FINAL REPORT

EVERGLADES PROTECTION AREA TRIBUTARY BASINS

LONG TERM PLAN FOR ACHIEVING WATER QUALITY GOALS

OCTOBER 27, 2003

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Mr. Nicolas J. Gutierrez, Jr., Esq.
Chairman of the Governing Board
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406

Everglades Protection Area Tributary Basins
Long-Term Plan for Achieving Water Quality Goals
Burns & McDonnell Project No. 32233

Dear Chairman Gutierrez:

Burns & McDonnell is pleased to present this *Long-Term Plan for Achieving Water Quality Goals* in the Everglades Protection Area Tributary Basins. This document updates the September 18, 2003, Review Draft to respond to comments received from stakeholders and the public. A listing of the changes made to that Review Draft is included as Appendix B to this Long-Term Plan.

We gratefully acknowledge the key contributions of many of your staff, as well as that of staff of the Florida Department of Environmental Protection and the Everglades Agricultural Area Environmental Protection District, to the development of this Long-Term Plan.

Sincerely,

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LONG-TERM PLAN For ACHIEVING WATER QUALITY GOALS

October 27, 2003

INDEX AND CERTIFICATION

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Certification

I hereby certify, as a Professional Engineer in the State of Florida, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the South Florida Water Management District or others without specific verification or adaptation by the Engineer. This certification is made in accordance with the provisions of the Laws and Rules of the Florida Board of Professional Engineers under Chapter 61G15-29, Florida Administrative Code.

Galen E. Miller, PE Florida PE # 40624
Date: October 27, 2003
(Reproductions are not valid unless signed, dated and embossed with Engineer's seal)

SYNOPSIS

Substantial progress towards reducing phosphorus levels discharged into the Everglades Protection Area (EPA) has been made by the State of Florida and other stakeholders. The combined performance of the regulatory program in the Everglades Agricultural Area (EAA) and the stormwater treatment areas of the Everglades Construction Project, both mandated by Florida's Everglades Forever Act (EFA), has exceeded expectations. In addition, some source control measures have been implemented in urban and other tributary basins included in the Everglades Stormwater Program. Nonetheless, additional measures are necessary to ensure that all discharges to the EPA meet water quality standards and the goals established in the EFA, including compliance with the phosphorus criterion established in Rule 62-302.540, F.A.C. This document sets forth a Long-Term Plan developed by technical representatives of the South Florida Water Management District (District), the Florida Department of Environmental Protection (FDEP), the EAA Environmental Protection District, and other stakeholders for achieving compliance with the phosphorus criterion. This 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 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.

This document updates the March 17, 2003, *Conceptual Plan for Achieving Long-Term Water Quality Goals*, Burns & McDonnell, to reflect additional guidance provided by the Florida Legislature in its 2003 amendment of the EFA. It specifically addresses the initial 13-year phase (FY 2004-2016, inclusive) defined in that 2003 amendment to the EFA. In addition, this update of the original *Conceptual Plan* has been modified as necessary to respond to comments received from stakeholders and the public.

Following operation of the Pre-2006 projects, the long-term geometric mean TP concentrations in discharges from the Everglades Construction Project, equal to approximately 88% of the water entering the Everglades, are predicted to range from 10-14 ppb. The only basins that are predicted to have discharge concentrations above that range after December 31, 2006 are those basins that have future CERP projects. These include the North Springs Improvement District, C-11 West, L-28 and Feeder Canal basins. Those basins' discharges account for approximately 12% of the total surface flows to the Everglades after completion of the Pre-2006 Projects and CERP projects scheduled for completion prior to December 2006.

The total estimated expenditures during Fiscal Years 2004 through 2016 for full implementation of this Long-Term Plan (excluding expenditures for presently identified CERP efforts) are $444 million. Proposed funding strategies, together with response to comments received as a result of additional Legislative, public and interagency review of this Plan, will be addressed prior to the District's submittal of the long-term permit application on December 31, 2003 required by the Everglades Forever Act. Should any significant element of the recommended strategy ultimately prove unsuccessful in its contribution to achieving water quality standards, more funding may be needed. It is anticipated that, no later than December, 2013, updated project scopes, cost estimates, and implementation schedules will be developed for the second ten-year period (2017-2026) defined in the EFA as may be needed to achieve compliance with the phosphorus criterion. The possible magnitude of that additional funding is sufficiently large that it definitively underscores the need to treat the various elements of this Long-Term Plan as an integrated whole, as failure to do so could lead to the need for unnecessary future expenditures.

The technical representatives of the various agencies and other stakeholders involved in formulation of this Long-Term Plan consider it to represent 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. This Long-Term Plan presents a rational basis for identification and early implementation of those steps, if and as they are needed.

* * * * *

EXECUTIVE SUMMARY

The long-term Everglades water quality goal is to achieve the phosphorus criterion in the Everglades Protection Area. This document sets forth the initial phase of a plan to ultimately achieve that goal, and to permit the State of Florida and the South Florida Water Management District (District) to proceed to fulfillment of 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). Implementation of this Plan shall achieve water quality standards relating to the phosphorus criterion in the Everglades Protection Area by December 31, 2006. This plan consists of an optimal combination of source controls, Stormwater Treatment Areas (STAs), Advanced Treatment Technologies (ATTs), regulatory programs and integration with CERP projects for achieving water quality standards. In addition, this plan continues the strong science base and adaptive implementation philosophy to allow continuous improvement until the long-term water quality goal is achieved.

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 regulatory program in the Everglades Agricultural Area (EAA) and the STAs constructed under the 1994 Everglades Construction Project (ECP), both mandated by the EFA, has exceeded expectations. Current projections suggest that, once all STAs are operational, the best estimate of the long-term flow-weighted mean TP concentrations in discharges from the ECP to the EPA is approximately 35 ppb (with a potential range of 25-45 ppb), as compared to the interim goal of 50 ppb established in the EFA. In addition, some source control measures have been implemented in urban and other tributary basins included in the Everglades Stormwater Program. Nonetheless, additional measures are necessary to ensure that all discharges to the Everglades achieve and maintain compliance with the phosphorus criterion established in Rule 62-302.540, F.A.C.

The EFA as amended in 2003 requires that:

(10) LONG-TERM COMPLIANCE PERMITS.—*By December 31, 2006, the department and the district shall take such action as may be necessary to implement the pre-2006 projects and strategies of the Long-Term Plan so that water delivered to the Everglades Protection Area achieves in all parts of the Everglades Protection Area state water quality standards, including the phosphorus criterion and moderating provisions.*
(a) By December 31, 2003, the district shall submit to the department an application for permit modification to incorporate proposed changes to the Everglades Construction Project and other

district works delivering water to the Everglades Protection Area as needed to implement the pre-2006 projects and strategies of the Long-Term Plan in all permits issued by the department, including the permits issued pursuant to subsection (9). These changes shall be designed to achieve state water quality standards, including the phosphorus criterion and moderating provisions. During the implementation of the initial phase of the Long-Term Plan, permits issued by the department shall be based on BAPRT, and shall include technology-based effluent limitations consistent with the Long-Term Plan, as provided in subparagraph (4)(e)3.

(b) If the Everglades Construction Project or other discharges to the Everglades Protection Area are in compliance with state water quality standards, including the phosphorus criterion, the permit application shall include:

1. A plan for maintaining compliance with the phosphorus criterion in the Everglades Protection Area.

2. A plan for maintaining compliance in the Everglades Protection Area with state water quality standards other than the phosphorus criterion.

This Long-Term Plan is intended to accompany and support the District's application for permit modification. This document updates and modifies the March 17, 2003 *Everglades Protection Area Tributary Basins, Conceptual Plan for Achieving Long-Term Water Quality Goals*, Burns & McDonnell, to reflect the Legislature's guidance as expressed in the EFA as amended, which states:

(3) EVERGLADES LONG-TERM PLAN.

(b) The Legislature finds that the most reliable means of optimizing the performance of STAs and achieving reasonable further progress in reducing phosphorus entering the Everglades Protection Area is to utilize a long-term planning process. The Legislature finds that the Long-Term Plan provides the best available phosphorus reduction technology based upon a combination of the BMPs and STAs described in the Plan provided that the Plan shall seek to achieve the phosphorus criterion in the Everglades Protection Area. The pre-2006 projects identified in the Long-Term Plan shall be implemented by the district without delay, and revised with the planning goal and objective of achieving the phosphorus criterion to be adopted pursuant to subparagraph (4)(e)2. in the Everglades Protection Area, and not based on any planning goal or objective in the Plan that is inconsistent with this section. 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. Revisions to the Long-Term Plan shall be approved by the department. In addition, the department may propose changes to the Long-Term Plan as science and environmental conditions warrant.

(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).

(d) The Legislature recognizes that the Long-Term Plan contains an initial phase and a 10-year second phase. The Legislature intends that a review of this act at least 10 years after implementation of the initial phase is appropriate and necessary to the public interest. The review is the best way to ensure that the Everglades Protection Area is achieving state water quality standards, including phosphorus reduction, and the Long-Term Plan is using the best technology available. A 10-year second phase of the Long-Term Plan must be approved by the Legislature and codified in this act prior to implementation of projects, but not prior to development, review, and approval of projects by the department.
(e) The Long-Term Plan shall be implemented for a initial 13-year phase (2003-2016) and shall achieve water quality standards relating to the phosphorus criterion in the Everglades Protection Area as determined by a network of monitoring stations established for this purpose. Not later than December 31, 2008, and each 5 years thereafter, the department shall review and approve incremental phosphorus reduction measures.

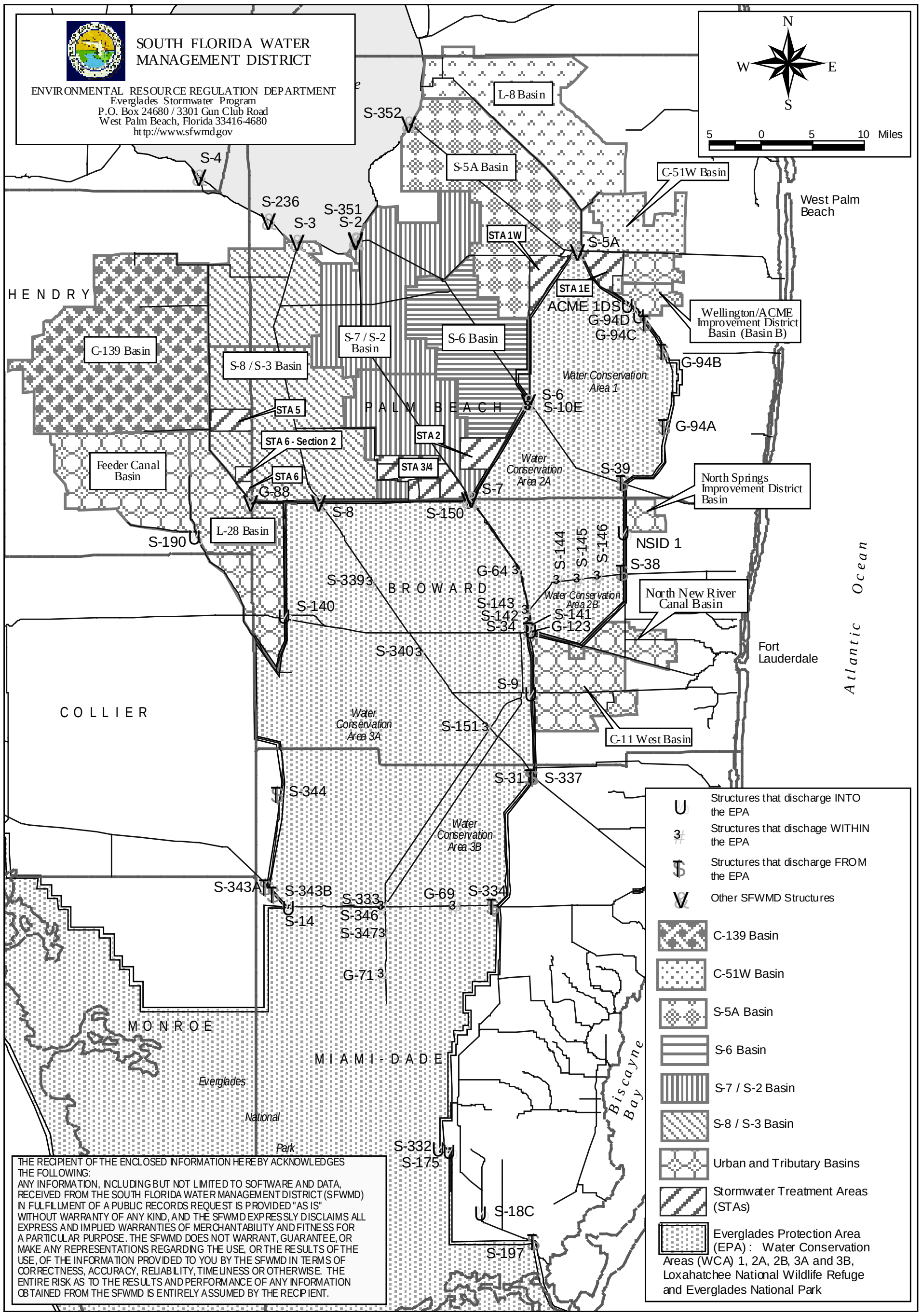
A summary listing of the basins addressed in this Long-Term Plan is presented in Table ES-1; they are organized into two primary groupings:

- Those basins for which an interim water quality improvement strategy has been implemented through the 1994 Everglades Construction Project (the ECP Basins)
- Urban and other tributary basins not addressed by the 1994 ECP (the Everglades Stormwater Program, or ESP, Basins). Two other basins (C-111 Basin and Boynton Farms Basin) will be addressed by other District and Federal programs, and are not further discussed herein.

Table ES.1 Summary of Hydrologic Basins Addressed in This Long-Term Plan

Everglades Construction Project (ECP) Basins	
Hydrologic Basin	**Receiving Stormwater Treatment Area (STA)**
S-5A	STA-1W, STA-1E
S-6	STA-2
S-7/S-2	STA-3/4
S-8/S-3	STA-3/4, STA-6
Note: The above basins are referred to conjunctly as the Everglades Agricultural Area (EAA) Basin	
C-51 West	STA-1E
C-139	STA-5, STA-3/4
C-139 Annex	STA-6
Everglades Stormwater Program (ESP) Basins	
Acme Improvement District, Basin B (Acme B)	
North Springs Improvement District (NSID)	
North New River Canal (NNRC)	
C-11 West	
L-28	
Feeder Canal	

The location of the basins is shown in Figure ES-1.



ERRD/ESP REV. 04-JUN-2001 CMIESSAU x:\ever-gis\ecp\aprfiles\ECP-Basins-cm1.apr Basin Feasibility Studies (13 Basins)-L

Figure ES-1. Overview of the Everglades Protection Area and Tributary Basins

(This Figure includes only SFWMD permit structures, and excludes structures operated by the USACE)

As an important step towards development of the Long-Term Compliance Permit application required under the EFA, the District recently completed *Basin-Specific Feasibility Studies* for the thirteen basins referenced above, all of which presently discharge to the EPA (Burns & McDonnell, October 23, 2002; Brown & Caldwell, October 23, 2002). The following conclusions may be taken from those studies:

1) The total estimated capital cost to implement treatment measures to achieve the mandates of the EFA, if developed independent of the Comprehensive Everglades Restoration Plan (CERP) and other regional initiatives, could aggregate to hundreds of millions of dollars. Analyses presented in Part 6 of this Long-Term Plan suggest a total of approximately $578 million in the ESP basins, and an additional $88 million in the ECP basins (both figures are in FY 2003 dollars) might be <u>added</u> to the estimated expenditures under this Long-Term Plan.
2) Several of the more costly measures, particularly those in the C-11 West, North New River Canal, North Springs Improvement District, and L-28 basins, are directed at discharges which contribute a small percentage of the phosphorus delivered to the EPA.
3) Many of those measures would be unnecessary, or greatly reduced in required scope, once presently scheduled CERP projects come on-line, as:
    - Many CERP projects call for diversion of water away from the EPA.
    - Several CERP projects as presently structured specifically incorporate water quality improvement measures.

Based on those conclusions, considerable economic benefits may be realized by synchronizing EFA mandates with the CERP projects. The majority of phosphorus reduction associated with CERP projects is not due to the addition of water quality treatment measures, but rather, diversion away from the Everglades, consistent with the authorized scope of the CERP projects. This will result in significant cost avoidance, and not cost increases to CERP projects to achieve significant water quality benefits to the Everglades.

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 Florida Department of Environmental Protection Environmental Regulation Commission has adopted by rule (Rule 62-302.540, F.A.C.) a numeric phosphorus criterion for the EPA. The planning objective for phosphorus levels in discharges to the EPA considered in the *Basin Specific Feasibility Studies* was based on guidance contained in the 1994 Everglades Forever Act, which stated that:

> *The phosphorus criterion shall be 10 parts per billion (ppb) in the Everglades Protection Area in the event the department does not adopt by rule such criterion by December 31, 2003,* and
>
> *Compliance with the phosphorus criterion shall be based upon a long-term geometric mean of concentration levels to be measured at sampling stations recognized from the research to be reasonably representative of receiving waters in the Everglades Protection Area.*

The objective adopted in the development and evaluation of alternatives for the *Basin-Specific Feasibility Studies* was to obtain a predicted long-term geometric mean total phosphorus concentration of 10 ppb in discharges to the EPA. For the purposes of the *Basin-Specific Feasibility Studies*, and as carried forward herein, "long-term" is taken as that represented by a 31-year geometric mean based on model simulations. The Basin-Specific studies were a fact-finding exercise, and not intended to define the final arrangement, location and character of water quality improvement strategies in the various basins; no specific recommendations were made for alternatives to be selected and carried forward to implementation.

Technical representatives of the District, the Florida Department of Environmental Protection, the Everglades Agricultural Area Environmental Protection District, and other stakeholders have reviewed the results of the Basin Specific Feasibility Studies. Those technical representatives used those results to formulate a consensus approach to achieving the long-term water quality goals of the Everglades Forever Act. That recommended approach was set forth in the March 17, 2003 *Everglades Protection Area Tributary Basins, Conceptual Plan for Achieving Long-Term*

Water Quality Goals, Burns & McDonnell. This document consists of an update to that *Conceptual Plan* to reflect additional guidance received from the Legislature, as expressed in the newly amended EFA; respond to comments received from a variety of stakeholders; and refine (and in some instances expand) the definition of proposed actions and activities.

This Long-Term Plan is embodied in three primary components:

- **Pre-2006 Projects:** Structural and operational modifications that can be supported by the current scientific and engineering knowledge base, to be implemented where feasible by December 31, 2006, as well as operation, maintenance and monitoring of the STAs. The pre-2006 recommended improvements and strategies are considered to be the maximum scientifically defensible steps that have been identified at this time. There is a possibility that these steps will meet a planning target of a long-term geometric mean total phosphorus concentration of 10 ppb in discharges from the various basins. However, it is also possible that these 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. Therefore, the Post-2006 Strategy discussed below is included in this Plan.
- **Process Development and Engineering (PDE):** Activities designed to:
  - Further understanding and optimize water quality performance in existing and proposed facilities
  - Facilitate integration with the Comprehensive Everglades Restoration Plan (CERP)
  - Maintain and improve upon the contribution of source controls to overall water quality improvement goals.
  - Investigate ways to accelerate the recovery of previously impacted areas in the EPA.
- **Post-2006 Strategy:** Identification and adaptive implementation of additional water quality improvement measures that may be considered necessary to comply with water quality standards following completion of the pre-2006 activities based on ongoing analysis of the PDE effort. Also 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.

The Long-Term Plan summarized herein has been developed as an integrated, comprehensive strategy for achieving water quality standards and goals for discharges to the Everglades Protection Area, including the phosphorus criterion established in Rule 62-302.540, F.A.C. Substantial modification or adjustment of any part of the Plan would jeopardize its intended overall performance.

This Long-Term Plan is developed in recognition that:

- Achieving water quality standards, including the numeric phosphorus criterion (Rule 62-302.540, F.A.C.) 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, even to the extent that existing schedules should be re-evaluated in some basins and synchronized with CERP project schedules, and modifications to the design and operation of planned CERP projects should be considered.

Specific measures included in the **Pre-2006 Projects** are discussed in detail in Part 2 (for the ECP Basins) and Part 3 (for the ESP Basins) of this Long-Term Plan. A brief summary of those recommended measures is presented in Table ES.2. The projected impact of those measures on the average annual volumes and total phosphorus loads discharged to the EPA and other receiving waters is summarized in Table ES.3.

As indicated in Table ES.2, substantial reliance is placed on source controls (BMPs) and full integration with the Comprehensive Everglades Restoration Plan (CERP) in some of the basins, most notably the Everglades Stormwater Program Basins. Part 3 of this Long-Term Plan presents certain technical recommendations for water-quality improvement strategies in those basins; it is intended that those recommendations be given full consideration in the CERP planning process.

Table ES.2 Pre-2006 Strategies

Basin	Strategies and Activities	Schedule (1)	
		Construct. Complete	Full Operation
STA-1E	Convert Downstream Cells to SAV	10/01/2005	12/31/2006
STA-1W	Additional Compartmentalization; Improved Flow Control; Convert Additional Areas to SAV; Identify and Implement Cost-Effective BMPs	05/01/2006	12/31/2006
STA-2	Additional Compartmentalization; Convert Additional Areas to SAV; Identify and Implement Cost-Effective BMPs	05/01/2006	12/31/2006
STA-3/4	Additional Compartmentalization; Convert Additional Areas to SAV; Identify and Implement Cost-Effective BMPs	05/01/2006	12/31/2006
STA-5	Improved Flow Control; Convert Additional Areas to SAV; Improved Management and Control of Seepage; Identify and Implement Cost-Effective BMPs	10/01/2006	12/31/2006
STA-6	Additional Compartmentalization; Improved Flow Control; Convert Additional Areas to SAV; Add Water Supply Capability; Identify and Implement Cost-Effective BMPs	10/01/2006	12/31/2006
Acme B	The CERP process will make the final determination of the appropriate strategy and be responsible for implementation. The most promising alternative appears to be diversion to STA-1E for treatment; Develop, evaluate and implement source controls.	10/01/2006	12/31/2006
NSID	Assist Local Communities in Developing & Evaluating Urban BMPs; CERP Diversion & Elimination of Direct Discharge to EPA (Hillsboro Site 1 Project)	12/31/2007 (Note 2)	12/31/2007 (Note 2)
NNRC	CERP Diversion & Elimination of Direct Discharge to EPA (Component YY4); Discontinue Use of G-123 if No Adverse Flooding Impacts	12/31/2006	2018 (Note 2)
C-11 West	Assist Local Communities in Developing & Evaluating Urban BMPs; CERP Diversion & Substantial Elimination of Direct Discharge to EPA (Western C-11, North Lake Belt Storage); Fund Add'l Analyses to Modify Project for Increased Reliability of Diversion	12/31/2006 (Note 2, Western C-11) 2036 (Note 2, North Lake)	2036 (Full complete) Majority of Diversion Complete in 2006
L-28	The CERP process will make the final determination of the appropriate strategy and be responsible for implementation. The most promising alternative appears to be construction of Miccosukee and Seminole Tribal STAs.	10/01/2008 (Note 3)	10/01/2010
Feeder Canal	Seminole Water Control Plan; McDaniel Ranch Property Owners Agreement; Additional BMPs in West Feeder Basin for Target TP Conc. of 50 ppb; Accelerate Completion of CERP Project for Diversion of L-28 Interceptor	12/31/2006 (Source controls)	10/01/2009 (Note 3)

Notes: (1) Anticipated earliest completion schedule for construction and full operation
(2) Actual completion schedule controlled by CERP; schedule taken from latest CERP documents.
(3) Actual completion schedule controlled by CERP; schedule shown is accelerated from that shown in latest CERP planning documents.

Table ES.3 Estimated Performance of Pre-2006 Projects

Period		Estimated Average Annual Discharges									
From	Thru	All ECP Basins				All ESP Basins			All Basins		
		Volume (ac-ft)	Load (metric tons)	TP Conc. (ppb) F.W. Mean	TP Conc. (ppb) Geo. Mean	Volume (ac-ft)	TP Load (metric tons)	FW TP Conc (ppb)	Volume (ac-ft)	Load (metric tons)	FW TP Conc (ppb)
2004	12/30/06	1,344,700	57.9 - 59.4	35 - 36	20 - 36	395,100	26.0	53	1,739,800	83.9 - 85.4	39 - 40
12/31/06	12/31/07	1,362,700	25.8 - 34.4	15 - 20	10 - 14	186,100	9.5	42	1,548,800	35.3 - 44.0	18 - 23
2008	2010	1,362,700	25.8 - 34.4	15 - 20	10 - 14	179,300	9.2	42	1,542,000	35.0 - 43.7	18 - 23
2011	2014	1,362,700	25.8 - 34.4	15 - 20	10 - 14	102,300	1.9	15	1,465,000	27.7 - 36.4	15 - 20
2015	2036	1,327,500	24.4 - 33.0	15 - 20	10 - 15	102,300	1.9	15	1,429,800	26.3 - 34.9	15 - 20
2037	2056	1,327,500	24.4 - 33.0	15 - 20	10 - 15	84,900	1.5	14	1,412,400	25.9 - 34.4	15 - 20

TP concentrations are simulated 31-year means applied to the intermediate periods indicated. These estimates assume all pre-2006 projects are operational and fully stabilized for projection of long-term performance. Long-term geometric mean outflow concentrations below 15 ppb have not been demonstrated in large-scale systems.

There exists a range of estimated performance of the recommended projects. The single variant considered in the narrow range shown in Table ES.3 is the uncertainty in performance of Submerged Aquatic Vegetation (SAV), which is a principal component in the recommended strategy for the ECP Basins. If optimal performance of that vegetative community is confirmed, the pre-2006 projects in the ECP Basins afford the potential for achieving the long-term water quality improvement goals within the existing Everglades Construction Project Stormwater Treatment Areas, consistent with the requirements of the EFA:

The district shall optimize the design and construction of the STAs described in the Everglades Construction Project prior to expanding their size. Additional methods to achieve compliance with water quality standards shall not be limited to more intensive management of the STAs.

Following operation of the Pre-2006 projects, the long-term geometric mean TP concentration in discharges from the Everglades Construction Project , equal to approximately 88% of the water entering the Everglades, are predicted to range from 10-14 ppb. The only basins that are predicted to have discharge concentrations above that range after December 31, 2006 are that basins that have future CERP projects. These include the North Springs Improvement District, C-11 West, L-28 and Feeder Canal basins. Those basins' discharges account for approximately 12% of the total surface flows to the Everglades after completion of the Pre-2006 Projects and CERP projects scheduled for completion prior to December 2006.

Nonetheless, there remains a significant degree of uncertainty as to whether or not that range of estimated performance in the ECP Basins can be realized without additional measures. In fact, the possible range of performance of the recommended measures is somewhat broader than indicated in Table ES.3, which simply summarizes two current estimates of performance. A more descriptive presentation of the possible range of performance of the recommended projects is shown in Figure ES-2. Modeling uncertainties alone could impact projected long-term mean concentrations and TP loads in discharges from the STAs by plus or minus 20%. Even that possible range of performance cannot be assured with certainty in biological treatment systems. The current performance of SAV in Cell 5B of STA-1W and STA-5 suggests that additional efforts may be needed to address full-scale implementation difficulties.

