Collier County Watershed Model Update and Plan Development
Phase 2 Scope of Work
Watershed Management Plan Development

INTRODUCTION

Following is the proposed scope of work budget and schedule to develop the watershed management plans for Collier County.

SCOPE OF WORK

The proposed scope of work for this project has been divided into seven (7) work elements, as described below. Individual watershed management plans will be developed for each of the three highest priority watersheds: Cocohatchee-Corkscrew, Golden Gate, and Rookery Bay. However, proposed projects identified by others in the Faka Union, Okaloacochee / SR 29, and the Fakahatchee basins that may impact other watersheds, will be considered for impact analysis to all affected watersheds.

ELEMENT	ELEMENT DESCRIPTION
1	Assessment of Existing Conditions – Watersheds
2	Assessment of Existing Conditions – Estuaries
3	Development of Performance Measures
4	Analysis of Alternatives and Recommendations
5	Public Involvement
6	Watershed Management Plan Reports
7	Project Management and Meetings

Following are descriptions of the tasks included in each work element.

Element 1: Assessment of Existing Conditions – Watersheds

In this element, the PBS&J/DHI team will conduct a detailed assessment of existing conditions for the three highest priority watersheds in Collier County: Cocohatchee-Corkscrew, Golden Gate, and Rookery Bay. The assessment will encompass surface water, groundwater, and natural system conditions and will be completed individually for each of the priority watersheds. In addition, an assessment of existing conditions based on literature review will be conducted for the Faka Union, Okaloacochee / SR 29, and Fakahatchee basins. The assessment will include comparisons of existing conditions (including existing conditions model results) against the Performance Measures identified in Element 3 to identify both watershed problems and potential opportunities. The element tasks are described below. In must be noted that the items related to water reservations and minimum water levels in Element 1 Tasks 1.1 and Element 3 Task 4 will require a separate Notice to Proceed due to an incomplete assessment related to pending permits. County Manager approval will be necessary to issue these Notices to Proceed.

Task 1. Surface Water

The assessment of existing conditions for surface water will include water quantity, water quality, and pollution loads as well as a detailed water quality model for the Gordon River based on the ECO Lab software.

Task 1.1 Water Quantity

The assessment will include the items described below.

- **Water Budgets and Seasonal Water Levels**. The Phase I scope of work for this project includes comparisons among of the results from the Big Cypress Basin Project Implementation Report (BCB PIR) MIKE SHE model, the BCB Natural Systems model (BCB NSM), and the BCB Future Conditions Model (BCB FCM). The effort focuses on comparing predicted flows to the estuaries and average wet and dry season water levels. Work on this project phase will encompass adding to the comparison the results of the MIKE SHE model currently being updated.

- **Water Reservations and Minimum Water Levels.** The PBS&J/DHI team will compare model results and existing targets that have been developed to manage water levels and uses within Collier County. As indicated above, this Task will require a separate Notice to Proceed due to an incomplete assessment related to pending permits. County Manager approval will be necessary to issue the Notice To Proceed. Specific issues to be addressed include:

  - **Water Reservations** - A water reservation is a legal mechanism to set water aside from consumptive use for the protection of fish and wildlife or public health and safety. The reservation represents the quantity of water to be protected from consumptive use and includes seasonal and location components. The PBS&J/DHI will review the water reservation targets for Picayune Strand and compare it to model results and determine current conditions relative to targets.

  - **Minimum Water Levels** – Minimum water levels for the aquifers are established to define levels required to protect water resources in an area. The PBS&J/DHI team will review the existing minimum level requirements defined for the Lower West Coast Aquifer system. The team will also seek to identify the key characteristics that will be considered during development of an MFL for Rookery Bay (scheduled for 2011). The information will be compared against model results to determine the current conditions relative to the established targets.

- **Flood Risk** – The PBS&J/DHI team will use the results of the levels of service and storm event analyses included in the current project phase (per Element 3, Tasks 13 and 14) to assess flood conditions at identified representative locations within each of the watersheds. Flooding conditions outside of designated Conservation Lands will be considered in the development of alternatives.

- **Conveyance System and Structure Operations** – In this analysis, the PBS&J/DHI team will evaluate model results to identify areas where culverts or other structures restrict conveyance. The assessment will also identify conveyance restrictions resulting from the current operations of the water control structures.

