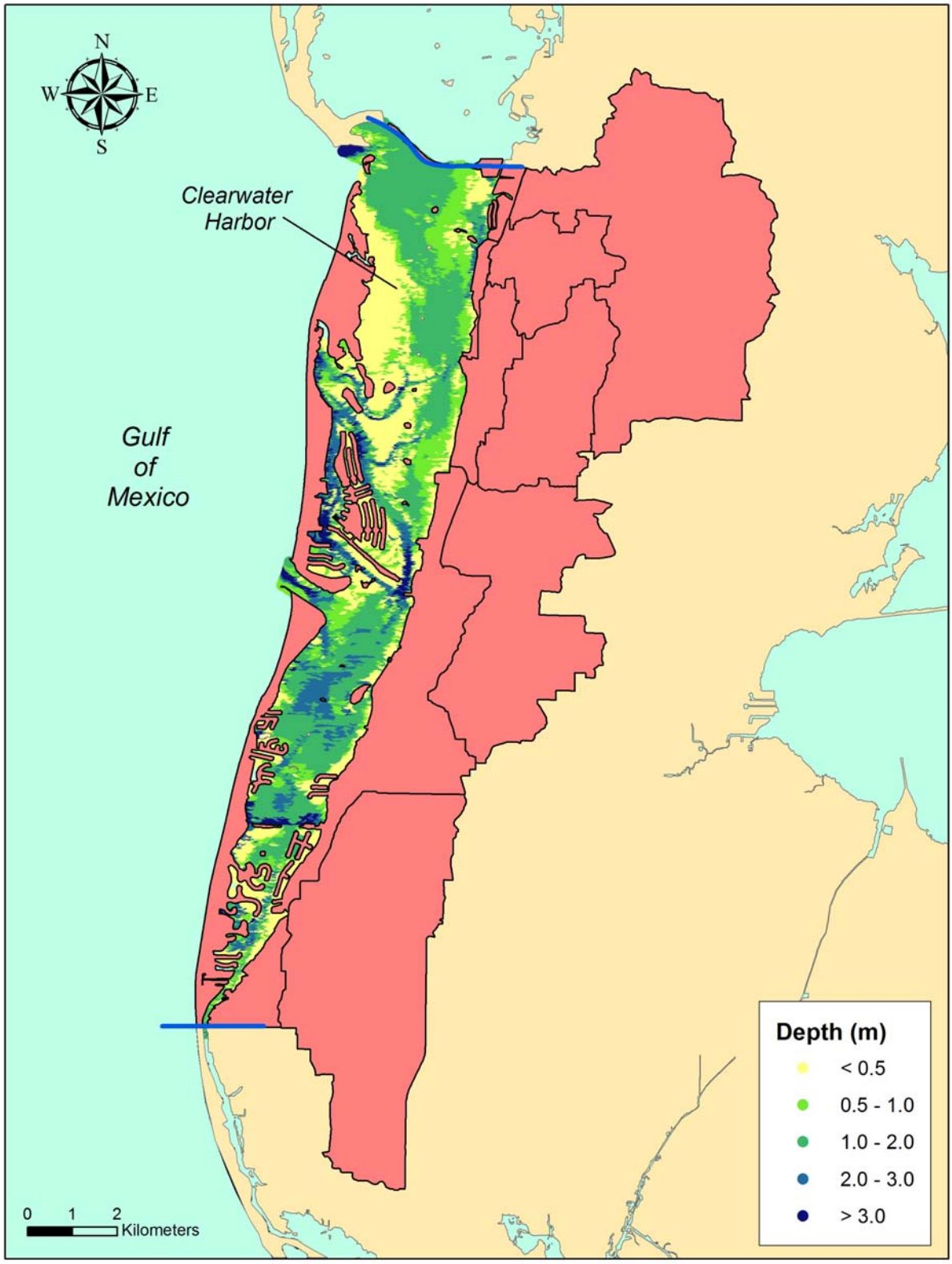

Figure 4-26. Clearwater Harbor bathymetry (Data source: USGS).

Florida Straits. Over a typical period of six to thirteen months, the Loop Current extends northward into the central Gulf of Mexico, sometimes as far as the continental slope and outer shelf south of the Mississippi River delta (Schmitz, 2002), then flows eastward and southward to the Florida Straits. The "loop" of warm water carried into the Gulf of Mexico eventually "pinches off" from the main Loop Current, creating a large clockwise circulating (anti-cyclonic) eddy. When this happens, the main Loop Current moves directly from the Yucatan Straits to the Florida Straits, and out along the eastern continental slope of the U.S., where it becomes the Gulf Stream. Figure 4-27 shows a typical evolution cycle of a Loop Current incursion into the Gulf of Mexico.

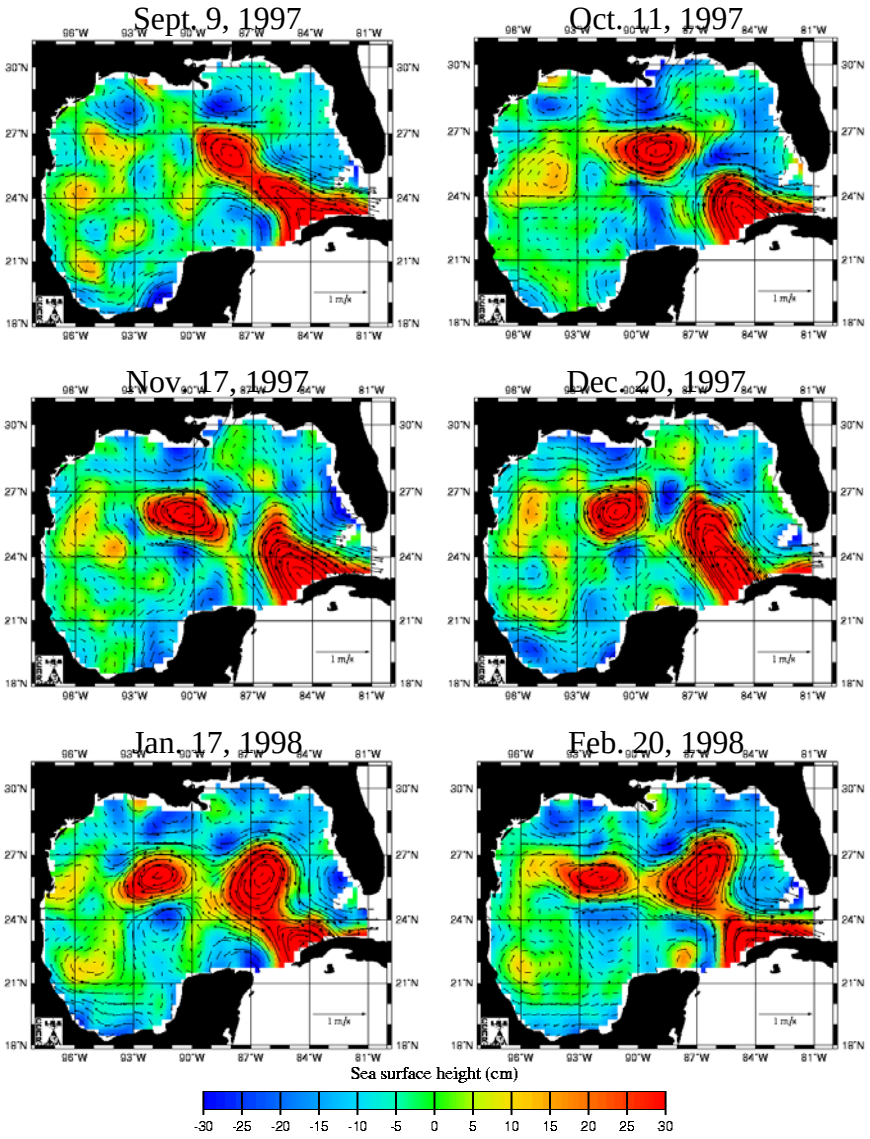

Figure 4-27. Sea surface height and current velocity showing the evolution of the Loop Current including separation of two anti-cyclonic Loop Current eddies in the Gulf of Mexico. Developed by Colorado Center for Astrodynamics Research (CCAR) from TOPEX and ERS-2 altimeter data.

Interactions of the Loop Current with the eastern Gulf of Mexico occur primarily when the current is extended northward into the Gulf of Mexico. During these times, the Loop Current flows southward along the continental slope and outer shelf. The slope and outer shelf are about 200 km west of the west coast of central Florida. The effects of the Loop

Current farther inshore are diminished, and the most inshore areas are typically not affected at all. Modeling studies have suggested that inshore of the 50-m isobath (the mid-shelf region) winds play the dominant role in circulation forcing (Yang and Weisberg, 1999). Drift studies at the mid-shelf region suggest a seasonal signal in surface circulation (Tolbert and Salsman, 1964; William et al., 1977) distinct from Loop Current cycles as well.

Circulation on the west Florida shelf is driven by winds, density gradients, tides, and interactions with the Loop Current. The Loop Current is not typically a primary forcing function inshore of the outer shelf, although intrusion may occur in the northern portion of the west Florida shelf (Gilbes et al., 1996). From the mid-shelf (50-m isobath) to the coast, a comparison of model results to measured data suggests that wind is the dominant forcing mechanism for circulation (Yang and Weisberg, 1999). Winds from the northeast in winter (October-March) typically result in southeastward flow along the coast from the Big Bend region to south of Tampa Bay, while winds from the southeast in summer (April-September) result in northwestward flow along the coast.

Offshore of the 50-m isobath, model studies suggest that horizontal density differences may also be important determinants of circulation (He and Weisberg, 2002a). These density differences may result from differential solar heating effects, with quicker heating of shallow water than of deeper water. Horizontal density differences may also result from transport of fresher water, as from the Mississippi River, along the outer shelf (He and Weisberg, 2002a).

Tidal circulation on the west Florida shelf results in cross-shelf movement of water parcels in an elliptical pattern, with no net displacement over a tidal cycle (Weisberg et al., 1996). Simulations of tidal circulation (He and Weisberg, 2002b) suggest that residual tidal circulation is small in the Clearwater Harbor/St. Joseph Sound region, with residual circulation directed to the southwest. During summer, when winds are typically from the southeast, tidal levels are higher than during winter, when winds are typically from the northeast.

Clearwater Harbor/St. Joseph Sound

Wind and tidal action, in concert with density effects related to freshwater inflow, are the primary forcing mechanisms for circulation in the Clearwater Harbor/St. Joseph Sound region. The tidal range in the area (i.e., the vertical difference between the lowest and highest tides on a given day) is relatively low. Tides in the Clearwater Harbor/St. Joseph Sound area are "mixed", with approximately equal "diurnal" (one low water and one high water per day) and "semidiurnal" (two low waters and two high waters per day) influences. As a result, two unequal low and two unequal high tides usually occur each day. An example of this type of tidal regime is shown in Figure 4-28. The mean diurnal tidal range is 0.8 m as measured at two sites, Clearwater Beach and Indian Rocks Beach, and this is approximately half the range between the annual minimum and maximum tidal elevations.

Observations of particle movement suggest that along the Gulf coast in the Clearwater Harbor/St. Joseph Sound area, flooding tides transport water to the northeast, while ebbing tides transport water to the southwest (He and Weisberg, 2002b). Early studies of the Anclote area (Baird et al., 1972) support these observations. Wind-induced circulation in the nearshore environment has been examined as part of a larger circulation study of the west Florida shelf (Yang and Weisberg, 1999). Model results suggest that winter (October-

March) winds from the northeast result in southward flowing nearshore currents from Tampa Bay to the Big Bend area, while summer (April-September) winds from the southeast result in northward flowing nearshore currents along the entire west Florida coast. These results agree with observed transport off the northern coast of Pinellas County.

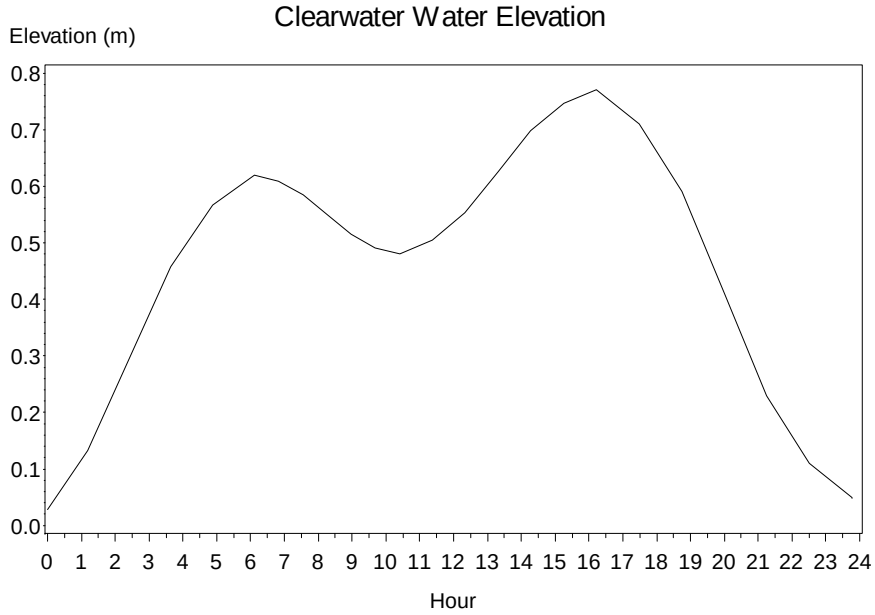

Figure 4-28. Illustration of a typical mixed semi-diurnal tidal signal at Clearwater Beach.

Fresh water enters Clearwater Harbor and St. Joseph Sound from several streams, including Stevenson's Creek, Cedar Creek, Spring Branch, Curlew Creek/Bee Branch, Rattlesnake Creek, Wall Spring, and Klosterman Creek, as well as from the Anclote River near the northern boundary of the study area. Fresh water inflow to the coastal areas north of the Anclote Anchorage, from sources including the Pithlachascotee, Weeki Wachee, and Chassahowitzka rivers, may also be transported southward into the Anclote Anchorage and Clearwater Harbor/St. Joseph Sound system. Transport of fresh water southward along the coast is dependent on wind-induced circulation, and is most likely when winds are from the north, as is typical during the winter.

Circulation Modeling

The exchange of water with the Gulf of Mexico through Clearwater Pass, Hurricane Pass, and the western and northern boundaries of St. Joseph Sound provides for flushing of the Clearwater Harbor/St. Joseph Sound system. It is expected that waters in the southern portion of the system do not exchange as often with the Gulf as do those in the northern portion, as there are only two passes into Clearwater Harbor, whereas St. Joseph Sound has a long common boundary with the Gulf of Mexico. The effects of the longer residence times expected in the southern portion of the system on water quality are likely to be of concern when examining potential pollutant loading scenarios. The effects of pass closures and openings on exchange with the Gulf also play a role in determining the water quality conditions within the system, especially in Clearwater Harbor.

A tool currently exists for examining the effects of morphometric changes in the Clearwater Harbor/St. Joseph Sound system, including changes due to pass closure and opening,

changes due to dredging, and changes due to variations in freshwater inflows. As part of an effort to examine the potential effects of a desalination facility near the Anclote River, Janicki Environmental developed a hydrodynamic model of the west-central Gulf coast and the Anclote Anchorage (Janicki Environmental, 2003a). The large spatial scale model grid (Figure 4-29) was run with inputs of freshwater inflows along a large portion of the west coast of Florida, and the output from this model was used to provide salinity, temperature, and water elevation boundary conditions to the more refined model grid of the Anclote Anchorage (Figure 4-30). The refined grid may be extended southward through St. Joseph Sound and Clearwater Harbor. This model may then be used to predict the effects of morphological and freshwater loading changes on residence time and salinity within the Clearwater Harbor/St. Joseph Sound system.

The County has provided Addendum 1 to the RFP for this project which lists additional physical oceanographic information available which also will be utilized for this project. This information will be used in conjunction with hydrodynamic model output developed as described above for the Clearwater Harbor/St. Joseph Sound system to characterize the effects of potential management activities on circulation and associated water quality effects. The additional information referenced in Addendum 1 includes the Hurricane Pass Inlet Management Plan, geological information on Caladesi Island and Honeymoon Island, a USACE report on the Dunedin Bay shoreline, an evaluation of the coastal processes of Honeymoon Island and the inlet dynamics of Hurricane Pass, and the Stevenson's Creek Tidal Inlet TMDL modeling report recently completed.

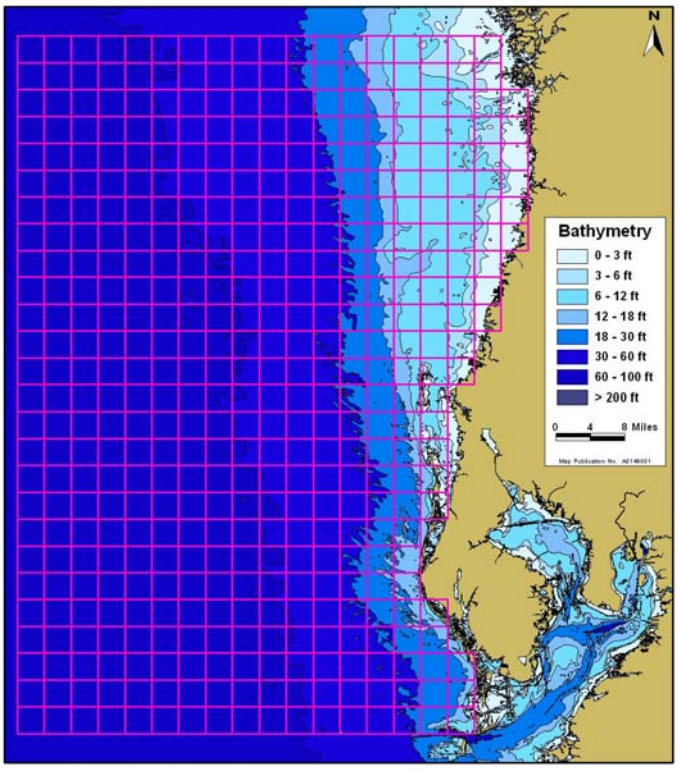

Figure 4-29. Large grid (5 km x 5 km cells) used for Gulf Coast Desalination model, west coast of Florida.

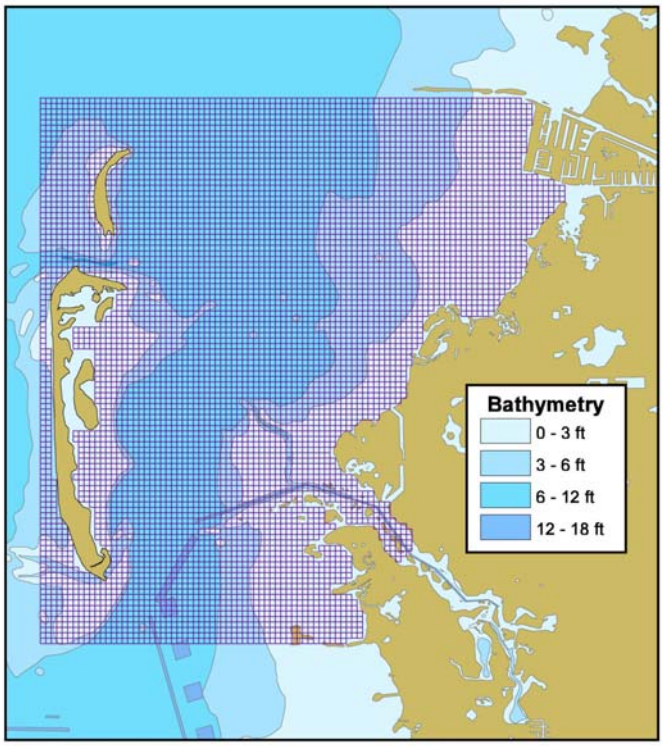

Figure 4-30. Nearshore small grid (100 m x 100 m cells) used for Gulf Coast Desalination model, Anclote Anchorage.