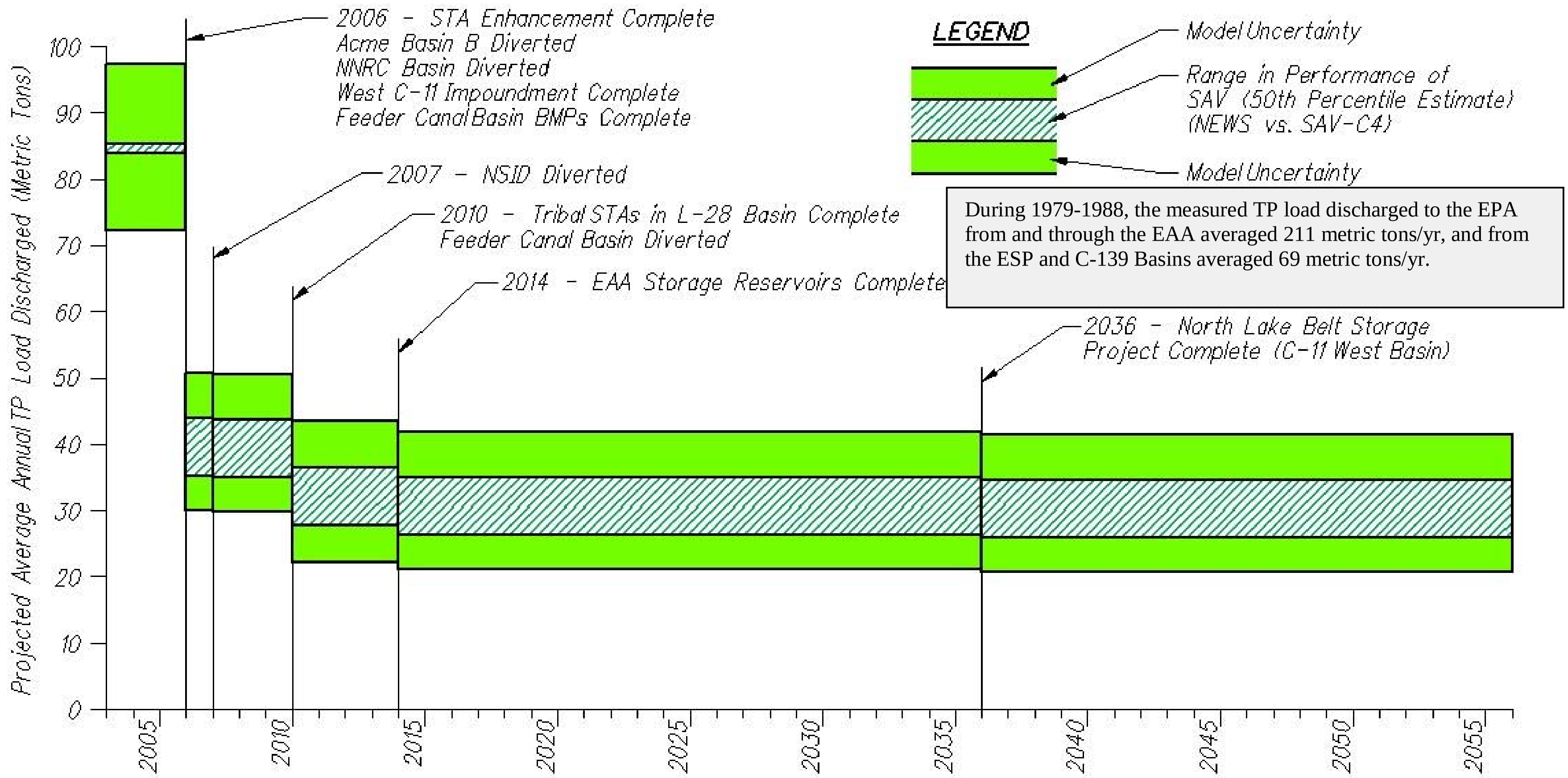


Figure ES-2. Potential TP Load Reductions under Long-Term Plan

Note: One metric ton equals 1,000 kilograms

The **Process Development and Engineering (PDE)** component of the overall strategy 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 various elements of the PDE component, described in detail in Part 5 of this Long-Term Plan, are directed towards:

- Identifying opportunities to maintain and improve upon the performance of source controls (BMPs) in reducing overall pollutant loads;
- Enhancing the control and monitoring of water quality improvement measures now in place, and which form the foundation of the recommended additional measures;
- Continued improvement in analytical and forecasting tools used to project treatment performance;
- Identification of specific means and methods to replicate on a reliable long-term basis the performance of the SAV community on which the more favorable performance projections in Table ES.3 are based (e.g., optimization of SAV performance);
- Development of engineering criteria and forecasting tools for additional water quality improvement measures, including the possible implementation of Periphyton-Based Stormwater Treatment Areas (PSTA);
- Improving the reliability of estimated treatment facility inflow volumes and pollutant loads, particularly in those basins for which current data is limited;
- Refining the estimated impact of CERP projects on basin discharge volumes and pollutant loads, including in particular the influence of the EAA Storage Reservoir projects, as well as long-term trends in the quality and quantity of water discharged from Lake Okeechobee;
- Determining the relationship between the quality of surface water discharged into, and the water quality within, the Everglades Protection Area (EPA).

A total expenditure of $42 million (in FY 2003 dollars) is projected for the PDE plan component. This PDE plan component will continue through 2016, with annual evaluations of the data collected and model refinements. The evaluations will address attainment of water quality standards, including the numeric phosphorus criterion (Rule 62-302.540, F.A.C.) 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, including the 2008 report described below, 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 this Long-Term Plan that additional steps, once identified and their need confirmed, be expeditiously implemented.

The Everglades Forever Act (EFA) (s. 373.4592 F.S.) acknowledges that this 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. Revisions to the Long-Term Plan shall be approved by the department. In addition, the department may propose changes to the Long-Term Plan as science and environmental conditions warrant. [s. 373.4592(3)(b), F.S.]*

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.]. However, the EFA does not specify the review and approval process. A proposed process for revisions to this Long-Term Plan, developed by staff of the District and the Department, is presented in Part 1. 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) prior to implementation.

It is the intent of this 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. 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 recommended herein. 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 this 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.

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 at the earliest practicable date through a strategy of **Adaptive Implementation**.

It is intended that science and engineering factors will drive the decision process for the adaptive implementation of additional measures. The funding needs projected herein include an **allowance** of $36 million in funds ($30.6 million in FY 2003 dollars) for the adaptive implementation process recommended herein, 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.

Documentation of any additional measures (the **Post-2006 Projects**) will be to a level of detail not less than that presented herein for the Pre-2006 Projects. The following is a list of some measures that might be included in such an adaptive implementation strategy (none of which are included in the current recommended strategy, for reasons discussed in Part 6 of this Long-Term Plan):

- 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.

The adaptive implementation funds described above would be reserved for application to such Post-2006 Projects as may be recommended, and are included in this Long-Term Plan so that the additional measures can be implemented as soon as their need and suitability is confirmed. It is the principal function and purpose of the PDE component to develop those measures necessary to provide adequate assurance of the ability to meet water quality standards, including the numeric phosphorus criterion, in the most cost-effective fashion possible.

The projected costs presented herein also include monies for:

- The operation and maintenance of the STAs as they now exist or are being constructed, including monitoring necessary for demonstration of permit compliance, control of the treatment works, and furtherance of the PDE component of this Long-Term Plan. While the cost for basic operation and maintenance of the STAs was considered in the February 15, 1994, *Everglades Protection Project*, *Conceptual Design* and recognized in the Everglades Forever Act, those documents specifically excluded costs associated with monitoring. The estimated cost for operation, maintenance and monitoring of the STAs (developed in Part 8 of this Long-Term Plan) over the period FY 2014 through 2016 is $215 million (expressed in FY 2003 dollars), which includes an estimated cost of $82 million for flow and water quality monitoring.

- Completion of the hydropattern restoration works intended in the February 15, 1994, *Everglades Protection Project, Conceptual Design* and authorized by Everglades Forever Act, together with additional activities to permit an accelerated recovery of previously impacted areas within the EPA. Development and operation of the hydropattern restoration works has not been permitted to date, due to concern over the potential impacts of discharging waters not meeting water quality standards to previously unimpacted areas in the

EPA. In addition, the continued refinement of information and design requirements has resulted in significant change in the nature of the works necessary to achieve the originally authorized intent. Strategies, schedules and estimated costs for completion of the hydropattern restoration works are discussed in detail in Part 7 of this Long-Term Plan. The estimated dates for project completion are driven by the need to assure that all such discharges meet water quality standards prior to implementation of the project(s). The estimated capital cost for those works (expressed in FY 2003 dollars) is approximately $24 million. Incremental operation and maintenance costs for those works are estimated to average roughly $0.4 million per year (again, in FY 2003 dollars).

It is intended that adoption and implementation of the strategies recommended in this Long-Term Plan result in compliance with water quality standards and the improvement goals of the EFA, including the phosphorus criterion established in Rule 62-302.540, F.A.C. Nonetheless, it remains possible that other, more extensive measures might eventually be required if the strategies recommended herein eventually prove inadequate, or if the intended full integration with CERP is not realized. Analyses and discussions of such future possible measures are included in Part 6 of this Long-Term Plan. Those measures, <u>none of which are presently recommended for implementation</u>, might include expansion of the STAs in the ECP Basins and additional measures, including diversion works and new treatment facilities in the ESP Basins.

Given the significant magnitude of possible <u>additional</u> expenditures for the items listed above (approaching $670 million in FY 2003 dollars as developed in Part 6 of this Long-Term Plan), it is intended that the District submit the December 31, 2008, comprehensive report to the Governor and Legislature on the status and progress of the Long-Term Plan discussed previously in this Executive Summary. That report should include specific identification of which, if any, of the above (or other) more extensive measures are then considered necessary and defensible to achieve water quality standards and the goals of the EFA. **It is the intent of this Long-Term Plan to prevent the need for such more extensive measures if at all possible.**

Projected costs for all components of the recommended water quality improvement strategies recommended herein are summarized in Table ES.4. Those projected funding needs include allowances for cost escalation at an average annual rate of 3%, and extend from Fiscal Year 2004 through Fiscal Year 2016.

Table ES.4 Projected Costs through FY 2016, by Plan Component

Fiscal Year	Summary of Projected Expenditures by Function (in $1,000s)									
	Pre-2006 Projects		PD&E Process	Recovery of Impacted Areas	Operation & Maintenance	Monitoring		Program Management	Funds for Adaptive Implement.	Fiscal Year Total Expenditure
	ECP Basins	ESP Basins				Permit Compliance	Operations Support			
2004	$5,049	$500	$8,835	$1,283	$9,433	$3,640	$2,208	$916	$0	$31,864
2005	$15,044	$750	$8,650	$1,317	$10,894	$3,475	$3,167	$1,248	$0	$44,544
2006	$11,426	$667	$6,268	$1,351	$12,085	$3,363	$3,580	$1,108	$0	$39,847
2007	$0	$0	$5,827	$279	$12,173	$3,450	$3,673	$1,970	$9,000	$36,372
2008	$0	$0	$5,404	$460	$12,545	$3,581	$3,812	$979	$9,000	$35,782
2009	$0	$0	$4,648	$1,199	$12,917	$3,674	$3,911	$994	$9,000	$36,343
2010	$0	$0	$1,050	$3,207	$12,816	$3,785	$4,029	$964	$9,000	$34,851
2011	$0	$0	$799	$15,525	$13,201	$3,898	$4,150	$1,073	$0	$38,644
2012	$0	$0	$626	$15,878	$13,593	$4,000	$4,258	$1,098	$0	$39,454
2013	$0	$0	$847	$2,000	$14,538	$4,135	$4,402	$706	$0	$26,628
2014	$0	$0	$666	$2,000	$14,974	$4,260	$4,534	$719	$0	$27,153
2015	$0	$0	$757	$0	$15,423	$4,387	$4,670	$681	$0	$25,919
2016	$0	$0	$563	$0	$15,893	$4,536	$4,829	$695	$0	$26,518
Total	**$31,518**	**$1,917**	**$44,942**	**$44,498**	**$170,484**	**$50,185**	**$51,224**	**$13,151**	**$36,000**	**$443,918**

Note: The above projections are expressed in escalated dollars, considering average annual inflation of 3% throughout the planning period.

The opinions of cost shown in Table ES.4 and throughout this Long-Term Plan are preliminary in nature, may be refined due to refined unit costs associated with the operation, maintenance and monitoring of the STAs, unanticipated work effort, increased scope, use of contract staff (as compared to in-house staff), and other unanticipated factors. Similarly, slippage in the schedules presented may occur as a result of limitations on staff resources, lack of the timely receipt of funding and other factors outside the control of the implementing parties.

The projected costs identified in Table ES.4 exclude costs for those recommended measures that are expected to be included in the purview of CERP.

At present, the only dedicated source of funding for the strategies recommended in this Long-Term Plan is the Everglades Trust Fund established by the Everglades Forever Act. Everglades Trust Fund revenues are subject to expenditures not otherwise included in the projected costs summarized in Table ES.4. Those expenditures include remaining capital expenditures for completion of the 1994 Everglades Construction Project.

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1. INTRODUCTION

The long-term Everglades water quality objective is to implement the optimal combination of source controls, Stormwater Treatment Areas (STAs), Advanced Treatment Technologies (ATTs), and/or regulatory programs to ensure that all waters in the Everglades Protection Area (EPA) meet the phosphorus criterion established in Rule 62-302.540 of the Florida Administrative Code (F.A.C.), consistent with the requirements of Florida's 1994 Everglades Forever Act (EFA), as amended by the Legislature in 2003. This document sets forth a recommended plan and strategy for achieving that objective and permitting the State of Florida and the South Florida Water Management District (District) to proceed to fulfillment of their obligations under both the EFA (F.S. 373.4592) and the federal Everglades Settlement Agreement (Case No. 88-1886-CIV-MORENO).

This document updates and modifies the March 17, 2003 *Everglades Protection Area Tributary Basins, Conceptual Plan for Achieving Long-Term Water Quality Goals*, Burns & McDonnell, to reflect the Legislature's guidance as expressed in the EFA as amended, which states:

(3) EVERGLADES LONG-TERM PLAN.
(b) The Legislature finds that the most reliable means of optimizing the performance of STAs and achieving reasonable further progress in reducing phosphorus entering the Everglades Protection Area is to utilize a long-term planning process. The Legislature finds that the Long-Term Plan provides the best available phosphorus reduction technology based upon a combination of the BMPs and STAs described in the Plan provided that the Plan shall seek to achieve the phosphorus criterion in the Everglades Protection Area. The pre-2006 projects identified in the Long-Term Plan shall be implemented by the district without delay, and revised with the planning goal and objective of achieving the phosphorus criterion to be adopted pursuant to subparagraph (4)(e)2. in the Everglades Protection Area, and not based on any planning goal or objective in the Plan that is inconsistent with this section. 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. Revisions to the Long-Term Plan shall be approved by the department. In addition, the department may propose changes to the Long-Term Plan as science and environmental conditions warrant.
(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).

(d) The Legislature recognizes that the Long-Term Plan contains an initial phase and a 10-year second phase. The Legislature intends that a review of this act at least 10 years after implementation of the initial phase is appropriate and necessary to the public interest. The review is the best way to ensure that the Everglades Protection Area is achieving state water quality standards, including phosphorus reduction, and the Long-Term Plan is using the best technology available. A 10-year second phase of the Long-Term Plan must be approved by the Legislature and codified in this act prior to implementation of projects, but not prior to development, review, and approval of projects by the department.

(e) The Long-Term Plan shall be implemented for a initial 13-year phase (2003-2016) and shall achieve water quality standards relating to the phosphorus criterion in the Everglades Protection Area as determined by a network of monitoring stations established for this purpose. Not later than December 31, 2008, and each 5 years thereafter, the department shall review and approve incremental phosphorus reduction measures.

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 regulatory program in the Everglades Agricultural Area (EAA) and the STAs constructed under the 1994 Everglades Construction Project (ECP), both mandated by the EFA, has exceeded expectations. Current projections suggest that, once all STAs are operational, the best estimate of the long-term flow-weighted mean TP concentrations in discharges from the ECP to the EPA is approximately 35 parts per billion (ppb), with a potential range of 25-45 ppb, as compared to the interim goal of 50 ppb originally established in the EFA. In addition, some source control measures have been implemented in urban and other tributary basins included in the Everglades Stormwater Program. Nonetheless, additional measures are necessary to ensure that all waters in the EPA achieve the phosphorus criterion.

The EFA as amended requires that:

(10) LONG-TERM COMPLIANCE PERMITS.—*By December 31, 2006, the department and the district shall take such action as may be necessary to implement the pre-2006 projects and strategies of the Long-Term Plan so that water delivered to the Everglades Protection Area achieves in all parts of the Everglades Protection Area state water quality standards, including the phosphorus criterion and moderating provisions.*

(a) By December 31, 2003, the district shall submit to the department an application for permit modification to incorporate proposed changes to the Everglades Construction Project and other district works delivering water to the Everglades Protection Area as needed to implement the pre-2006 projects and strategies of the Long-Term Plan in all permits issued by the department, including the permits issued pursuant to subsection (9). These changes shall be designed to

achieve state water quality standards, including the phosphorus criterion and moderating provisions. During the implementation of the initial phase of the Long-Term Plan, permits issued by the department shall be based on BAPRT, and shall include technology-based effluent limitations consistent with the Long-Term Plan, as provided in subparagraph (4)(e)3.
(b) If the Everglades Construction Project or other discharges to the Everglades Protection Area are in compliance with state water quality standards, including the phosphorus criterion, the permit application shall include:
1. A plan for maintaining compliance with the phosphorus criterion in the Everglades Protection Area.
2. A plan for maintaining compliance in the Everglades Protection Area with state water quality standards other than the phosphorus criterion.

It is intended that this document be included in and made a part of the December 31, 2003 application for permit modification required by the EFA. A summary listing of the basins addressed in this Long-Term Plan is presented in Table 1.1; they are organized into two primary groupings:

- Those basins for which an interim water quality improvement strategy has been implemented through the 1994 Everglades Construction Project (the ECP Basins);
- Urban and other tributary basins not addressed by the 1994 ECP (the Everglades Stormwater Program, or ESP, Basins). Two other basins (C-111 Basin and Boynton Farms Basin) will be addressed by other District and Federal programs, and are not further discussed herein.

Table 1.1 Summary of Hydrologic Basins Addressed in This Long-Term Plan

Everglades Construction Project (ECP) Basins	
Hydrologic Basin	**Receiving Stormwater Treatment Area (STA)**
C-51 West	STA-1E
S-5A	STA-1W, STA-1E
S-6	STA-2
S-7/S-2	STA-3/4
S-8/S-3	STA-3/4, STA-6
C-139	STA-5, STA-3/4
C-139 Annex	STA-6
Everglades Stormwater Program (ESP) Basins	
Acme Improvement District, Basin B (Acme B)	
North Springs Improvement District (NSID)	
North New River Canal (NNRC)	
C-11 West	
L-28	
Feeder Canal	

The location of the basins is shown in Figure 1-1.

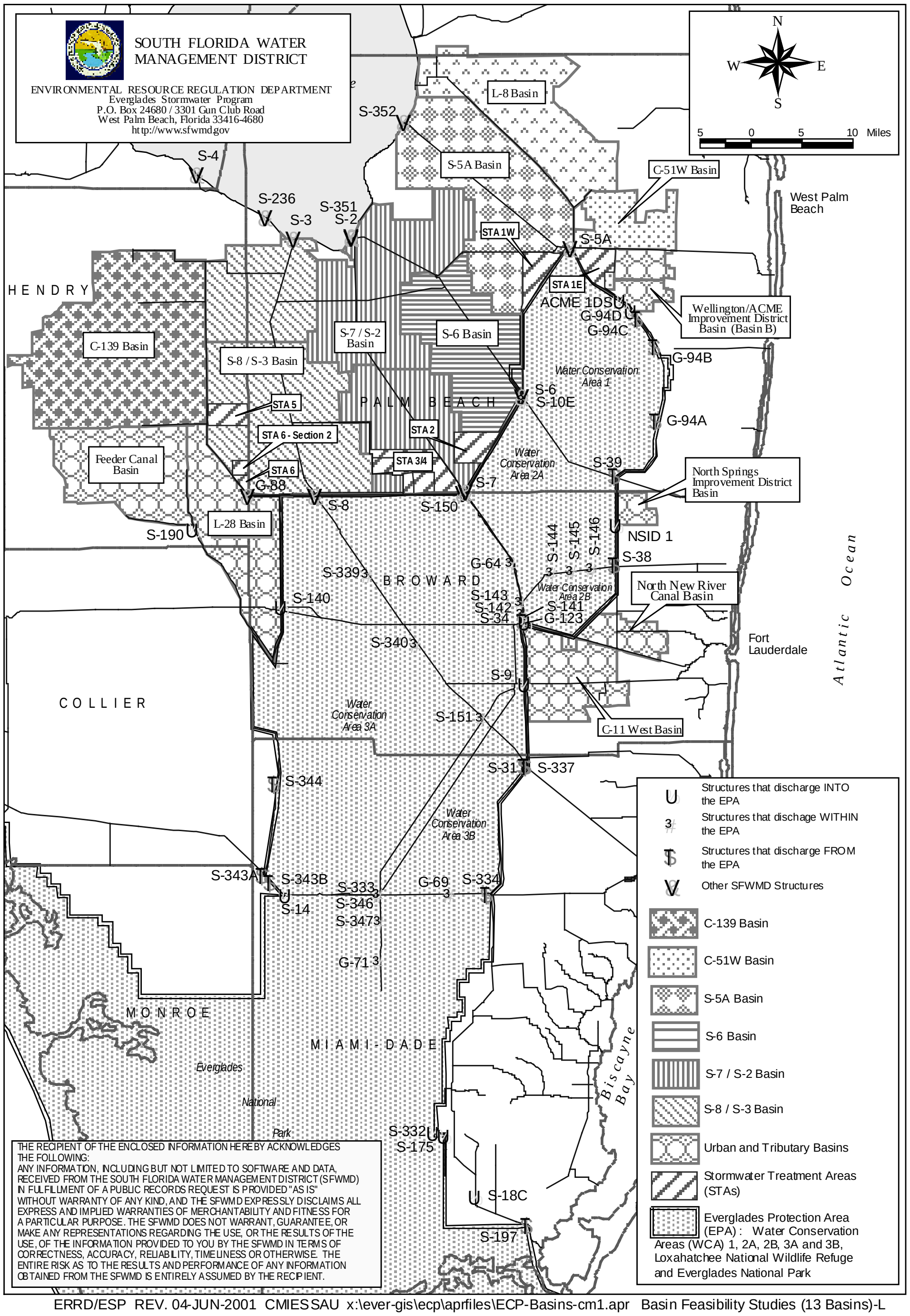

Figure 1-1. Overview of the Everglades Protection Area and Tributary Basins

(This Figure includes only SFWMD permit structures, and excludes structures operated by the USACE)

1.1. Background and Principal References

This section summarizes the basic sources of information on which this Long-Term Plan is based. It is not intended that the information presented herein be considered an exhaustive compilation of all reference material and data. Only the most recent and pertinent information is included.

1.1.1. Basin-Specific Feasibility Studies

As an important step towards development of the Long-Term Compliance Permit application required under the EFA, the South Florida Water Management District (SFWMD) recently completed Basin-Specific Feasibility Studies for the thirteen basins referenced above, all of which presently discharge to the EPA. Those studies are documented in the October 2002 *Evaluation of Alternatives for the ECP Basins*, prepared for SFWMD by Burns & McDonnell under Contract C-E023, and the October 2002 *Basin-Specific Feasibility Studies, Everglades Stormwater Program Basins* prepared for SFWMD by Brown & Caldwell under Contract C-E024.

The Basin-Specific studies were a fact-finding exercise, and not intended to define the final arrangement, location and character of water quality improvement strategies in the various basins; no specific recommendations were made for alternatives to be selected and carried forward to implementation. Rather, the purpose of the evaluations was to develop the information necessary for informed decision-making by the District's Board of Governors and the Florida Legislature relative to funding, final implementation schedule, rulemaking, and other necessary policy-level determinations.

1.1.2. Data Sources

Baseline estimates of basin discharge volumes and total phosphorus (TP) loads for each basin considered in the Basin-Specific Feasibility Studies were prepared by the District.

Those estimates are summarized in the May 2001 *Baseline Data for the Basin Specific Feasibility Studies to Achieve the Long-Term Water Quality Goals for the Everglades*, Goforth and Piccone. The baseline data sets consisted of simulated daily flow and TP loads for each basin for the 31-year period from 1965-1995. The daily flows and loads were estimated by combining simulated flow values from the South Florida Water Management Model (SFWMM) with historic TP concentrations. In some instances, those baseline estimates were adjusted during the conduct of the Basin-Specific Feasibility Studies.

1.1.3. Treatment Technologies and Projections

Dozens of biological and chemical treatment technologies, with potential to achieve very low TP concentrations, have been investigated to date. This research has led to two general approaches for treatment of stormwater runoff to meet long-term water quality goals: (1) biological treatment using stormwater treatment areas (STAs) consisting of emergent vegetation, submerged aquatic vegetation (SAV), periphyton, or some combination of these three vegetation types; and (2) chemical treatment followed by solids separation (CTSS). The results of research on these Advanced Treatment Technologies (ATTs) have been presented in demonstration project final reports using a standardized format to facilitate their comparison (*Supplemental Technology Standard of Comparison)*. Research efforts continue to refine the engineering requirements, performance characteristics, and costs associated with these treatment technologies.

This Long-Term Plan is developed with primary reliance on the use of biological treatment using STAs to reduce TP concentrations in basin discharges prior to their release to the EPA. The treatment projections presented in the Basin-Specific Feasibility Studies, and supplemental projections presented herein, employed the most recent version (April 12, 2002) of the Dynamic Model for Stormwater Treatment Areas (DMSTA), Walker and Kadlec. The estimated performance of the various vegetative communities in the reduction of phosphorus as reflected in these analyses represents the best information presently available. However, there remains a significant degree of uncertainty in that performance.

1.1.4. Planning Objective

The planning objective for phosphorus levels in discharges to the EPA considered in the Basin Specific Feasibility Studies was based on guidance contained in the original Everglades Forever Act, which stated that:

The phosphorus criterion shall be 10 parts per billion (ppb) in the Everglades Protection Area in the event the department does not adopt by rule such criterion by December 31, 2003, and

Compliance with the phosphorus criterion shall be based upon a long-term geometric mean of concentration levels to be measured at sampling stations recognized from the research to be reasonably representative of receiving waters in the Everglades Protection Area.

In the absence of more specific planning guidance, the objective adopted in the development and evaluation of alternatives for the Basin Specific Feasibility Studies was to obtain a predicted long-term geometric mean total phosphorus concentration of 10 ppb in discharges to the EPA. For the purposes of the Basin-Specific Feasibility Studies, "long-term" was taken as that represented by a 31-year geometric mean based on model simulations. The Basin-Specific studies were a fact-finding exercise, and not intended to define the final arrangement, location and character of water quality improvement strategies in the various basins; no specific recommendations were made for alternatives to be selected and carried forward to implementation.