- **Sensitivity of Modeled Conveyance Parameters** – This item will be used to evaluate the sensitivity of the hydraulic system to changes in hydraulic conveyance parameters such as roughness coefficients.

- **Regulatory Environment** – The PBS&J team will evaluate the existing state and local stormwater regulations and assess the impacts of the proposed stormwater rules.

Task 1.2 In-Stream Water Quality

Given time constraints, data limitations, and lack of specific familiarity with local conditions, there are occasions when the listing and de-listing stages of the TMDL process contain errors. If errors in impairment identification are not fully recognized, the TMDL process proceeds to the next step, that of TMDL development. For those systems where "impairment" does not accurately reflect the ecological health of the system in question, TMDL development can involve a considerable expenditure of time and resources for a system not necessarily needing such attention. A refined understanding of water quality conditions will be the basis for the development of site-specific and locally-relevant protection and/or restoration strategies.

To address these concerns, the PBS&J/DHI team will provide Collier County with the following services as they relate to the highest priority watersheds:

- Review of all data, both within IWR and in other databases, related to verified and planning lists for Collier County's watersheds.

- Review relevant reports from the SFWMD, FGCU, and others as they relate to target setting for natural resources dependent upon maintenance of adequate water quality (i.e., oysters, seagrass, etc.).

- Identification of potential conditions and/or locations where "impairment" is possibly related to natural conditions of the physical setting of the WBID itself.

- Determination of likely nutrient responsible for phytoplankton growth via three techniques: TN: TP ratios, comparison of regression coefficients when examining nutrient vs. chlorophyll-a relationships, and quantification of the percent of TN and TP remaining in an inorganic fraction, as related to chlorophyll-a levels.

- Based on the above steps, a determination of the nutrient most likely responsible for phytoplankton growth.

- Dependent upon the availability of data and the appropriateness of such a step, develop alternative criteria for nutrients, as related to appropriate chlorophyll-a target.

- When possible, development of conceptual models that explain the observed water quality will be assessed.

Task 1.3 Pollutant Loading

A pollutant loading model will be developed for each of the highest priority watersheds to estimate loads associated with the NPDES parameters. Loads will be estimated for each model grid cell in the MIKE SHE model. Results will then be aggregated by watershed as well as by

identified subwatersheds of interest to the County. A period of rainfall that best represents average annual conditions will be identified from the historical record and flows for this period will be assumed to be representative of average annual conditions. Pollutant concentrations associated with surface runoff by land use category (event mean concentrations or EMCs) will be obtained from the County's NPDES data. If these data are not available, literature values will be used. Loads associated with atmospheric deposition will be assumed to be included in the reported EMCs. Average annual point source loads will be added to the model based on their grid cell location.

The SWFFS pollutant loading model results will be used to assess conditions in the Faka Union, Okaloacochee / SR 29, and Fakahatchee basins.

Task 1.4 ECO Lab Water Quality Modeling of Golden Gate Canal System

A detailed water quality model based on the ECO Lab software will be developed for the Golden Gate canal system, including the Gordon River. The model will be used to a) provide a better understanding of potential impairment conditions in the water body, and b) assess the benefits of potential improvement projects in the watershed. In addition, the proposed model will serve as a pilot project to assess its applicability to other watersheds, canal systems and water bodies in the County that have similar hydrologic characteristics.

The development of the WQ model will start by creating a higher-resolution hydraulic/ hydrodynamic (H&H) MIKE SHE/MIKE 11 model for the Golden Gate watershed from the developed Collier County model, which will serve to establish the boundary conditions. Where applicable, higher resolution details of the drainage system will be added into the local scale model.

The model will combine the physically based spatially distributed hydrodynamics derived from MIKE SHE with the numerical ecological model ECO Lab. ECO Lab is a generic and open tool for customizing aquatic system models to describe water quality and eutrophication. The ECO Lab eutrophication template describes the physical, chemical and biological processes from various sources such as urban and agricultural runoff and various physical conditions such as sediment processes and pollutant loads.

