

Adaptive Management of the Long-Term Plan – The Role of Process Development and Engineering

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1.0 Executive Summary

This paper clarifies how the various Process Development and Engineering (PDE) activities contained within the Long-Term Plan work together to achieve the overall Everglades water quality goals. Clarification is provided on the process by which these PDE activities will be synthesized to form the basis of the adaptive implementation activities.

2.0 Background

The long-term Everglades water quality goal is for all discharges to the Everglades Protection Area (EPA) to achieve and maintain water quality standards, including compliance with the phosphorus criterion established in Rule 62-302.540, F.A.C., in the EPA. Substantial progress towards reducing phosphorus levels discharged into the EPA has been made by the State of Florida and other stakeholders. The combined performance of the source controls in the Everglades Agricultural Area (EAA) and the stormwater treatment areas (STAs) of the Everglades Construction Project has exceeded expectations. In addition, some source control measures have been implemented in urban and other tributary basins included in the Everglades Stormwater Program (ESP). Nonetheless, additional measures are necessary to achieve the Everglades water quality goal. The Long-Term Plan contains activities to achieve that goal, and to permit the State of Florida and the South Florida Water Management District (District) to fulfill their obligations under both the Everglades Forever Act (EFA, F.S. 373.4592) and the federal Everglades Settlement Agreement (Case No. 88-1886-CIV-MORENO). The Long-Term Plan is developed in full recognition of the substantive remaining scientific uncertainties surrounding that objective. It is predicated upon maximizing water quality improvement through an *adaptive implementation process*.

The Long-Term Plan was developed in recognition that:

- Achieving water quality standards will involve an adaptive management approach, whereby the best available information is used to develop and expeditiously implement incremental improvement measures consistent with informed and prudent expenditure of public and private funds.
- Continued investigations are necessary to further improve the overall operation and performance of integrated water quality improvement strategies.
- Significant performance and economic benefits can be realized by integrating Everglades water quality improvement measures with CERP projects, and modifications to the design and operation of planned CERP projects should be considered.

2.1 Adaptive Management. Given the complexity and scale of the overall water quality improvement strategy recommended in the Long-Term Plan, it should be considered possible

that additional measures will be needed. Those measures will be completed through a strategy of **Adaptive Management**. The EFA acknowledges that the Long-Term Plan is a planning document that shall be revised by **adaptive management** throughout the course of its implementation.

Revisions to the Long-Term Plan shall be incorporated through an adaptive management approach including a process development and engineering component to identify and implement incremental optimization measures for further phosphorus reductions [s. 373.4592(3)(b), F.S.]

The **Process Development and Engineering (PDE)** component of the Long-Term Plan consists of a series of focused efforts directed towards increasing the certainty that the overall water quality improvement objectives can be met by completion of the recommended measures. The PDE activities are designed to

- Further the understanding and optimize performance in existing and proposed facilities such as the STAs
- Facilitate integration with CERP projects
- Maintain and improve upon the contribution of source controls
- Investigate ways to accelerate the recovery of previously impacted areas in the EPA

The three categories of adaptive implementation anticipated in the Long-Term Plan are summarized in **Table 1** and described below.

Table 1. Categories of Adaptive Implementation in the Long-Term Plan

Category	Description	Level of Approval
1. Continuous Refinement Measures	Additional water quality improvement measures that can be implemented immediately, including the period before December 31, 2006. These measures may include operational and vegetation management refinements to the STAs.	FDEP, depending on degree of refinement
2. Post-2006 Measures	Additional water quality improvement measures, if needed, which may be implemented after October 1, 2006 to achieve the long-term water quality and quantity goals for the Everglades. These measures may include conversion of vegetation or additional structural modifications within the footprint of an STA and integration with CERP projects.	FDEP
3. Post-2008 Measures	Additional water quality improvement measures, if needed, which may be implemented after October 1, 2008 to achieve the long-term water quality and quantity goals for the Everglades. These activities may include expansion of STAs in ECP Basins, diversion works and new treatment facilities in ESP Basins.	FDEP and Legislature

2.2 Continuous Refinement. It is the intent of the Long-Term Plan that additional steps, once identified and their need confirmed, be expeditiously implemented. Examples include refining STA operational procedures and vegetation management activities as the body of knowledge increases. In addition, annual evaluations will address attainment of water quality standards,

including the numeric phosphorus criterion and other water quality improvement objectives of the Everglades Forever Act, and will recommend additional measures as may then be considered necessary. The evaluations will be presented and reviewed at the District's public STA Design Review Staff meetings and the annual public meetings on the implementation progress of the Long-Term Plan. Information and recommendations resulting from the PDE effort are intended to be coordinated by the District, in consultation with the Department, and implemented through the renewal process for the District's permits and other public processes.