The Florida Department of Environmental Protection Environmental Regulation Commission has now adopted by rule (62-302.540, F.A.C.) a phosphorus criterion for the EPA. The objective of this Long-Term Plan is to achieve compliance with that criterion. It is anticipated and intended that the specific projects and efforts outlined herein will be modified over time as may be necessary to achieve that objective.

1.2. Formulation of Conceptual Plan

Technical representatives of the District, the Florida Department of Environmental Protection, the Everglades Agricultural Area Environmental Protection District, and other stakeholders have reviewed the results of the Basin Specific Feasibility Studies. Those technical representatives used those results to formulate a consensus approach to achieving the long-term water quality goals of the Everglades Forever Act. That recommended approach was set forth in the March 17, 2003 *Everglades Protection Area Tributary Basins, Conceptual Plan for Achieving Long-Term Water Quality Goals*, Burns & McDonnell. That document was prepared by Burns & McDonnell Engineering Company, Inc., whose initial involvement was funded by the District through its issuance of a series of purchase orders. Burns & McDonnell subsequently completed preparation of that document under a contract with the Everglades Agricultural Area Environmental Protection District (EPD), which was approved by the Board of Directors of the EPD in December 2002.

The District also funded preparation of the Basin Specific Feasibility Studies which provided much of the technical information embodied herein, as well as the participation of its staff in the development of that *Conceptual Plan*. The Florida Department of Environmental Protection funded the participation of its staff. The EPD also funded the participation of its technical representatives in the development of that *Conceptual Plan*.

This document consists of an update to that *Conceptual Plan* to reflect additional guidance received from the Legislature, as expressed in the newly amended EFA; respond to comments received from a variety of stakeholders; and refine (and in some instances expand) the definition of proposed actions an activities. The District authorized preparation of this document through its issuance on August 4, 2003 of Purchase Order PC P302647.

This Long-Term Plan is embodied in three primary components:

- **Pre-2006 Projects:** Structural and operational modifications that can be supported by the current scientific and engineering knowledge base, to be implemented by December 31, 2006, as well as operation, maintenance and monitoring of the STAs. The pre-2006 recommended improvements and strategies are considered to be the maximum scientifically defensible steps that have been identified at this time. There is a possibility that these steps will meet a long-term geometric mean total phosphorus concentration of 10 ppb in discharges from the various basins. However, it is also possible that these 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. Therefore, the Post-2006 Strategy discussed below is included in this Plan.

- **Process Development and Engineering (PDE):** Activities designed to:
  - Further understanding and optimize water quality performance in existing and proposed facilities
  - Facilitate integration with the Comprehensive Everglades Restoration Plan (CERP)
  - Maintain and improve upon the contribution of source controls to overall water quality improvement goals.
  - Investigate ways to accelerate the recovery of previously impacted areas in the EPA.
- **Post-2006 Strategy:** Identification and adaptive implementation of additional water quality improvement measures that may be considered necessary to achieve the planning objective following completion of the pre-2006 activities based on ongoing analysis of the PDE effort. Also 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 are achieved.

This Long-Term Plan is developed in recognition that:

- Achieving the phosphorus criterion (Rule 62-302.540, F.A.C.) will involve an adaptive management approach, whereby the best available information is used to develop and implement incremental improvement measures as soon as their need and utility is confirmed, 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, even to the extent that existing schedules should be re-evaluated in some basins and synchronized with CERP project

schedules, and modifications to the design and operation of planned CERP projects should be considered.

Although CERP goals and objectives are broader than those of the State of Florida's Everglades Forever Act, the two programs share the common goal of enhancing ecological values and in part, enhancing economic values and social well-being. Specifically, projects contained in the *Long-term Plan* will:

- Increase the total spatial extent of natural areas (both through enhancement of over 40,000 acres of STAs and acceleration of recovery of areas within the Everglades Protection Area that are presently impacted);
- Improve habitat and functional quality through improvement in water quality and hydropattern;
- Improve native plant/animal species abundance/diversity through improvement in water quality and hydropattern and acceleration of recovery of areas within the Everglades Protection Area that are presently impacted;
- Increase the availability of fresh water by capturing and treating water in STA-1E that presently goes to tide through the C-51 Canal;
- Reduce flood damages in the C-51W basin through STA-1E;
- Provide limited recreational opportunities in the STAs;
- Protect cultural/archeological resources/values by complying with all appropriate State and Federal provisions related to construction projects.

1.3. Pre-2006 Projects

Specific measures included in the **Pre-2006 Projects** are discussed in detail in Part 2 (for the ECP Basins) and Part 3 (for the ESP Basins) of this Long-Term Plan. Substantial reliance is placed on CERP in some of the basins, most notably the Everglades Stormwater Program Basins. Part 3 of this Long-Term Plan presents technical recommendations for water-quality improvement strategies in those basins; it is intended that those recommendations be given due consideration in the CERP planning process.

In response to a request from Broward County Department of Planning and Environmental Protection, reduction of phosphorus through source controls (i.e., urban BMPs) is of highest priority for discharges from Broward County basins to achieve compliance with the phosphorus criterion. The District currently has cooperative agreements with all local water control districts in the County, and these include water quality provisions. The District will assist Broward County in coordinating a county-wide working group to develop a comprehensive pollution prevention plan with specific water quality goals and milestones.

The projected impact of the measures recommended in Parts 2 and 3 of this Long-Term Plan on the average annual volumes and total phosphorus loads discharged to the EPA and other receiving waters is detailed in Part 4.

As discussed in Part 4, there exists a range of estimated performance of the recommended projects. The analyses presented directly consider the uncertainty in performance of Submerged Aquatic Vegetation (SAV), which is a principal component in the recommended strategy for the ECP Basins. If optimal performance of that vegetative community is confirmed, the pre-2006 projects in the ECP Basins afford the potential for achieving the long-term water quality improvement goals within the existing Everglades Construction Project Stormwater Treatment Areas, consistent with the requirements of the EFA:

The district shall optimize the design and construction of the STAs described in the Everglades Construction Project prior to expanding their size. Additional methods to achieve compliance with water quality standards shall not be limited to more intensive management of the STAs.

Nonetheless, there remains a significant degree of uncertainty as to whether or not that potential can be realized without additional measures. In fact, the possible range of performance of the recommended measures is somewhat broader than would result only from a variation in performance of SAV. Modeling uncertainties alone could impact projected long-term mean concentrations and TP loads in discharges from the STAs by plus or minus 20%. Even that possible range of performance cannot be assured with certainty in biological treatment systems. The current performance of SAV in Cell 5B of STA-1W and STA-5 suggests that additional efforts may be needed to address full-scale implementation difficulties.

1.4. Process Development and Engineering (PDE)

The **Process Development and Engineering (PDE)** component of the overall strategy 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 various elements of the PDE component, described in detail in Part 5 of this Conceptual Plan, are directed towards:

- Identification of specific means and methods to replicate on a reliable long-term basis the performance of the SAV community on which the more favorable performance projections in Part 4 are based;
- Development of engineering criteria and forecasting tools for additional water quality improvement measures, including other vegetation types, which can be applied within the footprint of existing treatment facilities;
- Refining the estimated impact of CERP projects on basin discharge volumes and pollutant loads, including in particular the influence of the EAA Storage Reservoir projects, as well as long-term trends in the quality and quantity of water discharged from Lake Okeechobee to the EPA;
- Identifying opportunities to maintain and improve upon the performance of urban and agricultural source controls (BMPs) in reducing overall pollutant loads;
- Enhancing the control and monitoring of water quality improvement measures now in place, and which form the foundation of the recommended additional measures;
- Improving the reliability of estimated treatment facility inflow volumes and pollutant loads, particularly in those basins for which current data is limited.

This 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 this Long-Term Plan that additional steps, once identified and their need confirmed, be expeditiously implemented. Documentation of any additional measures (the **Post-2006 Projects**) will be to a level of detail not less than that presented herein for the Pre-2006 Projects.

It is the intent of this 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. 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 recommended herein. 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 this 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 the planning objective and the goals of the EFA, together with an evaluation of the cost-effectiveness of those measures.

1.5. Post-2006 Strategy

It is intended that adoption and implementation of the strategies recommended in this Long-Term Plan result in the achievement of compliance with the phosphorus criterion and the improvement goals of the EFA. Nonetheless, it remains possible that other, more extensive measures might eventually be required if the strategies recommended herein eventually prove inadequate, or if the final nature and operation of CERP projects relied upon in this Long-Term Plan result in a continuing need for water quality improvement measures. Analyses and discussions of such future possible measures are included in Part 6 of this Conceptual Plan. Those measures, none of which are presently recommended for implementation, might include:

- In the ECP Basins, further expansion of the STAs post-2006 if needed to meet water quality standards, including the numeric phosphorus criterion, which could include:
  - Expansion of STA-2, either through addition of a fourth parallel flow path, or through development of a new STA potentially sited immediately north of the Hillsboro Canal and west of the Arthur R. Marshall Loxahatchee National Wildlife Refuge;
  - Expansion of STA-5, increasing its effective treatment area by as much as 50%;
  - Expansion of STA-1E to include lands in Section 24, Township 44 South, Range 40 East in Palm Beach County.
- In the ESP Basins, a variety of 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 Canal 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 outside the purview of CERP.
  - For the Feeder Canal Basin, development of an additional STA outside the purview of CERP.

The December 31, 2008 report to the Governor and Legislature should include specific identification of which, if any, of the above (or other) more extensive measures are then considered necessary to achieve water quality standards and the goals of the EFA. **It is the intent of this Long-Term Plan to prevent the need for such more extensive measures if at all possible.**

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 (none of which are included in the current recommended strategy, for reasons discussed in Part 6 of this Conceptual Plan):

- Conversion of additional lands in the STAs to SAV, PSTA, 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.

Given the probable need for additional (but currently undefined) measures, the projected funding needs presented herein include funds in an amount considered reasonably representative of the overall magnitude of such needs prior to 2016. Those **adaptive implementation funds** would be reserved for application to such Post-2006 Projects as may be recommended, and are included in this Long-Term Plan so that the additional measures can be implemented as soon as their need and suitability is confirmed. It is the principal function and purpose of the PDE component to develop those measures necessary to provide adequate assurance of the ability to meet the numeric phosphorus criterion in the most cost-effective fashion possible.

It is intended that science and engineering factors will drive the decision process for the adaptive implementation of additional measures. The funding needs projected herein include an **allowance** of $36 million in funds for the adaptive implementation process recommended herein, 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.

1.6. Restoration and Recovery of Previously Impacted Areas

This component includes completion of the hydropattern restoration works intended in the February 15, 1994, *Everglades Protection Project, Conceptual Design* and authorized by Everglades Forever Act, together with additional activities to permit an accelerated recovery of previously impacted areas within the EPA. Development and operation of the hydropattern restoration works has not been permitted to date, due to concern over the potential impacts of discharging waters not meeting water quality standards to previously unimpacted areas in the EPA. In addition, the continued refinement of information and design requirements has resulted in significant change in the nature of the works necessary to achieve the originally authorized intent. Strategies, schedules and estimated costs for completion of the hydropattern restoration works are discussed in detail in Part 7 of this Conceptual Plan. The estimated dates for project completion are driven by the need to assure that all such discharges meet water quality standards prior to implementation of the project(s).

1.7. Operation, Maintenance and Monitoring

The operation and maintenance of the 1994 Everglades Construction Project as it now exists or is being constructed, including monitoring necessary for demonstration of permit compliance, control of the treatment works, and furtherance of the PDE component is central to this Long-Term Plan. While the cost for basic operation and maintenance of the STAs was considered in the February 15, 1994, *Everglades Protection Project, Conceptual Design* and recognized in the original Everglades Forever Act, those documents specifically excluded costs associated with monitoring. Updated definition of the intended operation, maintenance and monitoring plans and projected funding needs for the ECP, including the expanded monitoring program recommended as a part of the PDE component, are included in Part 8 of this Long-Term Plan.

1.8. Opinions of Cost

Projected costs for all components of the water quality improvement strategies recommended herein are presented in detail in Parts 2 through 8. Those projected expenditures are in Fiscal Year (FY) 2003 dollars, and extend from Fiscal Year 2003 through Fiscal Year 2016. The primary source of the unit costs employed in those projections is the July 2002 *Final Evaluation Methodology for the Water Quality Improvement Strategies for the Everglades*, SFWMD. Those unit cost estimates have been reviewed and in some instances updated for the projections presented in this Long-Term Plan.

Cost opinions and projections prepared by Burns & McDonnell relating to construction costs and schedules, operation and maintenance costs, and operating results are based on Burns & McDonnell's experience, qualifications, and judgment as design professionals. Since Burns & McDonnell has no control over weather, cost and availability of labor, material and equipment, labor productivity, construction contractors' procedures and methods, unavoidable delays, construction contractors' methods of determining prices, economic conditions, competitive bidding or market conditions, and other factors affecting such cost opinions or projections, Burns & McDonnell does not guarantee that actual rates, costs, performance, schedules and related items will not vary from the cost opinions and projections presented in this Long-Term Plan.

1.9. Implementation Schedule and Funding Needs

The intended schedules for implementation and completion for all components of the water quality improvement strategies recommended herein are presented in detail in Parts 2 through 8. A summary schedule and annual projection of funding needs for the entire effort is presented in Part 9. The annual projection of funding needs considers cost escalation at an average annual rate of 3% through FY 2016.

Part 9 gathers the projected funding needs by the District's internal budget classifications for the various projects recommended in this Long-Term Plan. Those budget classifications are an integral part of the District's overall Program Management Plan (PMP) for control of the implementation of the Long-Term Plan. A summary listing of those internal budget activity codes is presented in Table 1.2. Table 1.2 also includes identification of that Part or section of this Long-Term Plan in which each individual project or process is described in detail.

The description of each “project” recommended in Parts 2 through 8 includes its budget activity code taken from the listing in Table 1.2.

At present, the only dedicated source of funding for the strategies recommended in this Long-Term Plan is the Everglades Trust Fund established by the Everglades Forever Act. Everglades Trust Fund revenues are subject to expenditures not otherwise included in the projected costs for the water quality improvement strategies recommended in this Long-Term Plan. Those expenditures include remaining capital expenditures for completion of the 1994 Everglades Construction Project.

District staff is preparing a separate financial analysis of the Everglades Trust Fund in which those other expenditures and the funding needs projected herein are considered in concert with available funding.

Table 1.2 SFWMD Budget Activity Codes for Long-Term Plan Projects

Budget Code	Project Description	Ref. Section No.
ECP BASINS		2
Bc10	STA-1E Enhancements	2.1
Bc20	STA-1W Enhancements	2.2
Bc30	STA-2 Enhancements	2.3
Bc40	STA-3/4 Enhancements	2.4
Bc50	STA-5 Enhancements	2.5
Bc60	STA-6 Enhancements	2.6
Bf	ECP Operation and Maintenance - STAs and non-STAs	8.1, 8.2
Bf80	ECP Compliance Monitoring	8.3
Bc05	ECP Operations Monitoring	8.4
Bf81	STA Site Management	8.5.1
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
Bc90	**Program Management**	2.7.1, 3.7, 5.7, 6.3.1, 7.4.1, 8.5.2

1.10. Proposed Process for Revisions to the Long-Term Plan

The following discussion presents the proposed process for revisions to this Long-Term Plan; staff of the South Florida Water Management District and the Florida Department of Environmental Protection jointly drafted this proposed process.

1.10.1. Background

The Everglades Forever Act (EFA) (s. 373.4592 F.S.) acknowledges that the *Conceptual Plan for Achieving Long-Term Water Quality Goals* (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. Revisions to the Long-Term Plan shall be approved by the department. In addition, the department may propose changes to the Long-Term Plan as science and environmental conditions warrant. [s. 373.4592(3)(b), F.S.]*

"Department" refers to the Florida Department of Environmental Protection, and "District" refers to the South Florida Water Management District.

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.]. However, the EFA does not specify the review and approval process, and the process described below is recommended. 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) prior to implementation.

In addition, revisions to projects that require permits under the EFA or other permitting authority must comply with the requirements of the appropriate permitting authority (see e.g., s 373.4593(9)(j), (m) and (n)) and applications for new permits or modifications to existing permits must be processed in accordance with the appropriate procedures (see e.g. rule 62-343, F.A.C.).

1.10.2. Force Majeure

It is recognized that events beyond the District's control may prevent or delay projects of the *Long-Term Plan*. Such events include, but are not limited to, natural disasters as well as unavoidable legal barriers or restraints, including litigation of permits for projects of the *Long-Term Plan*.

1.10.3. Type of Revision

Changes to the *Long-Term Plan* may be proposed by the District, and also by the Department as science and environmental conditions warrant. Members of the public or other stakeholders will have the opportunity to assist the Department and District in developing proposed changes through numerous public forums (see section **1.10.7 Public Involvement** below for more details). Revisions to the *Long-Term Plan* will be classified as **Minor** or **Major** based upon: the magnitude and nature of the proposed revisions; the potential for the proposed revision to have environmental impacts that are significantly different from those previously considered by the department for the project; the potential for the revision to adversely impact the intent and purpose of the *Long-Term Plan*; and whether the revision requires District Governing Board approval. The determination of whether revisions to the plan are classified as Minor or Major will not necessarily determine the nature of any accompanying permit modifications which may be necessary. The nature of permit modifications will be governed by the definitions in Department rule 62-343.100, F.A.C. (Modification of Permits).

1.10.4. Notification and Review of Revision

The initial set of proposed revisions to the *Long-Term Plan* shall be contained in the revised *Long-Term Plan* anticipated to be accepted by the Governing Board no later than December 31, 2003. The following notification and review process shall apply for all future revisions.

1. For a **Minor Revision**, the District shall

   a. notify the Department of the proposed revision through a letter or e-mail, and
   b. discuss the revision at the communication forum anticipated to occur quarterly, and
   c. include a description of the revision in the annual *Everglades Consolidated Report*.
   d. If the revision applies to a permitted project or requires a new permit, the District shall include a summary of the revision in a modification request or the appropriate permit application.

2. For a **Major Revision**, the District shall

   a. notify the Department of the proposed revision through a letter or e-mail after obtaining Governing Board approval or acceptance, and
   b. discuss the proposed revision at the communication forum anticipated to occur quarterly, or, if time is of the essence, seek concurrence with a subset (to be identified later) of this group, namely representatives of the Department, the federal government and stakeholders, through meetings or telephone conferences; and
   c. include a description of the revision in the annual *Everglades Consolidated Report*.
   d. If the revision applies to a permitted project or requires a new permit, the District shall include a summary of the revision in a modification request or the appropriate permit application.

1.10.5. Approval

1. For a **Minor Revision**, within 30 days of receipt of the District notification, the Department shall notify the District of its approval through a letter or e-mail. Because these revisions are not expected to have a significant impact on the project's scope, cost or schedule, the District may proceed with implementation of the revision without delay; however, activities associated with the revision which require regulatory authorization through a Department permit prior to implementation shall not proceed prior to final agency action on that permit (see 1.10.5, item 3. below).

2. For a **Major Revision**, Department approval shall occur after the communication forum at which the proposed revision is presented, anticipated to occur quarterly, or, if time is of the essence, at the conclusion of the representatives' conferences. Within 30 days of the communication forum (or conclusion of the representatives' conferences if appropriate), the Department shall notify the District of its approval through a letter or e-mail. **Because these revisions are expected to have a significant impact on the project's scope, cost or schedule, the District should not proceed without Department approval. The Department recognizes the urgency to respond within the 30 day period to avoid delay of project activities.** Major revisions shall be presented to the District's Governing Board for their approval prior to implementation.

3. If the revision applies to a permitted project or requires a new permit, the District shall include a summary of the revision in a modification request or the appropriate permit application and any authorization necessary to implement the project shall be achieved through approval of the modification request or issuance of that permit.

1.10.6. Reporting

1. Scope – through correspondence, update at communication meetings, and in the annual *Everglades Consolidated Report.*

2. Schedule – quarterly P3e schedules shall document the revised project schedules incorporating revisions.
3. Financial – quarterly financial reports shall document the revised project costs associated with revisions.
4. Website – the District shall maintain a website describing the progress of implementation.

1.10.7. Public involvement

Significant public involvement led to the initial revised *Long-Term Plan*, anticipated to be accepted by the Governing Board prior to December 31, 2003. Following the December 2003 submittal of the initial revised *Long-Term Plan* to the Department, the following guidelines for public involvement are proposed.

1. *Long-Term Plan* Communications meeting (no less frequent than quarterly) – to discuss progress of implementation and proposed Major Revisions and to seek concurrence and approval as needed. Proposals for revisions, along with supporting documentation, may be submitted to the District or Department for consideration.
2. Mid-February of each year – annual public meeting to discuss Minor Revisions and proposed Major Revisions. Proposals for revisions, along with supporting documentation, may be submitted to the District or Department for consideration.
3. Mid-March of each year – District to submit annual revisions to Department to coincide with potential Legislative review.
4. Early May of each year – Department response to District's March submittal is needed to coincide with District's budget development process.
5. Prior to the end of September of each year – an annual summary of revisions that have been made, or have been proposed by the District and are awaiting Department approval, shall be presented to the District's Governing Board.

1.11. List of Acronyms

ATT	-	Advanced Treatment Technology
BAPRT	-	Best Available Phosphorus Reduction Technology
BCNP	-	Big Cypress National Preserve
BMP	-	Best Management Practices
C-#	-	Refers to a District canal with its numeric designation
CERP	-	Comprehensive Everglades Restoration Plan
CEU	-	Continuing Education Unit
CMP	-	Corrugated Metal Pipe (structure or culvert type)
CTSS	-	Chemical Treatment followed by Solids Separation
DMSTA	-	Dynamic Model for Stormwater Treatment Areas
EAA	-	Everglades Agricultural Area
ECP	-	Everglades Construction Project
EFA	-	Everglades Forever Act
EPA	-	Everglades Protection Area
EPD	-	EAA Everglades Protection District
ERP	-	Environmental Resource Permit
ESP	-	Everglades Stormwater Program
F.A.C.	-	Florida Administrative Code
F.S.	-	Florida Statutes
FTE	-	Full Time Equivalent
FY	-	Fiscal Year
G-#	-	Refers to a District structure with its numeric designation
L-#	-	Refers to a District levee with its numeric designation
NNRC	-	North New River Canal
NRCS	-	Natural Resource Conservation Service
NSID	-	North Springs Improvement District
OM&M	-	Operation, Maintenance and Monitoring
OPE	-	Other Project Element
PDE	-	Process Development and Engineering
PDT	-	Project Delivery Team

PIR	-	Project Implementation Report
PL	-	Public Law
PMP	-	Project Management Plan
PSTA	-	Periphyton-Based Stormwater Treatment Area
RCB	-	Reinforced Concrete Box (culvert or structure type)
S-#	-	Refers to federally constructed District or USACE structure with its numeric designation
SAV	-	Submerged Aquatic Vegetation
SFWMD	-	South Florida Water Management District
SFWMM	-	South Florida Water Management Model
STA	-	Stormwater Treatment Area
STA-#	-	STA with its numeric designation
STSOC	-	Supplemental Technology Standard of Comparison
TP	-	Total Phosphorus
USACE	-	United States Army Corps of Engineers
WCA	-	Water Conservation Area
WCA-#	-	WCA with its numeric designation
WCP	-	Water Conservation Plan
WMA	-	Wildlife Management Area
WMP	-	Water Management Plan
WRA	-	Water Resource Area
WRDA	-	Water Resources Development Act

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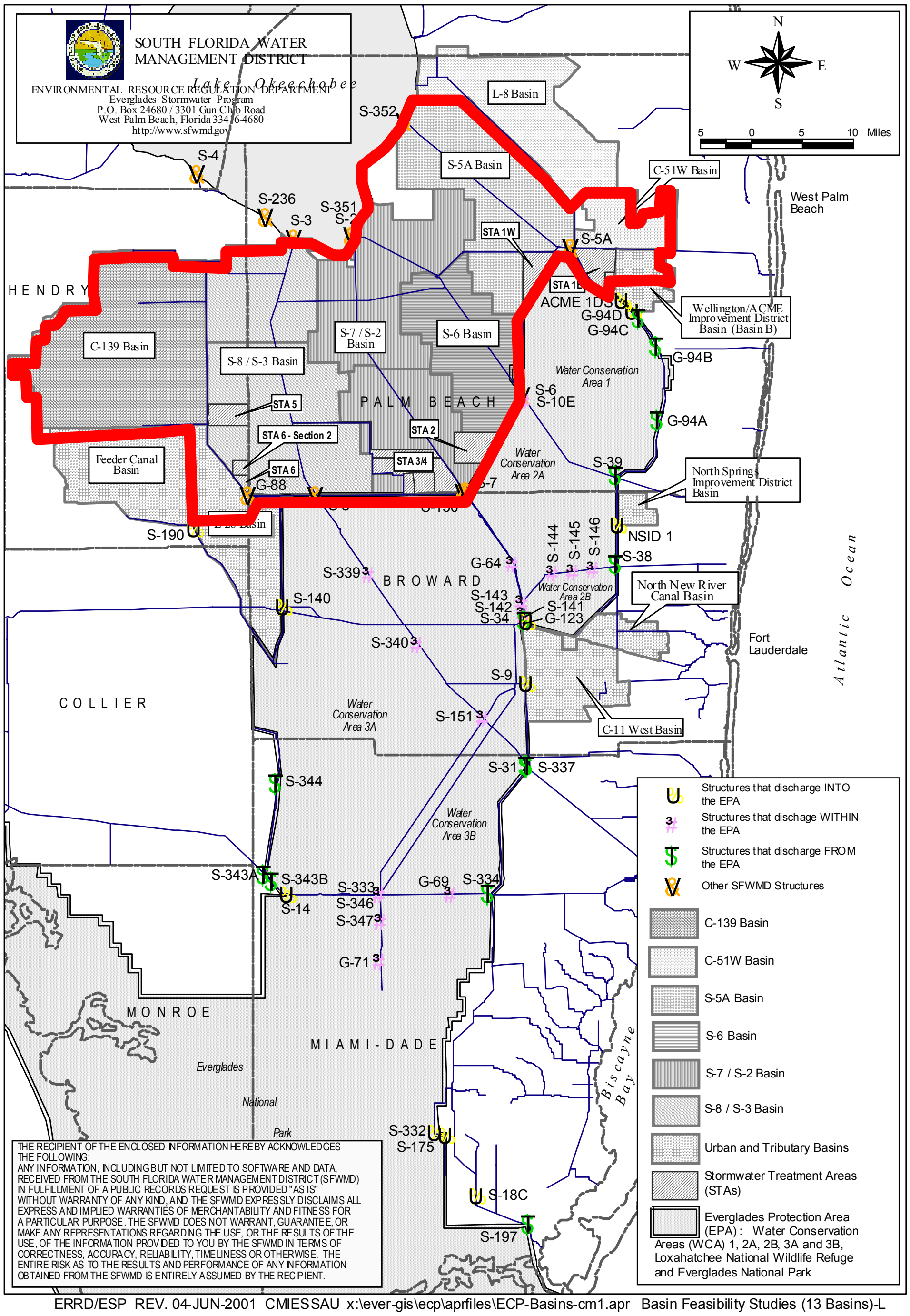
2. PRE-2006 STRATEGIES, ECP BASINS

This Part 2 defines enhancements and improvements to the Stormwater Treatment Areas (STAs) constructed under the 1994 Everglades Construction Project (ECP) recommended for completion in advance of December 31, 2006. As discussed in Part 1, the pre-2006 recommended improvements and strategies are considered to be the maximum scientifically defensible steps that have been identified at this time. There is a possibility that these steps will meet a long-term geometric mean total phosphorus concentration of 10 ppb in discharges from the various basins. However, it is also possible that these 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. As used herein, "long-term" is taken as that represented by a 31-year geometric mean based on model simulations. Also as noted in Part 1, there remains uncertainty concerning the efficacy of some recommended improvements and strategies, as well as of increased STA acreage and CERP adaptations. It is for those reasons that the Process Development and Engineering (PDE) actions recommended in Part 5 are included in this overall plan. If, as a result of future performance data and forecasts, it is found necessary to take additional actions to provide adequate assurance of an ability to meet the planning objectives, those actions will be based on the findings and conclusions of the PDE effort. Those post-2006 steps would include identification and adaptive implementation of additional water quality improvement measures that may then be considered necessary to achieve the phosphorus criterion (Rule 62-302.540, F.A.C.). Those steps would be finally defined and implemented in accordance with the overall strategy outlined in Part 6 of this Long-Term Plan. The hydrologic basins addressed in this Part 2 are listed in Table 2.1; the overall boundary of those basins is shown in Figure 2.1.