The eutrophication model describes nutrient cycling, phytoplankton and zooplankton growth, growth and distribution of rooted vegetation and microalgae in addition to simulating oxygen conditions. The model results describe the concentrations of phytoplankton, chlorophyll-a, zooplankton, detritus, organic and inorganic nutrients and oxygen. In addition a number of derived variables are stored: primary production, total nitrogen and phosphorous concentrations, sediment oxygen demand and turbidity.

The eutrophication model is integrated with the advection-dispersion (AD) component at each grid cell of the model, based on land use. The AD module will transport dissolved pollutants in the overland, drainage (interflow), and ground-water model components. Decay rates and the solubility limits will be established in the overland layer. Decay and sorption processes will be simulated in the ground-water layers.

The MIKE SHE AD module exchanges directly pollutants with the rivers, canals, and lakes in MIKE 11. Once they reach the surface water system in MIKE 11, pollutants from those non-point sources and from other point sources are transported in the rivers and lakes by the MIKE

11 AD module. ECO Lab will be coupled to MIKE 11 AD to incorporate the eutrophication processes and simulate the biochemical and ecological fate of these pollutants.

Pollution loads will be an external model input and they will be determined consistent with Task 1.3. Point source discharge of pollutants of interest into the rivers and canals will be identified in order to include them as boundary conditions in the MIKE 11 AD component.

The WQ model will be built and calibrated by adjusting model parameters inside their uncertainty range to better match the available WQ monitoring data. It will be used to a) provide a better understanding of potential impairment conditions in the water body, and b) assess the benefits of potential improvement projects in the Golden Gate watershed. In addition, the proposed model will be consider a pilot project to assess its applicability to other canal systems and water bodies in the County that have similar characteristics.

Water quality modeling of the remaining watersheds will be analyzed based on the Golden Gate model results as the success of the Golden Gate ECOLab modeling effort will provide substantial insight into the modeling scope of additional water quality modeling in the County. Additional water quality modeling may be considered as a follow-up project to this project phase.

Task 2. Groundwater

The assessment of existing conditions for groundwater will include an analysis of hydrologic conditions, water uses, water quality, and pollution loads.

Task 2.1 Hydrogeology

Water balance calculation from the MIKE SHE model results will be conducted to estimate the incoming and outgoing water fluxes in the aquifers. Maps with the typical distribution of the water balance components (including the recharge) will be generated for two times of the year corresponding to dry and wet conditions. Head drawdowns will be used to indicate areas of intensive / excessive pumping. Head maps will be generated for the different aquifers corresponding to dry and wet conditions. Planning implications may include such factors as protection measures for groundwater recharge areas or suggested reduced pumping in areas where impacts to wetlands may be predicted. Conversely, modeling results may indicate the best places to locate new water supply wells, while minimizing other impacts.

Task 2.2 Water Uses

This subtask will include the two items discussed below.

- Water Supply (Municipal and Domestic Self-Supply).

The PBS&J/DHI team will conduct a water supply analysis involving water balance calculations to assess the quantity of water being extracted from each aquifer and the use of that water, such as private wells, public supply, or agriculture. Maps depicting the spatial distribution for each type of groundwater source will be developed to include information of the County's water supply system. This information will aid in determining what areas may be contributing to over use of water supply resources and indicate what areas may be available to be added to the municipal water supply system.

- Irrigation (Agriculture, Golf Courses).

As with the potable water supply evaluation, water used as irrigation for agriculture and golf courses will be evaluated. Detailed water balance calculations from the MIKE SHE model results will be developed for each Irrigation Command Area and the golf courses to indicate the quantity of water extracted from each aquifer and the use of that water. The groundwater extraction rate predicted by the model for irrigation will be compared to permit limits to indicate whether permit limitations are reasonable or likely to be exceeded. Seasonal variation of the groundwater extraction rate will be also evaluated with respect to crop needs and permit limitations.

Task 2.3 Groundwater Quality

The groundwater quality issues will be assessed by an analysis of wellhead protection zones. These zones will be evaluated from MIKE SHE model results and current State and local standards. Areas where results indicate an increased risk for contamination of water supplies or transport of pollutants due to excessive withdrawal rates will be mapped and reviewed against current well head protection practices. As in the water quantity budget analysis, recommendations may come from the modeling results as to the best way to minimize water quality impacts induced by land use practices or excessive water supply production.