Climate Change and Sea Level Rise

The ramifications of climate change and associated sea level rise on public policy and coastal zone management are numerous. Potential coastal restoration and preservation projects must be examined while keeping the effects of sea level rise in mind. Urban planning and development must also heed the implications of sea level rise.

Tidal elevations at Cedar Key and Clearwater Beach have been analyzed by NOAA to examine trends (Figure 4-31). Sea level has increased at each of these sites since monitoring began. At Cedar Key (for the period 1910s to current), the sea level trend is increasing at 1.80 mm/yr (0.59 feet/100 yr), and at Clearwater Beach (1970s to current) the increase is 2.43 mm/yr (0.80 feet/100 yr). These analyses were based on monthly mean sea level, indicating that sea level rise along the Gulf Coast is occurring.

The Intergovernmental Panel on Climate Change (IPCC) released its 4th Assessment report in early 2007. The panel agreed that global warming is occurring and is "very likely" human-induced (IPCC AR4, 2007). It is generally accepted that greenhouse gases in our atmosphere have increased since the mid-1700s. In addition, the rate of increase of carbon dioxide in the atmosphere, one of the largest components of greenhouse gases, was faster for the 1995-2005 period than it was for the 1960-2005 period.

The resultant increase in atmospheric temperatures due to increases in greenhouse gases also extends to the ocean waters. When ocean temperatures rise, seawater volume increases, resulting in global sea level rise. Since the early 1950s, upper level ocean

temperatures in the tropical Atlantic have increased by an average of 1°F (Barnett et al., 2001). The IPCC report predicted air temperature increases of 3.5 to 8 °F by 2100 and concurrent increases in global sea levels by 7 to 23 inches (IPCC AR4, 2007). The IPCC prediction was made while excluding potential rapid changes in ice flow from Greenland and Antarctica (IPCC AR4, 2007). A recent study also linked increasing sea temperature to potential increases in the number of hurricanes (Elsner, 2006).

The impacts of potential sea level rise along the Mid-Atlantic Region of the US have been described in a recent document produced by the USEPA, USGS, NOAA, and DOT (CCSP, 2009), entitled "Coastal Sensitivity to Sea Level Rise: A Focus on the Mid-Atlantic Region." Another recent document predicts inundation of shoreline and subtidal habitats by 2100 resulting from sea level rise (National Wildlife Federation and Florida Wildlife Federation, 2006), with nearly 50% losses of saltmarsh and 84% losses of tidal flats within Florida.

Coastal habitats can adjust to sea level increases if the rate is relatively slow. In response to relatively slow increases, vegetative assemblages can grow vertically, migrate inland, or expand laterally (CCSP, 2009). However, if sea level rise is relatively fast, these habitats may not have sufficient time to adjust. Additionally, purely physical processes, such as sediment transport along barrier islands and beaches, may be insufficient to maintain shorelines, so that decisions will have to be reached on a management level regarding how to address the problems resulting from sea level rise, including increased beach erosion.

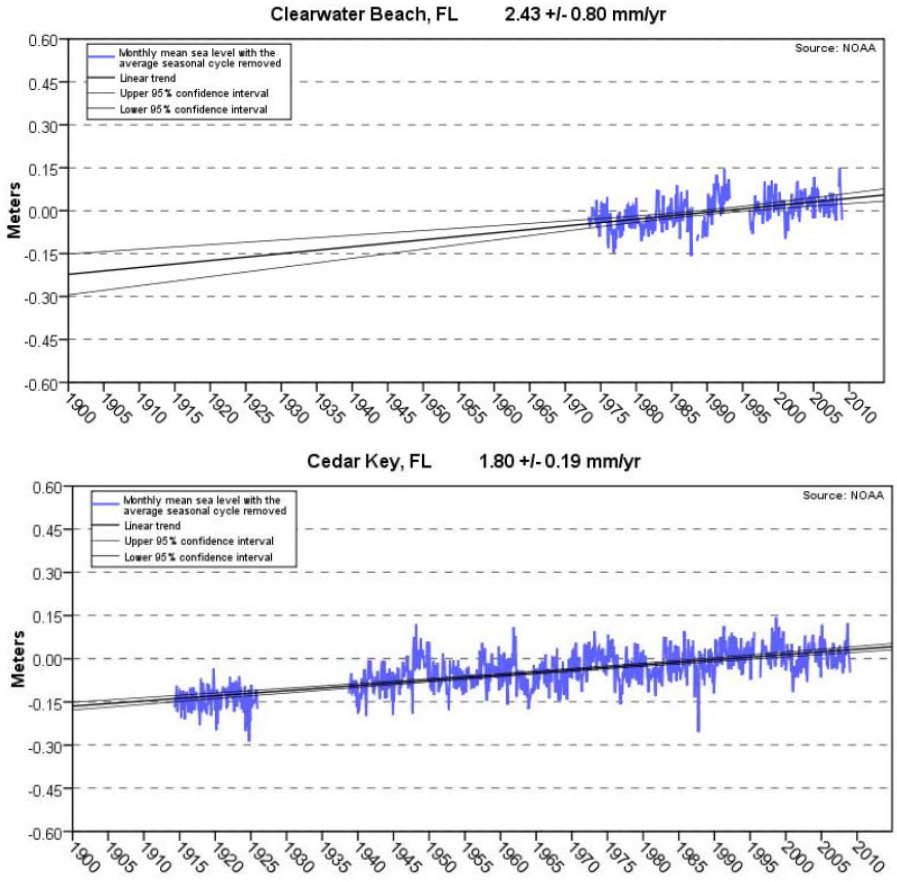

Figure 4-31. Sea level trends at Clearwater Beach and Ceday Key (from NOAA).

The CCSP (2009) document provides guidance on how communities, at national, regional, and local levels, can make preparations for sea level rise. These preparations include:

- **Enhance Understanding**
  Fill current gaps in knowledge about physical and environmental changes in response to sea level changes, including responses of shorelines, estuarine water bodies, and human populations.

- **Enhance Decision Support**
  Improve understanding of potential vulnerabilities and risks resulting from sea level rise to promote sound management policy on regional and local levels, including integration of physical vulnerabilities with economic analyses and planning options.

It should also be noted that management decision making in response to sea level rise will have to be adaptive, in response to changes in climate and sea level. Some of the problems which may be predicted with some certainty can be addressed with activities during the current period, while others may not need to be addressed until some future date. Unforeseen problems are likely to arise and will have to be addressed as they become evident. This calls for as complete an understanding as possible of the potential problems, as well as contingency planning so that future responses can be as efficient as possible.

- **WATER QUALITY**

Pinellas County uses a three-tiered monitoring approach to collect water quality information that includes a probabilistic design, a fixed station design, and an event based sampling design (Levy et al., 2004). The County conducts routine water quality monitoring throughout the project area including the Clearwater Harbor and St Joseph Sound estuarine environment (Figures 4-32 and 4-33). This design is based on a probabilistic routine and is designed to generalize water quality information collected at particular locations to the entire study area with statistical confidence (Janicki Environmental, Inc. 2003b) specifically to fulfill the needs of the Pinellas County Department of Environmental Management while also being applicable to the FDEP's use in their Impaired Waters assessments. None of the open bay segments (WBIDs) are currently on the list of verified impaired waterbodies, however, several of the watershed WBIDs including all the tributaries to the project area are designated as impaired. Impairments are primarily related to fecal coliforms and chlorophyll concentrations exceeding state standards. However, we recognize that state standards are only one means of judging impairment of a water body. We have developed locally derived water quality criteria to meet the specific needs of the particular resource under consideration. Establishing criteria for chlorophyll *a* concentrations in Tampa Bay is one example where we developed locally derived criteria to successfully protect the extensive seagrass beds critical to the healthy ecosystem function in Tampa Bay irrespective of the state standards adopted for the Impaired Water Rule.

The County also conducts a fixed station water quality monitoring sites are located in the tributaries of Clearwater Harbor and St Joseph Sound. The purpose of this aspect of the monitoring program is to develop estimates of pollutant loadings using grab sample nutrient concentrations and flow velocity measurements (See Figures 4-32 and 4-33 triangles). While these data are limited with respect to generalizing information to the water body of interest, they are very useful to detect changes in nutrient concentrations over time. For the

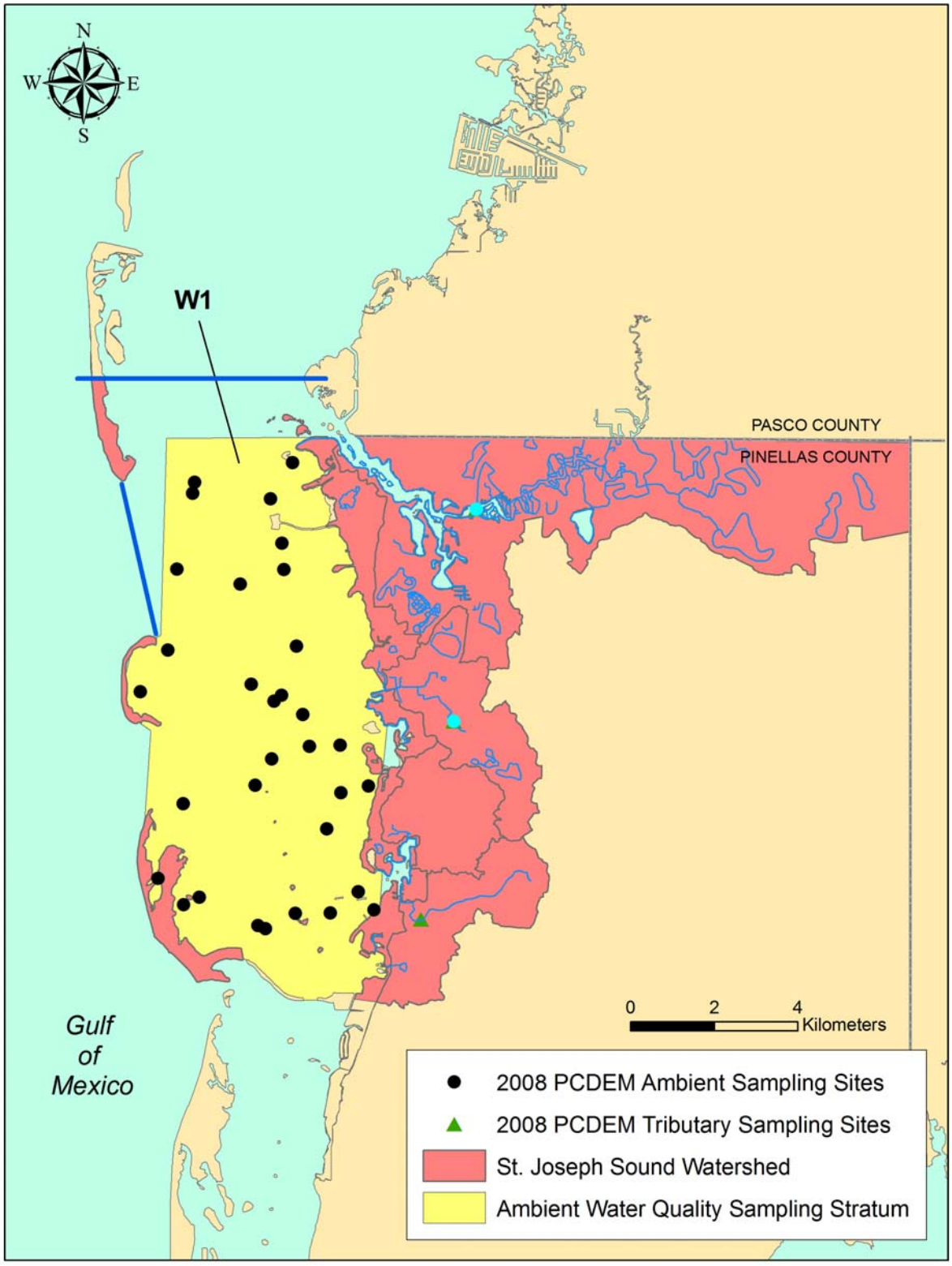

Figure 4-32. Water quality sampling sites in St. Joseph Sound.

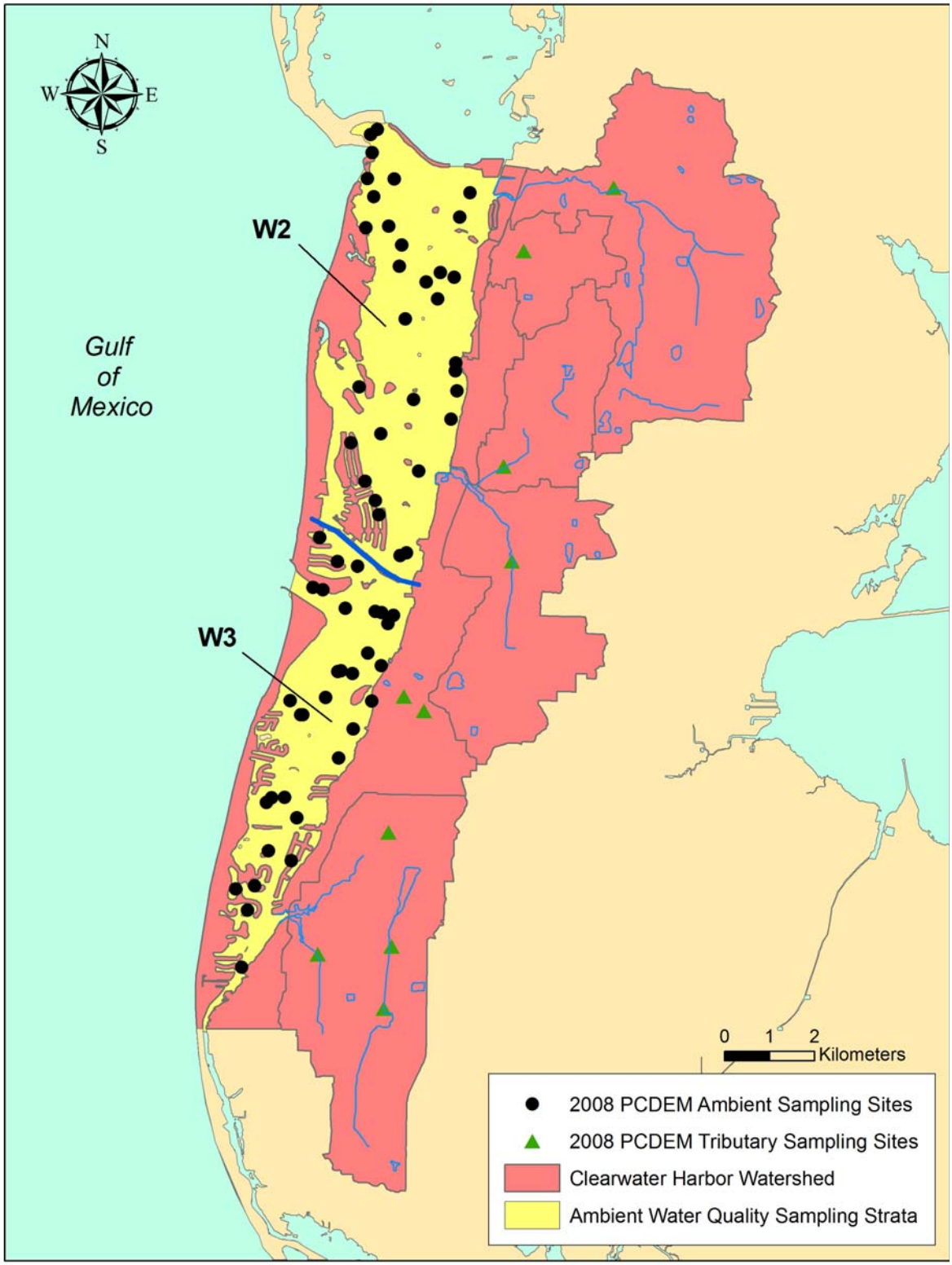

Figure 4-33. Water quality sampling sites in Clearwater Harbor.

CHNEP, we used sophisticated time series analysis to assess trend in water quality at fixed station water quality locations throughout an expansive study area in southwest Florida (Janicki Environmental, Inc. 2007a). We devised a mechanism for reporting these results in an easily understood format that conveyed the results efficiently and effectively (Figure 4-34).

The arrows in Figure 4-34 represent the direction of the trend while the color represents whether or not the trend is improving or declining. The size of the arrow is also indicative of whether the trend is of small or large magnitude. Reporting tools like these are vital for conveying sometimes complex information in a format readily understood by people who may not be familiar with the scientific evaluation of water quality data.

Basin and land use specific event mean concentration data are also collected and employed by the County. These data are obtained by a directed study aimed at monitoring stormwater runoff for estimating pollutant loads and evaluating the efficacy of Best Management Practice stormwater treatment devices in reducing the levels of pollutants delivered to receiving water bodies. The County has demonstrated that BMPs can effectively remove nitrogen and phosphorus species from the stormwater ponds in the Lake Seminole watershed (Levy et al., 2004).

We intend to identify all appropriate water quality data for use in this project. In particular, we intend to use the data included in Run #36 from the FDEP Impaired Waters database. Also, the water quality data collected by the County through September 2009 will be used.

Watershed Loading

We have developed a pollutant loading model for the Tampa Bay watershed (Zarbock et al., 1994). The model has been used to estimate hydrologic, TN, TP, TSS, and BOD loadings from both gaged and ungaged basins. The following is a brief discussion of this model. More complete presentation of the model formulation can be found in (Janicki Environmental, 2004).

Empirical data analyses indicated that the preferred model for predicting runoff was based on a log-linear relationship with rainfall and land use categories as independent variables. Rainfall for two previous months was included in the model in addition to that for the present month. The land use composition of each basin was included through an adjustment factor **(a).** The model used is:

$$\mathbf{FLOW = exp\ [a + (b_0 * RAIN_0 + b_1 * RAIN_1 + b_2 * RAIN_2)]} \qquad \text{(Equation 1)}$$

and,

$$a = (c_1 * L_1) + (c_2 * L_2) + (c_3 * L_3) + (c_4 * L_4)$$

where:

FLOW = nonpoint source flow (meters per month) for a given basin, year and month,
RAIN = rainfall (meters per month) in the month,
$RAIN_1$ = rainfall (meters per month) in the month before the present month,
$RAIN_2$ = rainfall (meters per month) two months before the present month,
L_1 = the fraction of the basin acreage in the URBAN land use category,

L_2 = the fraction of the basin acreage in the AGRICULTURAL land use category,
L_3 = the fraction of the basin acreage in the WETLANDS land use category, and
L_4 = the fraction of the basin acreage in the FOREST land use category, and
c_1, c_2, c_3, c_4, b_0, b_1, and b_2 are parameters to be estimated.