Table 2.1 Summary of ECP Basins and Receiving STAs

Hydrologic Basin	Receiving STA(s)
C-51 West	STA-1E
S-5A	STA-1W, STA-1E
S-6	STA-2
S-7/S-2	STA-3/4
S-8/S-3	STA-3/4, STA-6
C-139	STA-5, STA-3/4
C-139 Annex	STA-6



ERRD/ESP REV. 04-JUN-2001 CMIESSAU x:\ever-gis\ecp\aprfiles\ECP-Basins-cm1.apr Basin Feasibility Studies (13 Basins)-L

Figure 2.1 ECP Basins and Overall Boundary

(This figure includes only SFWMD permit structures, and excludes structures operated by the USACE)

Approx. Overall Boundary of ECP Basins

The primary source of the information and data contained in this Part 2 is the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, prepared for the South Florida Water Management District by Burns & McDonnell. In certain instances, the recommendations presented herein include additional steps beyond those discussed or contemplated in that reference. Those additional steps are specifically identified and discussed herein.

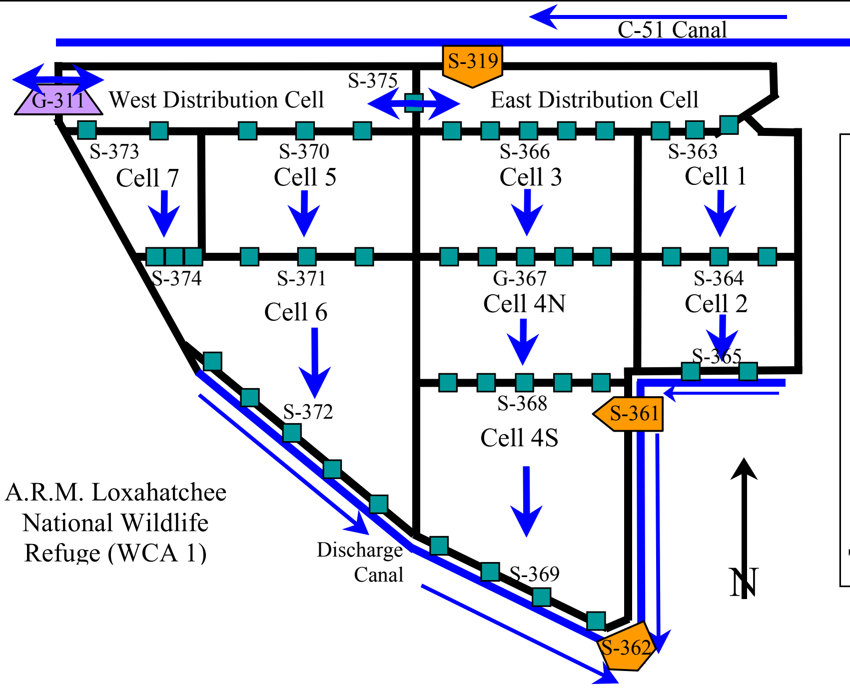
It should be anticipated that further refinements to the Pre-2006 Projects and activities recommended herein will be made as more scientific and engineering information is obtained.

It is intended that the stormwater treatment areas be operated to maximize the amount of water treated; e.g., no bypass of the treatment areas should be permitted except under extreme circumstances in which the hydraulic capacity of the works is exceeded. It is further intended that the operation of the treatment works not negatively impact flood protection. Ancillary uses of the treatment areas for purposes other than water quality improvement should be limited to those that do not negatively impact treatment performance.

An analysis of the potential impact of the pre-2006 measures recommended herein on phosphorus concentrations and loads delivered to the EPA is presented in Part 4 of this Long-Term Plan.

2.1. STA-1E

STA-1E is situated immediately east of the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1) and south of the C-51 Canal. Its primary source of inflow is the C-51 West Basin. Runoff from the C-51 West Basin will be introduced to STA-1E through Pumping Station S-319. An additional source of inflow to STA-1E is runoff from the Rustic Ranches subdivision. Although a part of the C-51 West basin, runoff from that area will be introduced to STA-1E through Pumping Station S-361. Discharges from STA-1E will be directed to WCA-1 through Pumping Station S-362. STA-1E, including those primary pumping stations, is presently being constructed by the Jacksonville District, USACE, and is scheduled for completion in 2004. A schematic diagram of STA-1E reflecting its current design is presented in Figure 2.2. The hydrologic basin boundaries of areas tributary to STA-1E are shown in Figure 2.4.



Cell	Effective Area (ac)
1	556
2	552
3	589
4N	645
4S	752
5	571
6	1,049
7	418
Total	5,132 ac

Figure 2.2 Current Design Schematic, STA-1E

The design of the STA-1 Inflow and Distribution Works is developed to permit the diversion and redirection of inflows between STA-1E and STA-1W. Structure G-311 will consist of a gated spillway constructed in Levee L-40, which forms the easterly perimeter of WCA-1. Runoff from the S-5A Basin can be directed to STA-1E through G-311; the current design and operation of STA-1W contemplates that redirection of flows whenever the discharge from Pumping Station S-5A exceeds the hydraulic capacity of STA-1W. Runoff from the C-51 West Basin can be directed to STA-1W through G-311 as well. However, the present design of STA-1E is developed such that no such redirection would be necessary as a result of hydraulic limitations in STA-1E. The construction of G-311 is presently scheduled for completion in 2004, concurrent with the presently planned completion of STA-1E.

Upon completion, STA-1E will provide a total effective treatment area of 5,132 acres, situated generally between the C-51 Canal (on the north) and WCA 1 (in the southwest), and west of Flying Cow Road. This stormwater treatment area is intended to treat inflows from the C-51 Canal (via Structure S-319), and G-311 via the Inflow and Distribution Basin. Those inflows are comprised of contributions from a number of sources, including:

- Agricultural and urban runoff and discharges from the C-51 Basin;
- Agricultural runoff and discharges from the L-101/EAA S-5A Basin (when pumpage rates at Pump Station S-5A exceed the hydraulic capacity of STA-1W);
- Supplemental (irrigation) water necessary to prevent dryout of the STA from Lake Okeechobee;
- Flow from the Rustic Ranches subdivision (a part of the C-51 West Basin) through Pumping Station S-361.

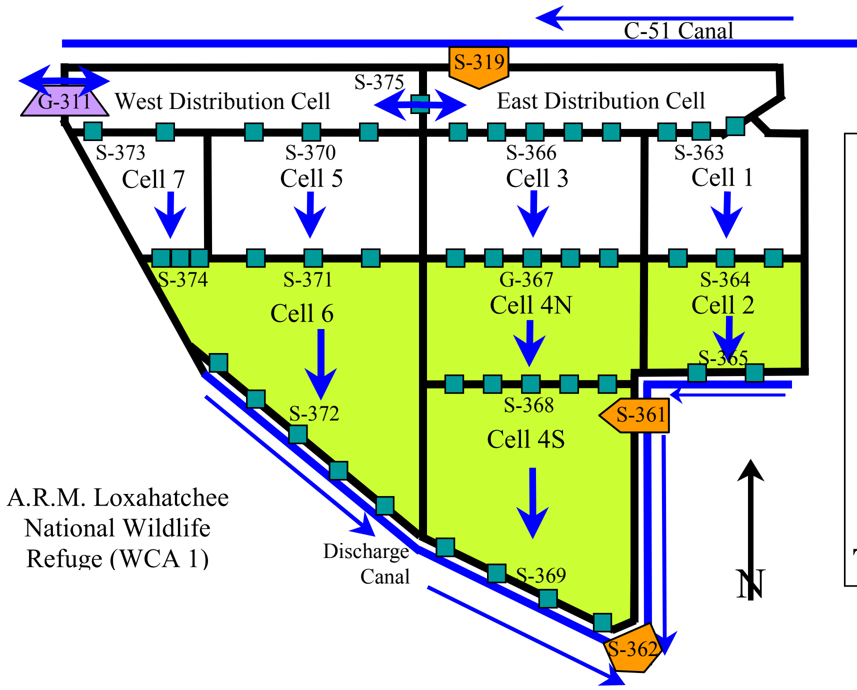
STA-1E is being developed as essentially three parallel flow paths, each developed with cells in series, preceded by distribution cells located along and parallel to the C-51 Canal. Those distribution cells encompass 1,046 acres in addition to the 5,132 acres in the STA-1E treatment cells. The current basis for design of STA-1E contemplates that all treatment cells will be developed in emergent macrophyte vegetation.

2.1.1. Recommended Improvements and Enhancements

Improvements and enhancements recommended for STA-1E consist of Alternative 1 as it is presented in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*. That alternative is intended to address currently planned inflows to STA-1E, and includes the following component element(s):

- Convert Cells 2, 4N, 4S and 6 from emergent macrophyte to submerged aquatic vegetation.

A schematic diagram of STA-1E, modified as recommended herein, is presented in Figure 2.3.



Cell	Effective Area (ac)
1	556
2	552
3	589
4N	645
4S	752
5	571
6	1,049
7	418
Total	5,132 ac

Figure 2.3 Schematic Diagram of Enhanced STA-1E

In Figure 2.3, those areas recommended for conversion to SAV are shown shaded.

Possible additional modifications to STA-1E are discussed in Part 3 for accommodation of Acme Improvement District, Basin B runoff diverted from the Loxahatchee National Wildlife Refuge to STA-1E.

2.1.2. Opinion of Capital Cost [Bc10]

An opinion of the capital cost of implementing the recommended enhancements and modifications to STA-1E is presented in Table 2.2. That estimate is reported in FY 2003 dollars.

Table 2.2 Opinion of Capital Cost, STA-1E Enhancement [Bf]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Eradication of Existing Vegetation	2998	ac	$200	$599,600	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$599,600**	**$600,000**
Planning, Engineering & Design		10 %			$59,960	**$60,000**
Construction Management		7 %			$41,972	**$42,000**
Total Estimated Cost, Without Contingency					**$701,532**	**$702,000**
Contingency		30 %			$210,460	**$210,000**
TOTAL ESTIMATED CAPITAL COST					**$911,992**	**$912,000**

2.1.3. Opinion of Incremental Operation and Maintenance Cost [Bf]

The following is a summary listing of the anticipated incremental operation and maintenance requirements for the recommended enhancement to STA-1E (e.g., requirements in addition to those for operation of maintenance of STA-1E as presently designed):

- ➢ Additional herbicide treatment of Cells 2, 4NS and 6 for control of invasive species and emergent macrophyte vegetation. This item includes:
  - Annual costs to spray for invasive species;
  - Additional costs for post-drought eradication of undesirable species.

An opinion of the average annual incremental operation and maintenance cost for the recommended enhancement of STA-1E is presented in Table 2.3.

Table 2.3 Opinion of Incremental O&M Cost, Enhanced STA-1E [Bf]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Incremental Cost forAnnual Vegetation Control	2998	ac	$30	$89,940	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$89,940**	
Contingency		30 %			$26,982	
TOTAL INCREMENTAL O&M COST					**$116,922**	**$117,000**

The estimated cost for operation, maintenance and monitoring of STA-1E as it is presently designed is discussed in Part 8. The estimated monitoring costs in Part 8 include the additional costs for monitoring of the recommended enhancements.

2.1.4. Implementation Schedule

As earlier noted, STA-1E is presently under construction, and is scheduled for completion in early 2004. The design and construction of STA-1E is being accomplished by the Jacksonville District, U.S. Army Corps of Engineers (with the exception of Structure G-311, which will be constructed by the South Florida Water Management District). The SFWMD has initiated discussions with the Jacksonville District in which it is recommended that the initial construction of STA-1E incorporate the development of submerged aquatic vegetation (SAV) in Cells 2, 4N, 4S, and 6, as recommended herein. A draft vegetation management plan has been prepared by the Corps that partially incorporates those recommendations. It is assumed that STA-1E will not be available for implementation of the recommended enhancements by SFWMD until early 2004. It is therefore anticipated that the design and preparation of contract documents for the enhancement will occur in the District's Fiscal Year (FY) 2004, with the actual implementation of the enhancements in FY 2005. Given that schedule, roughly one year would be available for maturation of the SAV community prior to the December 31, 2006 goal for overall completion. Additional coordination will occur between the District and the Corps in full accord with the Project Cooperation Agreement for STA-1E executed on April 29, 1999.

2.1.5. Projected Expenditures [Bc10, Bf]

A summary of the projected expenditures through FY 2016 (in FY 2003 dollars) for the recommended enhancement of STA-1E is presented in Table 2.4.

Table 2.4 Projected Expenditures, STA-1E Enhancement [Bc10, Bf]

Fiscal Year (FY)	Scheduled Expenditure by Type (FY 2003 $)							Total Fiscal Year Expenditure (FY 2003 $)
	Planning, Eng. & Design	Construction Management	Construction	Land Acquisition	Project Contingency	Total Capital Cost [Bc10]	Incremental O&M Cost [Bf]	
	(All in Budget Activity Code Bc10 [Bc10])							
2004	$60,000				$18,000	$78,000		$78,000
2005		$42,000	$600,000		$192,000	$834,000		$834,000
2006						$0	$117,000	$117,000
2007						$0	$117,000	$117,000
2008						$0	$117,000	$117,000
2009						$0	$117,000	$117,000
2010						$0	$117,000	$117,000
2011						$0	$117,000	$117,000
2012						$0	$117,000	$117,000
2013						$0	$117,000	$117,000
2014						$0	$117,000	$117,000
2015						$0	$117,000	$117,000
2016						$0	$117,000	$117,000
Total	**$60,000**	**$42,000**	**$600,000**	**$0**	**$210,000**	**$912,000**	**$1,287,000**	**$2,199,000**

2.2. STA-1W

STA-1W and STA-1E are hydraulically connected through the STA-1 Inflow and Distribution Works, situated at the extreme northerly end of the Loxahatchee National Wildlife Refuge. The design of the STA-1 Inflow and Distribution Works is developed to permit the diversion and redirection of inflows between STA-1E and STA-1W. Structure G-311 will consist of a gated spillway constructed in Levee L-40, which forms the easterly perimeter of WCA-1. Runoff from the S-5A Basin can be directed to STA-1E through G-311; the current design and operation of STA-1W contemplates that redirection of flows whenever the discharge from Pumping Station S-5A exceeds the hydraulic capacity of STA-1W. While runoff from the C-51 West Basin can also be directed to STA-1W through those same works, such diversions are not currently planned as a normal operating strategy. The relative locations of STA-1W and STA-1E, as well as depiction of the overall boundaries of their tributary areas, are shown in Figure 2.4.

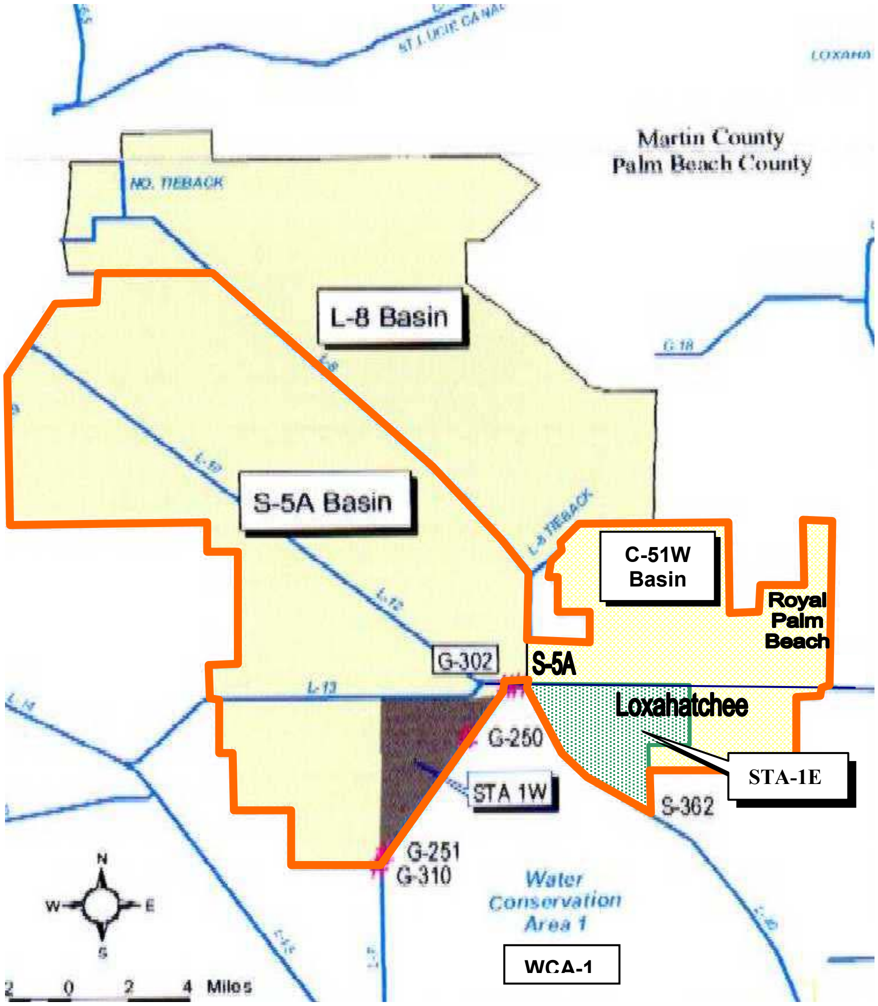


Figure 2.4 Basins Tributary to STA-1E and STA-1W

STA-1W is situated immediately west of the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1) and south of the L10/L12 (West Palm Beach) Canal. The primary source of inflow to STA-1W is the S-5A Basin in the Everglades Agricultural Area. Runoff from the S-5A Basin is lifted by Pumping Station S-5A to the STA-1 Inflow and Distribution Works, situated in the extreme northerly end of WCA-1. Discharges from the Inflow and Distribution Works to STA-1W are made through Structure G-302, a gated spillway in Levee L-7 (which forms the westerly perimeter of WCA-1). Discharges from STA-1W are directed to WCA-1 through pumping stations G-251 and G-310. STA-1W is complete and is presently operational. A schematic diagram of STA-1W as it presently exists is shown in Figure 2.5.

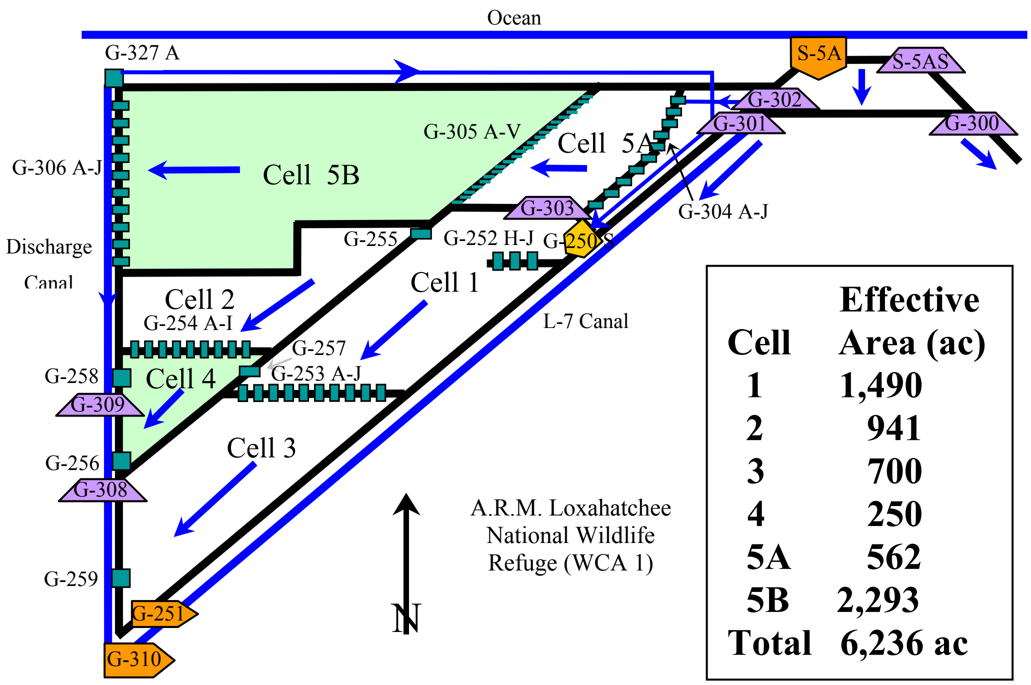


Figure 2.5 Schematic of Existing STA-1W

In Figure 2.5, those areas presently developed in SAV are shown shaded.

STA-1W provides a nominal treatment area of 6,670 acres, generally bounded by the Ocean Canal (on the north) and Water Conservation Area 1 (on the east and south). However, as discussed in the October, 2002 *Evaluation of Alternatives for the ECP Basins*, hydraulic inefficiencies and partial diversion of flows above the lower ends of Cells 3 and 4 result in a reduction of the total effective treatment area from 6,670 acres to 6,236 acres, as indicated in Figure 2.5. Inflows are comprised of contributions from a number of sources, including:

- Agricultural runoff and discharges from the S-5A Basin;
    - Includes discharges from certain Chapter 298 drainage districts diverted from Lake Okeechobee;
- West Palm Beach Canal Best Management Practices Makeup Water;
- Supplemental (irrigation) water necessary to prevent dryout of the STA from Lake Okeechobee.

STA-1W has three flow paths, each developed with cells in series. The northern path flows in a westerly direction and the eastern and western path flows in a southerly direction. Cells 1 through 4 comprise the original Everglades Nutrient Removal (ENR) project. All cells are nominally developed in emergent macrophytic vegetative communities except Cells 4 and 5B, which have been developed in submerged aquatic vegetation (SAV).

2.2.1. Recommended Improvements and Enhancements

Improvements and enhancements recommended for STA-1W consist of Alternative 2 as it is presented in the October, 2002 *Evaluation of Alternatives for the ECP Basins*. That alternative includes the following component elements:

- Construction of a small seepage pumping station (designated as G-327B) near the northeast corner of Cell 5B, included in the design to permit withdrawal from the seepage canal to maintain stages in the SAV Cell 5B. The station is assigned a preliminary capacity of 65 cfs (equal to a maximum daily evaporation rate of 0.24"/day in Cell 5A and 5B, and an estimated seepage loss from the cell of 0.30"/day);
- Herbicide treatment of Cell 3 for removal of emergent macrophyte vegetation to permit development of SAV. That treatment was considered as applicable to the entire 1,026-acre nominal area of Cell 3, despite limiting the effective area to 700 acres in the analysis;
- Replacement of existing Structure G-255 with a fully operable control structure (nominal capacity of approximately 585 cfs). It will also be necessary to extend power from G-303 to the new structure;
- Construction of a new levee across Cell 2, together with a series of culverts for improved flow distribution. Those structures are anticipated to consist of corrugated metal culverts with stop log risers (total of six 84" culverts);
- Construction of a new levee across Cell 1, together with a series of fully operable control structures. The nominal combined capacity of those structures would be 1,105

cfs; they are expected to consist of the hydraulic equivalent of four gated 8'x8' reinforced concrete box culverts (RCBs). The construction of a new power line would be required for those structures;

- Herbicide treatment in those parts of Cells 1 and 2 to be converted to SAV.

A schematic diagram of STA-1W, modified as recommended herein, is presented in Figure 2.6.

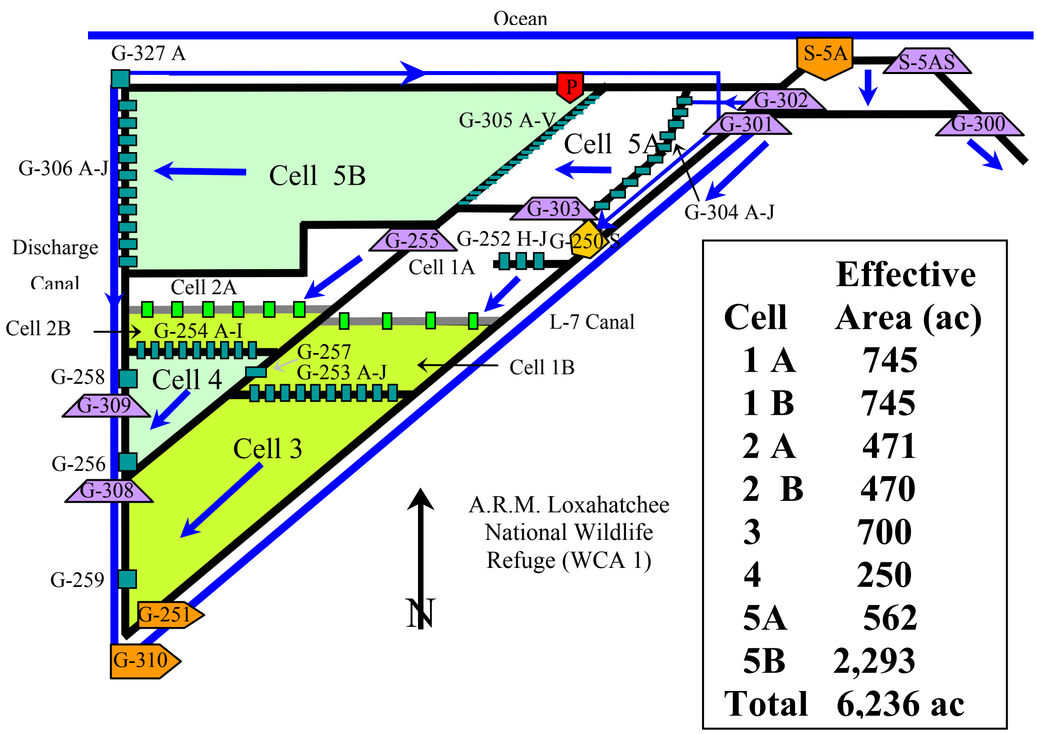


Figure 2.6 Schematic Diagram of Enhanced STA-1W

In Figure 2.6, those areas presently developed in SAV are shown lightly shaded; those additional areas recommended for conversion to SAV are shown in slightly darker shading.

2.2.2. Opinion of Capital Cost [Bc20]

An opinion of the capital cost of implementing the recommended enhancements and modifications to STA-1W is presented in Table 2.5. That estimate is reported in FY 2003 dollars.