Continuous refinement measures include activities that can be and are being implemented immediately based on early PDE results or other newly available information. Funding for the *continuous refinement measures*, although not explicitly identified in the Long-Term Plan, has been and should continue to be made available within the framework of the existing Long-Term Plan project components. Examples of *continuous refinement measures* include:

- Operational modifications such as termination of Lake releases to one or more STAs;
- Redirection of water supply deliveries normally sent through the STAs and to the A. R. M. Loxahatchee National Wildlife Refuge (Refuge);
- Lowering of average operating depths for SAV treatment cells within an STA;
- Extensive vegetation management activities focusing on control of undesirable vegetation communities such as water hyacinth or hydrilla; and
- Integration with CERP projects including providing assistance and funds for planning, design and engineering studies.

The above types of continuous refinement activities are intended to continue throughout the implementation of the Long-Term Plan, not just during the period leading up to December 31, 2006.

2.3 Post-2006 Measures. The strategies recommended in Parts 2 and 3 of the Long-Term Plan afford the possibility of meeting a long-term geometric mean TP concentration of 10 ppb in discharges from the various basins. However, it is also possible that the recommended improvements and strategies will not, in and of themselves, provide adequate assurance of an ability to consistently meet that objective on a long-term basis.

Given the complexity and scale of the overall water quality improvement strategy recommended herein, it should be considered possible that additional measures will be needed. Those measures will be completed through a strategy of **Adaptive Implementation**. The following is a list of some measures that might be included in such an adaptive implementation strategy:

- Conversion of additional lands in the STAs to SAV, or other vegetative communities;
- Additional structural and operational modifications within existing STAs;
- Interbasin transfer of water among the STAs for more integrated and improved operation.
- Integration of water quality improvement strategies into CERP projects;
- Implementation of more aggressive urban and agricultural source control programs.

It is intended that additional measures be expeditiously implemented following confirmation of their scientific defensibility and confirmation of their need, both of which are intended to result

from the Process Development and Engineering component discussed in Part 5 of the Long-Term Plan.

The PDE plan component will continue through 2016, with annual evaluations of the data collected and model refinements. The evaluations will address attainment of the planning objective and other long-term water quality improvement objectives of the Everglades Forever Act, and will recommend additional measures as may then be considered necessary. The evaluations will be presented and reviewed at the District's public STA Design Review Staff meetings. Information and recommendations resulting from the PDE effort are intended to be coordinated by the District, in consultation with the Department, and implemented through the renewal process for the District's permits and other public processes. It is the intent of the Long-Term Plan that additional steps, once identified and their need confirmed, be expeditiously implemented. Documentation of any *Post-2006 measures* will be to a level of detail not less than that presented for the Pre-2006 Projects.

It is intended that science and engineering factors will drive the decision process for the adaptive implementation of additional measures. The funding needs projected for the adaptive implementation process include an **allowance** of \$36 million, initially distributed as \$9 million per year in each of Fiscal Years 2007 through 2010. **It is further intended that those measures be implemented without waiting for a response from the 2008 Report (discussed below).**

2.4 Post-2008 Measures. The Long-Term Plan includes identification and adaptive implementation of additional water quality improvement measures that may be necessary to comply with water quality standards following completion of the pre-2006 activities based on ongoing analysis of the PDE effort. It is the intent of the Long-Term Plan to evaluate pre-2006 steps, commencing in January 2007 and extending over a two-year period, during which the required performance information is acquired and analyzed. These activities includes implementation of steps identified that are capable of accelerating the recovery of previously impacted areas in the EPA, including final implementation of the hydropattern restoration activities directed by the EFA once water quality standards, including the phosphorus criterion, are achieved. It is further intended that the District, no later than December 31, 2008, submit a comprehensive report to the Governor and Legislature on the status and progress of the Long-Term Plan. This 2008 timing is anticipated to coincide with the renewal of the Long-Term permits required under Section 10 of the EFA. That report, which is intended to be separate from the Everglades Consolidated Report, should include:

- A summary of the measured performance of the pre-2006 projects in improving the quality of water discharged to the EPA;
- A comparison of that performance to the performance which would have been anticipated employing the analytical tools utilized in the Long-Term Plan;
- Recommended updates to analytical tools to more closely reflect the actual performance of the pre-2006 projects, including:
 - Model structure;
 - Parameter calibrations;
 - Uncertainty analyses.

- Updated and refined estimates of basin runoff volumes and loads, including the extent to which they are then expected to be modified by completion of CERP;
- Evaluation of the performance and cost-effectiveness of specific pre-2006 measures;
- Identification of post-2006 measures necessary to achieve or maintain water quality standards and the goals of the EFA, together with an evaluation of the cost-effectiveness of those measures.