Task 2.4 Pollutant Loading

Pollutant loads associated with groundwater will be calculated as the product of the modeled groundwater flow and groundwater quality data available from local monitoring programs. A general assessment of pollutant loading that may be associated with septic tank groundwater recharge will also be conducted for those areas with large numbers of active septic drainage systems. The assessment will rely on established septic contributions of pollutants based on technical literature reviews. Maps depicting areas where septic tank recharge is conceptualized in the model will be developed.

Task 3. Natural Systems

The existing areal extent and functional quality of native wetland and upland communities will be assessed for each of the three primary study basins using a combination of methods.

Task 3.1 Reference Period Comparison

A reference period was identified as part of the SWFFS. The land cover associated with this period was derived from 1940 vintage aerials and the first soil survey and is available for this project. From this information, it is possible to discern historic hydrologic conditions by mapping the extent of hydric soils and other soil indicators. Such soil indicators are also strongly correlated with the distribution of native plant communities.

Once a spatial database has been developed for historic native plant communities, it will be possible to conduct a quantitative change analysis using current GIS land use cover data available from SFWMD. This will be done using a digital overlay process that generates a table that quantifies from/to changes in land use and cover (e.g., cypress swamp to row crops). For each primary basin GIS maps and tables for the reference and current periods will be prepared.

From this analysis, it will be possible to quantitatively estimate the losses and conversions of native plant communities and habitats over the past 50-60 years. This information will then be used to develop defensible performance standards and restoration targets.

Task 3.2 Functional Assessment

Using the wetland areal extent information developed in task 1.3.1, the PBS&J/DHI team will conduct a landscape-level functional assessment of native wetland and upland communities. This will be accomplished using a modified approach to the Uniform Mitigation Assessment Method (UMAM - 62-345 Florida Administrative Code). This method involves a quantitative scoring approach to assessing three primary metrics:

- Location and landscape support (e.g., adjacent development; loss of connectivity).
- Water environment (e.g., hydrologic alterations; water quality degradation).
- Community structure (e.g., presence of exotics).

A scoring procedure will be conducted for each mapping unit in each of the primary basins, summed across the basin, and then averaged per unit area, to develop an overall basin score. This quantitative approach will allow for meaningful comparisons of the relative functional quality of wetland and other native habitats between basins. In addition, the approach is codified in Florida law and well accepted as a quantitative functional assessment method.

The scoring process will be conducted primarily through a review of mapping materials and model output (e.g., water levels), but will be supported by limited field groundtruthing. A total of four man-field days (e.g., two ecologists in the field for two days) will be dedicated for each primary basin to assess and confirm conditions on the ground. This level of analysis would not be acceptable for project permitting. However, it is appropriate for regional planning.

The functional assessment will provide a quantitative measure of the relative loss of wetland functions in the subject basins. In addition, from the spatial comparison of land use/cover between the reference period and current conditions it will be possible to quantify other landscape changes such as:

- Conversion of native uplands to:
  - Urban land uses (e.g., impervious surface);
  - Agricultural land uses (e.g., ditching & draining).
- Dredged coastal areas.
- Filled coastal areas.
- Major changes to coastal circulation patterns (e.g., causeways).

These factors will be integrated into an anthropogenic disturbance index that will allow for a comparison of the relative level of man-induced impacts between basins and receiving waters.

Task 4. Deliverables

The deliverable for this task will be a summary report describing the results of the existing conditions analyses, both from a countywide perspective as well as for each of the three highest priority watersheds. The report will also include a description of existing conditions in the Faka Union, the Okaloacochee / SR 29, and the Fakahatchee watersheds. Assessments will be based on comparisons of existing conditions and Performance Measures. Descriptions will

follow the task format: surface water, groundwater. The deliverable will also include the generated GIS databases associated with the work performed.

Element 2: Assessment of Existing Conditions – Estuaries

The objective of this element is to characterize existing conditions in the estuarine receiving waters of discharges from the major basins addressed in this scope of work. This characterization will be accomplished primarily through a synthesis of existing information. Similar to the assessment of existing watershed conditions, problems and/or opportunities will be identified by comparison to the Performance Measures. The four primary estuaries to be addressed include: Wiggins Pass, Naples Bay, Rookery Bay, and Ten Thousand Islands. This effort will include five (5) tasks as described below.