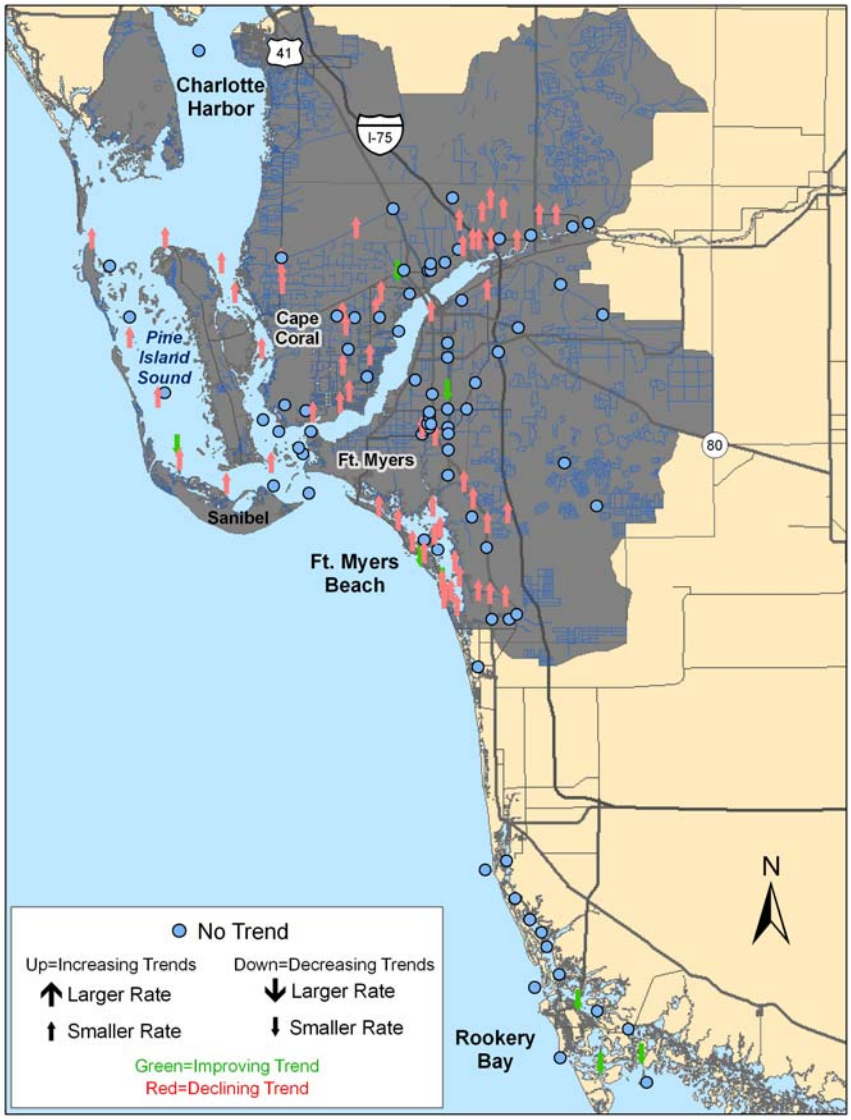

Figure 4-34. Trend results for total nitrogen (mg/l) at fixed stations in the Southern Coast region of the Charlotte Harbor National Estuary Program study area (1995-2005).

Flow is expressed as a volume of water with an area equal to the land area, and the depth in meters. Although the unit is listed as depth, the volume is implicitly accounted for in the land area. For rainfall, m/mo represents the depth of rainfall over the land area during the time period (month), although it may also be expressed as a volume, such as cubic meters/month, acre-feet/month, etc.

A least squares regression with no intercept was used to estimate the seven parameters in Equation (1) after taking the natural logarithm of both sides of the equation:

$$\text{Log (FLOW)} = (c_1 * L_1) + (c_2 * L_2) + (c_3 * L_3) + (c_4 * L_4) + (b_0 * \text{RAIN0} + b_1 * \text{RAIN}_1 + b_2 * \text{RAIN}_2) \quad \text{(Equation 2)}$$

Basins were classified into two categories based on land use category: greater than 19% urban or less than 19% urban. Months were classified into two categories based on rainfall: dry (November through June) or wet (July through October). The model was run for each combination of these categories, resulting in four complete sets of parameter estimates.

Total monthly flow was estimated for each basin using Equation (1) with the appropriate parameter estimates. Flow was then apportioned among the constituent land use categories within each basin as follows:

$$\text{FLOW} = \frac{\text{FLOW}_i * A_i * R_i}{\sum A_i * R_i} \quad \text{(Equation 3)}$$

Where:

FLOW_i = the total nonpoint source flow (cubic meters per month) from Land use category i,
FLOW = the total nonpoint source flow (cubic meters per month) from a subbasin,
A_i = area (acres) in land use category I, and
R_i = the runoff coefficient (fraction of rainfall that runs off) for land use Category I.

Runoff coefficients for each land use category were developed based on a literature review.

For the purpose of assigning land use-specific runoff and pollutant loading factors, land use data were aggregated into 21 classes.

We will use the District's 2008 land use/land cover data to estimate flows and pollutant loads. Flows will be estimated for each of the subbasins delineated in Figure 4-10 and 4-22 and will include the coastal areas that drain directly into either St. Joseph Sound or Clearwater Harbor.

Recently, County staff compared the TN loading estimates obtained by its ambient water quality monitoring program to those provided by the Tampa Bay model (Levy, pers. comm.). This comparison showed that the agreement of the two loading estimates was good, within approximately 30%. Therefore, we propose to use this model to estimate loadings from the various subbasins within the St. Joseph Sound and Clearwater Harbor watersheds.

Golf courses are unique among the land uses within the Clearwater Harbor/St. Joseph Sound watershed. They benefit the quality of life, providing recreational opportunities, enhanced aesthetics, and habitat. However, golf courses must be intensively maintained and can also use excessive water and be a significant nutrient source to surface and groundwaters (May et al., 2004). The effective management of golf courses for environmental sustainability has been an issue for several decades but is still an evolving craft (FDEP, 1995). We believe that golf course management should be identified as an

important element of the watershed management plan. Using Google Earth, no fewer than 13 golf courses are currently located within the study area.

Several industry groups currently address environmentally related issues for golf courses. The Golf Course Superintendents Association of America (GCSAA), among others, has environmental research groups to better understand the potential risks of environmental degradation through, for example, studying the fate and transport of introduced nutrients through different turf grasses (Brown et al., 1982; Starrett and Christians, undated), and to develop new management procedures and Best Management Practices (BMPs) to address these risks. Other groups, such as Audubon International, has a "Golf and the Environment" Initiative, that assists golf courses in providing wildlife habitat, protecting water quality, and improving overall environmental sustainability (Audubon, 2009). Their "Audubon Cooperative Sanctuary Program for Golf Courses" is an education and certification program that encourages golf facilities to participate in environmental stewardship.

We propose to work with local golf course managers to identify current management practices, and to investigate possible means of providing additional safeguards from adverse impacts to the watershed and estuary. Because the watershed is largely developed, environmental enhancements will need to be examined in a retrofit approach to existing facilities, and cannot be land-intensive. Some of the more recent developments in the environmental management of golf courses are not so much new technologies, but rather the refinement of BMPs that have been in use for some time. For example, the use of alum for surface water treatment has been well documented but its use is often limited because of high cost. The recent development of alum injection "package plants" makes this alternative much more attractive, at a fraction of the cost of custom made systems.

- **CRITICAL RESOURCES AND HABITATS**

As spawning, nursery, and feeding grounds, estuaries provide important habitats for a number of economically important fish and shellfish species. In Florida, estuaries are also a vital economic engine providing recreational opportunities for millions of people each year. Therefore, the health and productivity of estuarine environments are critical to the long term viability of Florida's natural resources and economic success. A CCMP should address all these aspects of managing estuarine environments. As part of the "State of the Resource" report, we intend to describe the critical habitats that provide refuge and sustenance to living organisms that drive ecological function within the estuary.

Benthos and Sediments

A critical estuarine habitat in the project area is the benthos. The type and quality of the sediments control the organisms that dwell in, on or near the seabed. These organisms are typically secondary producers and are affected by the amount of particulate organic carbon (POC) that reaches the sediment-water interface. This POC thereby becomes available for consumption by benthic invertebrates. Particulate organic carbon in southwest Florida estuaries is comprised mainly of phytoplankton but also includes bacteria, the smaller zooplankton, fecal matter, and phytodetritus.

There is a paucity of data collected on the benthos in the Clearwater Harbor/ St. Joseph Sound project area. However, the Environmental Protection Agency's (EPA) Inshore Mapping and Assessment Program (IMAP) has collected some synoptic information on benthos in coastal Florida waters, including the project area. The locations of the benthic sampling sites conducted by the Florida Fish and Wildlife Commission are provided in Figure 4-35. While there are few samples in the project area, the probabilistic nature of the design provides good spatial distribution of the samples. We propose to use information from these samples as well as other available data collected as part of dredging or construction permit requirements from to examine the spatial similarity of the benthic biota as well as the sediment chemistry to develop a sampling survey designed to provide baseline characterization of the benthos in the study area as part of the State of the Resource document.

The design of a sampling plan is critical to the appropriate characterization of the resource. The goals and objectives should be explicitly stated and the sampling plan should be capable of making inferences to the entire project area under study. We have proven experience in designing and conducting sampling plans in southwest Florida and have been involved in several local efforts to characterize the sediment chemistry and benthic biota in the Tampa Bay area. We have contributed to the development of an ecosystem based framework for assessing and managing sediment quality conditions in support of a Comprehensive Conservation and Management Plan for Tampa Bay (MacDonald et al., 2004). The framework includes five key elements, including identification of sediment quality issues and concerns, development of ecosystem goals and objectives, selection of ecosystem health indicators, establishment of metrics and targets for key indicators, and incorporation of key indicators, metrics, and targets into watershed management plans and decision-making processes. We also recently completed a sediment contaminant assessment for Cross Bayou (Janicki Environmental, Inc., 2006) in Pinellas County and previously helped to develop a sampling program for the TBEP to monitor benthic biotic integrity throughout Tampa Bay so we are intimately familiar with the needs of the project with respect to the benthic component of this management plan.

The collection and analysis of benthic and sediment quality data will be a significant effort in this project will be the collection of these data in the project area. To meet this need we propose to utilize the same field and laboratory methods used for the Tampa Bay Estuary Program Benthic Monitoring Program. Members of our project team contributed to the design (Dr. A. Janicki) and implementation (Mr. S. Grabe) of that program. Additionally, the field collections and laboratory analyses will be conducted by the Environmental Protection Commission of Hillsborough County (EPCHC).

Benthic infauna, hydrographic profiles, and sediments will be collected using the standard EMAP techniques adopted by USEPA for the Louisianan Province (Holland, 1990). At each

station, temperature, dissolved oxygen, and salinity will be measured with a Hydrolab Surveyor.

Sediment samples will be collected with a stainless steel 0.04 m^2 Young sampler. A core will be removed from each sample and stored, on ice, for subsequent analysis of the % silt + clay content [%SC].

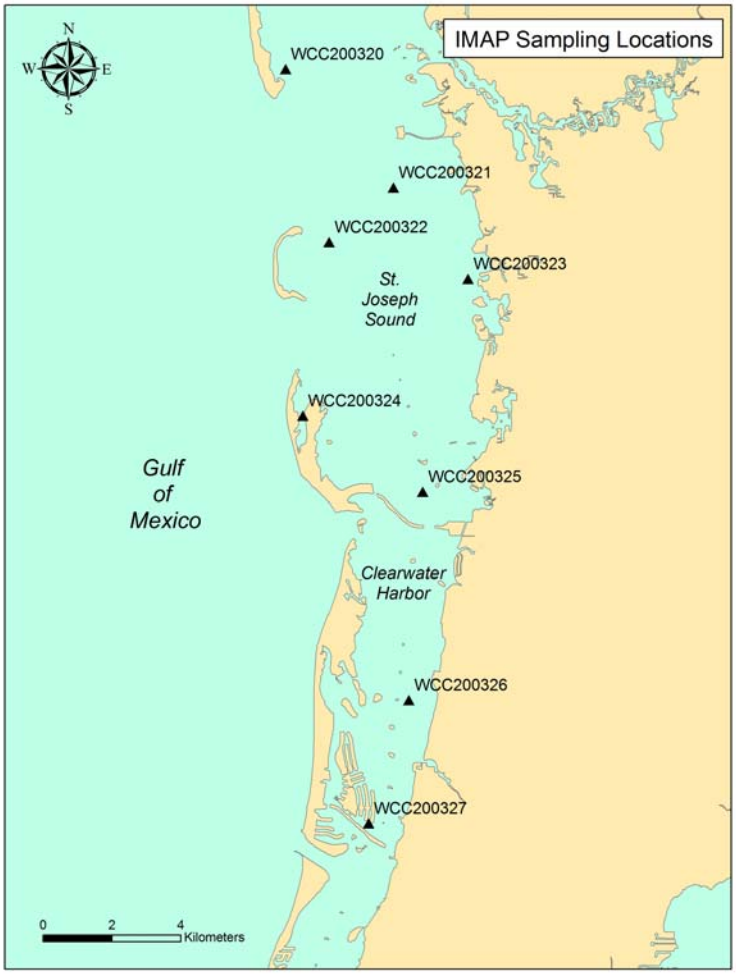

Figure 4-35. Location of IMAP sampling sites in the St. Joseph Sound/Clearwater Harbor area.

This core will also be examined for the presence of an apparent redox potential discontinuity layer [RPD]. The apparent RPD width demarcates reduced and oxidized sediments and the depth of this upper, oxidized layer is influenced by bioturbation (Rosenberg et al., 2001). In order for bioturbation to occur, the near-bottom DO regime must be adequate to sustain a diverse benthic assemblage (Nilsson and Rosenberg, 2000). If an RPD is discernible its width will be measured with a metric ruler.

Benthic samples will be stored on ice after adding a solution of magnesium sulfate to relax the organisms. Samples were later sieved (0.5 mm mesh) and then fixed in a 10% solution of borax-buffered formalin and Rose Bengal.

Additional samples will be collected from the seven primary bay segments and from a random subsample of HIMP sites for analysis of sediment contaminants (trace metal, organochlorine pesticides, PCBs, and PAHs).

Analysis of the %SC content followed a modification (Versar, Inc. 1993) of Plumb (1981). Sediment contaminant analyses followed methods outlined in USEPA (1993) and Grabe and Barron (2004). Benthic samples will be sorted and all organisms will be identified to the lowest practicable identification level.

Development of Sediment Quality Targets

We have previously assisted the TBEP with development of sediment quality targets that served as one component of an ecosystem-based framework for sediment quality condition assessment and management, as described in MacDonald et al. (2002, 2004). The framework included identification of sediment quality issues, development of ecosystem goals, selection of indicators of ecosystem health, establishment of metrics and targets for key indicators, and incorporation of the key indicators, metrics, and targets into the decision-making process and watershed management plans.

To establish sediment quality targets, a basis for determining the level of impact on aquatic habitats was needed. A database was developed for Tampa Bay containing sediment chemistry, toxicity, and benthic invertebrate community structure data. Using this database, a compilation of mean sediment quality guidelines (SQGs) quotients was developed, including probable effects levels (PELs) and threshold effects levels (TELs) for metals, total polycyclic aromatic hydrocarbons (tPAHs), total polychlorinated biphenyls (tPCBs), phthalate, and organochlorine pesticides (MacDonald et al., 2004). The SQGs were then evaluated and used to assess the incidence of adverse biological effects in relation to contaminant concentrations (MacDonald et al., 2004). The SQGs used to support the establishment of the numerical sediment quality targets in Tampa Bay are provided in Table 4-1.

Site-specific concentration-response relationships were then developed, allowing identification of sediment contamination levels corresponding to 10%, 20%, 50%, and 80% probability of observing acute toxicity, chronic toxicity, and benthic community impairment. Using these relationships, sediment management areas were identified and classified as unimpacted, moderately impacted, or highly impacted (MacDonald et al., 2004). Unimpacted areas were defined as those with mean PEL quotients below the 10% probability value for acute toxicity to amphipods, chronic toxicity, and benthic community impairment. Moderately impacted areas were defined as those with mean PEL quotients between the 10% and 20% probability values for acute toxicity to amphipods or between the 10% and 50% probability values for chronic toxicity or benthic community impairment. Highly impacted areas were those with mean PEL quotients above the 20% probability value for acute toxicity to amphipods or above the 50% probability values for chronic toxicity or benthic community impairment (MacDonald et al., 2004).

We propose to use the same methodology, and the sediment quality guidelines for Tampa Bay provided in Table 4-1, to identify and classify sediment management areas in Clearwater Harbor and St. Joseph Sound. This process will involve participation by all interested stakeholders to identify sediment quality issues, develop ecosystem goals, select indicators of ecosystem health, and establish metrics and targets for key indicators. This process will provide indicators, metrics, and targets for incorporation into the decision-making process and watershed management plans.

Table 4-1. Sediment quality guidelines (SQGs) that were evaluated to support the establishment of numerical sediment quality targets for Tampa Bay (from MacDonald et al., 2002).

Substance	Effects Levels SQGs[1]		Effect Range SQGs[2]	
	TEL	PEL	ERL	ERM
Trace Metals (mg/kg)				
Arsenic	7.24	41.6	8.2	70
Cadmium	0.68	4.21	1.2	9.6
Chromium	52.3	160	81	370
Copper	18.7	108	34	270
Lead	30.2	112	46.7	218
Mercury	0.13	0.7	0.15	0.71
Nickel	15.9	42.8	20.9	51.6
Silver	0.73	1.77	1	3.7
Zinc	124	271	150	410
Polycyclic Aromatic Hydrocarbons (PAHs; µg/kg)				
2-Methylnaphthalene	20.2	201	70	670
Acenaphthene	6.71	88.9	16	500
Acenaphthylene	5.87	128	44	640
Anthracene	46.9	245	85.3	1100
Fluorene	21.2	144	19	540
Naphthalene	34.6	391	160	2100
Phenanthrene	86.7	544	240	1500
Total LMW-PAHs	312	1442	552	3160
Benz(a)anthracene	74.8	693	261	1600
Benzo(a)pyrene	88.8	763	430	1600
Chrysene	108	846	384	2800
Dibenz(a,h)anthracene	6.22	135	63.4	260
Fluoranthene	113	1494	600	5100
Pyrene	153	1398	665	2600
Total HMW-PAHs	655	6676	1700	9600
Total PAHs	1684	16770	4022	44792
Polychlorinated Biphenyls (PCBs; µg/kg)				
Total PCBs	21.6	189	22.7	180
Organochlorine Pesticides (µg/kg)				
Chlordane	2.26	4.79	0.5	6
Dieldrin	0.72	4.3	0.02	8
Lindane	0.32	0.99	NG[3]	NG
Sum DDD	1.22	7.81	2	20
Sum DDE	2.07	374	2.2	27
Sum DDT	1.19	4.77	1	7
Total DDT	3.89	51.7	1.58	46.1
Phthalates (µg/kg)				
Bis(2-ethylhexyl) phthalate	182	2647	NG	NG

[1]TEL = threshold effect level; PEL = probable effects level from MacDonald, 1997

[2]ERL = effects range low; ERM = effects range median from Long et al., 1995; Long and Morgan 1991.

[3]NG = no guideline.

Seagrass

Seagrasses are a critical estuarine resource, functioning as a keystone species in healthy estuaries. The link between water quality and seagrass distribution makes seagrass a good indicator of ecosystem health. Healthy seagrass populations are critical resources that provide a multitude of benefits to estuarine ecosystems (Dawes *et al.*, 2004; Janicki *et al.*, 1995) including:

- providing structural habitat for recreationally and commercially important fish and invertebrate species and stabilization of sediments,
- providing support for epiphytic and macro algae, and
- functioning as an important component of nutrient cycles.