The EFA further states that “Not later than December 31, 2008, and each 5 years thereafter, the department shall review and approve incremental phosphorus reduction measures” [s. 373.4592(3)(e), F.S.]. Legislative review and approval of revisions to the initial 13-year (through 12/31/2016) phase is not required, but Legislative review and approval is required of the 10-year second phase (post 12/31/2016), if additional measures are necessary, prior to implementation.

2.5 PDE Organization. The PDE activities were specifically designed to improve the performance of the four primary elements of the Long-Term Plan:

1. STAs
2. Integration with CERP projects
3. Source controls, and
4. Recovery of impacted areas

A summary of the PDE and related activities is provided in **Table 2**. The relationship of these activities to the four primary elements is presented in **Figures 1 and 2**.

The remaining sections of this paper clarify how the various PDE activities contained within the Long-Term Plan work together to achieve the overall Everglades water quality objectives. Clarification is provided on the process by which these PDE activities will be synthesized to form the basis for adaptive implementation.

Table 2. Summary of PDE and Related Activities

Project Code	Project Description	Ref. Section No.
Bc05	ECP Operations Monitoring	8.4
ESP BASINS		3
Bc75	Acme Basin B	3.1
Bc71	NSID	3.2
Bc72	NNRC Basin	3.3
Bc73	C-11 West Basin	3.4
Bc74	Feeder Canal Basin	3.6
PROCESS DEVELOPMENT AND ENGINEERING (PDE)		5
Basin Source Controls		5.1
Bc81(1)	EAA Basins - Source Controls	5.1.1
Bc81(2)	C-139 Basin - Source Controls	5.1.2
Enhanced Control and Monitoring		5.2
Bc82(1)	Acquisition of Survey Data	5.2.1
Bc82(2)	Additional Flow and Water Quality Monitoring Stations	5.2.2
Bc82(3)	Review and Correction of Flow Measurement Anomalies	5.2.3
Bc82(4)	Analysis and Interpretation	5.2.4
Bc82(5)	Update and Maintenance of Hydraulic Models	5.2.5
Improved Analytical and Forecasting Tools		5.3
Bc83(1)	Continued Development and Refinement of DMSTA	5.3.1
Bc83(2)	Water Quality Impacts of Reservoirs	5.3.2
Bc83(3)	PSTA Investigations	5.3.3
Bc83(4)	PSTA Demonstration Project in STA-3/4	5.3.3
Optimizing SAV Performance		5.4
Bc84(1)	Operational Strategy	5.4.1
Bc84(2)	Vegetation Maintenance	5.4.2
Bc84(3)	Hydrologic and Hydraulic Assessment	5.4.3
Bc84(4)	Internal Measurements	5.4.4
Bc84(5)	Comparative Analysis	5.4.5
Additional Structural and Operational Measures		5.5
Bc25	Evaluation of Full-Scale STA Enhancements	5.5.1
Improved Reliability of Inflow Forecasts		5.6
Bc86(1)	Update Baseline Data Sets	5.6.1
Bc86(2)	Basins With Limited Current Data	5.6.2
Bc86(3)	Influence of CERP Projects on Inflow Volumes and Loads	5.6.3
Bc86(4)	Lake Okeechobee Long-term Trends	5.6.4
Bc86(5)	Determine Water Quality Relationships in the EPA	5.6.5
ACCELERATE RECOVERY OF IMPACTED AREAS		7
Bc87(1)	Recovery Model Development and Calibration	7.1.1
Bc87(2)	Downstream Influence of Adding Clean Water to Previously Impacted Areas	7.1.2
Bc87(3)	Options for Accelerating Recovery	7.1.3
Bc87(4)	Alternatives Analysis and Plan Formulation	7.1.4
Bc87(5)	Hydropattern Restoration	7.2
Bc87(6)	Implement Steps for Recovery in Impacted Areas	7.3
Bc88	Adaptive Implementation	6.3.1