Task 1. Volume and Timing of Freshwater Inflows

The objective of this task is to characterize the volume and timing of freshwater discharges delivered to the receiving water estuaries. The PBS&J/DHI team will obtain, and consolidate into a single database, all available streamflow data for tributary inflows as depicted by the MIKE SHE model into the four estuaries of concern. Existing streamflow databases will be inventoried for applicable data, including:

- USGS gauged flow records.
- SFWMD DBHydro.
- Other sources (e.g., University studies; permit files; etc.).

For each primary tributary, flow statistics for the period of record will be developed including, but not limited to, the following:

- Time series plots of daily flows.
- Average annual minimum, maximum, mean and median flows.
- Average monthly minimum, maximum, mean and median flows.
- Average wet season minimum, maximum, mean and median flows.
- Average dry season minimum, maximum, mean and median flows.
- Other statistical summaries as supported by the data.

An attempt will be made to identify inflection points in the time series plots which could correspond to major hydrologic changes in each of the primary tributaries (e.g., impoundments; ditching and draining; land development, etc.). The flow conditions that existed prior to the inflection point could be considered to be a reference or benchmark period representing more natural conditions. If supported by adequate flow data, the PBS&J/DHI team will conduct statistical change analyses comparing flow conditions that existed pre- and post of any major hydrologic alterations. If pre-development flow data are not available, or are not adequate to discern a reference period flow regime, then flows generated from the SWFFS Natural Systems Model will be used to estimate pre-development flow conditions.

The volume of freshwater discharged from each watershed into the receiving estuaries will be evaluated from the MIKE SHE model results. Conclusions will be drawn to associate impacts with the hydrologic characteristics of each watershed. In addition, the Index of Hydrologic Alteration (IHA) software, or other comparable analytical methods, will be used to compare pre- and post flow statistics and conditions. This analytical approach comparing pre- and post

hydrologic alteration time periods will be subsequently used to develop performance standards for freshwater inflows.

Task 2. Quality of Discharge

The objective of this task is to characterize the water quality of freshwater discharges and pollutant loads delivered to the receiving water estuaries. The PBS&J/DHI team will obtain, and consolidate into a single database, all available water quality data for tributary inflows into the four estuaries of concern. Existing water quality databases will be inventoried for applicable data, including:

- EPA (STORET).
- USGS.
- SFWMD DBHydro and other data sources.
- FDEP.
- Collier County.
- Lee County.
- Other sources (e.g., University studies; permit files; etc.).

Available data will be consolidated into a single database using SAS software. Appropriate statistical analysis of the data will be conducted (e.g., ranges, means, standard deviations, trends, etc.). Statistical summaries will be developed for each station and tributary. Where applicable, the summary date will be compared to appropriate regulatory standards and/or statewide averages.

By combining volumetric flow data developed in Tasks 1 with concentration data developed under this task, annual and seasonal pollutant loadings will be estimated for critical parameters related to coastal eutrophication, water quality impairment, and the loss of natural functions. Critical parameters will include:

- Total nitrogen.
- Total phosphorus.
- Total suspended solids.
- Color.
- Bacteria.

WBIDs identified in the State 303(d) listing as impaired, as well as other notable water quality problem segments, will be mapped. In addition, water quality conditions in each tributary will be summarized.

Task 3. Quality of Receiving Waters

The objective of this task is to characterize the water quality conditions in the receiving waters of each of the four estuaries of concern. As with task 2, the PBS&J/DHI team will obtain, and consolidate into a single database, all available water quality data for estuarine receiving waters in the four estuaries. Existing water quality databases will be inventoried for applicable data, including:

- EPA (STORET).
- USGS.

- SFWMD DBHydro and other data sources.
- FDEP.
- Collier County.
- Lee County.
- Other sources (e.g., University studies; permit files; etc.).

Available data will be consolidated into a single database using SAS software. Appropriate statistical analysis of the data will be conducted (e.g., ranges, means, standard deviations, trends, etc.). Statistical summaries will be developed for each station and tributary. Where applicable, the summary date will be compared to appropriate regulatory standards and/or statewide averages for critical parameters related to coastal eutrophication, water quality impairment, and the loss of natural functions. Critical parameters will include:

- Chlorophyll-a.
- Dissolved oxygen.
- Transparency.
- Bacteria.