Anthropogenic nitrogen loads can lead to excessive algae growth, which adversely affects light penetration to submerged seagrasses (Dennison *et al.*, 1993; SBEP, 1995; CHNEP, 2000; Chesapeake Bay Program, 2000; Morris and Virnstein, 2004; Greening and Janicki, 2006). Sediment deposition related to development of shorelines and the watershed also negatively impact seagrass growth. Therefore, these systems are highly susceptible to nutrient and sediment inputs. Fortunately, PCDEM and the SWFWMD have recognized the importance of seagrasses of the Clearwater Harbor/ St. Joseph Sound study area and implemented monitoring programs to study these valuable resources. Figures 4-36 and 4-37 depict the 2006 seagrass areal extent as estimated by the SWFWMD along with the location of PCDEM seagrass sampling points based on both fixed station and random sampling monitoring efforts.

The use of both fixed station transects and a random stratified sampling design provides a robust estimate of changes over time at a particular location within the estuary and also an assessment of the density and speciation of seagrass which can be generalized to the extent of the sampling list frame of the probabilistic design.

Historical seagrass coverage will be estimated from available historical aerial photography from the 1940-1950 period. We will compile an inventory of available photos and review them with County and District staff to identify the most appropriate photos to estimate the historical seagrass coverage.

The current seagrass data to be used in this project will include the 2008 District seagrass data and the seagrass transect data to be collected in fall 2009. We intend to utilize the seagrass coverage data to describe the historic and current state of the seagrass resource and estimate the areas of high susceptibility with respect to seagrass loss. We have worked with SWFWMD, TBEP, SBEP, Sarasota County Water Resources, and CHNEP in similar assessments and developed a methodology to assess the changes in seagrass areal extents over time and estimate the susceptibility of seagrasses to perturbation at small scale geographic extents. We also have experience working with these seagrass data in the Clearwater Harbor/St. Joseph Sound study area (Janicki Environmental, 2007b).

Figure 4-38 illustrates an example of how we use a grid overlay and the SWFWMD biennial aerial surveys between 1999 and 2006 to establish a seagrass persistence profile for the Clearwater Harbor/ St. Joseph Sound estuaries. The areas in brown represent places where seagrass was documented only in one survey year while areas in green represent areas where seagrasses were persistent in all years. The brown areas tend to be located in deeper

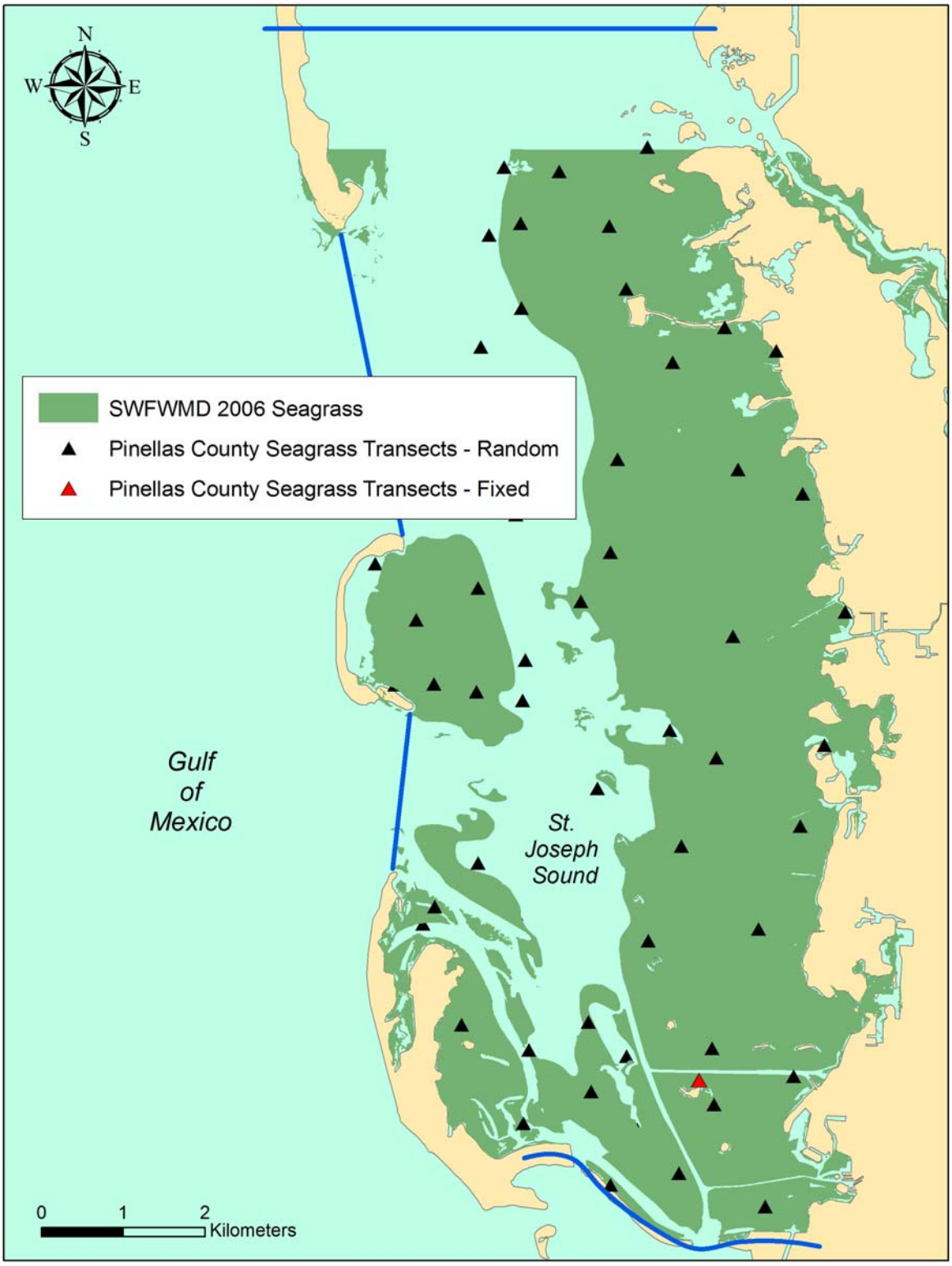

Figure 4-36. Seagrass areal extent from SWFWMD 2006 survey and location of Pinellas County Department of Environmental Management seagrass sampling locations in St Joseph Sound.

Figure 4-37. Seagrass areal extent from SWFWMD 2006 survey and location of Pinellas County Department of Environmental Management seagrass sampling locations in Clearwater Harbor.

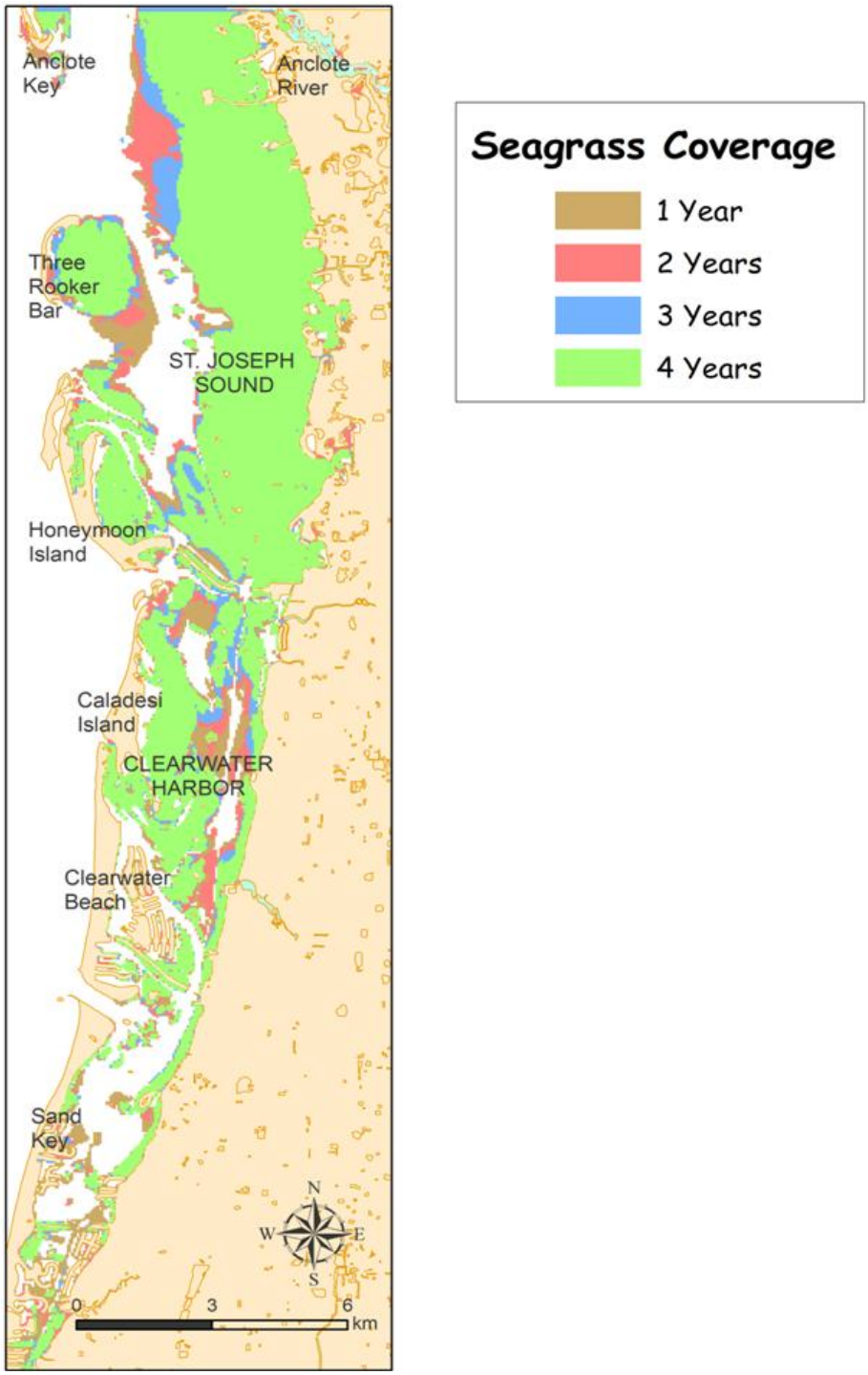

Figure 4-38. Map of seagrass persistence in the Clearwater Harbor/ St Joseph Sound estuary based on SWFMWD biennial surveys between 1999-2006.

waters. The depth to which seagrass grow is thought to be primarily limited by the amount of sunlight irradiance reaching the bottom. Water quality affects the attenuation of light and is a manageable quantity that can influence to distribution and success of this critical resource in the area. However, water quality is also a naturally variable quantity influenced by natural variation in rainfall. Therefore, the management targets need to incorporate

natural variability into the target setting process. We have the experience and expertise to set reasonable targets for seagrass that are achievable and representative of the management level actions that can be implemented to improve the health and success of seagrasses in this area.

Fish Communities and Protected Species

In 1996 the U.S. Congress amended the Magnuson-Stevens Fishery Conservation and Management Act, establishing a new mandate for the National Marine Fisheries Service (NMFS), the regional Fishery Management Councils, and other federal agencies to identify and protect "essential fish habitat" (EFH). The Clearwater Harbor/St. Joseph Sound project area includes expansive fish habitat that is classified as EFH including seagrass, mangroves and hard bottom habitats. Despite the existence of expansive EFH in the project area, there is currently limited information on trends in the relative abundance of fishes in this area. Some studies have been conducted in the vicinity of the Anclote River power plant (Fable 1973; Szedlmayer 1982); however, the information on estuarine fish species inhabiting the near shore seagrass beds of Clearwater Harbor and St. Joseph Sound is limited.

The Clearwater Marine Aquarium also conducts trawl sample collections, primarily in the Clearwater Harbor portion of the study area. These collections are performed as part of their education and outreach program providing ecological tours of the project area. The study area includes sixty fixed locations. On average, two samples are collected every day, weather permitting (Joe Malo, pers. comm.) with the locations rotated among the sixty stations. Each species collected is enumerated and summary reports are provided annually to regulatory agencies overseeing their permit requirements. A summary of the data was presented at the St. Joseph Sound workshop in 2007 in which the pinfish (*Lagodon rhomboides)* was the dominant species collected. Notable among these collections was the frequency of collections of gag grouper (*Mycteroperca microlepis*) as well as several other commercially and recreationally important species such as blue crab (*Callinectes sapidus*), stone crab (Menippi mercenaria), and the bay scallop (*Argopecten irradians*). The fish and invertebrate species of recreational or commercial importance that have been collected by the Clearwater Marine Aquarium in their trawl surveys are presented in Table 4-2.

In the summer of 2009 the Florida Fish and Wildlife Conservation Commission intends to conduct an index period sampling effort directed at capturing juvenile grouper species in proximity to Honeymoon Island (Tim MacDonald pers. comm.). This sampling effort will include sampling shallow offshore seagrass beds with a 183 meter haul seine pulled along exposed or slightly inundated offshore sand bars as well as potentially along shoreline habitats. While this effort is directed at capturing grouper in their first year of life while they utilize the estuarine seagrasses for refuge and exploitation, the protocol dictates that all species are counted and a sub-sample measured to determine length frequency information.

We believe that information from these programs will be useful in assessing the efficacy of utilizing fisheries data as an ecological indicator to measure the effects of management actions in the watershed on the health and productivity of the estuary. For example, these data can be evaluated to estimate a level of change that can be detected with statistical certainty for any given fish species based on the equation for detectable difference (Zar 1984):

$$\delta \geq \sqrt{\frac{2\sigma^2{}_p}{N}}(t_{\alpha,\nu} + t_{\beta(1),\nu})$$

Table 4-2. List of commercially or recreationally important fish species captured in trawl samples taken by the Clearwater Marine Aquarium in Clearwater Harbor between 2005 and 2008.

Scientific Name	Common Name
Argopecten irradians	Bay Scallop
Callinectes sapidus	Blue Crab
Centropomus undecimalis	Common Snook
Centropristis striata	Black Sea Bass
Cynoscion nebulosus	Spotted Seatrout
Epinephelus morio	Red Grouper
Haemulon aurolineatum	Tomtate
Haemulon plumieri	White Grunt
Haemulon sciurus	Bluestriped grunt
Leiostomas xanthurus	Spotted Seatrout
Lutjanus analis	Mutton Sanpper
Lutjanus griseus	Mangrove Snapper
Lutjanus synagris	Lane Snapper
Menippe mercenaria	Stone Crab
Menticirrhus americanus	Southern Kingfish
Menticirrhus littoralis	Gulf Kingfish
Micropogonias undulatus	Croaker
Mugil cephalus	Mullet
Mugil curema	Sivler Mullet
Mycteroperca bonaci	Black Grouper
Mycteroperca microlepsis	Gag Grouper
Orthopristis chrysoptera	Pigfish
Pagralichthys albigutta	Flouder
Pagrus pagrus	Red Porgy
Penaeus aztecus	Brown Shrimp
Pogonias cromis	Black Drum
Pomatomus saltatrix	Bluefish
Rachycentron canadum	Cobia
Sardinella aurita	Round Sardine
Sciaenops ocellatus	Redfish
Trachinotus carolinus	Pompano
Trachinotus falcatus	Permit

Our experience in utilizing fish data to support management decisions is extensive and includes our work with Tampa Bay Water's Hydrobiological Monitoring Program (HBMP). Recently, we evaluated the power of the HBMP sampling design for fish and benthos in an effort to understand the level of effort required to detect meaningful changes in these populations from year to year. The analysis suggested that for most individual taxa the variability in catch rates was so high that only changes of at least 50% of the mean were detectable given the current sampling effort (Janicki Environmental, Inc. 2008). The benefits of increasing the sampling effort were modest relative to the increased cost of the additional effort. We assessed index metrics such as the Shannon Weiner diversity index and the overall catch per unit effort and found that these metrics generally had increased power relative to individual taxa in detecting changes from year to year.

We are recommending careful evaluation of the fish data collected in the project area and a thoughtful assessment of how the data may be used prior to any recommendation on a routine fisheries monitoring program as part of the CCMP. Careful consideration of the costs of the program must be weighed against the potential utility of the information. Cooperative funding efforts aimed at multi-objective sampling efforts are worthy of consideration. An index period sampling effort for commercially and recreationally import species may be a feasible option. In this effort, an aggregate of species might be used as a metric for evaluation such as a "sportfish index" or a "baitfish index" that could be incorporated into the CCMP.

Federally protected species utilize the Clearwater Harbor/St. Joseph Sound project area including sea turtles, dolphins and manatee. Sea turtles utilize the western shorelines of the barrier islands as nesting sites and deposit eggs above the high tide line, westward of the primary dunes. Sea turtles have high site fidelity, returning to the same beaches year after year to nest and the barrier islands associated with the project area have management plans aimed at protecting the nesting sea turtles and their eggs from harm. Juvenile sea turtles also may use the estuarine portions of the project area for grazing. We will review pertinent information regarding the protection of sea turtles and their important habitats within the project area including established management plans for the barrier islands as part of the CCMP.

Manatees (*Trichechus manatus*) and dolphins (*Tursiops spp.)* are other federally protected species that utilize the project area and have the potential for interaction with recreational users of the study area. The CCMP should support any efforts to increase public awareness of the dangers humans pose to manatee and the federal guidelines surrounding interactions with this protected species. We will include a section in the CCMP addressing the need for protection of these protected species and their important habitats, especially the extensive seagrass habitats of Clearwater Harbor and St Joseph Sound, as part of the CCMP. We also suggest including the Clearwater Marine Aquarium as a stakeholder and get their input on how the CCMP can address issues related to the protection of manatees and dolphins in the study area.

Bird Communities

Of all the wildlife utilizing the Clearwater Harbor/St. Joseph system, probably no faunal group is more widely observed and appreciated than birds. The avian population of the study area is large, diverse, and well-documented. Numerous studies and surveys including the

Audubon Society's annual Christmas Bird Count, the Great Backyard Bird Count (GBBC), and numerous investigations by scientists from Audubon, Florida Fish and Wildlife Conservation Commission (FWC), and others consistently rank the Clearwater Harbor/St. Joseph Sound coastal area as one of the top habitats for nesting, foraging, and migrating birds in the nation. The 2008 Christmas Bird Count listed 163 species reported by St. Petersburg area observers. Also, last year's four-day GBBC results show that observers in St. Petersburg, Clearwater, Dunedin, and Tarpon Springs tallied 148, 77, 90, and 68 species respectively, with a total bird count of several thousand.

Additionally, the Clearwater Harbor/St. Joseph Sound area is recognized as one of the "Important Bird Areas of Florida" (Pranty, 2002). Coastal beaches and spoil islands in the estuary form prime habitat for several popular and listed species including Brown Pelican, Reddish Egret, Roseate Spoonbill, Black Skimmer, Least Tern, Snowy Plover, Great and Snowy Egret, White Ibis, and American Oystercatcher (Paul and Paul, 2002). In addition, several locations in the area are listed destinations of the Great Florida Birding Trail including Honeymoon Island State Park (Dunedin), Caladesi Island State Park (Dunedin), Hammock Park (Dunedin), Sand Key (Clearwater), and John R. Bonner Nature Park (Largo). Clearwater Harbor and St. Joseph Sound are also included in the Florida Coastal Islands Sanctuaries Program, which includes important habitats along the Florida Gulf of Mexico coast from Levy County to Charlotte County (Hodgson, 2007). The Pinellas County Aquatic Preserve also encompasses the study area (Runnel, 2007).

Besides those listed above, other common coastal species include several herons, cormorants, anhingas, numerous egrets, ospreys, terns, and the ubiquitous gulls. Of special interest to resource managers are the Reddish Egret and the American Oystercatcher. Research by Audubon of Florida scientist the late Rich Paul (Graham, undated) indicates that, although local populations of Reddish Egrets are rebounding, only about 50 nesting pairs were observed in the area in the late 1990s. More recent surveys indicate that up to 75 nesting pairs now frequent the area – about 20% of Florida's population (Audubon of Florida, 2009). Until recently Clearwater Harbor/St. Joseph Sound represented an isolated outpost of nesting for these birds. Recent research has revealed colonies as far north as South Carolina (Ferguson et al., 2005.)