Figure 1. Relationship of PDE Activities to Overall Long-Term Plan Components

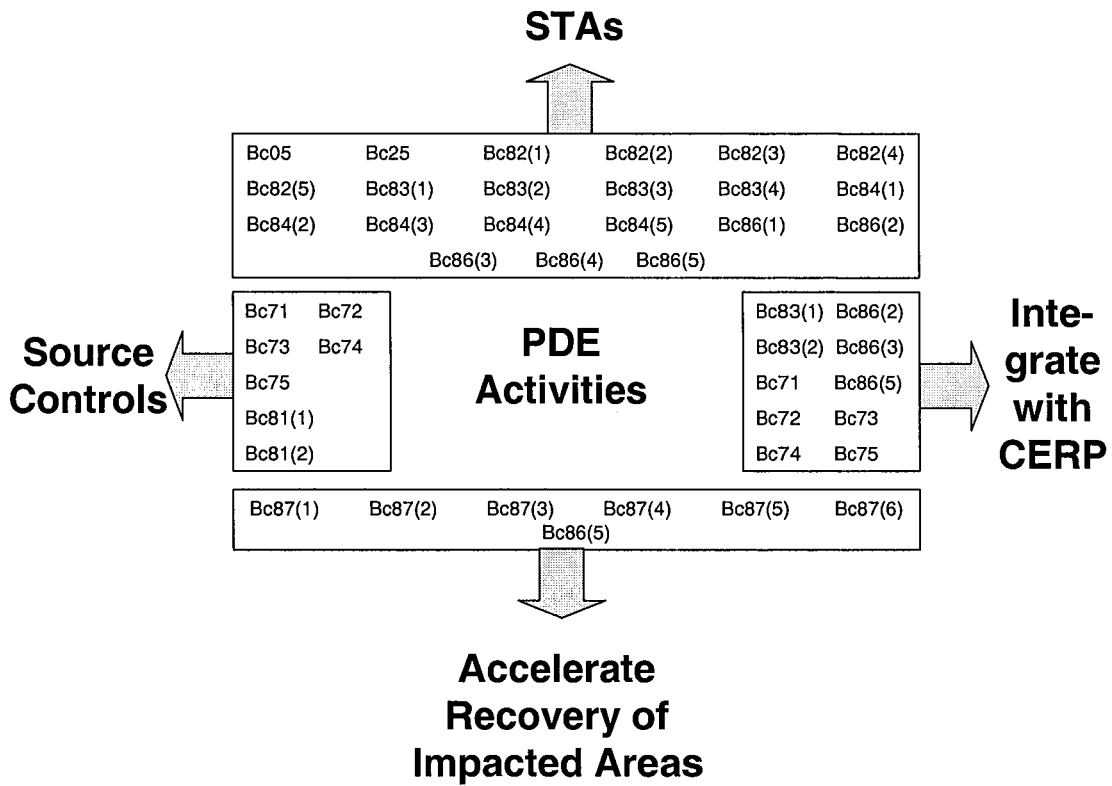
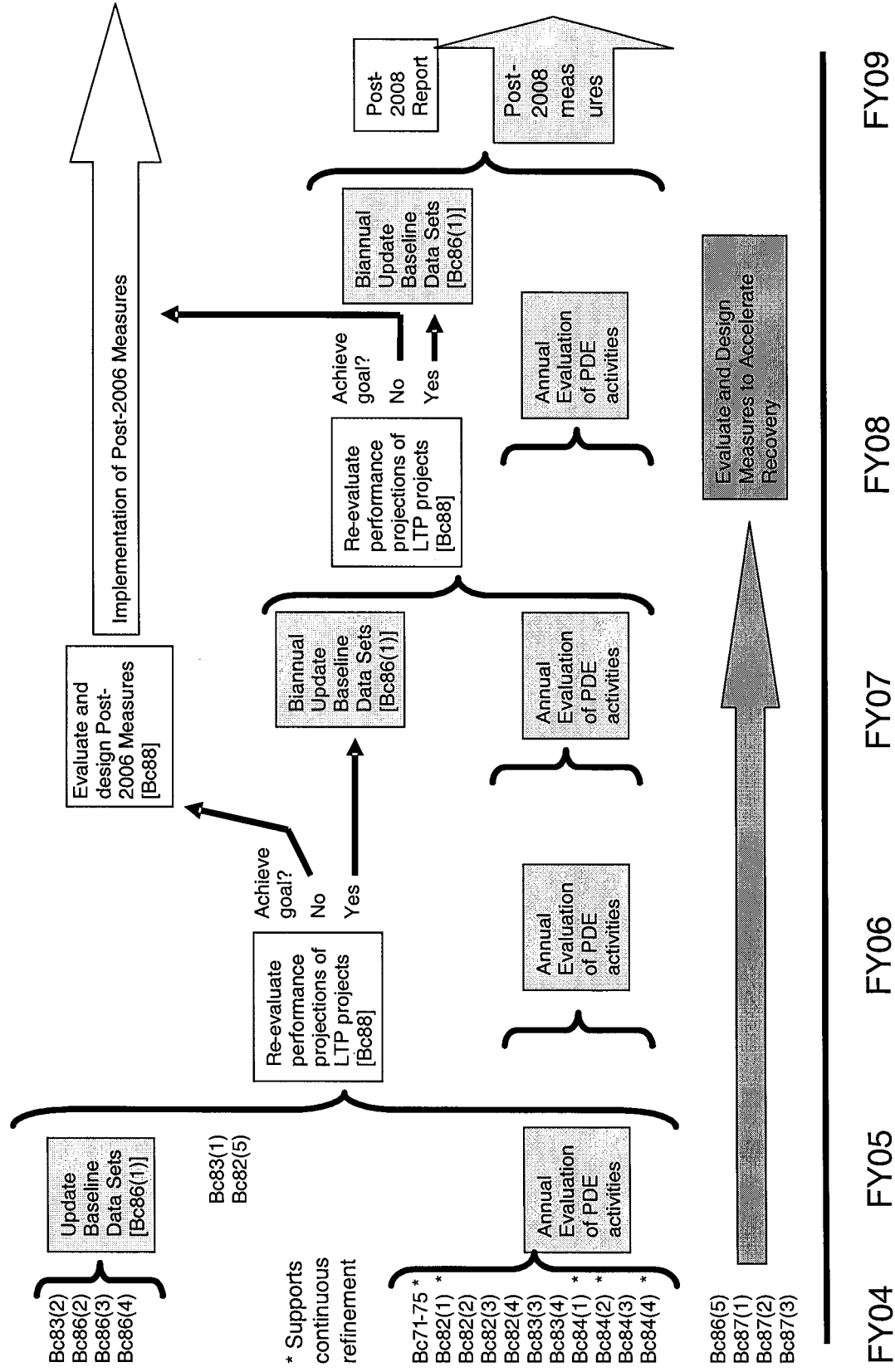