WBIDs identified in the State 303(d) listing as impaired, as well as other notable water quality problem areas, will be mapped. In addition, water quality conditions in each estuary will be summarized.

The quality of freshwater discharged from each watershed into the receiving estuaries will be evaluated from the pollutant loading model results. Conclusions will be drawn to associate quality in the receiving water bodies with the pollution loads from each watershed.

Task 4. Coastal Habitats

The objective of this task is to address the loss of natural functions in the four estuaries of concern, primarily through a review of existing literature. In general, the literature indicates that these estuaries have been impacted by hydrologic alterations in their watersheds. The timing and volume of freshwater discharges to the estuaries have been significantly altered from natural conditions, with the primary problem being the delivery of too much freshwater. As a result, the historic areal extents of oyster bars and seagrass beds have been reduced by salinity alterations, shading, and smothering.

The PBS&J/DHI team will conduct a literature review of water quality and living resource studies addressing the four estuaries of concern. Considerable work has been performed by the USGS, NOAA, FDEP Fish & Wildlife Research Institute, SFWMD, and Florida Gulf Coast University. Key literature addressing in-bay water quality and the distribution of living resources will be inventoried and summarized. If supported by adequate data, GIS maps will be prepared showing both the historic and existing areal extents of the following submerged and emergent coastal habitats:

- Oyster bars.
- Seagrass beds.
- Mangrove forests.
- Salt marshes.
- Salt barrens.
- Coastal beaches (Marco Island).

An appropriate reference period when more natural conditions existed will be identified. If supported by the data, an attempt will be made to conduct a quantitative change analysis of the areal extent of the coastal habitats listed above, comparing reference period conditions to existing conditions. This analysis will be conducted using GIS overlay techniques. In addition, the Natural Systems Model (SDI, 2007) developed for the Southwest Florida Feasibility Study will be evaluated for use in this effort.

A narrative report will be prepared summarizing the water quality and coastal habitat analysis.

Task 5. Deliverables

The deliverable for this task will be a summary report describing the results of the existing conditions analyses and comparison to the Performance Measures for the four estuaries. The report will address the relationships of the estuaries and the contributing watersheds. A qualitative - and where feasible, quantitative – assessment of the loss of natural functions in each of the four estuaries of concern will be developed. In addition, each of the four estuaries will be compared to each other with respect to the degree of alteration. This analytical approach will be subsequently used to develop performance standards for coastal habitats. A summary of conditions in Marco Island and the beaches will be included as part of Rookery Bay. Deliverables will also include the GIS databases associated with the work performed.

Element 3: Development of Performance Measures

To evaluate the relative importance associated with an existing problem, and gain insight into the applicability and feasibility of specific alternative analyses, performance measures will be established. Performance measures are quantitative indicators of how well proposed alternative scenarios meet specified objectives. They will be established and used to evaluate potential problem areas within each basin prior to the identification of proposed improvement scenarios. They will be setup to address the same issues associated with the assessment of existing conditions, surface water, groundwater, and natural systems. Performance measures will be based on the natural system conditions and/or goals established by the County.

Task 1. Water Budgets and Seasonal Water Levels.

This performance measure addresses the changes in water budgets and seasonal water levels compared to both existing and natural system conditions.

Task 2. Freshwater Discharge to Estuaries

This performance measure will include the four estuaries, Wiggins Pass, Naples Bay, Rookery Bay, and Ten Thousand Islands. The performance of a proposed scenario will be determined by comparing the model simulation results for that scenario with both the natural condition, as determined from the historical record per Element 2 Task 1, and the existing condition, as determined from the existing conditions model runs.

Task 3. Pollutant Load

The pollutant loading model results for existing conditions (Element 1, Task 1.3) will be compared to expected pollution loads associated with the proposed alternative scenarios. The

performance measures will consider that pollution reductions expected at impaired or significantly impacted subbasins are preferred over pollutant reductions at less impacted subbasins.