The Reddish Egret

The American Oystercatcher is another species of special interest. The Tampa Bay contingent (including Clearwater Harbor/St. Joseph Sound) of about 130 pairs is roughly 40% of the state population. These birds are highly vulnerable to disturbance during Clearwater Harbor/St. Joseph Sound) of about 130 pairs is roughly 40% of the state population. These birds are highly vulnerable to disturbance during nesting, and pairs nesting in Clearwater Harbor and St. Joseph Sound, have been labeled a population "sink" due to

chronic disturbance and nesting failure (Audubon, 2009). Overwash of nests by boat and ship wakes is a particular threat (Hodgson, 2007).

In addition to the special interest species, all beach-nesting birds in the area are under threat from a variety of sources, including weather, humans, and predators. By far the most important cause of nesting failure is disturbance by people (Paul, 2002). Efforts to preclude habitat destruction date back several years, for example the work to restore and stabilize dredged spoil islands in the estuary (Finch and Bauer, 1990). The management plan to be developed for this study should place the protection of valuable bird habitat near the top of priorities, building on previous management initiatives.

Analysis of Habitat Change

There has been extensive quantification of losses and gains of estuarine and other habitats for the Tampa Bay estuarine system. Most recently, PBS&J completed an estuarine wetland habitat change analysis for the Tampa Bay watershed for the periods: circa 1950, 1990, 1995, 1999, 2004, and 2007. This work was conducted as part of the Tampa Bay Habitat Master Plan Update, prepared for the Tampa Bay Estuary Program in 2009 (in press). It is our understanding that Pinellas County would like to replicate this effort for natural habitat and manmade structures in Clearwater Harbor and St. Joseph Sound. Accordingly the objectives of this effort are to:

- quantify the historic, current, and existing natural habitats and manmade structures (i.e. canals, dredge channels, etc.);
- conduct a spatial change analysis to quantify natural ecosystem shifts and manmade structure development over the time periods circa 1943, 1990, 1995, 1999, 2004, and 2007; and
- qualitatively assess the relative health and functioning of these habitat units in the study area; and

Geographic information systems (GIS), specifically ArcGIS 9.2, will be used to identify, classify, and quantify historic, current, and existing natural habitat and manmade structures in the Clearwater Harbor and St. Joseph Sound watersheds, and perform a spatial change analysis of natural ecosystem shifts and manmade structure development from 1943 to 2007. Figure 4-39 is a diagram of our technical approach.

Historic aerial photography will be used to develop baseline habitat maps and identify manmade structures. Aerial photographs flown by the United States Department of Agriculture (USDA) in 1943 will be obtained from the Aerial Photography Florida website. We will further investigate available historical aerial photographic resources for emergent tidal wetlands in the specific project area, including National Archives. As a preliminary deliverable, we will prepare an inventory of available photographic resources including dates and an assessment of their relative quality. The County and the District will have the ability to approve the source used before the analysis is initiated.

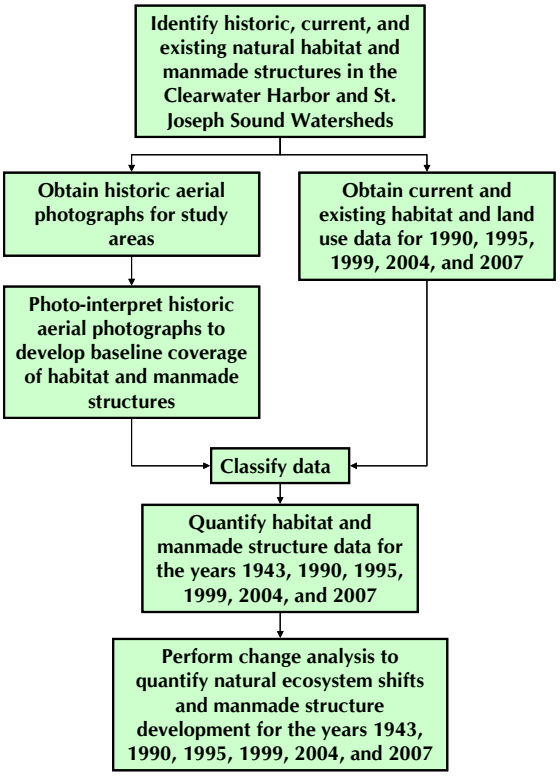

Figure 4-39. Technical approach for spatial change analysis in the Clearwater Harbor and St. Joseph Sound watersheds.

Current and existing land use/land cover data from 1990 through 2008 will be obtained from the District to identify and classify historic and existing wetland habitats. District land use/land cover codes will be used. Table 4-3 lists potential data sources to be used for the change analysis.

Table 4-3. Relevant Data for Spatial Change Analysis in Clearwater Harbor and St. Joseph Sound.

Data Reference	Agency Source	Date of Automation
Historical Aerial Photography	USDA	1943
Land Use and Land Cover	SWFWMD	1990, 1995, 1999, 2004, 2007
Florida Seagrass Areas	FWRI	1987-2007
National Wetlands Inventory	USFWS	1971, 2000
Florida Land Cover (GAP)	Florida Cooperative Fish and Wildlife Research Unit	1993

Upon completion of the identification and classification of habitats and manmade structures, acres of each habitat and manmade structure type will be quantified for the years 1943, 1990, 1995, 1999, 2004, and 2007. Natural ecosystem shifts and manmade structure development, including losses, gains, and conversions, will be calculated between each year of analysis. Figure 4-40 shows an example graphical output for this type of analysis.

As with the analysis conducted for tidal wetland habitats in the Tampa Bay Habitat Master Plan Update, this information will be used to develop quantitative habitat restoration targets for Clearwater Harbor and St. Joseph Sound based on the "restoring the balance" paradigm. It is anticipated that the circa 1940 ratio of habitats (e.g., relative proportion of each habitat type) will be used to determine the baseline against which later dates will be compared. From this analysis it will be possible to develop restoration, enhancement, and preservation targets for each of the key habitat types in major bay segments and drainage basins in the Clearwater Harbor and St. Joseph Sound watersheds.

Using this same approach, it will also be possible to develop quantitative restoration, enhancement, and preservation targets for native upland habitats in the watershed. It is anticipated that the distribution of native upland habitats such as pine flatwoods, oak hammocks, and scrub can be mapped and quantified for the circa 1940 baseline period, as well as the 1990-2007 current periods, using the same data and resource summarized above for freshwater wetlands. As with freshwater wetlands, quantitative targets for native upland habitats can then be developed for each major drainage basin in the study area.

Periodic updates of land use and land cover data conducted by SWFWMD every 2-3 years are likely adequate to track quantitative changes in wetland and native upland habitats in Clearwater Harbor and St. Joseph Sound, and their watersheds. As part of this effort, we will develop a recommended protocol for quantifying and reporting gains, losses, and conversions in wetlands and native uplands for each future update period.

Mangrove Islands and Other Management Areas

Review of existing resource management plans for mangrove islands and other applicable areas within the St. Joseph Sound and Clearwater Harbor estuaries and watersheds is necessary to facilitate and ensure consistency between these plans and the proposed Clearwater Harbor/St. Joseph Sound Conservation Management Plan. This is important so as to: not reinvent issues that have been addressed previously; update management approaches that may be outdated; and determine opportunities for interagency cooperation on resource management issues.
The project team will review the following documents:

- Pinellas County Comprehensive Plan Coastal Management, Future Land Use, Natural Resources, Recreation and Open Space, and Surface Water Management Element;
- Pinellas County Water and Navigation Code;
- Pinellas County Aquatic Preserve Management Plan;

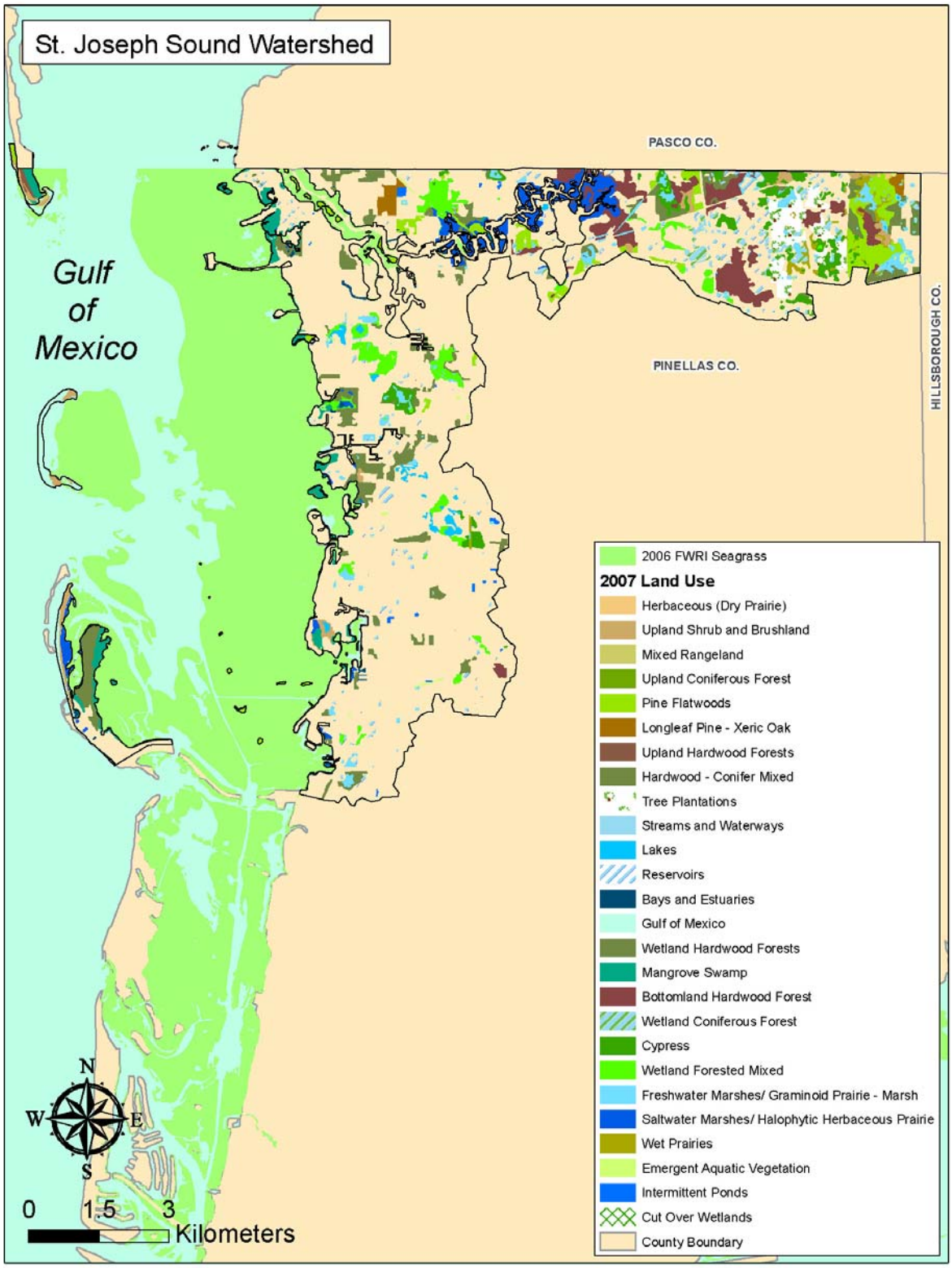

Figure 4-40. Example graphical output from a habitat change analysis.

- Pinellas County Boating Regulatory Zones;
- City of Clearwater Comprehensive Plan Future Land Use, Stormwater Management, Conservation, Coastal Management, and Recreation Elements;
- City of Clearwater Floodplain Management Plan;
- City of Clearwater Stevenson Creek Watershed Management Plan;
- City of Clearwater/USACOE Stevenson Creek Aquatic System Restoration Plan;
- Tampa Bay/Anclote River Comprehensive Watershed Management Plan;
- Caladesi Island State Park;
- Honeymoon Island State Park;
- Florida Outstanding Florida Waters Regulations;
- Florida TMDL for Klosterman Bayou Run and St. Joes Creek;
- Boater's Guide for Clearwater Harbor;
- FDEP Clean Marina Program; and
- Island Estates Neighborhood Plan.

In addition to the list above, provided by Pinellas County, we recommend that following additional documents be reviewed under this task:

- Pasco County Comprehensive Plan: Coastal Management, Future Land Use, Natural Resources, Recreation and Open Space, and Surface Water Management Elements.
- City of Tarpon Springs Comprehensive Plan: Coastal Management, Future Land Use, Natural Resources, Recreation and Open Space, and Surface Water Management Elements.
- Progress Energy Anclote Power Plant NPDES Operating Permit.
- Tampa Bay Estuary Program Comprehensive Conservation and Management Plan.
- Sarasota Bay National Estuary Program Comprehensive Conservation and Management Plan.
- Charlotte Harbor National Estuary Program Comprehensive Conservation and Management Plan.

The topics to be addressed and evaluated in each of these plan documents include: water quality, habitat, fish and wildlife, exotic species, land use, public health and safety, recreation, and public education. A comparative matrix will be developed summarizing goals, objectives, and policies from each document related to these topics of concern. The comparative matrix will be appropriately color coded to indicate consistency and deviations between the various documents.

It should be noted that Doug Robison of PBS&J is an original member and past chair of the Pinellas County Environmental Science Forum, and is intimately familiar with the Pinellas County Comprehensive Plan and associated environmental lands policies. In addition, Mr. Robison previously worked at the Tampa Bay Regional Planning Council, and is knowledgeable of many of the listed local government planning documents.

Deliverable(s)

The following deliverables will be prepared in Task 4:

- an outline for the "State of the Resource" report,
- a detailed description of each of the data analysis plans,

- the results from the implementation of these data analysis plans, including geodatabases for all spatial data, and
- a narrative report summarizing the analysis of the existing management plans, including a comparative matrix that compares and contrasts the goals, objectives and policies of each with regard to the topics of concern.

Task 5 – Define resource goals/objectives

Objective

The objective of Task 5 is to define specific, and where possible and appropriate, quantitative goals and objectives for the critical resources and issues to be addressed in the development of the CCMP. This is a crucial task as it will serve to provide the much-needed focus for the plan and very importantly the "yardstick" to be used to track progress following implementation of the CCMP.

Technical Approach

Based on the output from Tasks 3 and 4, we will develop "straw-man" goals and objectives for each of the critical resources and issues for the Clearwater Harbor/St. Joseph Sound estuaries and watersheds. Our team has developed quantitative goals for a number of estuaries and their watersheds including:

- Tampa Bay,
- Charlotte Harbor (Peace River),
- Sarasota Bay,
- Roberts Bay,
- Lemon Bay,
- Caloosahatchee River,
- Loxahatchee River, and
- Naples Bay.

Generally, there are several potential strategies for establishing quantitative goals based on the following:

- reference conditions,
- resource-based targets,
- historical conditions, and
- regulatory-based levels.

Wherever possible, our preferred strategy is the resource-based alternative. However, in some instances the existence of a regulatory-based limit supersedes even the resource-based. Even in such cases, our work has been accepted by agencies such FDEP and resulted in the implementation of resource-based targets.

Currently, we are developing seagrass targets for both the Sarasota Bay and Charlotte Harbor estuary programs. Following the approach taken in Tampa Bay, historical conditions, i.e., seagrass coverage circa 1950, are being used to establish seagrass restoration and protection targets.

Goals and objectives will be established for a number of resources and criteria, including but not limited to:

- seagrass,
- near shore habitats,
- water quality (e.g., chlorophyll a, light attenuation), and
- nutrient loading.

In some cases, goals and objectives may be more descriptive in nature, particularly where defensible quantitative goals cannot be developed. In these cases, we will make recommendations for filling data gaps that preclude setting quantitative targets.

Deliverable(s)

Draft goals and objectives for the critical resources and issues for the Clearwater Harbor/St. Joseph Sound estuaries and watersheds will be developed and presented in a draft report. The bases for each goal or objective, including data used, analytical approach applied, and any significant assumptions will be presented. These draft goals and objectives will presented to County and District staff in a workshop where input on the appropriateness, validity, and achievability of these goals will be considered. Following this workshop, a final report on the resource goals and objectives will be produced.

Task 6 – Produce "State of the Resource" report

Objective

The objective of Task 6 is to produce a "State of Resource" report.

Technical Approach

A comprehensive understanding of the Clearwater Harbor/ St. Joseph Sound study area is essential to the development of a CCMP. The study area has extensive valued natural resource components which require protection and stewardship. An evaluation of the current status and recent trends of these resources is essential. We will provide a comprehensive assessment of the current state of the resources, define the critical environmental requirements for these resources, Identify actions necessary for the protection of the resources, and develop a strategic implementation plan to provide an effective and efficient mechanism to serve as a framework for implementing this plan. This document entitled "State of the Resource" will detail the current status of and trends in the resources in Clearwater Harbor/ St. Joseph Sound.

Clearly, the content of this report is critical, but it is also critical to recognize the intended audience. More technically oriented individuals will comprise a significant portion of the intended audience. However, decision-makers also comprise a significant portion of the intended audience and they will be responsible for making the commitments that will allow the CCMP to be implemented. To reach this portion of the intended audience we propose to produce an executive summary-like document to accompany the full "State of the Resource" report. This summary document will likely be no more than about 10 pages in

length and where possible used graphical/pictorial means to present the major findings found in the full report.

Another important consideration is the specific format of the documents to be produced and the means by which they would be disseminated. Obviously, hard copy production costs can be significant. Therefore, the executive summary report can be used to meet some of the hard copy needs. We also anticipate that both reports would be made available in a pdf format on both the County and District websites. Fully cross-referenced bookmarks, both internally and across the documents produced in this project will be essential. We propose that two (2) hard copies of the "State of the Resource" and executive summary reports be provided for County and District staff. We also recommend that a public meeting, to be attended by the major CCMP stakeholders, be held where the major findings from the "State of the Resource" can be presented.

Deliverable(s)

The following deliverables will be produced in Task 6:

- draft "State of the Resource" report in pdf format for County and District review,
- draft executive summary report in pdf and hard copy formats for County and District review,
- public meeting to present major findings in the "State of the Resource" report,
- final "State of the Resource" report in pdf and hard copy (2 copies) formats, and
- final executive summary report in pdf and hard copy (2 copies) formats.

Task 7 – Identify, review, and prioritize potential action plans

Objective

The objective of Task 7 is to identify, review and prioritize potential action plans that address the goals and objectives developed in Task 5 and any critical issues identified in the "State of the Resource" report.

Technical Approach

As part of the development of the CCMP for Clearwater Harbor and St. Joseph Sound, action plans which include strategies to improve and protect the resources of interest, as well as addressing TMDLs for the area will be developed. These strategies may be directed towards protection, preservation, and restoration of resources, such as important habitats and associated water quality, and may also be directed towards reducing pollutant loads linked to habitat degradation.

Both structural and non-structural actions will be identified and reviewed. Given the maturity of much of the St. Joseph Sound and Clearwater Harbor watersheds, non-structural strategies will be particularly important. Recently, Low Impact Development strategies have received considerable attention in central Florida and can be practically applied in some redevelopment instances.

We will prepare a list of potential actions to address the goals and objectives developed in Task 5 and any critical issues identified in the "State of the Resource" report. These plans will be prioritized based on several factors including relative cost and the expected probabilities of success and permitting. Actions that address multiple goals and objectives will be given greater consideration.

We will present the list of potential actions in a workshop for review and comment by County and District staff as well as the CCMP stakeholders.