Figure 2. Relationship of PDE Activities to Improving Performance of STAs, Source Controls and Recovery



Bc83(2)
Bc86(2)
Bc86(3)
Bc86(4)

Bc83(1)
Bc82(5)

* Supports continuous refinement

Bc71-75 *
Bc82(1) *
Bc82(2)
Bc82(3)
Bc82(4)
Bc83(3)
Bc83(4)
Bc84(1) *
Bc84(2) *
Bc84(3)
Bc84(4) *

Bc86(5)
Bc87(1)
Bc87(2)
Bc87(3)

FY04 FY05 FY06 FY07 FY08 FY09

3.0 Stormwater Treatment Areas

3.1 Continuous Refinement

Many activities support the *continuous refinement measures* for improving performance of the STAs, including STA site management, STA vegetation management, and STA operations. In addition, many PDE activities will generate information that can be instrumental in effecting refined operational or vegetation changes, such as *Acquisition of Survey Data* [Bc82(1)], *Operational Strategy (SAV)* [Bc84(1)], *Vegetation Maintenance (SAV)* [Bc84(2)], and *Internal Measurements* [Bc84(4)].

3.2 Pre-2006 Measures

The key projects that synthesize information from PDE activities are *Improved Reliability of Inflow Forecasts* [Bc86(1)], the annual evaluation of data in *Analysis and Interpretation* [Bc82(4)], and *Adaptive Implementation* [Bc88].

Principal Steps for Assimilating Results from *Improved Reliability of Inflow Forecasts* [Bc86(1)]

A key component of the PDE process is the component referred to as *Improved Reliability of Inflow Forecasts* [Bc86(1)]. The following steps are proposed for assimilating the results of the various projects in this PDE component:

Step 1

- Evaluate accuracy of existing Baseline Data Sets
- Compare with observed post-BMP flow & load data for each STA
- Separate lake and runoff sources
- Adjust runoff comparisons for variations in rainfall (e.g., regression method)
- Identify discrepancies
- Identify potential causes

Step 2

- Update Baseline Data Sets to reflect new information
- Recalibrate SFWMM as required for consistency with post-BMP data in each basin
- Adjust for changes in water management (e.g., reductions in Lake releases to S-5A)
- Adjust for changes in Lake and runoff P concentrations
- Check revised datasets for consistency with flow & load data in each basin
- Update C-51 W data
- Update information in the SFWMM for the Phase 1 EAA Storage Reservoir Project
- This step relies on new SFWMM Baseline run to be completed by June 2004 & new SFWMM run including EAA Storage Reservoir to be completed by January 2005.