Task 4. Water Reservations and Minimum Water Levels

For this performance measure, the PBS&J/DHI team will compare existing conditions model results with existing targets, such as the proposed water reservation targets for Picayune Strand and minimum water levels that have been established for the aquifers.

Task 5. Flood Risk

Key locations within each watershed that are representative of flooding conditions, as described for existing conditions, will be used as baseline for comparison of impacts resulting from alternative improvement scenarios.

Task 6. Aquifer Recharge / Yield

This performance measure will focus on issues related to groundwater recharge and aquifer yield. Targets specified in the document entitled "Proposed Minimum Water Level Criteria for the Lower West Coast Aquifer System within the South Florida Water Management District" will be used as the baseline comparison.

Task 7. Natural Systems

The development of performance measures for wetlands and native habitats will be based largely on the results of Element 1, Task 3. A quantitative assessment of the loss of wetlands and other native plant communities will be developed. In addition, a quantitative functional assessment under current conditions will be prepared. Through a comparison of historic and current conditions, quantitative targets for restoration of both areal extent and functional quality will be developed.

Element 4: Analysis of Alternatives and Recommendations

As described for Element 1, the PBS&J/DHI team will compare the existing condition of each watershed against the defined Performance Measures. Subsequently, a broad list of potential solutions to problems will be identified and evaluated. This element will also consider watershed stressors resulting from future development such as increased water demands. The Element tasks are described below.

Task 1. Identification of Potential Projects, Future Watershed Stressors, and Policies

The objective of this task is to compile the information of existing watershed problems, future problems that may result from future development, potential solutions that have been identified through previous work, and potential solutions resulting from the analyses conducted as part of this project. Potential solutions would include projects that have been previously indentified in previous work including the Southwest Florida Feasibility Study (SWFFS), Belle Meade Area Stormwater Management Master Plan, Immokalee Storm Water Management Plan, South Lee

County Watershed Management Plan, and other recent basin master plans. Projects will also include the water supply projects identified in the Lower West Coast Water Supply Plan (LWCWSP). Non-structural/management and structural projects will also be identified and proposed by the PBS&J/DHI team in coordination with Collier County and other local stakeholder groups. In addition, the PBS&J/DHI team may identify other potential projects or opportunities that have not been previously considered. Potential projects will be identified specifically for each watershed and may include the following types:

Task 1.1 Non-Structural/Policy

- Structure operations.
- Water use management.
- Land acquisition for restoration/conservation.
- Land development practices.
- Water use regulations (rates, reuse, irrigation practices, etc).
- Best Management Practices (BMPs).

Task 1.2 Structural Improvements

- Culvert or bridge replacement.
- Water diversion.
- Restoration.
- Water Conservation Areas.
- Aquifer Storage and Recovery.
- Salt Water Intrusion Protection (injection wells/cutoff walls, etc.).
- Other BMPs.

The PBS&J/DHI team will deliver a GIS database of proposed projects similar to that developed for the SWFFS. A conceptual description of each will be provided.

Task 2. Initial Screening of Proposed Projects

For this task, the PBS&J/DHI team will conduct a screening level analysis of the potential projects by comparing expected benefits to the Performance Measures and by estimating project performance under full build-out conditions. The evaluation of the projects will also include preliminary estimates of implementation costs as well as permitability and constructability. Constructability reviews will be conducted to make sure projects can be physically implemented. The objective of the task will be to eliminate from further consideration potential projects and policies that are judged to be impractical or that will provide little benefit to the County.

Task 3. Development and Analysis of Alternative Scenarios

For this task, the PBS&J/DHI team will assemble alternative scenarios consisting of a combination of watershed conditions under various development scenarios and improvement projects. Development scenarios will include watershed stressors and proposed projects resulting from Task 2. As indicated previously, watershed stressors are conditions that may result from future development such as increased potable water demand and impact to recharge areas. The identified scenarios will then be subject to a more detailed evaluation

based on comparisons to the performance measures. The work will include the following subtasks.