Table 2.5 Opinion of Capital Cost, STA-1W Enhancement [Bc20]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Internal Levee in Cell 2, 7' height (Excludes Blasting Costs)	1.2	Mi.	$390,000	$468,000	Unit cost from Evaluation Methodology
2	New Internal Levee in Cell 1, 7' height (Excludes Blasting Costs)	1	Mi.	$390,000	$390,000	Unit cost from Evaluation Methodology
3	Blasting for New Levee and Canals	2.2	Mi.	$48,000	$105,600	Allow Approx.$1/cy
4	New Water Control Structures in Cell 1 (8'x8' similar to G-381, Gated)	4	Ea.	$190,000	$760,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
5	New Water Control Structures in Cell 2	6	Ea.	$35,000	$210,000	Unit cost from Evaluation Methodology
6	Replacement Structure G-255	1	Ea.	Allow	$380,000	Roughly equivalent to two 8'x8' RCBs
7	Water Control Structure Electrical (Includes Telemetry)	5	Ea.	$43,000	$215,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
8	Stilling Wells (Includes Electrical and Telemetry)	4	Ea.	$9,000	$36,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
9	Electrical Power Distribution	3.2	Mi.	$80,000	$256,000	Unit cost from Evaluation Methodology
10	Pumping Station G-327B, Cell 5A	65	cfs	$9,900	$643,500	Unit cost from Evaluation Methodology
11	Eradication of Existing Vegetation	2241	ac	$200	$448,200	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$3,912,300**	**3,900,000**
Planning, Engineering & Design		10 %			$391,230	**400,000**
Construction Management		7 %			$273,861	**275,000**
Total Estimated Cost, Without Contingency					**$4,577,391**	**4,575,000**
Contingency		30 %			$1,373,217	**1,375,000**
TOTAL ESTIMATED CAPITAL COST					**$5,950,608**	**5,950,000**

2.2.3. Opinion of Incremental Operation and Maintenance Cost [Bf]

The following is a summary listing of the anticipated incremental operation and maintenance requirements for the recommended enhancements to STA-1W (e.g., requirements in addition to those for operation and maintenance of STA-1W as it presently exists):

- Operation and maintenance of a new seepage return pumping station G-327B at Cell 5A. The pumps in this station are assumed driven by electric motors. The pump station operating costs are estimated using a power cost of $0.08/kw-hr; an assumed total head of 6 feet; an overall efficiency of 85%; and an assigned utilization equal to 10% of the overall time. The resultant power consumption is 0.43 kw/cfs, or 3,770 kw-hr/cfs/yr, which yields an approximate average annual cost of $300/yr/cfs;
- Additional herbicide treatment of Cell 1B, 2B and 3 for control of invasive species and emergent macrophyte vegetation. This item includes both:
  - Annual costs to spray for invasive species;
  - Additional costs for post-drought eradication of undesirable species.
- Costs for maintenance of the additional levees and control structures.

An opinion of the average annual incremental operation and maintenance cost for the recommended enhancement of STA-1W is presented in Table 2.6.

Table 2.6 Opinion of Incremental O&M Cost, Enhanced STA-1W [Bf]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Internal Levees	2.2	Mi.	$3,300	$7,260	
2	New Gated Culverts in Cell 1	4	Ea.	$8,000	$32,000	
3	New Structure G-255	1	Ea.	$18,000	$18,000	Similar to gated spillway
4	New Culverts in Cell 2	6	Ea.	$5,000	$30,000	Manually operated culverts with risers
5	Mech. Maintenance, Pumping Station, Cell 5A, 2 units assumed	2	Ea.	$10,000	$20,000	Unit cost from Evaluation Methodology
6	Power Consumption, Pumping Station G-327B, Cell 5A	65	cfs	$300	$19,500	See text for basis of estimated unit cost
7	Incremental Cost forAnnual Vegetation Control	2241	ac	$30	$67,230	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$193,990**	
Contingency		30 %			$58,197	
TOTAL INCREMENTAL O&M COST					**$252,187**	**$250,000**

The estimated cost for operation, maintenance and monitoring of STA-1W as it presently exists is discussed in Part 8. The estimated monitoring costs in Part 8 include the additional costs for monitoring of the recommended enhancements.

2.2.4. Implementation Schedule

As earlier noted, STA-1W is complete and in full operation. It will be desirable to sequence and schedule construction activities to maximize the proportion of STA-1W that remains operational during the construction and conversion period. In addition, it will be desirable to address the apparent erosion in performance of Cells 2 and 4, which appears to be primarily related to a worsening degree of hydraulic short circuiting in that flow path.

It is anticipated that construction of the new levee and control structures in Cell 2, as well as replacement of Structure G-255 and conversion of the newly created Cell 2B to SAV, can occur no earlier than Fiscal Year (FY) 2005, and should be conducted during the dry season. Construction of the seepage return pump station in Cell 5B should occur on that same schedule. The engineering and design of all components of the recommended enhancement of STA-1W should occur in FY 2004.

The construction of the new levee and control structures in Cell 1, as well as conversion of the vegetation in Cells 1B and 3 from emergent macrophyte to SAV, would occur in FY 2006, and should be conducted during the dry season (e.g., complete in April 2006). Given that schedule, roughly seven months would be available for grow-in and maturation of the SAV community prior to the December 31, 2006 goal for overall completion.

2.2.5. Projected Expenditures [Bc20, Bf]

A summary of the projected expenditures through FY 2016 (in FY 2003 dollars) for the recommended enhancement of STA-1W is presented in Table 2.7.

Table 2.7 Projected Expenditures, STA-1W Enhancement [Bc20, Bf]

Fiscal Year (FY)	Scheduled Expenditure by Type (FY 2003 $)							Total Fiscal Year Expenditure (FY 2003 $)
	Planning, Eng. & Design	Construction Management	Construction	Land Acquisition	Project Contingency	Total Capital Cost [Bc20]	Incremental O&M Cost [Bf]	
	(All in Budget Activity Code Bc20 [Bc20])							
2004	$400,000				$120,000	$520,000		$520,000
2005		$145,000	$2,090,000		$670,000	$2,905,000		$2,905,000
2006		$130,000	$1,810,000		$585,000	$2,525,000	$215,000	$2,740,000
2007						$0	$250,000	$250,000
2008						$0	$250,000	$250,000
2009						$0	$250,000	$250,000
2010						$0	$250,000	$250,000
2011						$0	$250,000	$250,000
2012						$0	$250,000	$250,000
2013						$0	$250,000	$250,000
2014						$0	$250,000	$250,000
2015						$0	$250,000	$250,000
2016						$0	$250,000	$250,000
Total	**$400,000**	**$275,000**	**$3,900,000**	**$0**	**$1,375,000**	**$5,950,000**	**$2,715,000**	**$8,665,000**

2.3. STA-2

STA-2 provides a total effective treatment area of 6,340 acres, and is situated immediately west of the L-6 Borrow Canal, with Water Conservation Area 2A (WCA-2A) to its east, and three miles north of Pump Station S-7. Roughly two-thirds of STA-2 is situated on the former Brown's Farm Wildlife Management Area. This stormwater treatment area is intended to treat inflows from the Hillsboro Canal (via Pumping Station S-6). Those inflows are comprised of contributions from a number of sources, including:

- Agricultural runoff and discharges from the S-6/S-2 Basin;
- A partial diversion of runoff from the S-5A Basin via the Ocean and Hillsboro Canals;
- Chapter 298 drainage districts situated on the easterly shore of Lake Okeechobee;
- Supplemental (irrigation) water necessary to prevent dryout of the STA from Lake Okeechobee and Best Management Practice Makeup Water;

- Water supply releases from Lake Okeechobee meant for delivery to the Lower East Coast.

The general boundary of the area tributary to STA-2 is shown in Figure 2.7.

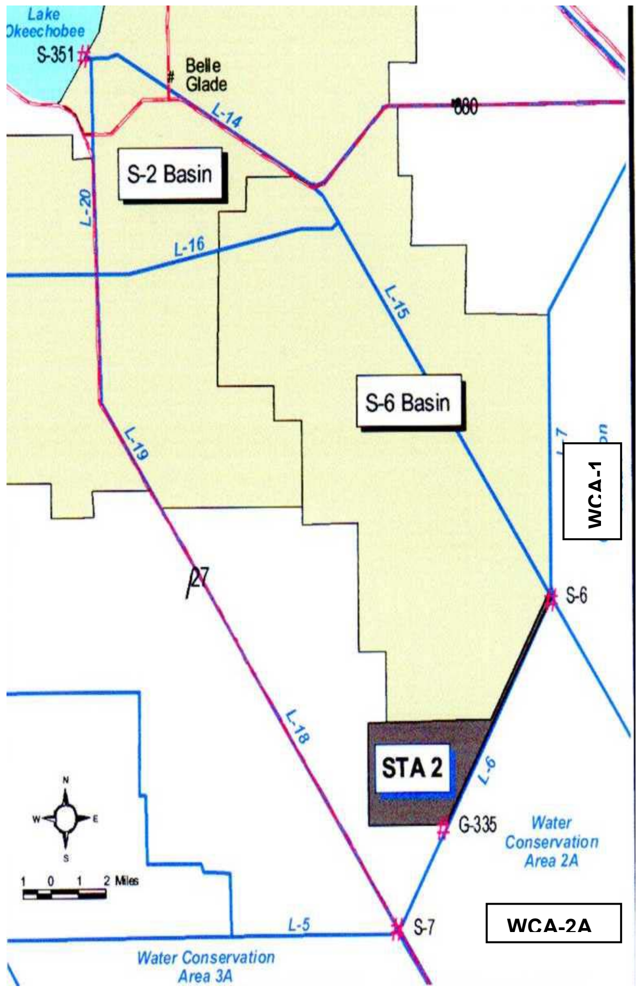


Figure 2.7 Area Tributary to STA-2

STA-2 is now complete and in full operation. It is developed in three parallel flow paths, each with a southerly flow direction. Cells 1 and 2 are at present populated primarily with emergent macrophytic vegetative communities; Cell 3 is primarily submerged aquatic vegetation (SAV), although there are approximately 500 acres of emergent vegetation (former Brown's Farm Wildlife Management Area, or WMA, lands) in the southeasterly corner of the cell. A schematic of STA-2 as it presently exists is shown in Figure 2.8.

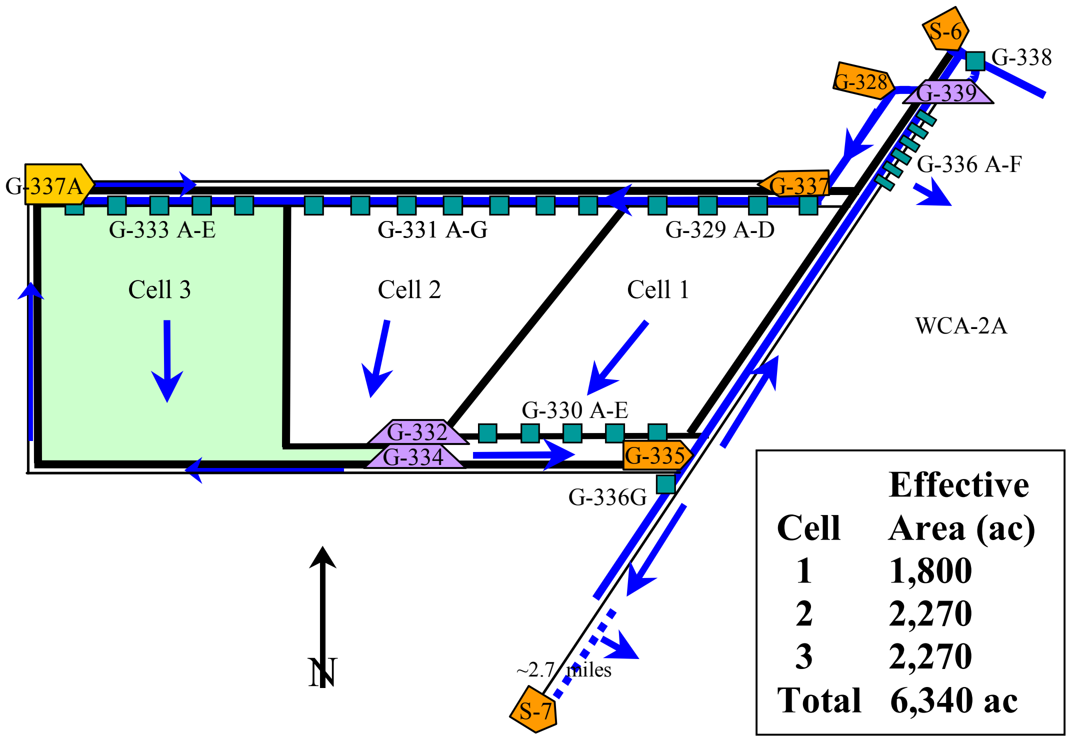


Figure 2.8 Schematic of Existing STA-2

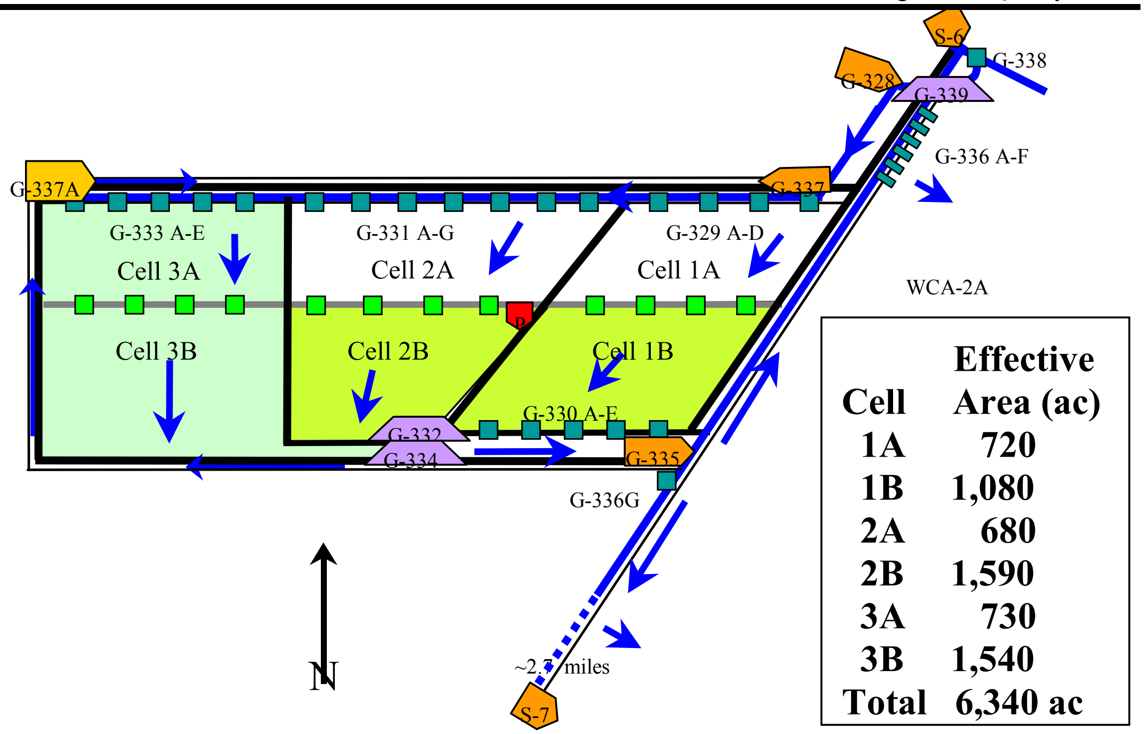
In Figure 2.8, those areas presently developed in SAV (Cell 3) are shown shaded; there are approximately 500 acres in the southeasterly corner of Cell 3 that are at present emergent vegetation.

2.3.1. Recommended Improvements and Enhancements

Improvements and enhancements recommended for STA-2 are generally consistent with Alternative 1 as it is presented in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*. The single exception is the proposed routing of power lines to new water control structures, which has been adjusted to reflect the specific construction sequence outlined in Section 2.3.3. The recommended enhancements to STA-2 include the following component elements:

- Construction of approximately 3.3 miles of interior levee, subdividing Cell 1 into Cells 1A and 1B, Cell 2 into Cells 2A and 2B, and Cell 3 into 3A and 3B;
- Construction of additional water control structures through the new levee between cells in series. Four control structures are assigned to each cell, and assumed to be equivalent in number and character to STA-3/4's G-381 Structures (8'x8' gated reinforced concrete box culverts, or RCB's, with telemetric control);
- Extension of an overhead power distribution line along the westerly perimeter of Cell 3 from the northwesterly corner of the treatment area (or, alternatively, from the general location of Structure G-332 along the interior levee between Cells 2 and 3) to the westerly end of the new levee across Cell 3, and then east along the new levee across Cells 1, 2 & 3 (total length of approximately 4.8 miles);
- One small forward-pumping station along the new interior Cell 2 levee to permit withdrawal from upstream emergent marsh cell to maintain stages in the downstream SAV cell. This station pumping from Cell 2A to Cell 2B is assigned a preliminary capacity of 14 cfs (equal to a maximum daily evaporation rate from Cell 2B of 0.24"/day);
- Herbicide treatment of Cells 1B, 2B and 500 acres of 3A/3B (conversion of remaining emergent vegetation) for removal of emergent macrophyte vegetation to permit development of SAV.

A schematic of STA-2 modified as recommended herein is presented in Figure 2.9. As originally simulated in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, the subdivision of each of the three flow paths was modeled assigning 40% of the total area in the flow path to the upstream cell, with the remaining 60% of the flow path in the downstream cell. That distribution has subsequently been refined to take advantage of existing topographic features in the interest of construction economy. As presently planned, Cell 1A will occupy 40% of the most easterly flow path; Cell 2A will occupy 30% of the central flow path; and Cell 3A will occupy 32% of the most westerly flow path. Those adjustments in the extent of area converted to SAV would be expected to have a slight beneficial impact on the results of the original simulations.



Cell	Effective Area (ac)
1A	720
1B	1,080
2A	680
2B	1,590
3A	730
3B	1,540
Total	6,340 ac

Figure 2.9 Schematic of Enhanced STA-2

In Figure 2.9, those areas presently developed in SAV are shown lightly shaded. Those additional areas recommended for conversion to SAV are shown in slightly darker shading.

2.3.2. Opinion of Capital Cost [Bc30]

An opinion of the capital cost for implementing the recommended enhancements to STA-2 is presented in Table 2.8. It varies from the opinion of capital cost presented in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins* due to the increased length of new power line, and is reported in FY 2003 dollars.

Table 2.8 Opinion of Capital Cost, STA-2 Enhancement [Bc30]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Internal Levee, 7' height (Excludes Blasting Costs)	3.3	Mi.	$390,000	$1,287,000	Unit cost from Evaluation Methodology
2	Blasting for New Levee and Canals	3.3	Mi.	$48,000	$158,400	Allow Approx.$1/cy
3	New Water Control Structures (8'x8')	12	Ea.	$190,000	$2,280,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
4	Water Control Structure Electrical (Includes Telemetry)	12	Ea.	$43,000	$516,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
5	Stilling Wells (Includes Electrical and Telemetry)	6	Ea.	$9,000	$54,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
6	Electrical Power Distribution	4.8	Mi.	$80,000	$384,000	Unit cost from Evaluation Methodology
7	Pumping Station, Cell 2A-2B	14	cfs	$7,600	$106,400	Unit cost from Evaluation Methodology
8	Eradication of Existing Vegetation	3170	ac	$200	$634,000	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$5,419,800**	**5,420,000**
Planning, Engineering & Design		10 %			$541,980	**540,000**
Construction Management		7 %			$379,386	**380,000**
Total Estimated Cost, Without Contingency					**$6,341,166**	**6,340,000**
Contingency		30 %			$1,902,350	**1,900,000**
TOTAL ESTIMATED CAPITAL COST					**$8,243,516**	**8,240,000**

2.3.3. Opinion of Incremental Operation and Maintenance Cost [Bf]

The following is a summary listing of the anticipated incremental operation and maintenance requirements for the recommended enhancements to STA-2 (e.g., requirements in addition to those for operation and maintenance of STA-2 as it now exists):

- Maintenance of approximately 3.3 additional miles of interior levee;
- Operation and maintenance of the additional water control structures through the new levee subdividing Cell 1 into Cells 1A and 1B, Cell 2 into Cells 2A and 2B, and Cell 3 into 3A and 3B;
- Operation and maintenance of one small forward-pumping station along the interior levee in Cell 2 between cells in series, included in the design to permit withdrawal from upstream emergent marsh cells to maintain stages in the downstream SAV cells. The pump in this station is assumed to be driven by electric motor. The unit operating costs are estimated using a power cost of $0.08/kw-hr; an assumed total

head of 6 feet; an overall efficiency of 85%; and an assigned utilization equal to 10% of the overall time. The resultant power consumption is 0.43 kw/cfs, or 3,770 kw-hr/cfs/yr., yielding an approximate average annual cost of $300/yr/cfs;

- Additional herbicide treatment of Cells 1B, 2B and 500 acres of 3A/3B (conversion of remaining emergent vegetation) for control of invasive species and emergent macrophyte vegetation. This item includes both:
  - Annual costs to spray for invasive species;
  - Additional costs for post-drought eradication of undesirable species.

An opinion of the average annual incremental operation and maintenance cost for the recommended enhancement of STA-2 is presented in Table 2.9.

Table 2.9 Opinion of Incremental O&M Cost, Enhanced STA-2 [Bf]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Internal Levee	3.3	Mi.	$3,300	$10,890	
2	New Water Control Structures	12	Ea.	$8,000	$96,000	Gated Culverts
3	Mech. Maintenance, Pumping Station, Cell 2A-2B, 1 unit assumed	1	Ea.	$10,000	$10,000	
4	Power Consumption, Pumping Station, Cell 2A-2B	14	cfs	$300	$4,200	
5	Incremental Cost forAnnual Vegetation Control	3170	ac	$30	$95,100	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$216,190**	
Contingency		30 %			$64,857	
TOTAL INCREMENTAL O&M COST					**$281,047**	**$280,000**

The estimated cost for operation, maintenance and monitoring of STA-2 as it now exists is discussed in Part 8. The estimated monitoring costs in Part 8 include the additional costs for monitoring of the recommended enhancements.

2.3.4. Implementation Schedule

As earlier noted, STA-2 is complete and in full operation. It will be desirable to sequence and schedule construction activities to maximize the proportion of STA-2 that remains operational during the construction and conversion period. In addition, it is noted that the emergent macrophyte community in Cell 2 is presently performing better than anticipated. That suggests the desirability of delaying conversion of the vegetative community in this cell (and, by extension, in Cell 1, as both Cells 1 and 2 share the common history of having not been previously farmed) as long as feasible so that the need for that large-scale conversion can be finally demonstrated during actual operation.

The recommended construction in each of the three cells of STA-2 suggests the need to sequence the construction over multiple years, limiting direct impacts on overall treatment performance during any given year. For beneficial effect on construction costs, as well as reduced impact on overall performance of STA-2, the construction should take place in the dry season (November through April) of any given fiscal year.

Given the above, and the need for completion in advance of the target date of December 31, 2006, it is anticipated that all engineering, planning and design will be completed in Fiscal Year (FY) 2004. Construction in FY 2004 would be limited to excavation and stockpiling of borrow materials for subsequent levee construction. It is presently anticipated that the source of the borrow material would be enlargement of the North New River Canal in selected reaches; the design of that borrow area will need to be coordinated with the CERP PDT for the EAA Storage Reservoirs, Phase 1 project.

The following construction should occur in FY 2005:

- Construction of the new internal levee in Cell 2;
- Construction of the new water control structures (4) in Cell 2, complete with electrical/telemetry work and stilling wells (2);
- Construction of approximately 1.3 miles of new power lines to serve the new water control structures in Cell 2;
- Eradication of approximately 1,360 acres of emergent vegetation in (new) Cell 2B. This eradication and conversion to SAV may be delayed pending further analysis of the continuing performance of Cell 2 in the interim;

- Construction of the irrigation supply pumping station in Cell 2;
- Construction of the new internal levee in Cell 1;
- Construction of the new water control structures (4) in Cell 1, complete with electrical/telemetry work and stilling wells (2);
- Construction of approximately one mile of new power line to serve the new water control structures in Cell 2;
- Eradication of approximately 1,080 acres of emergent vegetation in (new) Cell 1B. This eradication and conversion to SAV may be delayed pending further analysis of the continuing performance of Cell 1 in the interim.

The following construction should occur in FY 2006:

- Construction of the new internal levee in Cell 3.
- Construction of the new water control structures (4) in Cell 3, complete with electrical/telemetry work and stilling wells (2).
- Construction of approximately 2.5 miles of new power lines to serve the new water control structures.
- Eradication of approximately 500 acres of emergent vegetation in the southeasterly corner of Cell 3 (former Brown's Farm WMA lands). This eradication and conversion to SAV may be delayed pending further analysis of the continuing performance of Cell 1 in the interim.

2.3.5. Projected Expenditures [Bc30, Bf]

A summary of the projected Expenditures through FY 2016 (in FY 2003 dollars) for the recommended enhancement of STA-2 is presented in Table 2.10.

Table 2.10 Projected Expenditures, Enhanced STA-2 [Bc30, Bf]

Fiscal Year (FY)	Scheduled Expenditure by Type (FY 2003 $)							Total Fiscal Year Expenditure (FY 2003 $)
	Planning, Eng. & Design	Construction Management	Construction	Land Acquisition	Project Contingency	Total Capital Cost [Bc30]	Incremental O&M Cost [Bf]	
	(All in Budget Activity Code Bc30 [Bc30])							
2004	$540,000	$40,000	$600,000		$360,000	$1,540,000		$1,540,000
2005		$230,000	$3,320,000		$1,070,000	$4,620,000		$4,620,000
2006		$110,000	$1,500,000		$470,000	$2,080,000	$205,000	$2,285,000
2007						$0	$280,000	$280,000
2008						$0	$280,000	$280,000
2009						$0	$280,000	$280,000
2010						$0	$280,000	$280,000
2011						$0	$280,000	$280,000
2012						$0	$280,000	$280,000
2013						$0	$280,000	$280,000
2014						$0	$280,000	$280,000
2015						$0	$280,000	$280,000
2016						$0	$280,000	$280,000
Total	**$540,000**	**$380,000**	**$5,420,000**	**$0**	**$1,900,000**	**$8,240,000**	**$3,005,000**	**$11,245,000**

2.4. STA-3/4

The South Florida Water Management District is presently constructing STA-3/4; completion of the entire treatment works is presently scheduled for May 2004, yet it should be noted that efforts are underway to initiate flow-through operations of the 4,500-acre Cell 3 by March 2004. Upon completion, STA-3/4 will provide a total effective treatment area of 16,653 acres, situated generally between U.S. Highway 27 (on the east) and the Holey Land Wildlife Management Area (on the west), lying immediately north of the L-5 Borrow Canal. This stormwater treatment area is intended to treat inflows from the Miami Canal (via Pumping Station G-372) and the North New River Canal (via Pumping Station G-370). Those inflows are comprised of contributions from a number of sources, including:

- Agricultural runoff and discharges from the North New River Canal Basin (S-7/S-2 Basin);
- Agricultural runoff and discharges from the Miami Canal Basin (S-8/S-3 Basin);
- Lake Okeechobee. Anticipated inflows from Lake Okeechobee include:
    - Regulatory releases to both the Miami Canal and North New River Canal;
    - Best Management Practice (BMP) makeup water for both the Miami Canal and North New River Canal basins;

- Supplemental (irrigation) water necessary to prevent dryout of the STA (considered as delivered to the Miami Canal).