Step 3

- Evaluate potential impacts of modified flows & loads on STAs in current Long-Term Plan
- Update performance forecasts - outflow loads and concentrations using DMSTA
- Update DMSTA calibrations to reflect STA operating data

- Forecast using existing & updated DMSTA calibrations e.g., NEWS, SAV-C4, STA-specific calibration

Steps 1 and 2 are currently underway. District staff have met with Dr. Walker and Dr. Kadlec to discuss the apparent underestimation of EAA runoff in the SFWMM simulation used as the basis of the Basin-Specific Feasibility Studies and the Long-Term Plan. District staff evaluated the rainfall/runoff relationship for the EAA and have completed a recalibration of the model for the EAA on a basin by basin basis. District staff are currently working to develop a new SFWMM Baseline (pre-CERP) simulation for use in updating the projected STA inflow volumes. District staff are also evaluating recent observed flow and load data for use in updating the regression relationships that are to be used with the new SFWMM flows to develop daily inflow loads for each of the STAs. Step 3 components, such as updating DMSTA calibrations, should occur on a parallel path with Steps 1 and 2 so when the updated Baseline Data Sets are complete, the updated performance forecasts can be completed.

3.3 Post-2008 Measures

On a parallel path with the implementation of the *Pre-2006 measures* and evaluation of potential *Post-2006 measures*, District staff continue to monitor the status of the additional treatment area locations identified in the Long-Term Plan as potential *Post-2008 measures*. For those properties identified as potential additional treatment areas, District staff are working to ensure that no irreversible use or development is permitted until such time as the recommended reservations in use expire.

No recommended funding or funding source was identified for implementation of additional treatment areas. Because of the relatively high costs but relatively small increase in treatment performance associated with these additional treatment areas, the Long-Term Plan recommends that they be implemented only after their need is conclusively demonstrated. In the mean time, the following publicly owned properties are being monitored for potential additional treatment area in the ECP Basins should their need be conclusively demonstrated:

- Snail Farm (1,380 acres to assist STA-1W and/or STA-2)
- Former Obern Property (514.91 acres in Hendry County to assist STA-5)
- Western Reservoir a.k.a. Compartment C (to assist STA-5 and/or STA-6)
- Eastern Reservoir a.k.a. Compartment B (to assist STA-2 and/or STA-3/4)
- Section 24 (375+ acres to assist STA-1E)

It should be noted that in Part 6 of the Long-Term Plan, it is recommended that detailed planning and design for expanded treatment areas should be undertaken no earlier than FY2011 – 2013.

Proposed Steps for Evaluating Potential Post-2006 Measures – Bc88 – Adaptive Implementation

A methodology is needed to evaluate what if any *Post-2006 measures* should be implemented once the results of **Improving the Reliability of Inflow Forecasts** and the other PDE components shown in **Table 1** are available. Using the results of Step 3 above, the updated

DMSTA predicted long-term geometric TP concentrations for the STAs can be compared to the performance projections shown in the Long-Term Plan.

If the revised performance projections are unchanged from those in the Long-Term Plan, that is, if it is predicted that the long-term water quality goals will be met, then *Post-2006 Measures* would not be necessary. However, if it is predicted that the long-term water quality goals will not be met, the next step is to develop and evaluate alternatives geared toward achieving the goals. This analysis would include evaluating the cost-effectiveness of each alternative developed. Similar to the process utilized during the Basin-Specific Feasibility Studies (BSFS), this evaluation of alternatives is intended to develop the information necessary for informed decision making. Once the evaluation of alternatives has been reviewed and additional measures have been recommended, the next step is to submit the proposed Long-Term Plan revisions (describing the recommended additional measures) to the FDEP for approval as required by the 2003 amended EFA.

The final step is to implement the recommended measures consistent with the FDEP approval of the proposed revisions to the Long-Term Plan. This step would include design and construction of projects slated for implementation under the Bc88 Adaptive Implementation Long-Term Plan component.

4.0 CERP

The potential benefits of synchronizing Florida's efforts to achieve the phosphorus criterion with CERP were recognized by the Legislature in the EFA:

(c) It is the intent of the Legislature that implementation of the Long-Term Plan shall be integrated and consistent with the implementation of the projects and activities in the Congressionally authorized components of the CERP so that unnecessary and duplicative costs will be avoided. Nothing in this section shall modify any existing cost share or responsibility provided for projects listed in s. 528 of the Water Resources Development Act of 1996 (110 Stat. 3769) or provided for projects listed in section 601 of the Water Resources Development Act of 2000 (114 Stat. 2572). The Legislature does not intend for the provisions of this section to diminish commitments made by the State of Florida to restore and maintain water quality in the Everglades Protection Area, including the federal lands in the settlement agreement referenced in paragraph (4)(e).

The primary mechanism by which CERP projects in the ESP Basins will improve water quality in the EPA is to divert pollutant-laden stormwater away from the Everglades. CERP projects in the ECP basins, such as the EAA Storage Reservoir and the Bolles and Cross Canal Improvements projects, can potentially improve the treatment performance of one or more of the STAs by providing flow-equalization and/or interbasin transfer of water.