The action plan strategies developed will serve to identify management actions that could be taken to meet goals and priorities for protection, preservation, and restoration of habitats as described above. Of critical importance is the linkage of management actions to these goals. One method of accomplishing this linkage is the development of an Action Plan Database. We have assisted the Tampa Bay Estuary Program (TBEP) in development of a database which serves as an effective means of tracking actions, for both habitat projects and for load reduction projects. The TBEP Action Plan Database was developed to serve as a data storage and analysis tool for tracking nitrogen load reductions, habitat restoration, and other activities outlined in the Tampa Bay CCMP. The database contains projects, both completed and planned, which address the goals of the CCMP. For the 2009 TBEP Reasonable Assurance effort, the database is being used to compile nitrogen load reductions over the entire bay, by bay segment, by jurisdiction, by major drainage basin, and by individual entity to aid in the development of load reduction allocations.

The Sarasota Bay Estuary Program has recently adopted a similar action plan tracking system. This system has been recognized by the Association of National Estuary Programs as being an effective means to track the linkage of management actions to goals. The action plan tracking system provides a means of linking expected results of management actions to goals, and is a convenient and efficient means of tracking actions and progress towards goals.

Potential Action Plan Database Contents

Action plans for inclusion in the potential Clearwater Harbor and St. Joseph Sound Action Plan database will include information which allows calculation of project habitat protection, preservation, and restoration areas by habitat type, as well as information to allow calculation of pollutant load reductions due to land use change, change in land management practices, and directed load reduction projects. Specific project plans should include sufficient information to assign habitat and load reduction projects to specific areas of the study area, to allow tracking of expected plan results by basin and jurisdictional entity. As plans are implemented, additional information related to realized results can be used to refine the project effects with respect to habitat and/or load reduction benefits.

Another important aspect of the projects contained in the action plan database will be the effective date of the project. Inclusion of planned and actual completion dates for projects allows management decisions to be made for selected time periods, with complete information regarding when specific projects will be in place.

An action plan database will allow convenient entry of action plan projects and associated information. We have developed a potential Action Plan database front page and project entry page for Clearwater Harbor and St. Joseph Sound (Figures 4-41 and 4-42), based on

our work with the TBEP database. The database would be developed and maintained as a Microsoft Access database, allowing for efficient compilation and reporting of projects developed for specific action plans (i.e., habitat restoration, nutrient load reduction) or for specific areas/jurisdictional entities.

The front page of the database (Figure 4-41) would allow users to add projects and view compilations of project information based on certain criteria (i.e. location in the watershed, completion date). The project entry page (Figure 4-42) provides for inclusion of project-specific information, including attachment of additional documentation in the form of electronic files (Word or Adobe documents, spreadsheets, text files) to support estimation of habitat acreages and/or nutrient load reductions expected. As seen in Figure 4-42, the relevant information also includes location, cost, and schedule for the project.

The action plan database developed for Clearwater Harbor and St. Joseph Sound will allow for tracking of habitat projects and load reduction projects with respect to the goals of the CCMP. Progress towards those goals specific to TMDLs will be tracked using expected and realized pollutant loading reduction projects included in the database.

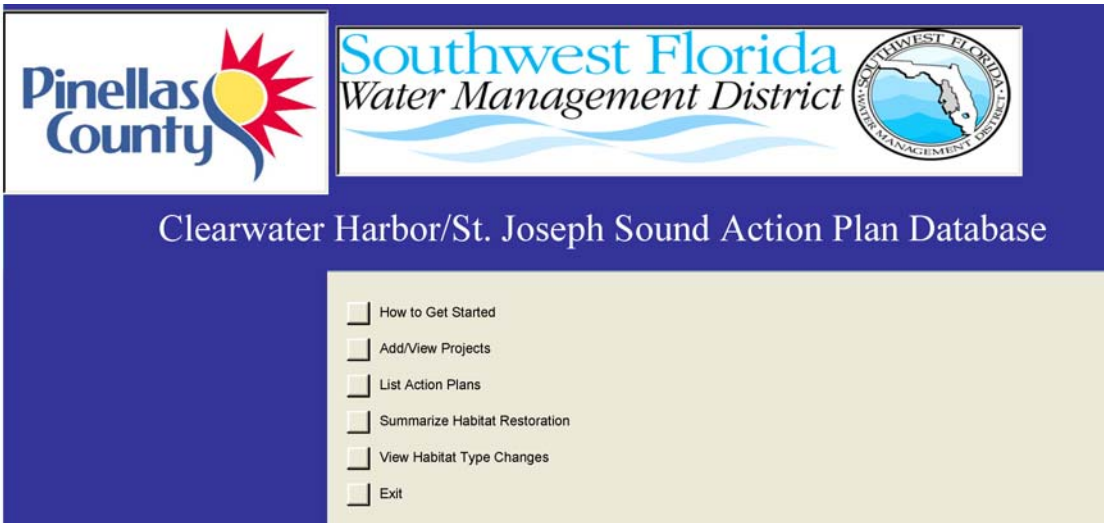

Figure 4-41. Potential front page for the CCMP Action Plan Database.

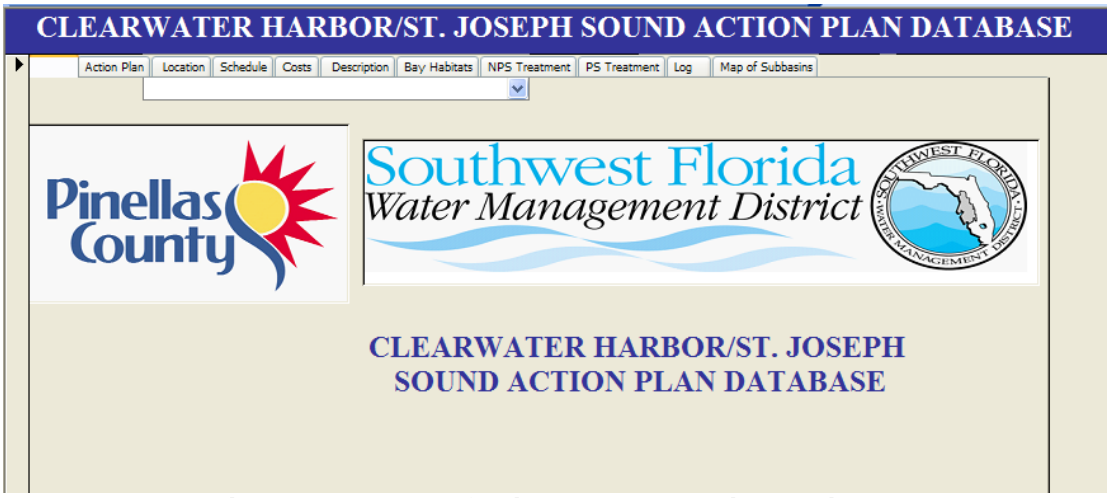

Figure 4-42. Potential project entry page for the CCMP Action Plan Database.

Deliverable(s)

The following deliverables will be produced in Task 7:

- a draft list of potential action plans/strategies that address the goals and objectives developed in Task 5 and any critical issues identified in the "State of the Resource" report including TMDLs,
- a workshop to present the draft list of potential action plans,
- a draft action plan report that presents the strategies for County and District review, and
- a final action plan report that presents the strategies that address the goals and objectives developed in Task 5 and any critical issues identified in the "State of the Resource" report including TMDLs.

Task 8 – Develop CCMP implementation plan

Objective

We will develop a draft CCMP implementation plan that identifies the stakeholders who have committed to implementing specific action plans. In addition, we will present recommended methods for tracking progress in the CCMP implementation. Specifically, we will recommend the quantitative methods for tracking progress similar in form to that we have established for TBEP and recently for Sarasota County. Where possible, potential funding sources will be identified.

Technical Approach

The development of the St. Joseph Sound/Clearwater Harbor CCMP will be a tremendous opportunity to protect and preserve the valuable natural resources in this area only if it can be successfully implemented. Our experience with the Tampa Bay Estuary Program CCMP, as well as our work with the CHNEP, SBEP and the Sarasota County watershed management plans will be invaluable to Pinellas County in developing a CCMP that can be effectively and efficiently implemented. Our development of action plans and an action plan database will provide the detailed framework from which to implement the CCMP. By integrating the action plans with other existing environmental rules and programs through inter-local agreements, the County can leverage resources to efficiently achieve maximum environmental benefits. Therefore, the role of local stakeholders is critical in the implementation process to provide the most cost effective and locally feasible strategies for reducing pollutant loading to the bay and protecting critical habitats. A firm commitment from stakeholders is essential to tackle the environmental, and cost sharing issues associated with this CCMP.

It is important that the action plans build on other local plans designed to ameliorate impacts on the environment where the plans are consistent with the goals established by the CCMP. The action plan database will fulfill this purpose by serving as a centralized resource to track projects as they are implemented and completed within the St. Joseph Sound and Clearwater Harbor watersheds. The action plan database we developed for the TBEP CCMP has been a valuable tool used to track progress of the CCMP since 1997. This database has been crucial to tracking progress toward the goals established by the CCMP

specifically goals addressing issues associated with established TMDLs. That the St. Joseph Sound/Clearwater Harbor study area has several TMDLs makes the need for an action plan database essential to the successful implementation of the CCMP.

Pinellas County Department of Environmental Management has been a leader in environmental stewardship of the Clearwater Harbor/ St. Joseph Sound project area and has well established and cost effective monitoring programs in place to track progress toward the reduction of pollutants associated with TMDLs in its watersheds. We intend to review the designs of these programs as part of the CCMP to ensure that the County is collecting and reporting information at the appropriate frequency. We have performed a similar exercise with a review of Sarasota County's strategic monitoring design in which we developed recommendations for ways to improve existing monitoring programs, identified critical data gaps and made recommendations on ways to efficiently fill those gaps to collect information useful in tracking progress of management actions. As part of the CCMP, we would perform a similar review of all the routine monitoring programs in the watershed to ensure that the programs are capable of providing information necessary to make informed management level decisions.

Recent budget constraints necessitated the review of PCDEMs water quality sampling program. We reviewed the PCDEM water quality monitoring program and helped the County to identify sampling frequency reduction scenario's likely to cause the least amount of information loss in the ability detect changes in water quality from year to year. This type of statistical analysis has been a foundation for Janicki Environmental since its inception and is how we have built our reputation of excellence in applying sound science for informed decision making.

A reporting mechanism is required to disseminate information on how progress is being made on the goals and objectives of the CCMP. These reporting tools need to convey sometimes complex information in a concise and understandable way to constituents who may not have strict scientific backgrounds. Policy makers, politicians and the general public need to be able to understand this information to promote "buy in" to the CCMP. We have extensive experience in developing these reporting mechanisms. For instance, we developed a decision rule for evaluating monitoring data relating nutrient loads, chlorophyll levels and seagrass distributions in Tampa Bay as part of the TBEP CCMP. This decision rule provides a step by step procedure for identifying whether or not water quality data are meeting established criteria for seagrass success (Figure 4-43).

The decision rule is based on data for chlorophyll *a* and light attenuation. A decision matrix is used to assign management level responses based on the outcome scores (Table 4-4). The green level signifies that the water quality meet the target criterion while the yellow indicates a caution level that water quality may be declining. The red level is an alert level indicating that management actions may be needed to address water quality problems.

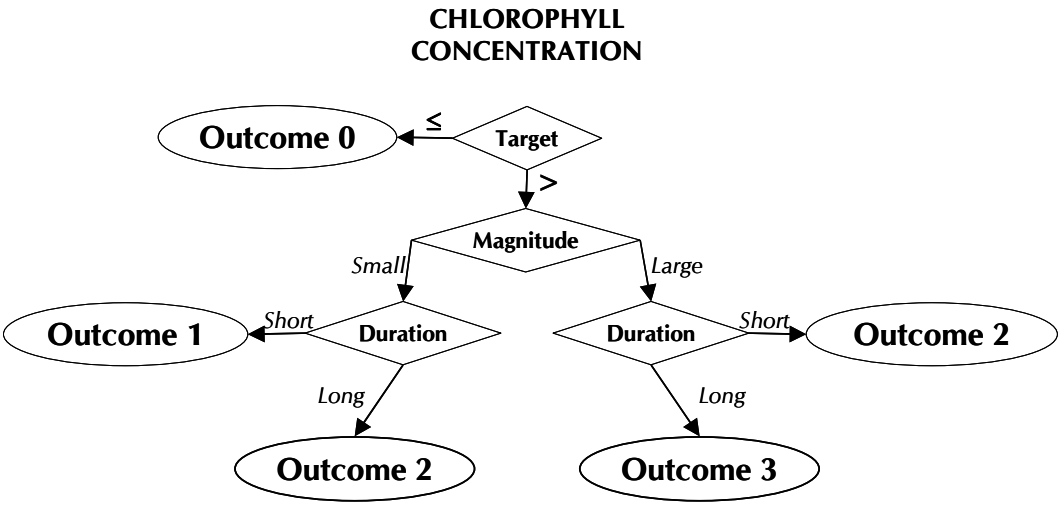

Figure 4-43. Decision rule for TBEP chlorophyll criteria assessment.

Table 4-4. Decision matrix identifying appropriate categories of management actions in response to various outcomes of the monitoring and assessment of chlorophyll *a* and light attenuation data.

CHLOROPHYLL	LIGHT ATTENUATION			
	Outcome 0	Outcome 1	Outcome 2	Outcome 3
	GREEN	*YELLOW*	*YELLOW*	*YELLOW*
Outcome 1	*YELLOW*	*YELLOW*	*YELLOW*	*RED*
Outcome 2	*YELLOW*	*YELLOW*	*RED*	*RED*
Outcome 3	*YELLOW*	*RED*	*RED*	*RED*

Results of the decision matrix are summarized into a progress report so that trends over time can quickly be assessed for each segment of the bay (Table 4-5). The decision matrix has enabled the TBEP to convey information in an easily understandable format providing trends in this metric over time and has proven to be a valuable asset for the TBEP.

We have also developed a "Report Card" for Sarasota County that synthesizes a variety of evaluative outcomes into a single document that will be provided to the board of county commissioners as well as the general public each year. The report card includes a list of fast facts about the watershed, pertinent information about the hydrology and rainfall in the reporting year, as well as ranks for each component of the overall watershed score (Figure 4-44). There are links enabling the reader to explore useful information about the watershed and a description of stakeholders and constituents participating in the watershed management planning process. We intend to develop a similar scoring and reporting mechanism for the St. Joseph Sound/Clearwater Harbor CCMP that will include a water quality component, a seagrass component and a pollutant loading component as essential aspects of the report card.

Table 4-5. Decision matrix for Tampa Bay 1975-2007.

Year	Old Tampa Bay	Hillsborough Bay	Middle Tampa Bay	Lower Tampa Bay
1975	Red	Red	Red	Green
1976	Red	Red	Red	Yellow
1977	Red	Red	Red	Red
1978	Red	Red	Red	Yellow
1979	Red	Red	Red	Red
1980	Red	Red	Red	Red
1981	Red	Red	Red	Red
1982	Red	Red	Red	Red
1983	Red	Yellow	Red	Red
1984	Red	Green	Red	Yellow
1985	Red	Red	Red	Yellow
1986	Red	Yellow	Red	Green
1987	Red	Yellow	Red	Green
1988	Yellow	Green	Yellow	Green
1989	Red	Yellow	Red	Yellow
1990	Red	Green	Red	Yellow
1991	Green	Yellow	Yellow	Yellow
1992	Yellow	Green	Yellow	Yellow
1993	Yellow	Green	Yellow	Yellow
1994	Yellow	Yellow	Red	Red
1995	Red	Yellow	Red	Yellow
1996	Yellow	Green	Yellow	Green
1997	Yellow	Green	Red	Yellow
1998	Red	Red	Red	Red
1999	Yellow	Green	Yellow	Yellow
2000	Green	Green	Yellow	Yellow
2001	Yellow	Green	Yellow	Yellow
2002	Yellow	Green	Green	Green
2003	Red	Yellow	Green	Yellow
2004	Red	Green	Green	Yellow
2005	Green	Green	Yellow	Yellow
2006	Green	Green	Green	Green
2007	Green	Green	Green	Green

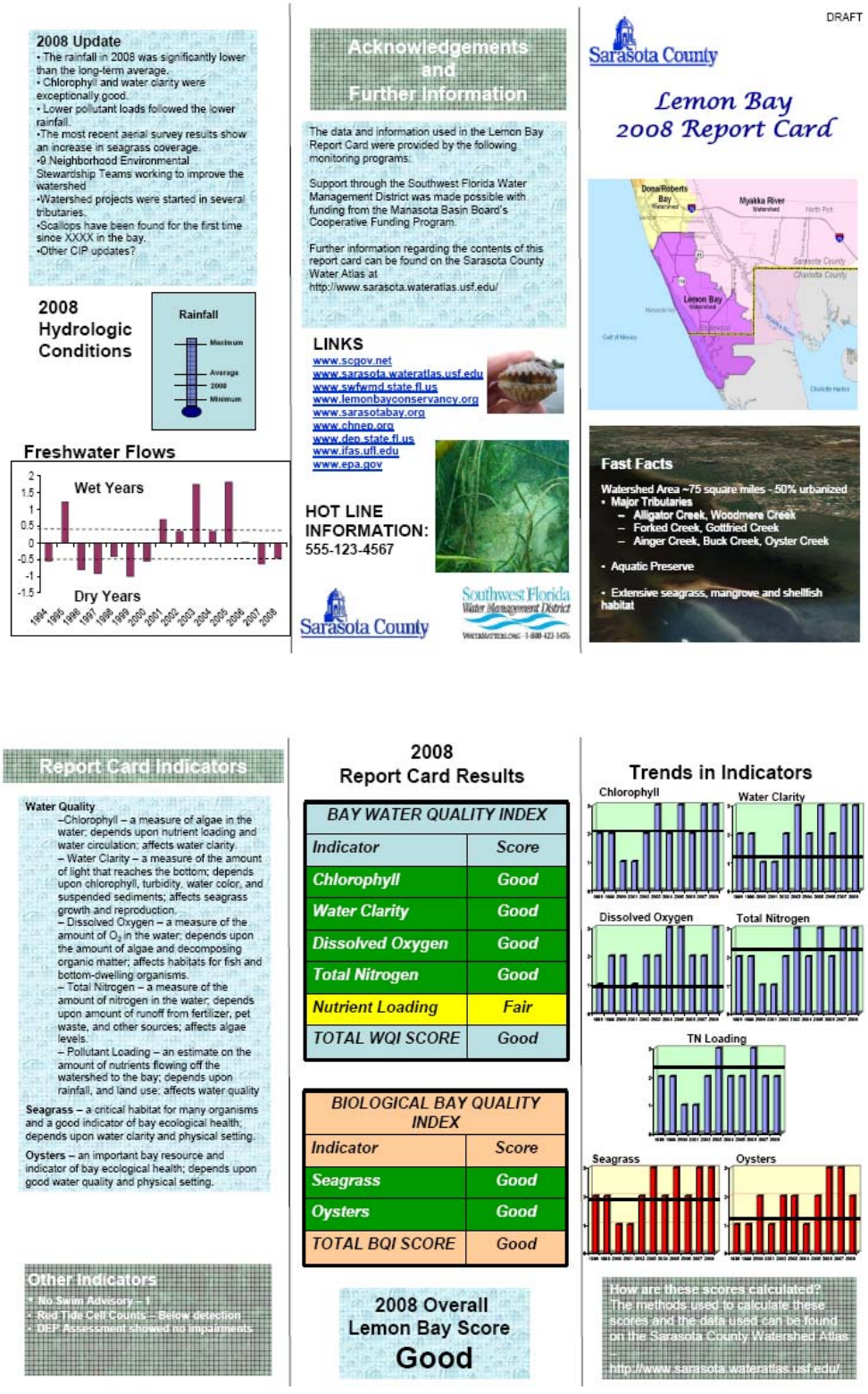

Figure 4-44. Draft "Report Card" for the Lemon Bay watershed management plan (Note: all scores are hypothetical in this draft document).