- Agricultural runoff and discharges from the C-139 Basin (episodic inflows through Structure G-136 and the L-1E Canal to the Miami Canal);
- Pumping Station S-236 discharges to be diverted from Lake Okeechobee to the Miami Canal for delivery to STA-3/4;
- Storm runoff and discharges from the South Shore Drainage District, to be diverted from Lake Okeechobee to the Miami Canal for delivery to STA-3/4.

The general boundaries of STA-3/4's primary tributary basins are shown in Figure 2.10.

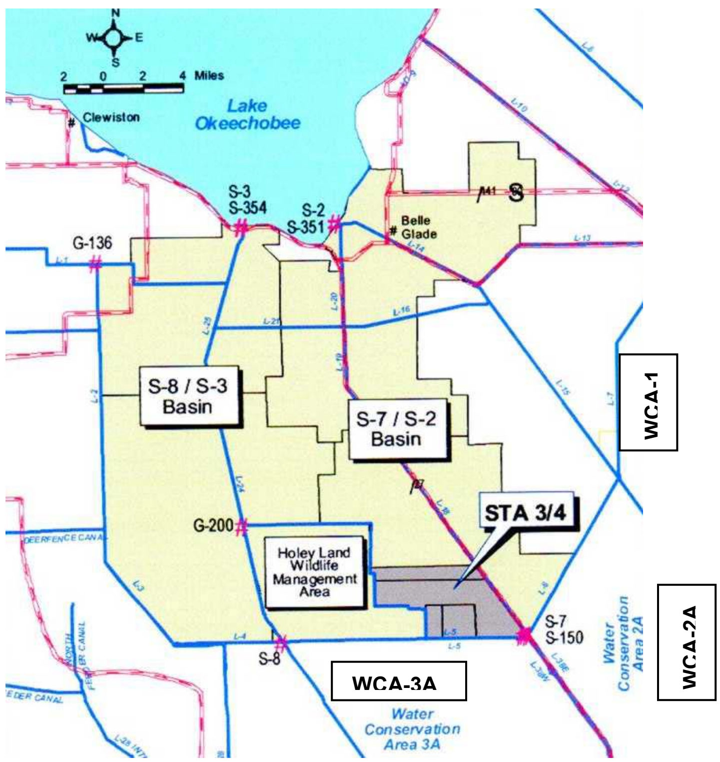
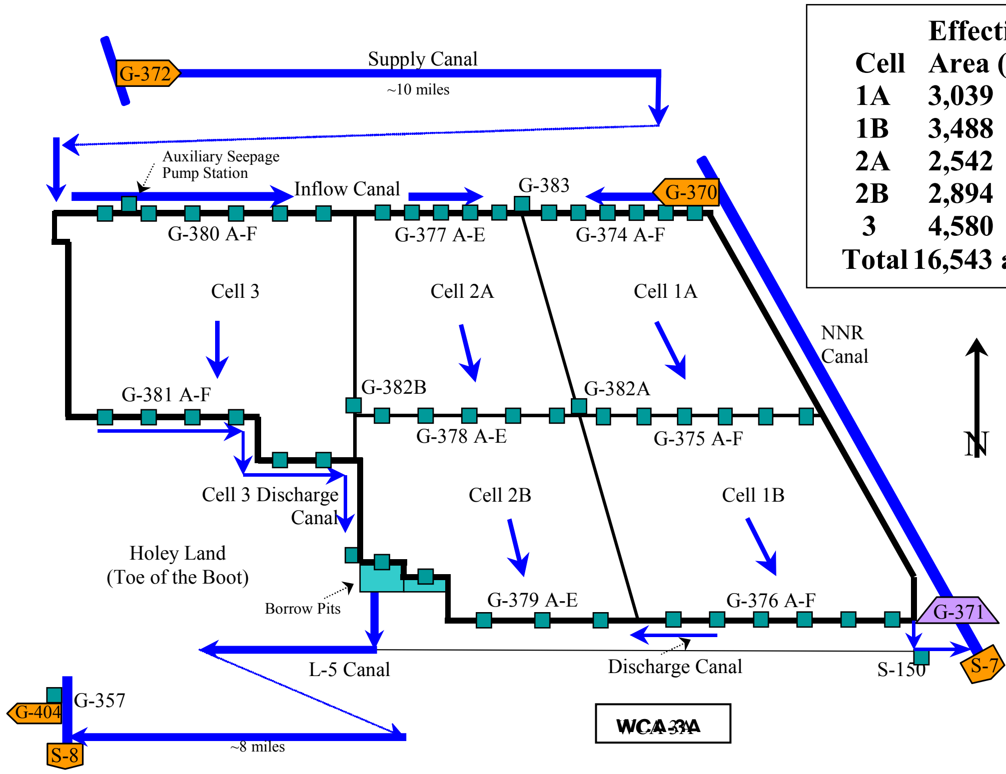


Figure 2.10 Areas Tributary to STA-3/4

STA-3/4 is being developed as three parallel flow paths. The most easterly flow path (Cells 1A and 1B in series) is intended to treat inflows from the North New River Canal. The two westerly flow paths (Cells 2A and 2B in series, Cell 3 in parallel) are intended to treat inflows from the Miami Canal. A schematic of the present design of STA-3/4 is shown in Figure 2.11.



Cell	Effective Area (ac)
1A	3,039
1B	3,488
2A	2,542
2B	2,894
3	4,580
Total	16,543 ac

Figure 2.11 Current Design Schematic, STA-3/4

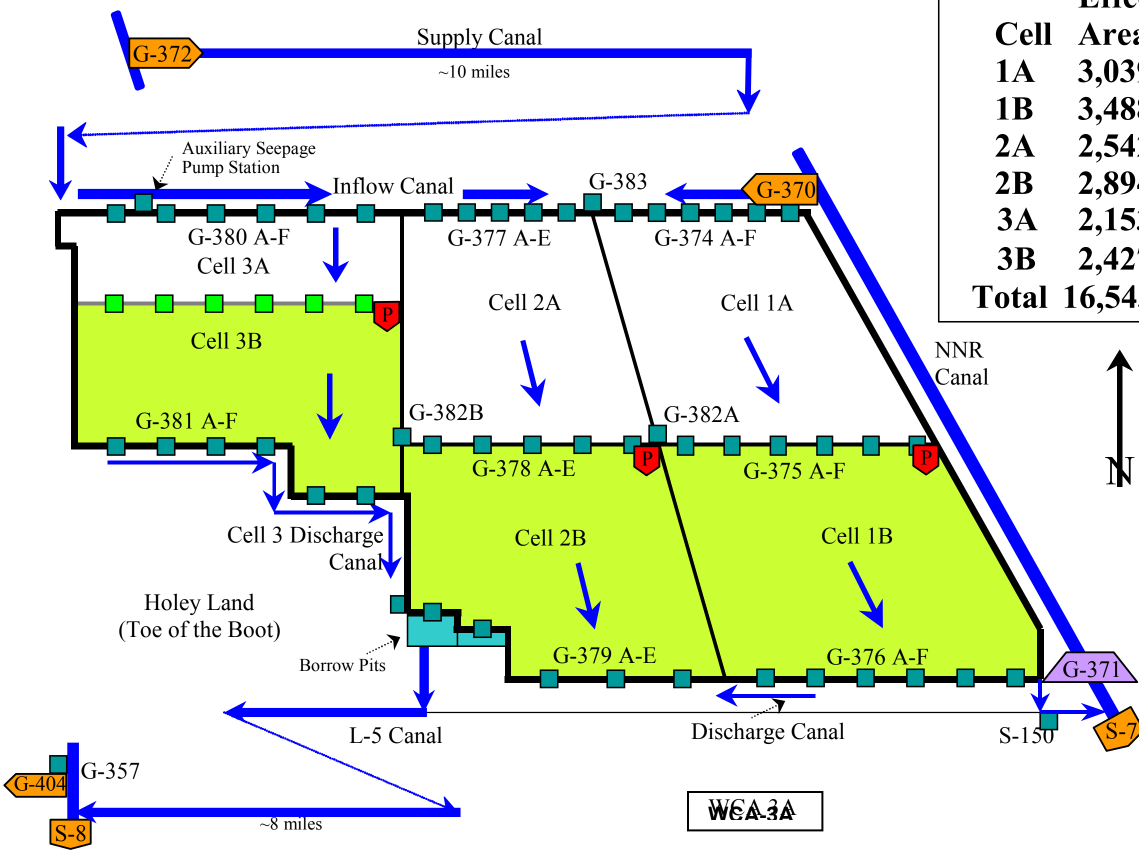
STA-3/4 is presently being developed in emergent macrophyte vegetation throughout its effective treatment area. The construction sequence and methods being employed during construction of STA-3/4 are structured to promote maximum possible vegetative grow-in and maturation prior to its presently scheduled completion date.

2.4.1. Recommended Improvements and Enhancements

Improvements and enhancements recommended for STA-3/4 consist of Alternative 2 as it is presented in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*. That alternative includes the following component elements:

- Construction of approximately 3.3 miles of interior levee, subdividing Cell 3 into Cells 3A and 3B;
- Construction of additional water control structures through the new levee subdividing Cell 3 into Cells 3A and 3B. These structures are assumed to be equivalent in number and character to Structures G-381 (six 8'x8' gated RCB's with telemetric control);
- Extension of an overhead power distribution line from the intersection of Interior Levee 3 and Interior Levee 4, extending north along Interior Levee 4 to the new levee across Cell 3, and then west along the new levee across Cell 3 (total length of approximately 3.6 miles);
- Small forward-pumping stations along the interior levees between cells in series to permit withdrawal from upstream emergent marsh cells to maintain stages in the downstream SAV cells. Three stations are anticipated. The station pumping from Cell 1A to Cell 1B is assigned a preliminary capacity of 54 cfs (equal to a maximum daily evaporation rate from Cell 1B of 0.24"/day, and an estimated seepage loss from Cell 1B of 0.13"/day). The stations pumping from Cell 2A to Cell 2B and from Cell 3A to Cell 3B are assigned preliminary capacities equal to 0.24"/day of evapotranspiration over the downstream cell (29 cfs in Cells 2, 24 cfs in Cells 3). Supplemental flows can be transferred from Cell 2A to Cell 1A through Structure G-382A, and between Cell 2A and Cell 3B through Structure G-382B;
- Herbicide treatment of Cells 1B, 2B and 3B for removal of emergent macrophyte vegetation to permit development of submerged aquatic vegetation (SAV).

A schematic diagram of STA-3/4, enhanced as recommended herein, is presented in Figure 2.12.



Cell	Effective Area (ac)
1A	3,039
1B	3,488
2A	2,542
2B	2,894
3A	2,153
3B	2,427
Total	16,543 ac

Figure 2.12 Schematic Diagram of Enhanced STA-3/4

In Figure 2.12, those areas recommended for conversion to SAV are shown shaded.

2.4.2. Opinion of Capital Cost [Bc40]

An opinion of the capital cost for implementing the recommended enhancements and modifications to STA-3/4 is presented in Table 2.11. That estimate is reported in FY 2003 dollars.

Table 2.11 Opinion of Capital Cost, STA-3/4 Enhancement [Bc40]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Internal Levee, 7' height (Excludes Blasting Costs)	3.3	Mi.	$390,000	$1,287,000	Unit cost from Evaluation Methodology
2	Blasting for New Levee and Canals	3.3	Mi.	$48,000	$158,400	Allow Approx.$1/cy
3	New Water Control Structures (8'x8' similar to G-381, Gated)	6	Ea.	$190,000	$1,140,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
4	Water Control Structure Electrical (Includes Telemetry)	6	Ea.	$43,000	$258,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
5	Stilling Wells (Includes Electrical and Telemetry)	2	Ea.	$9,000	$18,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
6	Electrical Power Distribution	3.8	Mi.	$80,000	$304,000	Unit cost from Evaluation Methodology
7	Pumping Station, Cell 1A-1B	54	cfs	$9,900	$534,600	Unit cost from Evaluation Methodology
8	Pumping Station, Cell 2A-2B	29	cfs	$7,600	$220,400	Unit cost from Evaluation Methodology
9	Pumping Station, Cell 3A-3B	24	cfs	$7,600	$182,400	Unit cost from Evaluation Methodology
10	Eradication of Existing Vegetation	8809	ac	$200	$1,761,800	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$5,864,600**	**5,860,000**
Planning, Engineering & Design		10 %			$586,460	**590,000**
Construction Management		7 %			$410,522	**410,000**
Total Estimated Cost, Without Contingency					**$6,861,582**	**6,860,000**
Contingency		30 %			$2,058,475	**2,060,000**
TOTAL ESTIMATED CAPITAL COST					**$8,920,057**	**8,920,000**

Planning, engineering and design of enhancements to STA-3/4 were initiated in FY 2003. A total of $207,000 has been expended in FY 2003 for those purposes, and is excluded from subsequent projections of expenditures in FY 2004 through FY 2016.

2.4.3. Opinion of Incremental Operation and Maintenance Cost [Bf]

The following is a summary listing of the anticipated incremental operation and maintenance requirements for the recommended enhancement to STA-3/4 (e.g., requirements in addition to those for operation and maintenance of STA-3/4 as presently designed):

- Maintenance of approximately 3.3 additional miles of interior levee;
- Operation and maintenance of the additional water control structures through the new levee subdividing Cell 3 into Cells 3A and 3B;

- Operation and maintenance of the three small forward-pumping stations along the interior levees between cells in series, included in the design to permit withdrawal from upstream emergent marsh cells to maintain stages in the downstream SAV cells. The pumps in these stations are assumed to be driven by electric motors. The unit operating costs are estimated using a power cost of $0.08/kw-hr; an assumed total head of 6 feet; an overall efficiency of 85%; and an assigned utilization equal to 10% of the overall time. The resultant power consumption is 0.43 kw/cfs, or 3,770 kw-hr/cfs/yr., yielding an approximate average annual cost of $300/yr/cfs;

- Additional herbicide treatment of Cells 1B, 2B and 3B for control of invasive species and emergent macrophyte vegetation. This item includes both:

    - Annual costs to spray for invasive species;

    - Additional costs for post-drought eradication of undesirable species.

An opinion of the average annual incremental operation and maintenance cost for the recommended enhancement of STA-3/4 is presented in Table 2.12.

Table 2.12 Opinion of Incremental O&M Cost, Enhanced STA-3/4 [Bf]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Internal Levee	3.3	Mi.	$3,300	$10,890	
2	New Water Control Structures	6	Ea.	$8,000	$48,000	Gated culverts
3	Mech. Maintenance, Pumping Station, Cell 1A-1B, 2 units assumed	2	Ea.	$10,000	$20,000	
4	Mech. Maintenance, Pumping Station, Cell 2A-2B, 1 unit assumed	1	Ea.	$10,000	$10,000	
5	Mech.Maintenance, Pumping Station, Cell 3A-3B, I unit assumed	1	Ea.	$10,000	$10,000	
6	Power Consumption, Pumping Station, Cell 1A-1B	54	cfs	$300	$16,200	
7	Power Consumption, Pumping Station, Cell 2A-2B	29	cfs	$300	$8,700	
8	Power Consumption, Pumping Station, Cell 3A-3B	24	cfs	$300	$7,200	
9	Incremental Cost forAnnual Vegetation Control	8809	ac	$30	$264,270	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$395,260**	
Contingency		30 %			$118,578	
TOTAL INCREMENTAL O&M COST					**$513,838**	**$510,000**

The estimated cost for operation, maintenance and monitoring of STA-3/4 as is it presently designed and being constructed is discussed in Part 8. The estimated monitoring costs in Part 8 include the additional costs for monitoring of the recommended enhancements.

2.4.4. Implementation Schedule

As noted earlier, STA-3/4 is presently under construction. The planning, engineering and design of all enhancements to STA-3/4 will be completed in FY 2004 (as noted earlier, that effort was begun in FY 2003). The following items of construction are scheduled to be completed by December, 2006:

- Construction of the new interior levee subdividing Cell 3 into Cells 3A and 3B;
- Construction of the additional water control structures through the new levee subdividing Cell 3 into Cells 3A and 3B;
- Extension of the overhead power distribution line;
- Construction of the small forward-pumping stations along the interior levees between cells in series;
- Herbicide treatment of Cells 1B, 2B and 3B for removal of emergent macrophyte vegetation to permit development of submerged aquatic vegetation (SAV).

It is recommended that the herbicide treatment of Cells 1B and 2B be scheduled for FY 2004, and that the herbicide treatment of Cell 3B be scheduled for FY 2006. By staggering the treatment of the downstream cells in this fashion, STA-3/4 can be kept in at least partial operation throughout the period 2004-2006. Cell 1B was taken out of agricultural production in 1994, and has since been operated as the Terrytown Wildlife Management Area (WMA).

2.4.5. Projected Expenditures [Bc40, Bf]

A summary of the projected Expenditures through FY 2016 (in FY 2003 dollars) for the recommended enhancement of STA-3/4 is presented in Table 2.13.

Table 2.13 Projected Expenditures, Enhanced STA-3/4 [Bc40, Bf]

Fiscal Year (FY)	Scheduled Expenditure by Type (FY 2003 $)							Total Fiscal Year Expenditure (FY 2003 $)
	Planning, Eng. & Design	Construction Management	Construction	Land Acquisition	Project Contingency	Total Capital Cost [Bc40]	Incremental O&M Cost [Bf]	
	(All in Budget Activity Code Bc40 [Bc40])							
2004	$383,000	$89,000	$1,276,000		$524,000	$2,272,000		$2,272,000
2005		$123,000	$1,760,000		$565,000	$2,448,000	$249,000	$2,697,000
2006		$198,000	$2,824,000		$971,000	$3,993,000	$249,000	$4,242,000
2007						$0	$510,000	$510,000
2008						$0	$510,000	$510,000
2009						$0	$510,000	$510,000
2010						$0	$510,000	$510,000
2011						$0	$510,000	$510,000
2012						$0	$510,000	$510,000
2013						$0	$510,000	$510,000
2014						$0	$510,000	$510,000
2015						$0	$510,000	$510,000
2016						$0	$510,000	$510,000
Total	**$383,000**	**$410,000**	**$5,860,000**	**$0**	**$2,060,000**	**$8,713,000**	**$5,598,000**	**$14,311,000**

The above projection excludes a total of $207,000 expended in FY 2003 for planning, engineering and design of the recommended enhancements.

2.5. STA-5

STA-5 provides a total effective treatment area of 4,110 acres, situated generally on lands between L-2 Borrow Canal (on the west) and Rotenberger Wildlife Management Area (on the east), immediately northeast of the confluence of the Deer Fence Canal with the L-2 Borrow Canal. This stormwater treatment area is intended to treat inflows from the L-2 Borrow Canal (via Structure G-342). These inflows are comprised of contributions from the following:

- Agricultural runoff and discharges from the C-139 Basin (partial, see STA-6 discussion);

- Supplemental (irrigation) water necessary to prevent dryout of the STA from Lake Okeechobee.

The area tributary to STA-5 is shown in Figure 2.13.

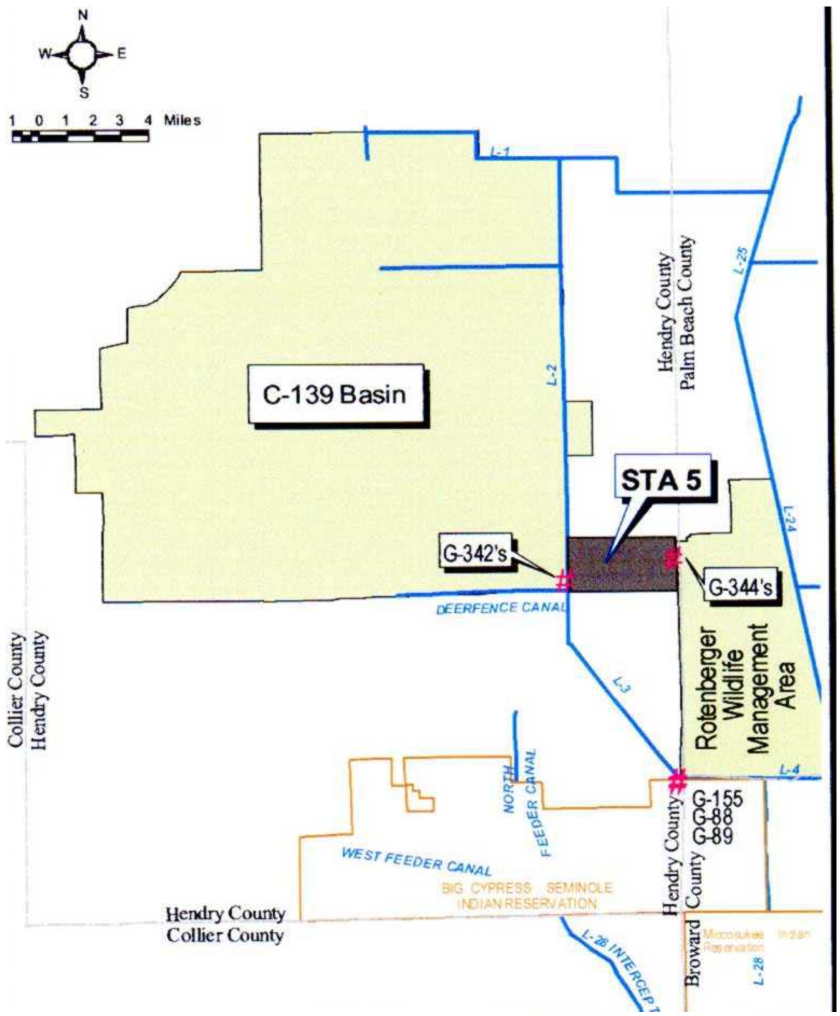
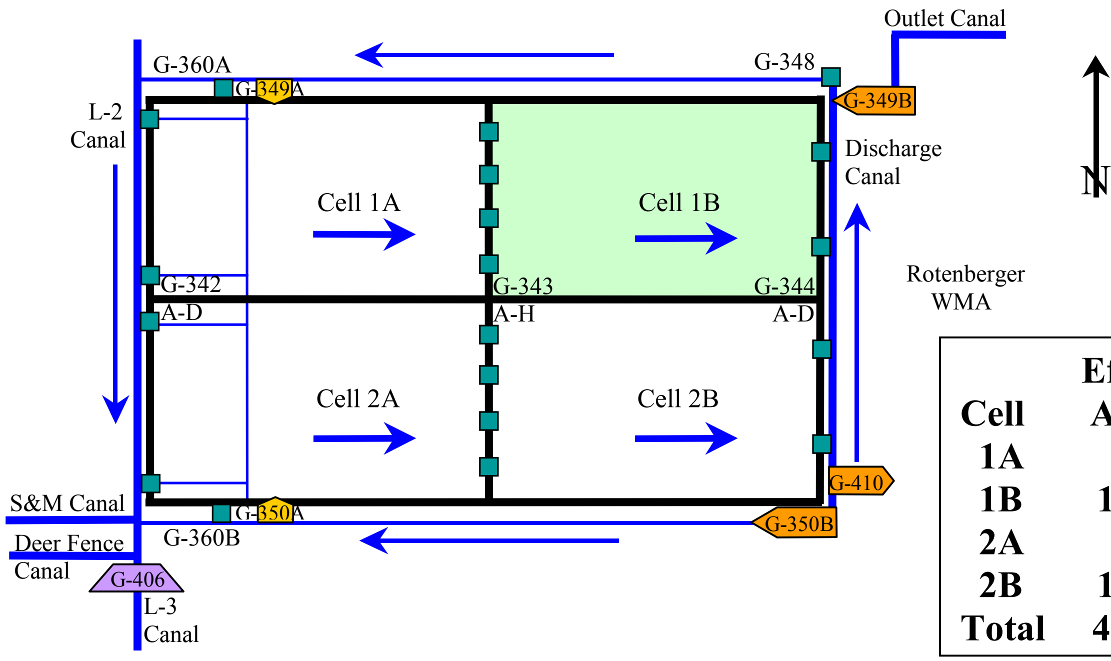


Figure 2.13 STA-5 Tributary Basin

Discharges to STA-5 may be directed either to the Miami Canal (through the STA-5 Discharge Canal along the north line of the Rotenberger Wildlife Management Area) or to the Rotenberger Wildlife Management Area (WMA) itself. Discharges to the Rotenberger WMA are for the purpose of hydrologic restoration of the (approx.) 29,000-acre WMA.

STA-5 is now complete and in full operation. A schematic diagram of STA-5 as it exists is presented in Figure 2.14.



Cell	Effective Area (ac)
1A	835
1B	1,220
2A	835
2B	1,220
Total	4,110 ac

Figure 2.14 Schematic of Existing STA-5

STA-5 has two parallel flow paths, each developed with two cells in series, each with an easterly flow direction. With the exception of Cell 1B, STA 5 has been developed in emergent macrophytic vegetative communities; Cell 1B has been developed as a submerged aquatic vegetation (SAV) community (shown shaded in Figure 2.14).

2.5.1. Recommended Improvements and Enhancements

The primary recommended enhancement to STA-5 consists of the conversion of Cell 2B from emergent macrophyte vegetation to submerged aquatic vegetation (SAV), generally consistent with Alternative 2 as it is presented in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*. However, certain additional improvements are considered necessary to permit the enhanced STA-5 to function as intended following that basic improvement. Those additional improvements are discussed below.

Modification of G-343 Structures: The G-343 structures are situated in the north-south interior levee subdividing Cells 1A and 2A from Cells 1B and 2B. At present, those structures consist of reinforced concrete box culverts controlled by simple weir crests set at the design static water surface elevation in Cells 1A and 2A. The nature of those structures inhibits the District's ability to control proper flow distribution across the STA. Of greater significance is that the nature of those structures limits the District's flexibility in operation of STA-5 in response to significant inflow events. The maximum rate of inflow to STA-5 is limited by water surface elevations in the L-2 Borrow Canal. As those elevations rise to prescribed levels, Structure G-406 is operated to bypass C-139 Basin runoff to the L-3 Borrow Canal. Following completion of STA-6, Section 2, those bypasses will be introduced to STA-6 for treatment. At present, those bypasses continue down the L-3 Borrow Canal and are discharged directly to the Everglades Protection Area (WCA-3A) across existing Structure G-155 and through the L-3 Borrow Canal Extension. The limited flexibility in operation of the G-343 Structures leads to a higher-than-intended frequency and volume of bypass, which in the future can be expected to adversely impact the performance of STA-6. To address these limitations and afford the District increased flexibility in the operation of STA-5, it is recommended that the existing G-343 Structures be modified through the addition of operable gates, and the upstream weir controls removed. This modification also requires the addition of telemetric control to the structures, coupled with the addition of stilling wells for water level data acquisition in the upper ends of Cells 1B and 2B. Stilling wells presently exist in Cells 1A and 2A upstream of the G-343 Structures. It will also be necessary to extend an overhead power transmission line along the interior levee to service the modified water control structures.