[This section is to be completed later]

Describe current and future proposed Long-Term Plan activities involving integration with CERP projects

- ECP basins
 - EAA Storage Reservoir
 - Bolles and Cross Canal Improvements

- ESP basins
 - C-11 Impoundment
 - Acme Basin B
 - Feeder Canal
 - L-28 Canal
 - NSID
 - NNR

[This section is to be completed later]

4.1 Continuous Refinement Measures

[This section is to be completed later]

4.2 Post-2006 Measures

[This section is to be completed later]

4.3 Post-2008 Measures – ESP Basins

Potential *Post-2008 measures* for the ESP Basins are shown in the Long-Term Plan to have an estimated cost of \$577 million in 2003 dollars. The potential high cost for these measures underscores the importance of full integration with and reliance on CERP as discussed in Part 3 of the Long-Term Plan. No recommended funding or funding source was identified for implementation of these measures which might include:

- For Acme Basin B, diversion of discharges to STA-1E for treatment outside the purview of CERP;
- For the North Springs Improvement District, development of a reservoir and flow diversion outside the purview of CERP;
- For the C-11 West Basin, development of a new STA, outside the purview of CERP.
- For the North New River Basin, development of additional capacity for diverting discharges from G-123;
- For the L-28 Basin, development of the tribal STAs as generally recommended in Part 3 of the Long-Term Plan outside the purview of CERP;
- For the Feeder Canal Basin, development of an additional STA outside the purview of CERP

It is important to note that the land availability and cost analyses that formed the basis of the evaluations completed for the Basin-Specific Feasibility Studies, and were incorporated into Part 6 of the Long-Term Plan, were completed in mid-2002. The lands in the urban areas, such as C-11W Basin, which were evaluated during the Studies are now most likely completely developed.

Any additional lands which might be required in urban areas in support of *Post-2008 measures* would be substantially higher in cost than the costs shown in the Basin-Specific Feasibility Studies and the Long-Term Plan. It should also be noted that acquiring these lands for a potential water quality improvement project would create a much greater impact than was previously considered due to the need to demolish homes and buildings and to relocate residents and landowners.

5.0 Source Controls

Describe Source Control activities included in Long-Term Plan.

Describe other Source Control strategies:

- EAA BMP rule
- C-139 BMP rule
- ESP RAS activities

Need to add individual figure of Source Control activities

[This section to be completed later]

5.1 Continuous Refinement Measures

[This section to be completed later]

5.2 Post-2006 Measures

[This section to be completed later]

5.3 Post-2008 Measures – ESP Basins

[This section to be completed later]

6.0 Accelerate Recovery of Impacted Areas

Florida's Everglades Forever Act of 1994 directed the implementation of the overall strategy for water quality improvement and hydropattern restoration outlined in the February, 1994 *Everglades Protection Project, Conceptual Design* (Burns & McDonnell 1994). That *Conceptual Design* included, in addition to the various stormwater treatment areas constructed under the Everglades Construction Project, certain works specifically intended to restore a sheet flow approximation to various areas along the northerly boundary of the Everglades Protection Area (EPA). The overall structure and hydrologic analysis of the Comprehensive Everglades Restoration Plan (CERP) considers that the entire 1994 Everglades Construction Project (including those hydropattern restoration components) is complete and in place.

The 1994 Everglades Construction Project (ECP) was developed to achieve certain interim goals for improvement in the quality of water discharged to the EPA, while recognizing that additional

steps might be necessary for meeting final water quality standards in those discharges. Those additional steps necessary for meeting final water quality standards are the primary subject matter of the Long-Term Plan. During implementation of the 1994 ECP, continuing concern over the potential impact of discharging waters meeting the interim goals, but potentially not the final standards, on previously unimpacted areas of the EPA led to a delay in the implementation of those hydropattern restoration works. In essence, the permits issued for the various stormwater treatment areas specifically excepted completion and operation of all or major components of the following hydropattern restoration projects:

- WCA-2A Hydropattern Restoration
- East WCA-3A Hydropattern Restoration
- West WCA-3A Hydropattern Restoration

The hydropattern restoration features contemplated in the EFA will distribute water along a broad boundary of the water conservation areas. Benefits include restoring more natural hydroperiods throughout the northern Everglades. While that redistribution will not reduce the total phosphorus load delivered to the Everglades, it will reduce the areal loading rate, another added benefit of the proposed work. The current discharge configuration concentrates the total phosphorus load at the location of the outlet structures. The proposed configurations will spatially distribute this load as function of the modified outlet works.

Part 7 of the Long-Term Plan outlines a strategy for completion of the hydropattern restoration works originally envisioned in the Everglades Forever Act, the general location and extent of which are shown in **Figure 3**.