We will develop a draft CCMP implementation plan that identifies the stakeholders who have committed to implementing specific action plans. In addition, we will present recommended methods for tracking progress in the CCMP implementation. Specifically, we will recommend the quantitative methods for tracking progress similar in form to that we have established for TBEP and recently for Sarasota County. Both electronic and hard copy formats will be considered for these tracking methods.

The draft implementation plan will be submitted to County and District staff for review and comments and upon receipt of these comments a final CCMP implementation report will be prepared.

Deliverable(s)

The following deliverables will be produced in Task 8:

- draft CCMP implementation plan for County and District review,
- workshop to present the draft CCMP implementation plan,
- methodologies for tracking progress offered by the CCMP implementation, and
- final CCMP implementation plan.

Task 9 – Produce draft and final CCMP documents

Objective

The objective of Task 9 is to produce draft and final CCMP documents for the St. Joseph/Clearwater Harbor area.

Technical Approach

At this point in the project much of the technical support work will have been completed and the focus of the remaining effort will be in producing a CCMP document that meets the expectations of the County, District, and the other stakeholders for the St. Joseph Sound/Clearwater Harbor CCMP. There are many examples of CCMP documents from the various NEPs across Florida and the U.S. Many of them have very similar contents and the following proposed outline is based on a review of those documents.

1. Introduction – brief geographic description of the CCMP area and overall objective of the CCMP
2. CCMP Stakeholders – identify the major stakeholders that have contributed to the development of the CCMP; interlocal agreement(s) in support of the CCMP
3. Outline for the CCMP – brief description of the contents of the CCMP document
4. State of the Resource – summary of the major findings from the "State of the Resource" report
5. CCMP Goals and Objectives – summary of the major findings from the Goals and Objectives report
6. Action Plans
    a. Water Quality
    b. Watershed Loading
    c. Sediment Quality

   d. Seagrass
   e. Nearshore Habitats
   f. etc
7. CCMP Implementation & Schedule – summary of the major findings from CCMP Implementation report
8. Data/Information Gaps – identify and monitoring and/or research needs
9. References
10. Glossary and Acronyms

Since it is not reasonable to expect many of the decision-makers who have contributed to the CCMP development or those responsible for its implementation to read the full CCMP we recommend that a Power Point presentation that summarizes the major elements of the CCMP be produced. This presentation will be relatively non-technical in nature and will be made available to the County, District, and other local governments, agencies, private sector partners, and environmental groups.

Deliverable(s)

The following deliverables will be produced in Task 9:

- draft CCMP document for County, District, and other stakeholder review,
- final CCMP document that addresses comments questions received, and
- a Power Point presentation to be made available to all stakeholders that describes in relatively non-technical terms the major elements of the CCMP.

Task 10 – Project management

Objective

The objective of Task 10 is to provide project management that will ensure the timely and efficient conduct of the St. Joseph Sound/Clearwater Harbor CCMP project.

Technical Approach

The proposed project management plan includes several elements:

- monthly progress meeting between our project manager and the County and District project managers and other staff as needed;
- monthly progress reports that describe the activities completed in the previous month, anticipated activities for the coming month, and any obstacles that the project team has confronted and recommended remediation;
- effective invoicing that meets the County's invoicing requirements and minimizes efforts for the County project manager.

Internal project communication will be achieved via weekly phone conferences. The County and/or District project managers can participate as desired in these phone conferences.

With respect to project quality control Janicki Environmental uses the following quality control procedures in data acquisition and analysis.

Data acquisition: All data and documents acquired by Janicki Environmental are logged into a file that records the date received, the sender and receiver, and the format and nature of the material received. The file also includes a directory of any computerized data. During later analyses, the date and size of the copy of any computerized data set being analyzed is compared to these records to confirm that it has not been modified or corrupted.

Data analysis: For each analysis performed by Janicki Environmental, we archive copies of the computer calculation records and output, and this provides a complete record of the calculations that were performed. It is our standard procedure to write programs that print out intermediate data and summary statistics for error checking. When reports are available based on the same data set being used in our current analyses we first attempt to duplicate related numbers in the report. In case of problems, we contact the source of the data to determine the cause of any inconsistencies. For every analysis that is incorporated into a final report, the complete code is checked by an experienced staff member other than the one who wrote it.

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RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

5. PROJECT SCHEDULE

Pinellas County

Southwest Florida Water Management District

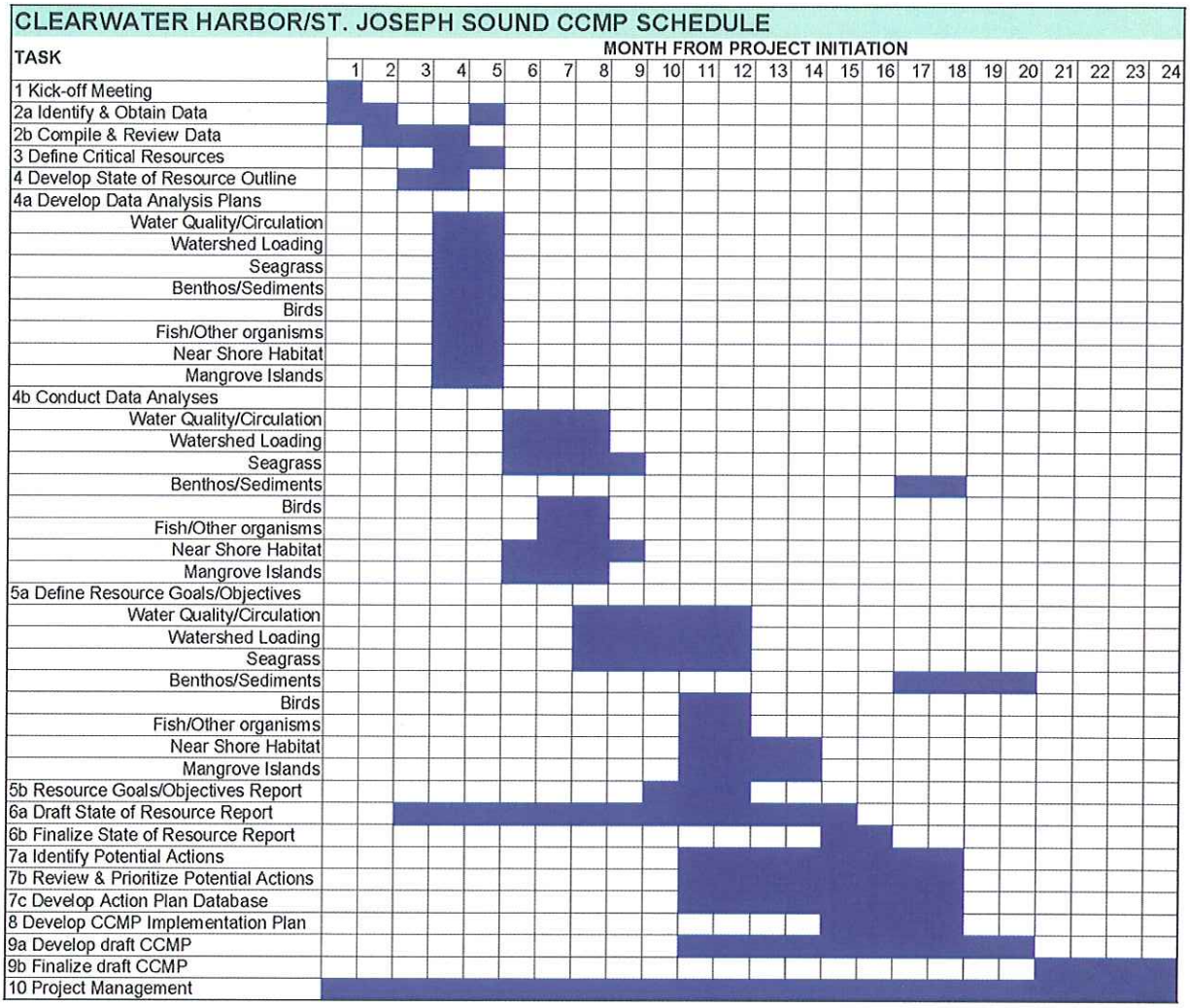
Janicki Environmental, Inc.

PBS&J

31 March 2009

5.0 PROJECT SCHEDULE

The table below presents the major project tasks and the initiation and completion dates represented in months from project initiation. Based on our experience and expertise we have shortened the timeline to 24 months.



RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

6. FEES AND COSTS

Pinellas County

Southwest Florida Water Management District

Janicki Environmental, Inc.

PBS&J

31 March 2009

6.0 FEES AND COSTS

A summary of our fee schedule for all inclusive services is presented in the table below.

CLEARWATER HARBOR/ST. JOSEPH SOUND CCMP	
	TOTAL COST
JANICKI ENVIRONMENTAL, INC.	$344,640
PBS&J	~~$173,076~~ $179,916
ENVIRONMENTAL PROTECTION COMMISSION OF HILLSBOROUGH COUNTY	$30,600
TOTAL	~~$548,316~~ $555,156

The detailed fee schedule that indicates the number of hours required for each project staff member and the hourly rate of each member is attached. Also attached is the March 25, 2009 letter from Environmental Protection Commission of Hillsborough County that details their costs.

CLEARWATER HARBOR/ST. JOSEPH SOUND CCMP	
	TOTAL COST
JANICKI ENVIRONMENTAL, INC.	$344,640
PBS&J	$179,916
ENVIRONMENTAL PROTECTION COMMISSION OF HILLSBOROUGH COUNTY	$30,600
TOTAL	$555,156

CLEARWATER HARBOR/ST. JOSEPH SOUND CCMP

JANICKI ENVIRONMENTAL, INC.

TASK	Principal	Senior Sciemtist	Scientist	Support	Total Labor	Other Direct Costs	Total Cost
1 Kick-off Meeting	0	0	0	0	$0	$0	$0
2a Identify & Obtain Data	8	72	80	70	$17,530	$150	$17,680
2b Compile & Review Data	8	72	80	8	$14,120	$0	$14,120
3 Define Critical Resources	8	80	80	40	$16,600	$0	$16,600
4 Develop State of Resource Outline	8	24	0	24	$4,680	$0	$4,680
4a Develop Data Analysis Plans							
Water Quality/Circulation	8	12	0	0	$2,280	$0	$2,280
Watershed Loading	4	24	12	0	$3,660	$0	$3,660
Seagrass	8	8	12	8	$3,260	$0	$3,260
Benthos/Sediments	4	24	24	0	$4,560	$0	$4,560
Birds	2	2	4	0	$780	$0	$780
Fish/Other organisms	2	8	4	0	$1,320	$0	$1,320
Near Shore Habitat	4	2	0	0	$780	$0	$780
Mangrove Islands	2	2	0	0	$480	$0	$480
4b Conduct Data Analyses							
Water Quality/Circulation	8	80	96	40	$17,800	$0	$17,800
Watershed Loading	8	80	80	40	$16,600	$0	$16,600
Seagrass	8	24	80	40	$11,560	$0	$11,560
Benthos/Sediments	4	32	80	32	$11,240	$0	$11,240
Birds	2	16	12	8	$3,080	$0	$3,080
Fish/Other organisms	2	40	40	8	$7,340	$0	$7,340
Near Shore Habitat	2	0	0	0	$300	$0	$300
Mangrove Islands	2	0	0	0	$300	$0	$300
5a Define Resource Goals/Objectives							
Water Quality/Circulation	12	80	80	12	$15,660	$0	$15,660
Watershed Loading	12	72	80	12	$14,940	$0	$14,940
Seagrass	8	16	80	28	$10,180	$0	$10,180
Benthos/Sediments	12	80	80	12	$15,660	$0	$15,660
Birds	2	16	16	12	$3,600	$0	$3,600
Fish/Other organisms	2	40	40	12	$7,560	$0	$7,560
Near Shore Habitat	4	4	0	0	$960	$0	$960
Mangrove Islands	4	4	0	0	$960	$0	$960
5b Resource Goals/Objectives Report	8	40	48	24	$9,720	$0	$9,720
6a Draft State of Resource Report	8	80	80	70	$18,250	$0	$18,250
6b Finalize State of Resource Report	4	24	24	24	$5,880	$0	$5,880
7a Identify Potential Actions	4	48	64	12	$10,380	$0	$10,380
7b Review & Prioritize Potential Actions	4	80	8	24	$9,720	$0	$9,720
7c Develop Action Plan Database	2	4	24	70	$6,310	$0	$6,310
8 Develop CCMP Implementation Plan	8	80	80	70	$18,250	$0	$18,250
9a Develop draft CCMP	40	80	120	70	$26,050	$0	$26,050
9b Finalize draft CCMP	24	40	80	28	$14,740	$1,000	$15,740
10 Project Management	80	0	0	80	$16,400	$0	$16,400
	Hours / Rate	Hours / Rate	Hours / Rate	Hours / Rate			
	340 / $150	1390 / $90	1588 / $75	878 / $55	$343,490	$1,150	$344,640

Note: Travel charges are being waived.

CLEARWATER HARBOR/ST. JOSEPH SOUND CCMP

PBS&J

TASK	Principal	Senior Scientist	Scientist	Support	Total Labor	Other Direct Costs	Total Cost
1 Kick-off Meeting	2	2	2	0	$852	$0	$852
2a Identify & Obtain Data	2	16	40	16	$7,088	$0	$7,088
2b Compile & Review Data	2	16	40	16	$7,088	$0	$7,088
3 Define Critical Resources	4	16	0	0	$3,040	$0	$3,040
4 Develop State of Resource Oultine	2	8	0	0	$1,520	$0	$1,520
4a Develop Data Analysis Plans							
Water Quality	0	0	0	0	$0	$0	$0
Watershed Loading	0	0	0	0	$0	$0	$0
Seagrass	2	8	8	0	$2,208	$0	$2,208
Benthos/Sediments	2	8	8	0	$2,208	$0	$2,208
Birds	2	8	8	0	$2,208	$0	$2,208
Fish/Other organisms	0	0	0	0	$0	$0	$0
Near Shore Habitat	4	16	16	0	$4,416	$0	$4,416
Mangrove Islands	4	16	16	0	$4,416	$0	$4,416
4b Conduct Data Analyses							
Water Quality	0	0	0	0	$0	$0	$0
Watershed Loading	0	0	0	0	$0	$0	$0
Seagrass	2	8	8	24	$3,720	$500	$4,220
Benthos/Sediments	2	8	8	0	$2,208	$0	$2,208
Birds	2	8	40	40	$7,480	$0	$7,480
Fish/Other organisms	0	0	0	0	$0	$0	$0
Near Shore Habitat	4	32	80	120	$19,720	$1,500	$21,220
Mangrove Islands	4	32	80	120	$19,720	$1,500	$21,220
5a Define Resource Goals/Objectives							
Water Quality	0	0	0	0	$0	$0	$0
Watershed Loading	0	0	0	0	$0	$0	$0
Seagrass	2	8	0	0	$1,520	$0	$1,520
Benthos/Sediments	2	8	0	0	$1,520	$0	$1,520
Birds	2	8	8	0	$2,208	$0	$2,208
Fish/Other organisms	0	0	0	0	$0	$0	$0
Near Shore Habitat	8	16	8	0	$4,528	$0	$4,528
Mangrove Islands	8	16	8	0	$4,528	$0	$4,528
5b Resource Goals/Objectives Report	8	32	24	8	$8,648	$0	$8,648
6a Draft State of Resource Report	16	32	24	8	$10,248	$0	$10,248
6b Finalize State of Resource Report	8	24	16	8	$6,840	$0	$6,840
7a Identify Potential Actions	8	24	26	0	$7,196	$0	$7,196
7b Review & Prioritize Potential Actions	8	24	16	0	$6,336	$0	$6,336
7c Develop Action Plan Database	4	16	24	0	$5,104	$0	$5,104
8 Develop CCMP Implementation Plan	16	16	8	0	$6,128	$0	$6,128
9a Develop draft CCMP	16	24	16	8	$8,440	$0	$8,440
9b Finalize draft CCMP	16	24	16	8	$8,440	$0	$8,440
10 Project Management	8	24	16	8	$6,840	$0	$6,840
	Hours / Rate	Hours / Rate	Hours / Rate	Hours / Rate			
	170 / $200	498 / $140	564 / $86	384 / $63	$176,416	$3,500	$179,916

Note: ODCs include boat and equipment time only. Travel charges are being waived.

Roger P. Stewart Center
3629 Queen Palm Dr. • Tampa, FL 33619
Ph: (813) 627-2600
Fax Numbers (813):

Admin.	627-2620	Waste	627-2640
Legal	627-2602	Wetlands	627-2630
Water	627-2670	ERM	627-2650
Air	627-2660	Lab	272-5157

Executive Director
Richard D. Garrity, Ph.D.

March 25, 2009

Dr. Anthony Janicki
Janicki Environmental, Inc.
1155 Eden Isle Drive, N.E.
St. Petersburg, Florida 33704

RE: Pinellas County's St. Joseph Sound/ Clearwater Harbor Comprehensive Conservation and Management Plan project

Dear Dr. Janicki: Tony

It is our understanding that Janicki Environmental, Inc. is bidding to Pinellas County for an environmental consulting project as further described below. The Environmental Protection Commission of Hillsborough County (EPC) is pleased to offer the following proposal on behalf of the Environmental Resource Management Division (ERM) Benthic Department to assist in that bid proposal.

Relationship: EPC will team with Janicki Environmental, Inc. for the Pinellas County's St. Joseph Sound/ Clearwater Harbor Comprehensive Conservation and Management Plan project. Acceptance of a contractual relationship between EPC and Janicki Environmental, Inc. is contingent upon acceptance by the EPC Commission and/or the Executive Director and authorization for a budget amendment by the Hillsborough County Board of County Commissioners. The EPC Legal Department will draft a basic contract memorializing the below proposal if your bid is accepted by Pinellas County.

Objective: EPC will collect sediment samples from a total of not less than 30 and not more than 50 locations in St. Joseph Sound / Clearwater Harbor. EPC will analyze sediment samples from each location for percent silt-clay, chemical contaminants, i.e. organic compounds and metals, and macro-invertebrate taxonomy (to lowest practical level). All collection and analyses will utilize established methods, consistent with other benthic sediment work conducted by EPC, such as for the Tampa Bay Estuary Program (TBEP). All work will be conducted with strict adherence to all applicable quality assurance and quality control protocols.

Methods and Timelines: All sample collection will occur during an index period, presumably in the Sept/October, 2009 timeframe; samples from all locations will be collected 30 days of initiating sampling activities. The sampling locations will be provided to EPC. EPC will collect and preserve sufficient quantities and replicates of sediment samples to accommodate all described analyses. Field methods, including applicable quality assurance and quality control, will be consistent with those adopted for the Tampa Bay Benthic Monitoring Program as described in Courtney et al. (1995). Percent silt/clay analysis will be performed using the method describe in the EPA guidance document, Environmental Monitoring

And Assessment Program (EMAP), Laboratory Methods, C.J. Strobel3, et.al (1995). Sediment samples will be analyzed by EPC for chemical contaminants. Chemical contaminants include selected EPA priority pollutant metals and selected EPA priority pollutant organic compounds. Standard analytical methods, including EPA Method 8080 for organics and poly-chlorinated biphenyls (PCBs), EPA Method 8270 for polycyclic aromatic hydrocarbons (PAHs), and EPA Method 200.7 for metals will be used to determine chemical contaminants. Benthic sediment samples will be analyzed for macro-invertebrates taxonomy using available identification keys and primary scientific literature. Samples will be initially sorted under a dissecting microscope into general taxonomic categories (Annelids, Mollusks, Crustaceans, and Miscellaneous Taxa). QA/QC protocols require re-sorting on 10% of the samples completed by each technician for. The sorted animals will be identified to the lowest practical taxonomic level (species level when possible) and counted.