Additional Seepage Control Facilities: The projections of treatment performance in inflows to STA-5 presented in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins* included consideration of the volume and total phosphorus load in seepage water captured and returned. Those estimates were based on detailed seepage analyses conducted during the detailed design of STA-5. As reflected in the DMSTA analyses, the average annual seepage losses from STA-5 aggregate to approximately 10,000 acre-feet per year. Of that total seepage, it was anticipated that approximately 50% (5,000 acre-feet per year) would be returned to STA-5 at pumping stations G-349A and G-350A, at an assigned mean total phosphorus concentration of 20 ppb. The associated average annual total phosphorus load in seepage return would be approximately 125 kilograms per year.

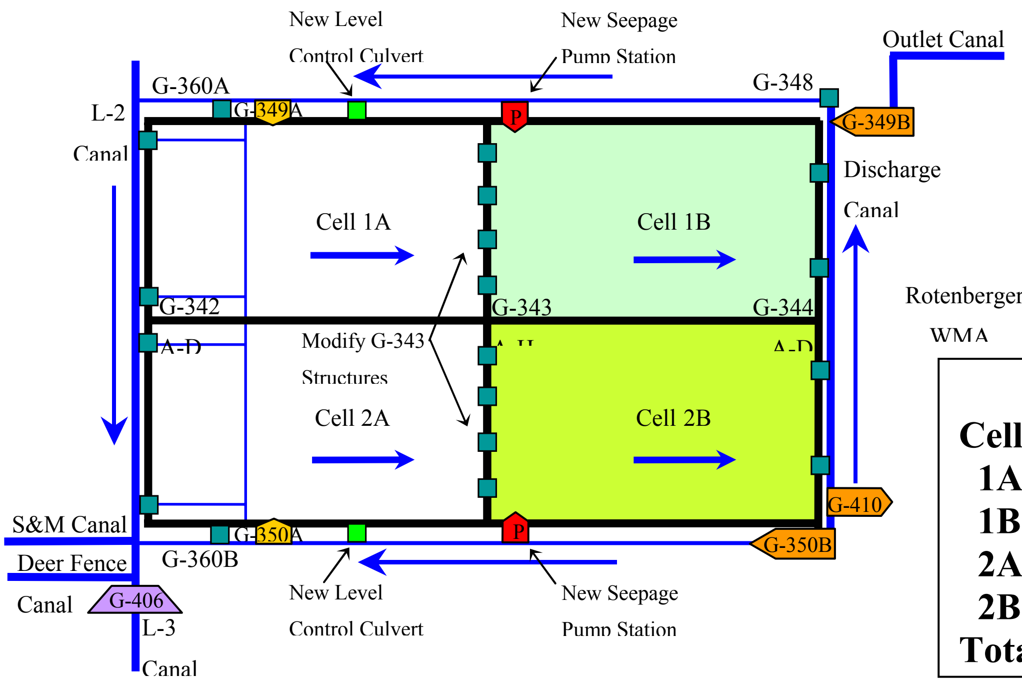
As noted earlier, STA-5 is now in full operation. Operating data for the period July 24, 2001 through April 8, 2002 was obtained from the District's website. Over that period, the average seepage return pumping rate at G-349A and G-350A combined was 48 cfs, equivalent to an average annual volume of 34,750 acre-feet. Available water quality data at those stations over that period was limited, but suggested a mean TP concentration in those inflows of roughly 30 ppb. The associated average annual total phosphorus loads in the seepage return would be roughly 1,300 kilograms per year, approximately a factor of ten greater than considered in the DMSTA analysis. In comparison, the estimated average annual total phosphorus load in inflows to STA-5 at the G-342 Structures reported in Table 5.1 of the October 23, 2002, *Evaluation of Alternatives for the ECP Basins* is 29,040 kilograms per year.

Over that same 259-day period, the total outflow volume from STA-5 at the G-344 Structures exceeded the total inflow volume at the G-342 structures by an average of 16 cfs, equivalent to an average annual difference of 11,600 acre-feet per year, despite an estimated net average annual loss due to evaporation of roughly 7" (2,400 acre-feet). Given all the above, it appears that a secondary source of inflow to STA-5 exists. That secondary source of inflow logically consists of inflows induced from the adjacent lands (which are in the S-8 Basin) by the operation of the seepage collection and return system. That operation by necessity maintains seepage collection canal stages below normal depths (measured from ground surface) in the higher lands west of Cells 1B and 2B, in order to adequately control stages adjacent to Cells 1B and 2B.

In order to minimize the induced loading on STA-5, it is recommended that additional seepage return pumping stations be constructed near the northwest corner of Cell 1B and the southwest corner of Cell 2B. Those stations are expected to provide a nominal capacity of 45 cfs each, similar to the capacity of existing pumping stations G-349A and

G-350A. In addition, it will be desirable to construct an additional canal level control culvert in each of the seepage collection canals.

A schematic diagram of STA-5, enhanced and modified as recommended herein, is presented in Figure 2.15.



Cell	Effective Area (ac)
1A	835
1B	1,220
2A	835
2B	1,220
Total	4,110 ac

Figure 2.15 Schematic of Enhanced STA-5

In Figure 2.15, those areas now developed in SAV are shown lightly shaded. Additional areas to be converted to SAV are shown in slightly darker shading.

2.5.2. Opinion of Capital Cost [Bc50]

An opinion of the capital cost for implementing the recommended enhancements and modifications to STA-5 is presented in Table 2.14. That estimate is reported in FY 2003 dollars.

Table 2.14 Opinion of Capital Cost, STA-5 Enhancement [Bc50]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Gates for Exist. G-343 Structures	8	Ea.	$45,000	$360,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
2	Water Control Structure Electrical (w/Telemetry) for Modified G-343	8	Ea.	$43,000	$344,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
3	Stilling Wells (Includes Electrical and Telemetry) at N-S Interior Levees	2	Ea.	$9,000	$18,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
4	Electrical Power Distribution for N-S Interior Levee (G-343)	2.0	Mi.	$80,000	$160,000	Unit cost from Evaluation Methodology
5	New Seepage Return Pump Station, Cell 1B	45	cfs	$9,500	$427,500	Unit cost from Evaluation Methodology
6	New Seepage Return Pump Station, Cell 2B	45	cfs	$9,500	$427,500	Unit cost from Evaluation Methodology
7	Eradication of Existing Vegetation	1220	ac	$200	$244,000	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$1,981,000**	**$2,000,000**
Planning, Engineering & Design		10 %			$198,100	**$200,000**
Construction Management		7 %			$138,670	**$140,000**
Total Estimated Cost, Without Contingency					**$2,317,770**	**$2,340,000**
Contingency		30 %			$695,331	**$700,000**
TOTAL ESTIMATED CAPITAL COST					**$3,013,101**	**$3,040,000**

2.5.3. Opinion of Incremental Operation and Maintenance Cost [Bf]

The following is a summary listing of the anticipated incremental operation and maintenance requirements for the recommended enhancement to STA-5 (e.g., requirements in addition to those for operation and maintenance of STA-5 as it presently exists).

- Additional operation and maintenance requirements for the modified G-343 structures;
- Maintenance of the two new seepage return stations, in which the pumps (two pumps in each station) are anticipated to be driven by electric motors. As the total volume of seepage return is not expected to increase, no additional power consumption is anticipated;
- Additional herbicide treatment of Cell 2B for control of invasive species and emergent macrophyte vegetation. This item includes both:
    - Annual costs to spray for invasive species;

- Additional costs for post-drought eradication of undesirable species.

An opinion of the average annual incremental operation and maintenance cost for the recommended enhancement of STA-5 is presented in Table 2.15.

Table 2.15 Opinion of Incremental O&M Cost, Enhanced STA-5 [Bf]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Additional Maintenance of Gates at Modified G-343 Structures	8	Ea.	$8,000	$64,000	Unit cost from Evaluation Methodology, Applied at 1/2
2	Mech. Maintenance, New Seepage Pump Stations, per unit	4	Ea.	$10,000	$40,000	Unit cost from Evaluation Methodology
3	Incremental Cost forAnnual Vegetation Control, SAV Cells	1,220	ac	$30	$36,600	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$140,600**	
Contingency		30 %			$42,180	
TOTAL INCREMENTAL O&M COST					**$182,780**	**$180,000**

The estimated cost for operation, maintenance and monitoring of STA-5 as it presently exists is discussed in Part 8. The estimated monitoring costs in Part 8 include the additional costs for monitoring of the recommended enhancements.

2.5.4. Implementation Schedule

It is recommended that the conversion of Cell 2B from emergent macrophyte vegetation to SAV be conducted in the dry season of Fiscal Year (FY) 2005, and that the construction of all other physical works be conducted during FY 2005 and FY 2006. Planning, engineering and design of the enhancements to STA-5 would take place in FY 2004.

2.5.5. Projected Expenditures [Bc50, Bf]

A summary of the projected expenditures through FY 2016 (in FY 2003 dollars) for the recommended enhancement of STA-5 is presented in Table 2.16.

Table 2.16 Projected Expenditures, Enhanced STA-5 [Bc50, Bf]

Fiscal Year (FY)	Scheduled Expenditure by Type (FY 2003 $)							Total Fiscal Year Expenditure (FY 2003 $)
	Planning, Eng. & Design	Construction Management	Construction	Land Acquisition	Project Contingency	Total Capital Cost [Bc50]	Incremental O&M Cost [Bf]	
	(All in Budget Activity Code Bc50 [Bc50])							
2004	$200,000				$60,000	$260,000		$260,000
2005		$80,000	$1,120,000		$360,000	$1,560,000		$1,560,000
2006		$60,000	$880,000		$280,000	$1,220,000	$50,000	$1,270,000
2007						$0	$180,000	$180,000
2008						$0	$180,000	$180,000
2009						$0	$180,000	$180,000
2010						$0	$180,000	$180,000
2011						$0	$180,000	$180,000
2012						$0	$180,000	$180,000
2013						$0	$180,000	$180,000
2014						$0	$180,000	$180,000
2015						$0	$180,000	$180,000
2016						$0	$180,000	$180,000
Total	**$200,000**	**$140,000**	**$2,000,000**	**$0**	**$700,000**	**$3,040,000**	**$1,850,000**	**$4,890,000**

2.6. STA-6

STA-6 Section 1 currently provides a total effective treatment area of 870 acres, situated on lands between L-3 Borrow Canal (on the west) and Rotenberger Wildlife Management Area (on the east), immediately north of the confluence of the L-3 and L-4 Borrow Canals. Section 1 is now complete and in operation. The Everglades Construction Project also includes the construction of Section 2, which will provide an additional total effective treatment area of approximately 1400 acres, immediately north of Section 1. The construction of Section 2 is presently scheduled for completion prior to December 31, 2006.

Inflows to STA-6 are comprised of contributions from a number of sources, including:

- Agricultural runoff and discharge from the United States Sugar Corporation's (USSC) Southern Division Ranch, Unit 2;
- Agricultural runoff and discharges from the USSC Southern Division Ranch, Unit 1 (the "C-139 Annex");
- Agricultural runoff and discharges from the C-139 Basin (high flows diverted from STA-5 through Structure G-406);

- Supplemental (irrigation) and BMP water necessary to prevent dryout of the STA from Lake Okeechobee (at present, no physical means are in place to introduce the supplemental water to STA-6).

The basins tributary to STA-6 are shown in Figure 2.16.

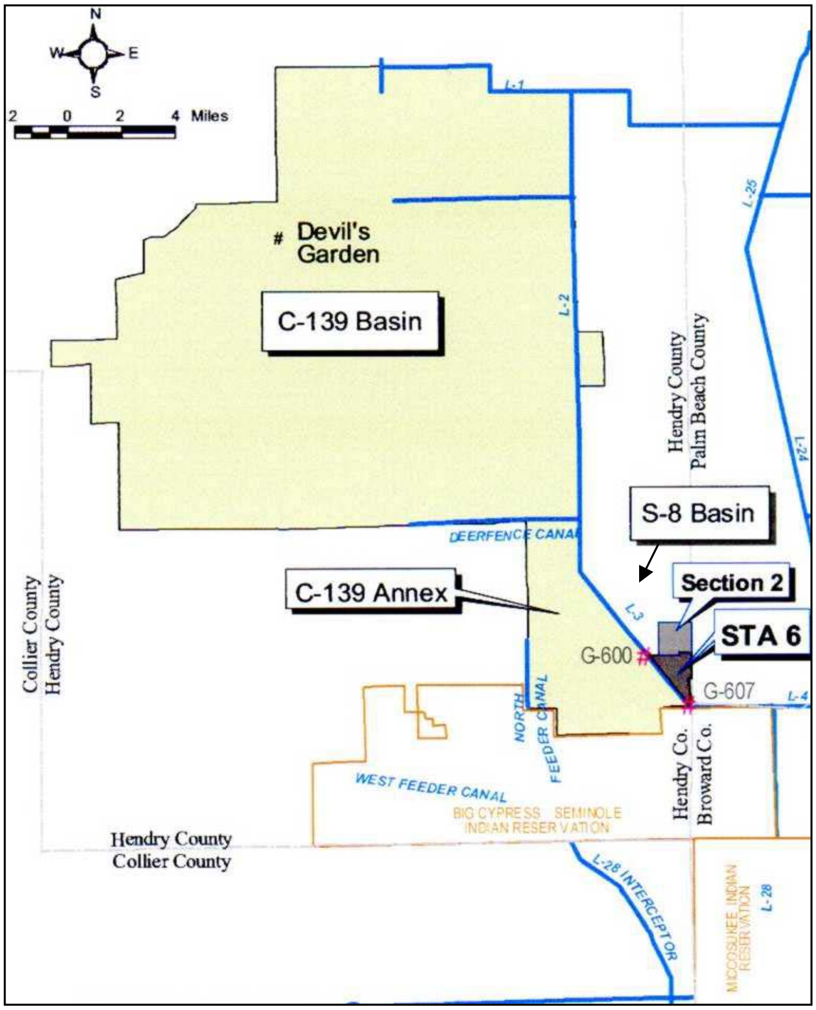
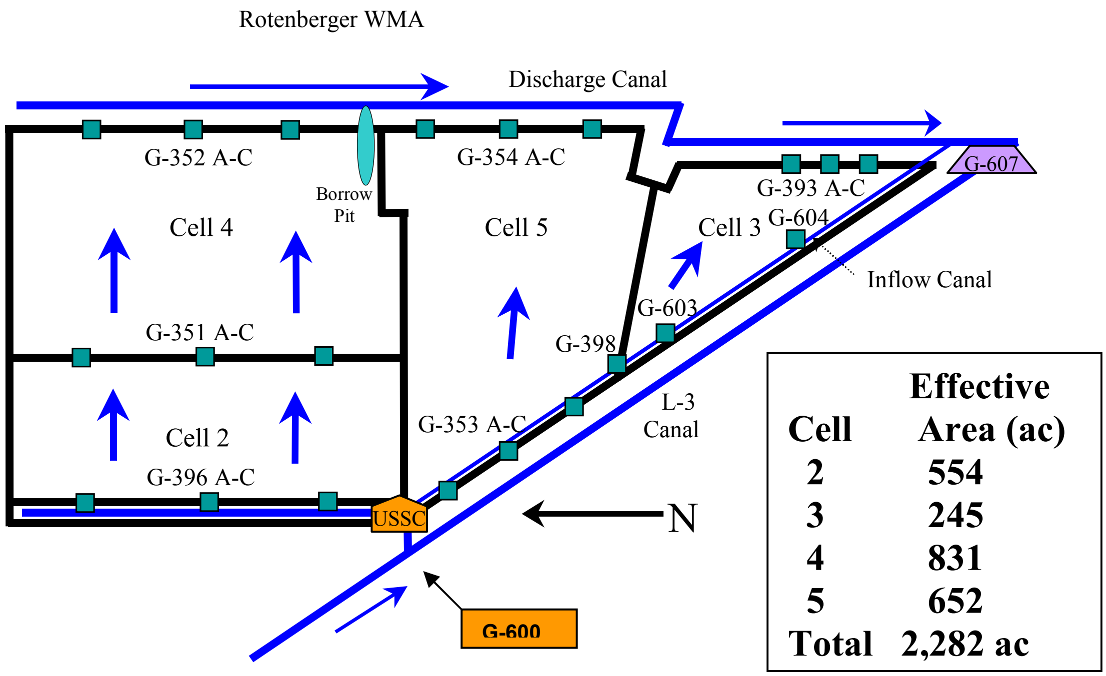


Figure 2.16 Basins Tributary to STA-6

A schematic diagram of STA-6, including both Section 1 and Section 2, is presented in Figure 2.17.



Cell	Effective Area (ac)
2	554
3	245
4	831
5	652
Total	2,282 ac

Figure 2.17 Schematic of STA-6, Sections 1 and 2

Cells 3 and 5 comprise the existing Section 1. Cells 2 and 4 comprise the proposed Section 2. It should be noted that the general configuration of Cells 2 and 4 vary from the current design of Section 2, which was carried to a 90% level of completion in 1997. Section 2 has been rearranged to facilitate the proposed enhancements to STA-6 recommended herein. In essence, the current design reflects two cells in parallel, which has in this analysis been modified to two cells in series. Upon full completion, STA-6 will consist of three parallel flow paths; the most northerly path will consist of two cells in series. Section 1 is presently developed in emergent macrophyte vegetation; Section 2 is presently planned for that same vegetation type.

2.6.1. Recommended Improvements and Enhancements

Improvements and enhancements recommended for STA-6 consist, with one exception, of Alternative 2 as it is presented in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*. That exception consists of a modification in the location and capacity of water supply pumping stations. As developed for Alternative 2, those pumping stations would consist of forward-pumping station from Cell 2 to Cell 4, with an estimated capacity of 11 cfs, and a forward-pumping station from Cell 5A to Cell 5B (see Figure 2.17 for new cell designations) with an estimated capacity of 4 cfs.

STA-6, primarily as a result of its (at present) limited tributary area, experiences dryout on an annual basis. No facilities presently exist to introduce irrigation water to STA-6 to prevent dryout. It is recommended that an irrigation (STA water supply) pumping station be constructed capable of maintaining the entire STA in an hydrated condition, in lieu of the forward-pumping station between cells 2 and 4.

The following component elements are included in the recommended improvements to and enhancements of STA-6:

- Construction of approximately 0.8 miles of interior levee, subdividing Cell 5 into Cells 5A and 5B;
- Construction of additional water control structures through the new levee subdividing Cell 5 into Cells 5A and 5B. These structures are assumed to be equivalent in number and character to Structures G-381 (two 8'x8' gated RCB's with telemetric control);
- Extension of an overhead power distribution line from Interior Levee 4, then north along the new levee across Cell 5 (total length of approximately 0.8 miles);
- Herbicide treatment of Cells 4 and 5B for removal of emergent macrophyte vegetation to permit development of SAV;
- Construction of a new water supply pumping station (G-401) for irrigation of STA-6. That pumping station is assigned a preliminary capacity of 30 cfs, roughly equivalent to a supply rate of 0.30" per day over the entire surface area of STA-6;
- Replacement of Structure G-603 (presently an uncontrolled weir at the inflow to Cell 3).

A schematic diagram of STA-6, enhanced and modified as recommended herein, is presented in Figure 2.18.

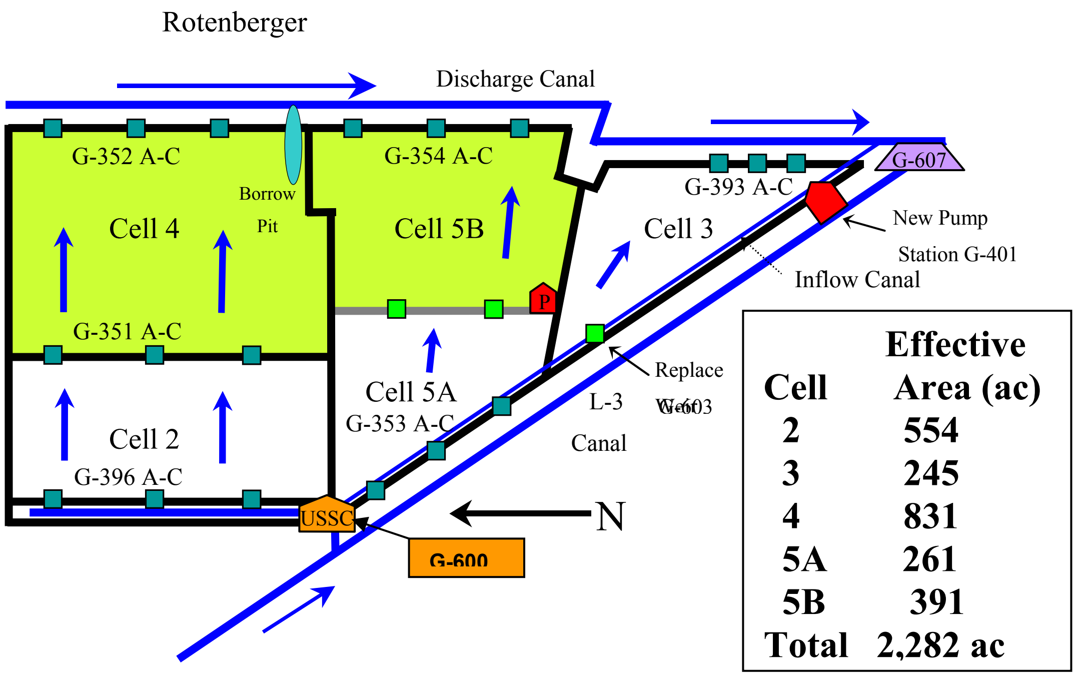


Figure 2.18 Schematic of Enhanced STA-6

In Figure 2.18, those areas to be converted to SAV are shown shaded.

2.6.2. Opinion of Capital Cost [Bc60]

An opinion of the capital cost for implementing the recommended enhancements and modifications to STA-6 is presented in Table 2.17. That estimate is reported in FY 2003 dollars.

Table 2.17 Opinion of Capital Cost, STA-6 Enhancement [Bc60]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Internal Levee, 7' height (Excludes Blasting Costs)	0.8	Mi.	$390,000	$312,000	Unit cost from Evaluation Methodology
2	New Water Control Structures (10'x8', Gated)	3	Ea.	$200,000	$600,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
3	Water Control Structure Electrical (Includes Telemetry)	3	Ea.	$43,000	$129,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
4	Stilling Wells (Includes Electrical and Telemetry)	3	Ea.	$9,000	$27,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
5	Electrical Power Distribution	0.8	Mi.	$80,000	$64,000	Unit cost from Evaluation Methodology
6	Water Supply Pumping Station	30	cfs	$9,500	$285,000	Unit cost from Evaluation Methodology
7	Eradication of Existing Vegetation	1222	ac	$200	$244,400	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$1,661,400**	**$1,660,000**
Planning, Engineering & Design		10 %			$166,140	**$170,000**
Redesign of STA-6, Section 2					$300,000	**$300,000**
Construction Management		7 %			$116,298	**$120,000**
Total Estimated Cost, Without Contingency					**$2,243,838**	**$2,250,000**
Contingency		30 %			$673,151	**$670,000**
TOTAL ESTIMATED CAPITAL COST					**$2,916,989**	**$2,920,000**

In the above tabulation, the estimated cost for planning, engineering and design includes an allowance of $300,000 for the redesign of STA-6, Section 2 necessary for compatibility with the long-term plan for STA-6.

2.6.3. Opinion of Incremental Operation and Maintenance Cost [Bf]

The following is a summary listing of the anticipated incremental operation and maintenance requirements for the recommended enhancement to STA-6. (e.g., requirements in addition to those for operation and maintenance of STA-6 as presently constructed and planned):

- Maintenance of approximately 0.8 additional miles of interior levee;
- Operation and maintenance of the additional water control structures through the new levee subdividing Cell 5 into Cells 5A and 5B;
- Operation and maintenance of the new water supply pumping station (G-401). The pumps are assumed to be driven by electric motors. The unit operating costs are

estimated using a power cost of $0.08/kw-hr; an assumed total head of 6 feet; an overall efficiency of 85%; and an assigned utilization equal to 10% of the overall time. The resultant power consumption is 0.43 kw/cfs, or 3,770 kw-hr/cfs/yr., yielding an approximate average annual cost of $300/yr/cfs;

- Operation and maintenance of the new water control structure replacing the inflow weir to Cell 3 (G-603);
- Additional herbicide treatment of Cells 4 and 5B for control of invasive species and emergent macrophyte vegetation. This item includes both:
  - Annual costs to spray for invasive species;
  - Additional costs for post-drought eradication of undesirable species.

An opinion of the incremental operation and maintenance cost for the recommended enhancement of STA-6 is presented in Table 2.18.

Table 2.18 Opinion of Incremental O&M Cost, Enhanced STA-6 [Bf]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Internal Levee	0.8	Mi.	$3,300	$2,640	
2	New Water Control Structures	3	Ea.	$8,000	$24,000	
3	Mech. Maintenance, Water Supply Pumping Station, Each Unit	2	Ea.	$10,000	$20,000	
4	Power Consumption, Water Supply Pumping Station	30	cfs	$300	$9,000	
5	Incremental Cost forAnnual Vegetation Control	1222	ac	$30	$36,660	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$92,300**	
Contingency		30 %			$27,690	
TOTAL INCREMENTAL O&M COST					**$119,990**	**$120,000**

The estimated cost for operation, maintenance and monitoring of STA-6 as it is presently planned is discussed in Part 8. The estimated monitoring costs in Part 8 include the additional costs for monitoring of the recommended enhancements.

2.6.4. Implementation Schedule

As earlier noted, STA-6 Section 2 is presently scheduled for completion in late 2006. Accordingly, all recommended enhancements to STA-6 should be completed on a parallel schedule. It will be desirable to effect those enhancements in the same contract as that under which Section 2 is constructed. It is therefore anticipated that the planning, engineering and design of the enhancements to STA-6 will occur concurrently with the necessary redesign of STA-6, Section 2, both taking place in FY 2004. It is recommended that the construction of STA-6, Section 2 and the enhancements to STA-6 outlined in this Long-Term Plan be expeditiously implemented to relieve current overloading of STA-5 and associated bypass of C-139 discharges to WCA-3A.

2.6.5. Projected Expenditures [Bc60, Bf]

A summary of the projected expenditures through FY 2016 (in FY 2003 dollars) for the recommended enhancement of STA-6 is presented in Table 2.19.

Table 2.19 Projected Expenditures, Enhanced STA-6 [Bc60, Bf]

Fiscal Year (FY)	Scheduled Expenditure by Type (FY 2003 $)							Total Fiscal Year Expenditure (FY 2003 $)
	Planning, Eng. & Design	Construction Management	Construction	Land Acquisition	Project Contingency	Total Capital Cost [Bc60]	Incremental O&M Cost [Bf]	
	(All in Budget Activity Code Bc60 [Bc60])							
2004	$470,000				$140,000	$610,000		$610,000
2005		$60,000	$830,000		$265,000	$1,155,000		$1,155,000
2006		$60,000	$830,000		$265,000	$1,155,000		$1,155,000
2007						$0	$120,000	$120,000
2008						$0	$120,000	$120,000
2009						$0	$120,000	$120,000
2010						$0	$120,000	$120,000
2011						$0	$120,000	$120,000
2012						$0	$120,000	$120,000
2013						$0	$120,000	$120,000
2014						$0	$120,000	$120,000
2015						$0	$120,000	$120,000
2016						$0	$120,000	$120,000
Total	**$470,000**	**$120,000**	**$1,660,000**	**$0**	**$670,000**	**$2,920,000**	**$1,200,000**	**$4,120,000**

2.7. Summary Opinion of Expenditures

A summary opinion of the total estimated expenditures, in FY 2003 dollars, for the recommended enhancements to the STA's of the Everglades Construction Project is presented in Tables 2.20 and 2.21.