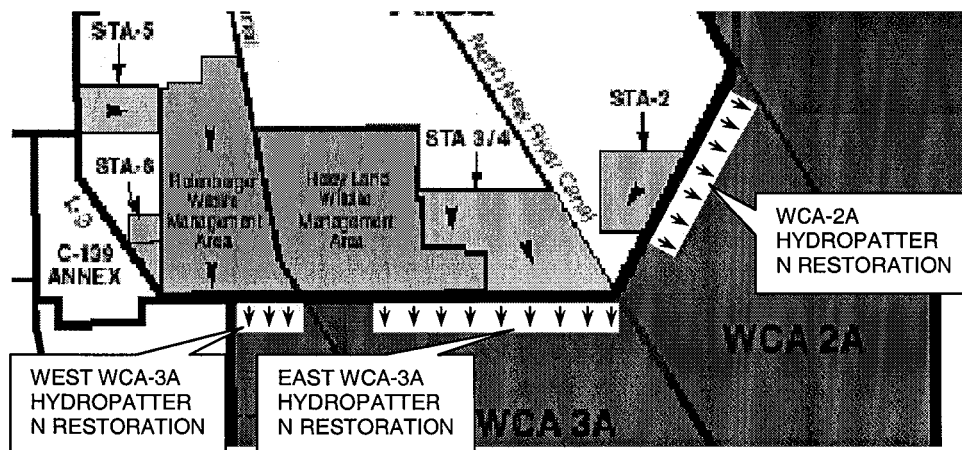


Figure 3. EFA Hydropattern Restoration Works

Given that the intended hydropattern restoration works will redistribute flow to areas in the EPA not previously impacted by high phosphorus discharges, it is desirable to fully understand the following prior to construction and operation of those works:

- The degree to which discharges from the stormwater treatment areas comply with water quality standards;

- The potential impact of the newly relocated discharges on previously unimpacted areas;
- The extent to which modification of the discharge patterns will permit the recovery of previously impacted areas (e.g., areas downstream of the current point discharges). Both spatial and temporal estimates of recovery would be desirable;
 - In anticipation that natural recovery will require an extended period of time, it will also be desirable to develop options and methods for accelerating the recovery of previously impacted areas.
- The downstream consequences of adding “clean” water to previously impacted areas;
- The compatibility of the proposed design and operation with other long-term changes to the regional hydrography (e.g., CERP).

Accordingly, Part 7 of the Long-Term Plan includes:

- A plan for development of the necessary planning and analytical tools;
- A conceptual description of the physical works for hydropattern restoration, which are subject to adjustment prior to full design and implementation, together with estimates of the capital and incremental operation and maintenance costs associated with those works;
- The proposed implementation schedule;

The Accelerate Recovery of Impacted Areas component of the Long-Term Plan includes the following activities:

- Recovery Model Development and Calibration
- Downstream Influence of Adding Clean Water to Previously Impacted Areas
- Options for Accelerating Recovery
- Alternatives Analysis and Plan Formulation
- Hydropattern Restoration works

Insert new figure of activities to accelerate recovery of impacted areas

[This section to be completed later]

6.1 Continuous Refinement Measures

[This section to be completed later]

6.2 Post-2006 Measures

[This section to be completed later]

6.3 Post-2008 Measures – ESP Basins

[This section to be completed later]

7.0 Summary

The Long-Term Plan is predicated upon maximizing water quality improvement through an adaptive implementation process in which

- All scientifically defensible steps are taken at the earliest achievable dates, and in full recognition of the timeline established in the EFA.
- Focused efforts are directed to improving the scientific and technical basis for additional steps, leading to incremental implementation of those steps as soon as their need is confirmed.
- The synergy between this effort and other regional efforts, in particular the Comprehensive Everglades Restoration Plan (CERP) is recognized and maximum benefit realized from full integration with those efforts.
- Existing and proposed treatment facilities are operated, maintained and monitored to maximize their treatment effectiveness.
- Steps are taken to accelerate the recovery of previously impacted areas in the EPA, including completion of the hydropattern restoration goals of the EFA.

The Long-Term Plan represents the most aggressive approach to achieving the goals of the Everglades Forever Act supportable by the current scientific and technical knowledge base. Other, presently unidentified, future steps may be needed. The Long-Term Plan presents a rational basis for identification and early implementation of those steps, if and as they are needed.

This paper clarifies how the various Process Development and Engineering activities contained within the Long-Term Plan work together to achieve the overall Everglades water quality goals. Clarification is provided on the process by which these PDE activities will be synthesized to form the basis for the adaptive implementation activities.