Deliverables: Preparation for sample collection will begin within 3 weeks of a contractual relationship between EPC and Janicki Environmental, Inc. being authorized and accepted by both the EPC and a budget amendment being approved by Hillsborough County Board of County Commissioners. EPC will coordinate timing of sample collection with Janicki Environmental, Inc. EPC will provide the results of the all analyses, as described above, within fifteen months of initiating actual sampling activities. The contract will be deemed complete when EPC has provided to Janicki Environmental, Inc. a completed dataset of all analytical results for the sediment sampling and analytical activities described above.

Costs Breakdown and Invoicing: The cost for doing the work described above is $1020.00 per sample, based on a minimum of 30 samples and a maximum of 50 samples. Per sample costs are derived based on the following schedule:

$ 75.00	Collection and preservation
$ 610.00	Taxonomy (sample sorting, macroinvertebrate identification)
$ 15.00	%silt/clay analysis
$ 86.00	Sediment Chemistry - Metals (Aluminum, Antimony, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Nickel, Selenium, Silver, Tin, Zinc).
$ 234.00	Sediment Chemistry - Organics (OCP, PCB, PAH)

EPC will invoice in one installment subsequent to delivering all analytical results to Janicki Environmental, Inc. Payment is due net 60 days from the date of the invoice.

Please notify us immediately if the bid is accepted, so that we may begin to draft the contract and the necessary Board agenda items.

Sincerely,

Richard Boler
General Manager
Environmental Monitoring Department

March 30, 2009

Anthony Janicki, Ph.D.
President
Janicki Environmental, Inc.
1155 Eden Isle Drive
St. Petersburg, FL 33704

RE: Pinellas Co. RFP 089-0222-P - Development of Conservation Management Plan for Clearwater Harbor and St. Joseph Sound

Dear Dr. Janicki:

This letter is to confirm our exclusive commitment to serve as a subconsultant to Janicki Environmental, Inc. on the above referenced project, and affirms our excellent, long-standing working relationship. I have full confidence that the combined resources of our team make us the best qualified for this project.

We have a complete understanding of your expectations for our services and, as an officer of PBS&J, you have my commitment that we will provide all necessary staff and equipment resources to support the work effort, and to deliver all work products on time and on budget.

Sincerely,

Doug Robison, M.S., PWS
Senior Division Manager – Environmental Sciences
Vice President

RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

7. MODIFICATIONS

Pinellas County

Southwest Florida Water Management District

PBS&J

Janicki Environmental, Inc.

7.0 MODIFICATIONS

We offer the following as a potential additional effort to support the development of the St. Joseph Sound/Clearwater Harbor CCMP.

Sediment Management Plan

Erosion control in the Clearwater Harbor/St. Joseph Sound system is usually thought of in relation to the estuary – for maintenance of navigation or habitat protection. Beach erosion on the west side of the barrier islands is also important. However, erosion and sedimentation within the watershed is another element of this issue that should be addressed in a comprehensive resource management plan. We offer the option to develop a watershed erosion management plan to supplement the existing Scope of Work, as described below.

Erosion is a natural process that, in nature, keeps streams and rivers vital and dynamic. However, in an altered environment such as the highly urbanized watersheds within the study area, erosion may become excessive and cause adverse impacts to both freshwater and estuarine resources by degrading habitat and water quality, as well as exacerbate flooding risk. Although erosion of this type has been addressed for some localized areas (e.g., Stevensons Creek) a unified erosion control approach for the entire estuary seems a logical next step.

The watershed and estuary are susceptible to erosion for several reasons. The sandy, unconsolidated soil is easy to erode and high levels of impervious surfaces generate high velocity stormwater runoff in drainage channels. Also, areas with relatively high relief such as the Clearwater and Belleair bluffs are especially vulnerable to high erosion and sedimentation rates.

Our proposed erosion control plan would address both mitigating existing erosion problems, as well as reducing future risk areas. The plan would include several phases including:

Characterization of Existing Conditions – The first phase will include a systematic assessment of sediment and

the features that influence its behavior. Sediment accumulation in named tributaries and major drainage channels will be measured at a number of locations. Sampling could occur in one location in each headwater stream or major tributary and at approximately half-mile intervals along the mainstems. Sampling at each location would generally consist of sediment depth estimates near the banks and in the middle of the channel, a measurement of channel bottom width, a GPS point representing the sampling location, and upstream and downstream photographs referenced as attributes in a GIS feature class containing the attributes above. Some sediment samples will be analyzed to determine particle size distribution, metals present and their concentration, and other factors affecting water quality as budget allows.

Identification of Management Alternatives – There are a variety of management measures that could be implemented to reduce erosion, including channel stabilization, source control, sediment capture Best Management Practices (BMPs), and non-structural methods such as construction and maintenance standards.

Selection of Appropriate Management Methods - Many of the above measures are already in place to some degree but have not been evaluated with respect to a comprehensive approach to protecting an entire water body. When potential alternatives have been identified, a ranking process will be used to determine the optimal selection of alternatives for a particular problem location. For example, an eroding stream channel in an area with limited topographic relief and available open land could benefit from an on- or off- line sediment pond trap, but an eroding channel in area with steep slopes and limited open land may need channel stabilization measures.

An efficient approach would be to include County and municipal stormwater maintenance staff in the determination of appropriate methods to recommend. These agencies currently are charged with limiting erosion, and it may be feasible to accomplish both erosion control and flood risk reduction through program coordination.

RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

8. SAMPLE REPORTS

Pinellas County

Southwest Florida Water Management District

Janicki Environmental, Inc.

PBS&J

31 March 2009

8.0 SAMPLE REPORTS

This section of our proposal presents sample reports from multiple projects in PDF format on compact disc. The reports included are:

- Janicki Environmental, Inc. 2008. Sarasota County Watershed Report Card Design (DRAFT). Development of a recommended format for watershed report card for continued stewardship of Sarasota County's valued natural resources. Prepared for Sarasota County Environmental Services.

- Janicki Environmental, Inc. 2008. Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 2004-2007. Prepared for Florida Department of Environmental Protection.

- Janicki Environmental, Inc. 2007. Water Quality Data Analysis and Report for the Charlotte Harbor National Estuary Program. Prepared for Charlotte Harbor National Estuary Program.

- Janicki Environmental, Inc. 2003. An Ecological Characterization of Aquatic and Wetland Habitats in the Anclote River Estuary and Adjacent Inshore and Offshore Waters of West-Central Florida. Prepared for Tampa Bay Water.

- Janicki Environmental, Inc. 2003. A Design of a Surface Water Quality Monitoring Program for Pinellas County, Florida. Prepared for Pinellas County Department of Environmental Management.

- Janicki Environmental, Inc. 2001. Tampa Bay Estuary Program Model Evaluation and Update: Nitrogen Load – Chlorophyll a Relationship. Prepared for Tampa Bay Estuary Program.

RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

9. REQUIRED FORMS

Pinellas County

Southwest Florida Water Management District

Janicki Environmental, Inc.

PBS&J

31 March 2009

9.0 REQUIRED FORMS

SUBMIT TO:	REQUEST FOR PROPOSAL
PINELLAS COUNTY BOARD OF COUNTY COMMISSIONERS 0 S. FT. HARRISON AVENUE ANNEX BUILDING – 6TH FLOOR CLEARWATER, FL 33756	Pinellas County PURCHASING
ISSUE DATE: **MARCH 5, 2009**	*PROPOSAL SUBMITTALS RECEIVED AFTER SUBMITTAL DATE & TIME WILL NOT BE CONSIDERED*

TITLE: **Development of Conservation Management Plan for Clearwater Harbor & St. Joseph Sound**	RFP NUMBER: **089-0222-P (AM)**
SUBMITTAL DUE: **MARCH 31, 2009 @ 3:00 P.M.** *AND MAY NOT BE WITHDRAWN FOR 120 DAYS FROM DATE LISTED ABOVE.*	PRE-PROPOSAL DATE & LOCATION: NON-MANDATORY MARCH 13, 2009 @ 1:00 PM AT 400 S FORT HARRISON AVE, 4TH FLOOR CONFERENCE ROOM #429, CLEARWATER, FLORIDA 33756
DEADLINE FOR WRITTEN QUESTIONS: **March 19, 2009 BY 3:00 P.M.** SUBMIT QUESTIONS TO: AMELIA McFARLANE, CPPB AT amcfarla@pinellascounty.org Phone: (727) 464-3311 Fax: (727) 464-3925	

COMMISSIONERS	THE MISSION OF PINELLAS COUNTY	
CALVIN D. HARRIS - CHAIRMAN KAREN WILLIAMS SEEL - VICE CHAIRMAN NANCY BOSTOCK NEIL BRICKFIELD SUSAN LATVALA JOHN MORRONI KENNETH T. WELCH	Pinellas County Government is committed to progressive public policy, superior public service, courteous public contact, judicious exercise of authority and sound management of public resources to meet the needs and concerns of our citizens today and tomorrow.	Cindy Mancuso JOSEPH LAURO, CPPO/CPPB Director of Purchasing for JL

PROPOSER MUST COMPLETE THE FOLLOWING

PROPOSERS ARE CAUTIONED THAT THE POLICY OF THE BOARD OF COUNTY COMMISSIONERS, PINELLAS COUNTY, IS TO ACCEPT THE LOWEST RESPONSIBLE PROPOSAL RECEIVED MEETING SPECIFICATIONS. NO CHANGES REQUESTED BY A PROPOSER DUE TO AN ERROR IN PRICING WILL BE CONSIDERED AFTER THE RFP OPENING DATE AS ADVERTISED. BY SIGNING THIS PROPOSAL FORM YOU ARE ATTESTING TO YOUR AWARENESS OF THIS POLICY AND ARE AGREEING TO ALL OTHER PROPOSAL TERMS AND CONDITIONS.

PAYMENT TERMS: ____% ___DAYS, NET **45** (PER F.S. 218.70) *RFP DEPOSIT, IF REQUIRED, IS ATTACHED IN THE AMOUNT OF $ _____

PROPOSER (COMPANY NAME): Janicki Environmental, Inc. **D/B/A** Janicki Environmental, Inc.

MAILING ADDRESS: 1155 Eden Isle Drive NE **CITY / STATE / ZIP** St. Petersburg, FL 33704

COMPANY EMAIL ADDRESS: SJanicki@JanickiEnvironmental.com

PHN: (727) 895-7722 **FAX:** (727) 895-4333

***REMIT TO NAME:** Janicki Environmental, Inc.
(As Shown On Company Invoice)

Proper Corporate Identity is needed when you submit your bid, especially how your firm is registered with the Florida Division of Corporations. Please visit www.sunbiz.org for this information. It is essential to return a copy of your W-9 with your bid. Thank you.

CONTACT NAME: Susan Janicki

PRINT NAME: Susan Janicki

EMAIL ADDRESS: SJanicki@JanickiEnvironmental.com

I HEREBY AGREE TO ABIDE BY ALL CONDITIONS OF THIS RFP & CERTIFY I AM AUTHORIZED TO SIGN THIS RFP FOR THE PROPOSER.

AUTHORIZED SIGNATURE: Susan Janicki

PRINT NAME/TITLE: Susan Janicki

FORMS CHECKLIST	
COPY OF COMPANY INVOICE	
W-9 (TAXPAYER ID)	

THIS FORM MUST BE RETURNED WITH YOUR RESPONSE

SEE PAGE 15 SECTION E SCOPE OF WORK

SECTION D - VENDOR REFERENCES

Proposal Title: Development of Conservation Management Plan for Clearwater Harbor & St. Joseph Sound
Proposal Number: 089-0222-P (AM)

THE FOLLOWING INFORMATION IS REQUIRED IN ORDER THAT YOUR PROPOSAL MAY BE REVIEWED AND PROPERLY EVALUATED.

COMPANY NAME: Janicki Environmental, Inc.

LENGTH OF TIME COMPANY HAS BEEN IN BUSINESS: 10 Years

BUSINESS ADDRESS: 1727 Dr. MLK Street N., St. Petersburg, FL 33704

HOW LONG IN PRESENT LOCATION: 1.5 Years

TELEPHONE NUMBER: (727) 895-7722

FAX NUMBER: (727) 895-4333

TOTAL NUMBER OF CURRENT EMPLOYEES: 6 FULL TIME 4 PART TIME

NUMBER OF EMPLOYEES YOU PLAN TO USE TO SERVICE THIS CONTRACT: 10

All references will be contacted by a County Designee via email, fax, mail or phone call to obtain answers to questions, as applicable before an evaluation decision is made.

LOCAL COMMERCIAL AND/OR GOVERNMENTAL REFERENCES THAT YOU HAVE PREVIOUSLY PERFORMED SIMILAR CONTRACT SERVICES FOR:

All fields below must be completed

1
Tampa Bay Estuary Program — COMPANY NAME
St. Petersburg, FL — CITY, STATE
Mr. Richard M. Eckenrod — CONTACT PERSON
(941) 776-1780 — TELEPHONE
(941) 776-1780 — FAX
EckenrodTBC@verizon.net — EMAIL ADDRESS

2
Charlotte Harbor National Estuary Program — COMPANY NAME
Fort Myers, FL — CITY, STATE
Dr. Lisa Beever — CONTACT PERSON
(239) 338-2556 — TELEPHONE
(239) 338-2560 — FAX
LBeever@swfrpc.org — EMAIL ADDRESS

3
Sarasota County Envrion. Services — COMPANY NAME
Sarasota, FL — CITY, STATE
Mr. Jack Merriam — CONTACT PERSON
(941) 861-0804 — TELEPHONE
(941) 861-0504 — FAX
JMerriam@scgov.net — EMAIL ADDRESS

4
Southwest Florida Water Mngt. District — COMPANY NAME
Brooksville, FL — CITY, STATE
Dr. Martin Kelly — CONTACT PERSON
(352) 796-7211 ext. 4235 — TELEPHONE
(352) 754-6885 — FAX
Marty.Kelly@swfwmd.state.fl.us — EMAIL ADDRESS

Substitute Form **W-9**

Request for Taxpayer Identification Number and Certification

Give form to the requester. Do not send to the IRS.

Print or type See Specific Instructions on page 2.

Name (as shown on your income tax return)
Janicki Environmental, Inc.

Business name, if different from above

Check appropriate box: ☐ Individual/Sole proprietor ☒ Corporation ☐ Partnership
☐ Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ▶ .....
☐ Other (see instructions) ▶

☐ Exempt payee

Address (number, street, and apt. or suite no.)
1155 Eden Isle Drive NE

Requester's name and address (optional)

City, state, and ZIP code
St. Petersburg, FL 33704

List account number(s) here (optional)

Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number
: :

or

Employer identification number
59:3560050

Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here Signature of U.S. person ▶ Susan Janicki Date ▶ March 11, 2009

Detach on the perforation

STATEMENT ON USE OF SOCIAL SECURITY NUMBERS

The Clerk of the Court collects social security numbers as required or permitted by law. We are committed to protecting sensitive information and will disclose social security numbers to independent parties only as legally required.

Purposes for which we collect social security numbers include:

- Compliance with record-keeping and tax reporting to federal, state and local agencies;
- Classification of accounts;
- Identification and verification;
- Billing and payments;
- Data collection;
- Reconciliation;
- Tracking; and

Applications for home solicitation permits, marriage licenses and passports as required by state or federal law.

SECTION G - ADDENDA ACKNOWLEDGMENT FORM

Proposal Title: Development of Conservation Management Plan for Clearwater Harbor & St. Joseph Sound
Proposal No: 089-0222-P (AM)

PLEASE ACKNOWLEDGE RECEIPT OF ADDENDA FOR THIS ITB/RFP BY SIGNING AND DATING BELOW:

ADDENDA NO.	SIGNATURE/PRINTED NAME	DATE RECEIVED
1	Anthony Janicki	March 20, 2009

Note: Prior to submitting the response to this solicitation, it is the responsibility of the firm submitting a response to confirm if any addenda have been issued. If such document(s) has been issued, acknowledge receipt by signature and date in section above and return Addenda Acknowledgement Form with RFP. Failure to do so may result in being considered non-responsive or result in lowering the rating of a firm's proposal.

Information regarding Addenda issued is available on the Purchasing Department section of the County's website at, www.pinellascounty.org/purchase/Current_Bids1.htm , listed under category 'Current Bids'.

RFP Number
089-0222-P (AM)

DEVELOPMENT OF A COMPREHENSIVE CONSERVATION MANAGEMENT PLAN FOR CLEARWATER HARBOR & ST. JOSEPH SOUND

10. CERTIFICATES

Pinellas County

Southwest Florida Water Management District

Janicki Environmental, Inc.

PBS&J

31 March 2009

10.0 CERTIFICATES

Janicki Environmental is certified as a Small Business Enterprise (SBE) with Pinellas County's Small Business Enterprise Program (SBEP) and as a Minority Business Enterprise (MBE) by the State of Florida.

Joseph Lauro, CPPO/CPPB
Director

January 28, 2008

Janicki Environmental, Inc.
Attn: Susan Janicki
1155 Eden Isle Drive, NE
St. Petersburg, FL 33704

Vendor # 63117

Re: Small Business Enterprise Program

Welcome! Thank you for your interest in Pinellas County's Small Business Enterprise Program (SBEP). We are pleased to inform you that your company has met the eligibility requirements for participation in the SBEP. Your certification will be effective for a three (3) year period, from February 1, 2008 through January 31, 2011.

In order to participate in the opportunities available through the Small Business Enterprise Program, it is important to keep us informed of your current address, telephone and fax numbers and your e-mail address. If the information we have on file is not current, we will not able to advise you of opportunities that become available.

Prior to the expiration date you will be notified by mail of your need to re-certify in order to remain eligible and continue to participate in the Small Business Enterprise Program. The SBEP grants your company a "Sheltered Market" for all contracts purchased through the Purchasing Department below $10,000.00. Only eligible vendors in the SBEP will be called for quotation for purchases below $10,000.00. If there are no eligible SBEP vendors available to provide the required good or service, then all county vendors will be available for quotation. If you have any questions, please do not hesitate to call the Purchasing Department at 727-464-3148. To learn about other resources available to help you grow your business, visit Pinellas County Economic Development Web Site at: www.siliconbay.org

Thank you,

Karol Crain

Karol Crain, CPPB
Buyer/Small Business Enterprise Program Liaison

PLEASE ADDRESS REPLY TO:
400 South Ft. Harrison, Sixth Floor
Clearwater, Florida 33756-5113
Phone: (727) 464-3311
FAX: (727) 464-4294
Website: www.pinellascounty.org/purchase

State of Florida

Minority Business Enterprise

Certification

Janicki Environmental, Inc.

is certified as a Minority Business Enterprise under the provisions of Chapter 287, Florida Statutes for a one year period from:

February 3, 2009 to February 3, 2010

Executive Director

Florida Department of Management Services
Office of Supplier Diversity

Office of Supplier Diversity • 4050 Esplanade Way, Suite 380 • Tallahassee, Fl 32399-0950 • 850.487.0915 • www.osd.dms.state.fl.us