Task 3.1 Set up Alternative Scenarios

Proposed projects (non-structural and structural) will be grouped by watershed, functional criteria, perceived benefit and cost to create alternative improvement scenarios. Each scenario may assume implementation of the projects identified in the SWFFS Tentatively Selected Plan. It is estimated that 8 to 10 Alternative Scenarios will be selected for detailed evaluation. A hierarchy of relative importance/feasibility will be established to improve the overall efficacy of the alternative analysis process. Examples of such scenarios may include addition of proposed well fields, construction of storage reservoirs, converting of agricultural lands to urban, or restoration of farmland to natural conditions. The most cost effective and feasible projects will be considered first and verified by specific alternative simulations.

Task 3.2 Run Model Simulations

Those feasible and cost effective scenarios will be simulated to determine the impacts of proposed projects with respect to the Performance Measures. Each scenario will be modeled to define its characteristics in terms of surface water, groundwater, and natural systems.

Task 3.3 Evaluation of Alternative Scenarios

The benefits of each scenario will be evaluated with respect to its estimated contribution to meeting the Performance Measures. In addition, implementation cost estimates, both capital and operation and maintenance, will be developed for each scenario. Permitting requirements and public acceptance will also be important components of the evaluation process.

Task 4. Selection of Recommended Watershed Management Actions

The product of the evaluation of alternative scenarios will be a ranking of the evaluated scenarios and a recommended scenario consisting of a set of projects to be implemented at each watershed. The recommendations will include implementation costs and a project implementation sequence.

Element 5: Public Involvement

Public involvement is an important component of the watershed management plan process to obtain buy-in and support during plan development and implementation. For this project, the PBS&J/DHI team will participate in two public meetings at each of the top priority watersheds:

- Meeting to present the results of the identification of potential projects and their initial screening (Element 4, Tasks 1 and 2). This meeting will also be used to present to the public the performance measures and describe the methodology to evaluate the alternative scenarios.

- Meeting to present the alternative scenarios, results of a preliminary alternative evaluation of those scenarios, and draft recommendations.

Element 6: Watershed Management Plan Reports

The final product of this project will be the County's Watershed Management Plan. It will consist of four reports, one for each of the top priority watersheds, Cocohatchee-Corkscrew, Golden Gate, and Rookery Bay, and one for the Faka Union, Okaloacochee / SR 29, and Fakahatchee basins. The reports will complement the previous deliverables and will describe the methodology and findings associated with Project Elements 3 through 5, performance measures, analysis of alternative projects, and recommendations. Draft reports will be provided for County review. Comments provided by the County and other agencies will be addressed and Final Report will be submitted. Draft and Final Reports will be provided in pdf format. One copy of each will also be provided in hard copy format.

Element 7: Project Management and Progress Meetings

This element will include general project management and coordination activities, as well as development of progress reports and invoicing. Each monthly invoice will be accompanied with a brief progress report indicating schedule progression and any milestone accomplishments. All progress meetings will be by conference call or Webex. The PBS&J/DHI team will also participate in one meeting at the County offices.

PROJECT SCHEDULE AND BUDGET

The work associated with the proposed scope will be completed by September 30, 2010. It has been assumed that the Notice to Proceed will be received by October 1, 2009. The cost estimated to complete the work is #1,303,397.38. This cost includes a 5% mark-up on subconsultant work. The PBS&J labor rates are shown in the attached Table 1. A detailed hourly cost breakdown is shown in the attached Table 2.

TABLE 1
PBS&J Labor Rates
Collier County Watershed Model Update
and Plan Development RFP #08-5122

Labor Multiplier: 3.0

LABOR CATEGORY	BURDENED LABOR RATES ($/HR)
Technical Director	200.00
Project Manager	185.00
Deputy Project Manager	158.00
Sr. Engineer III	131.00
Sr. Engineer II	109.00
Sr. Engineer I	99.00
Engineer II	86.00
Engineer I	72.00
GIS Project Manager	142.00
GIS Sr. Professional	135.00
GIS Professional II	105.00
GIS Professional I	79.00
Sr. Planner	122.00
Planner II	88.00
Planner I	79.00
Sr. Environmental Scientist III	152.00
Sr. Environmental Scientist II	112.00
Environmental Scientist/Ecologist	89.00
Staff Environmental Scientist	69.00
Sr. Hydrogeologist	159.00
Hydrogeologist II	111.00
Hydrogeologist I	74.00
CADD Designer	56.00
Administrative Assistant	62.00
Clerical	46.00
Survey Field Crew	155.00