Table 2.20 presents a listing of estimated expenditure by fiscal year and location for the incremental operation and maintenance costs projected to result from the enhancements. Table 2.21 presents a listing of estimated expenditure by fiscal year and location for the capital costs associated with the enhancements.

Table 2.20 Projected Expenditures, Incremental O&M for Enhanced STAs [Bf]

Fiscal Year	Projected Incremental O&M Expenditure by Location [Bf], in FY 2003 $						Fiscal Year Total Expenditure
	STA-1E	STA-1W	STA-2	STA-3/4	STA-5	STA-6	
2004	$0	$0	$0	$0	$0	$0	$0
2005	$0	$0	$0	$249,000	$0	$0	$249,000
2006	$117,000	$215,000	$205,000	$249,000	$50,000	$0	$836,000
2007	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2008	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2009	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2010	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2011	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2012	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2013	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2014	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2015	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
2016	$117,000	$250,000	$280,000	$510,000	$180,000	$120,000	$1,457,000
Total	**$1,287,000**	**$2,715,000**	**$3,005,000**	**$5,598,000**	**$1,850,000**	**$1,200,000**	**$15,655,000**
Note:	All estimated expenditures are in FY 2003 dollars and exclude cost escalation						

Table 2.21 Projected Capital Expenditures, STA Enhancements [Bc10-60, Bc90]

Fiscal Year (FY)	Projected Capital Expenditure by Location, in FY 2003 $						Program Mngmt. [Bc90]	FY Total (2003 $)
	STA-1E [Bc10]	STA-1W [Bc20]	STA-2 [Bc30]	STA-3/4 [Bc40]	STA-5 [Bc50]	STA-6 [Bc60]		
2004	$78,000	$520,000	$1,540,000	$2,272,000	$260,000	$610,000	$158,000	$5,438,000
2005	$834,000	$2,905,000	$4,620,000	$2,448,000	$1,560,000	$1,155,000	$406,000	$13,928,000
2006	$0	$2,525,000	$2,080,000	$3,993,000	$1,220,000	$1,155,000	$329,000	$11,302,000
Total	**$912,000**	**$5,950,000**	**$8,240,000**	**$8,713,000**	**$3,040,000**	**$2,920,000**	**$893,000**	**$30,668,000**
Note:	All estimated expenditures are in FY 2003 dollars and exclude cost escalation							

2.7.1. Program Management [Bc90]

The projected expenditures in Table 2.21 include Program Management costs computed at approximately 3% of the projected capital expenditure in each fiscal year.

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3. PRE-2006 STRATEGIES, ESP BASINS

This Part 3 defines strategies and approaches for water quality improvement in discharges from the Everglades Stormwater Program (ESP) Basins recommended for completion in advance of December 31, 2006, where feasible. In certain basins, it is not considered feasible to fully meet the phosphorus criterion (Rule 62-302.540, F.A.C.) in advance of that date. In those instances, the earliest completion date and associated implementation schedule considered feasible is identified herein. It should be anticipated that further refinements to the Pre-2006 Projects and activities recommended herein would be made as more scientific and engineering information is obtained.

Projections of the potential impact of the strategies recommended herein on phosphorus discharges to the EPA are discussed in Part 4 of this Long-Term Plan.

As noted in Part 1, there remains uncertainty concerning the efficacy of some and recommended improvements and strategies, as well as of increased STA acreage and CERP adaptations. It is for those reasons that the Process Development and Engineering (PDE) actions recommended in Part 5 are included in this Long-Term Plan. If, as a result of future performance data and forecasts, it is found necessary to take additional actions to provide adequate assurance of an ability to meet the planning objectives, those actions will be based on the findings and conclusions of the PDE effort. Those post-2006 steps would include identification and adaptive implementation of additional water quality improvement measures that may then be considered necessary to meet the planning objective. Those steps would be finally defined and implemented in accordance with the overall strategy outlined in Part 6 of this Long-Term Plan.

The Everglades Stormwater Program includes a total of eight basins; six of those basins are addressed in this Part 3 and are listed in Table 3.1; the overall boundaries of those basins are shown in Figure 3.1.

Table 3.1 ESP Basins Included in Long-Term Plan

Hydrologic Basin
Acme Improvement District, Basin B
North Springs Improvement District
North New River Canal
C-11 West
L-28
Feeder Canal

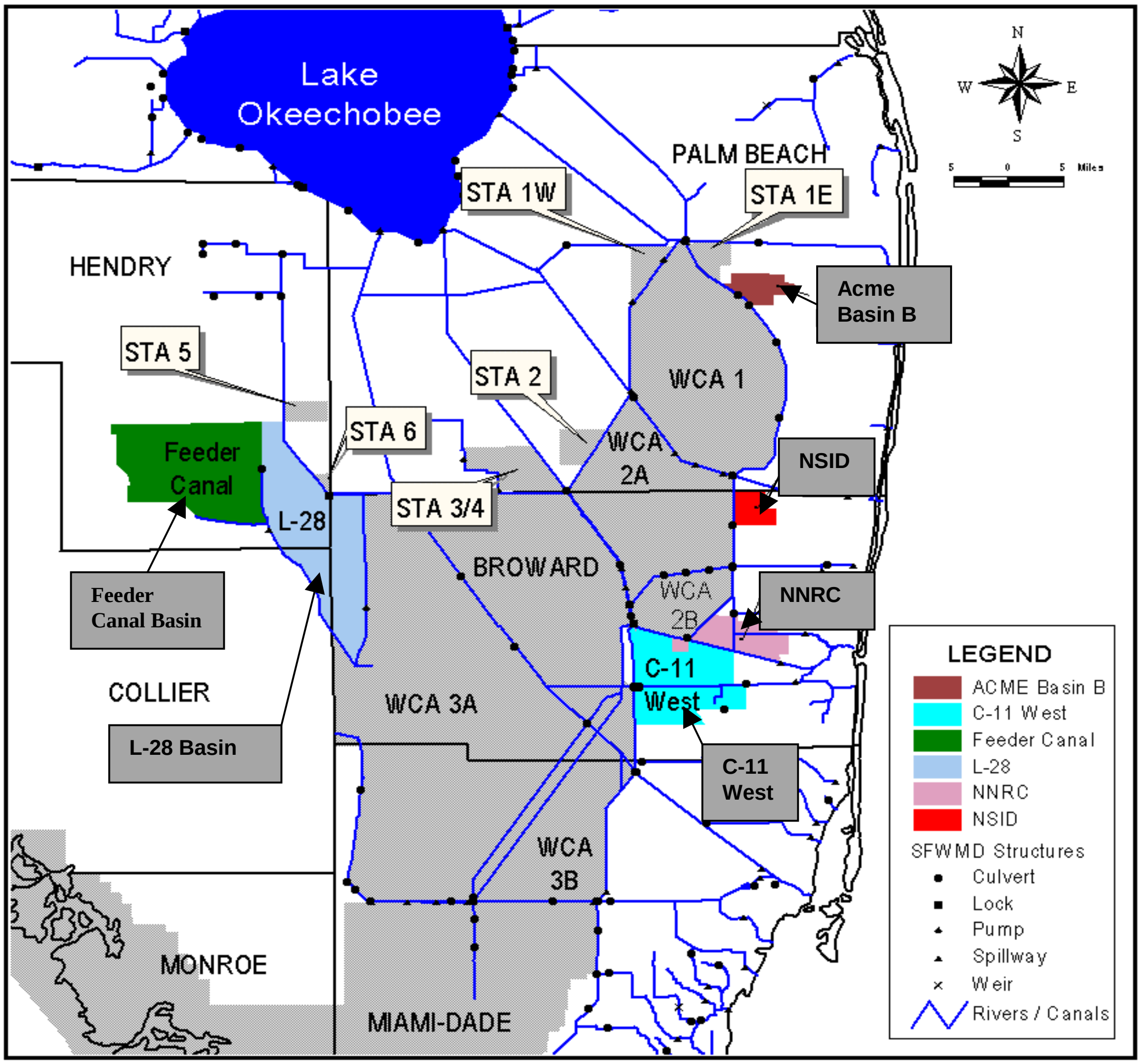


Figure 3.1 ESP Basin Locations

The two remaining basins of the Everglades Stormwater Program, the C-111 Basin and the Boynton Farms Basin, will be addressed by other District and Federal programs.

The primary source of the information and data contained in this Part 3 is the October 23, 2002 *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins* prepared for the South Florida Water Management District by Brown & Caldwell. In certain instances, the recommendations presented herein include certain modifications to and additional steps beyond the alternatives discussed or contemplated in that reference. All such modifications and additional steps are specifically identified and discussed herein.

Each of the Everglades Stormwater Program basins is scheduled to receive one or more projects under the Comprehensive Everglades Restoration Plan (CERP). In general, the recommended strategy in the ESP basins is to rely upon source controls and full integration with CERP to achieve water quality standards and the improvement goals of the Everglades Forever Act, to the extent that this is consistent with state and federal authorization, and will require close coordination with the PDT process.

Additional guidance for implementation of the recommended strategy was provided by the Florida Legislature in its 2003 amendment of the Everglades Forever Act (373.4592 F.S.), which states:

> *(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).*

It is intended that the stormwater treatment areas and other works recommended herein be operated to maximize the amount of water treated; e.g., no bypass of the treatment areas should be permitted except under extreme circumstances in which the hydraulic capacity of the works is exceeded. It is further intended that the operation of the treatment works not negatively impact flood protection. Ancillary uses of the treatment areas for purposes other than water quality improvement should be limited to those that do not negatively impact treatment performance.

3.1. Acme Improvement District, Basin B [Bc75]

The Acme Improvement District (ACME) covers an area of about 19,000 acres in Central Palm Beach County that generally comprises the jurisdictional limits of the Village of Wellington. Recently, ACME was reorganized to become a dependent district of the Village. The boundaries of ACME are illustrated in Figure 3-2.

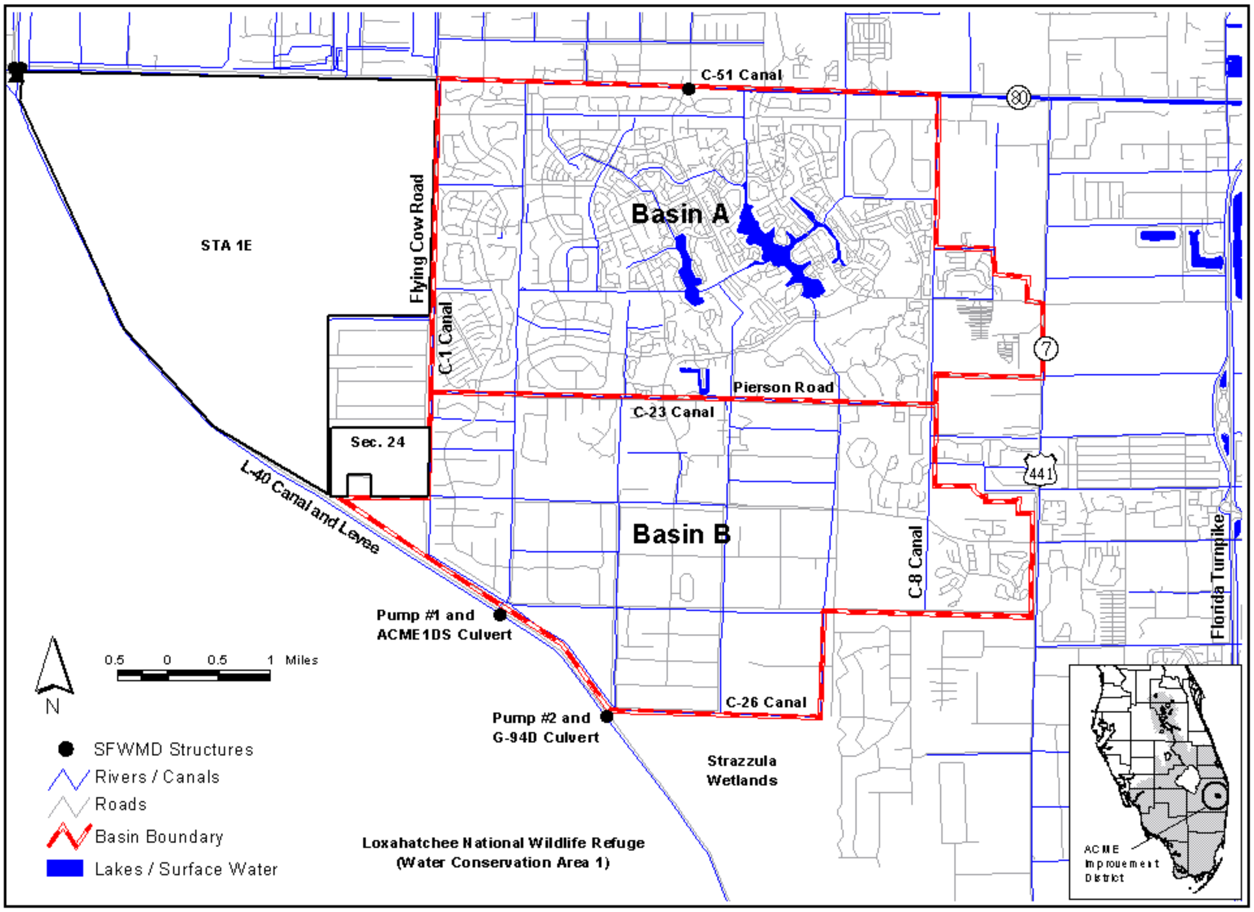


Figure 3.2 Acme Improvement District

Generally, the area is bounded by Southern Boulevard and Canal C-51 on the north; Flying Cow Road and Canal C-1 on the west; Levee L-40 and Canal C-26 on the south; and Canal C-8 on the east. Stormwater Treatment Area (STA) 1 East borders the area to the west and the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge, Water Conservation Area 1 or WCA-1) borders the area to the southwest.

ACME's drainage area is divided into two basins, Basin A and Basin B. Pierson Road and Canal C-23 divide the two basins. Basin A is characterized by low and medium-density residential development, whereas Basin B is predominated by rural land uses. Drainage from Basin A is routed north and discharged to Canal C-51. Drainage from Basin B is routed south and discharged to the Refuge. During very large storm events, drainage from Basin A overflows into Basin B. This Part 3 addresses only that drainage which is generated from ACME Basin B and discharged to the Refuge, including any overflows from Basin A. Basin A is included in the C-51 West Basin, which is tributary to STA-1E and, as a result, addressed in Part 2.

ACME Basin B encompasses an area of about 8,800 acres south of Pierson Road and Canal C-23 in the Village of Wellington. Land use consists primarily of rural residential development and agriculture. There are also a number of horse farms and other equestrian facilities in the basin.

Drainage from ACME Basin B is collected in a network of interconnected lakes and canals that are operated by ACME to provide water supply and flood protection throughout the basin. Two pumping stations, both located along the L-40, are used to discharge water into the L-40 borrow canal inside the Refuge. ACME Pump No. 1 conveys water from Canals C-2, C-25 and C-27 through the ACME 1DS structure into the Refuge. ACME Pump No. 2 conveys water from Canals C-4 and C-26 through the South Florida Water Management District's (District's) G-94D Structure to the Refuge. Pump No. 1 has a permitted capacity of 100,000 gallons per minute (gpm) or 222 cubic feet per second (cfs). Pump No. 2 has a permitted capacity of 120,000 gpm or 267 cfs.

In 2000, the Village of Wellington passed a BMP ordinance as part of the Village's cooperative efforts with the District to improve water quality in discharges to the

Everglades. The ordinance places controls on the storage and application of fertilizer and includes an educational component on the proper use of fertilizers and irrigation practices. Of particular importance in ACME Basin B are requirements for the storage, handling and transport of waste materials from livestock operations, including horse farms and equestrian facilities. It is likely that high TP concentrations in runoff from these facilities have contributed significantly to the overall phosphorus load entering the refuge from this basin. Since the Village of Wellington BMP ordinance has been in effect for only a short time, water quality improvements resulting from its implementation have yet to be quantified. It was assumed that implementation of source controls would (1) have no affect on the 31-year baseline flows simulated by the District, and (2) would reduce the annual TP load in runoff from ACME Basin B by 25 percent. These assumptions were applied uniformly to the evaluation of all alternatives and had the net effect of reducing the flow-weighted mean TP concentration in runoff from ACME Basin B from 94 ppb to 71 ppb.

3.1.1. Recommended Improvements and Strategies

CERP directly addresses Acme Basin B as an Other Project Element (OPE). The following discussion is excerpted from the April 1999, *Central and Southern Florida Project, Comprehensive Review Study* (the *Restudy*).

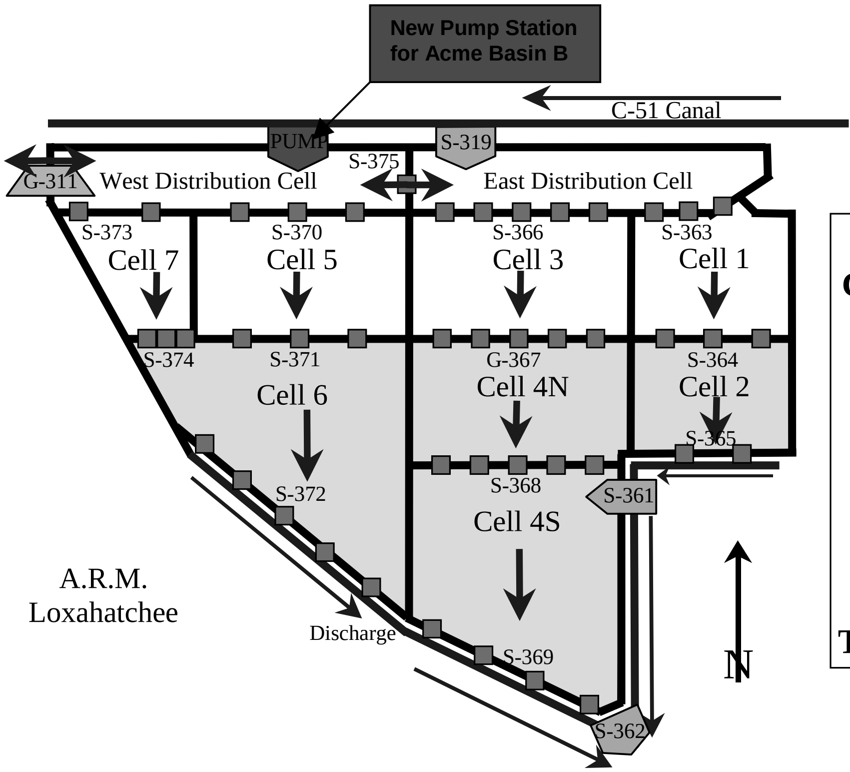
> *"This feature includes the construction of a wetland or chemical treatment area and a storage reservoir with a combined total storage capacity of 3,800 acre-feet located adjacent to the Loxahatchee National Wildlife Refuge in Palm Beach County. The initial design for the treatment area and reservoir assumed 310 acres with the water level fluctuating up to 4 feet above grade and 620 acres with the water level fluctuating up to 8 feet above grade. The final size, depth and configuration of these facilities will be determined through more detailed planning and design.*
>
> *The purpose of this feature is provide water quality treatment and stormwater attenuation for runoff from Acme Basin "B" prior to discharge to the Loxahatchee National Wildlife Refuge or alternative locations described below. Excess available water may be used to meet water supply demands in central and southern Palm Beach County.*
>
> *Stormwater runoff from Acme Basin "B" will be pumped into the wetland treatment area and into the storage reservoir until such time as the water can be discharged into the Loxahatchee National Wildlife Refuge if water quality*

treatment criteria is met or into the one of two alternative locations: the Palm Beach County Agricultural Reserve Reservoir (VV) or the combination above-ground and in-ground reservoir area located adjacent to the L-8 Borrow Canal and north of the C-51 Canal (GGG)."

As a result, it is anticipated that final selection of the strategy for Acme Basin B, as well as determination of its implementation schedule, will be accomplished through the CERP planning process. Substantial information has been generated with respect to possible alternatives for Acme Basin B and is available to the CERP Project Development Team (PDT) for consideration.

A total of five alternatives for Acme Basin B were considered in the Basin Specific Feasibility Studies. Brown & Caldwell evaluated four of those alternatives in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins*. Burns & McDonnell evaluated a fifth alternative (Alternative 5) in the October 23, 2002 *Evaluation of Alternatives for the ECP Basins*. Of the alternatives considered, that fifth alternative (identified as Alternative No. 2 in the *Evaluation of Alternatives for the ECP Basins*), with additional adjustments as describe herein, is recommended to the PDT for specific consideration, as it is considered the preferred alternative with respect to achieving water quality standards.

Alternative 5 contemplates the introduction of all discharges from Acme Basin B to STA-1E, which would be improved and enhanced as recommended in Part 2. The introduction of those discharges will require the construction and operation of additional inflow pumping capacity to STA-1E. A schematic of the enhanced STA-1E, with the conceptual location of the new pumping station indicated, is presented in Figure 3.3. Other than addition of the new inflow pumping capacity, no other physical changes are recommended for STA-1E; some operational changes, slightly redistributing the overall inflows to the three parallel flow paths in STA-1E, would be considered desirable as well. The new inflow pumping station is assigned a capacity of 491 cfs, equal to the presently permitted capacity of the two Acme pump stations discharging to the Refuge.



Cell	Effective Area (ac)
1	556
2	552
3	589
4N	645
4S	752
5	571
6	1,049
7	418
Total	5,132 ac

Figure 3.3 STA-1E Modified For Acme Basin B Discharges

At the time of publication of the *Evaluation of Alternatives for the ECP Basins*, no specific identification of the modifications to the Acme Improvement District system necessary to divert Basin B discharges to the C-51 West Canal was available. The intent is that the Village's existing network of canals and lakes be utilized to move water from Basin B to and through Basin A, pumping into the C-51 Canal at four locations. Subsequent to that date, the Village of Wellington's Storm Water Action Team (SWAT) has identified the following additional improvements and operational modifications as being necessary:

- Replace and reconfigure the Village's six control structures along Pierson Road at the Village's canals C-1, C-2, C-4, C-6, C-7 and C-8. In addition, there may be some culverts within the Village that will require improvement;

- Channel improvements on the C-1 Canal (north-south canal along the east side of Flying Cow Road along the westerly boundary of the Village) to connect the C-1 Canal to the C-51 West Canal;
- Addition of a new pumping station at the northwestern corner of the Village, discharging from the C-1 Canal to the C-51 West Canal. This new pumping station (designated as Pump Station No. 7) is expected to provide a capacity of between 40,000 and 60,000 gallons per minute (gpm), together with a backup pumping capacity of approximately 60,000 gpm;
- Use of the backup pumps in the Village's Pump Stations 3, 4 and 6 in the Village's C-2, C-7 and C-8 Canals. The nominal capacities of those backup pumps are 60,000 gpm, 60,000 gpm and 62,000 gpm, respectively.

Upon completion of the above modifications to the Village's system, existing Pump Stations 1 and 2 would be retired from drainage service. It is presently anticipated that an existing two-way pump at Pump Station No. 1 and culverts at both pumping stations would remain in use for water supply withdrawals from the Refuge.

As a part of the overall plan of improvement in the C-51 West Basin, the Jacksonville District, U.S. Army Corps of Engineers is presently engaged in design of a canal enlargement along the C-51 West Canal (a flood protection improvement under the Central & Southern Florida Flood Control Project). That enlargement results from the need to redirect flow in the C-51 West Canal to the west, leading to the STA-1E inflow Pumping Station S-319. The above-described modifications to the Village of Wellington's discharges to the C-51 West Canal can be expected to impact the C-51 West Canal enlargement. The specific nature of those impacts is not presently known; additional detailed hydraulic analyses will be needed to quantify those impacts. For this analysis, it is assumed that the C-51 West Canal will require further enlargement in those reaches to accommodate the incremental inflow rates. The following is a summary of the additional discharges added to the C-51 West Canal as a result of the Acme Basin B diversion, and the assumed nature of the additional enlargement (based on maintaining a mean channel velocity of 2.5 fps):

- An increase of approximately 491 cfs along a two-mile reach extending east from S-319 to the Village's C-1 Canal, requiring an average additional waterway below elevation 11.0 ft. NGVD of 196 square feet, and an incremental excavation of roughly 120,000 cubic yards;
- An increase of approximately 406 cfs along a one-mile reach between the Village's C-1 and C-2 canals, requiring an average additional waterway below elevation 11.0 ft. NGVD of 162 square feet, and an incremental excavation of roughly 50,000 cubic yards;
- An increase of approximately 272 cfs along a two-mile reach between the Village's C-2 and C-7 canals, requiring an average additional waterway below elevation 11.0 ft. NGVD of 109 square feet, and an incremental excavation of roughly 60,000 cubic yards;
- An increase of approximately 138 cfs along a two-mile reach between the Village's C-7 and C-8 canals, requiring an average additional waterway below elevation 11.0 ft. NGVD of 55 square feet, and an incremental excavation of roughly 30,000 cubic yards.

3.1.2. Reservation of Use, Section 24 T44S R40E

The various water quality analyses and treatment performance estimates presented in the October 23, 2002 *Evaluation of Alternatives for the ECP Basins* suggest that STA-1E, enhanced as described in Part 2, may provide adequate capacity for accommodating the additional inflows diverted from Basin B. However, there remains uncertainty in both the projected inflows to STA-1E and in the performance of the recommended submerged aquatic vegetation (SAV) community in the downstream cells of STA-1E. The purpose of the Process Development and Engineering (PDE) activities recommended in Part 5 is to address those uncertainties, and identify the required nature and extent of further enhancements (if any) to STA-1E necessary to assure compliance with water quality standards.

One possible further enhancement to STA-1E would be an expansion in its effective treatment area through addition of lands in Section 24, Township 44 South, Range 40 East (e.g., lands situated immediately south of the Rustic Ranches subdivision and west of Flying Cow Road). A discussion of that possible enhancement is included in Part 6 of this Long-Term Plan.

The SFWMD presently owns 375 acres in Section 24; an additional out-parcel of 40 acres is potentially available for acquisition. It is recommended that no irreversible use or development of those lands be permitted until at least such time as the PDE activities have progressed to the point that the potential need for those lands can be fully assessed. This reservation in use should extend at least through December 31, 2008.

3.1.3. Opinion of Capital Cost

An opinion of the capital cost for implementing Alternative 5 for Acme Improvement District, Basin B discharges is presented in Table 3.2. That opinion of cost varies from that presented in both the October 23, 2002, *Evaluation of Alternatives for the ECP Basins* and the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins* due to the addition of:

- Costs for redirecting Basin B discharges through Basin A to the C-51 West Canal (an opinion of those capital costs was provided by the Village of Wellington SWAT);
- Costs for the assumed additional enlargement of the C-51 West Canal to accommodate the increased discharges resulting from that redirection of Basin B discharges.

Table 3.2 Opinion of Capital Cost, Acme Improvement District Basin B

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New STA-1E Inflow Pumping Station	491	cfs	$9,900	$4,860,900	
2	Redirection of Acme Basin B Discharges					
a	New Pumping Station on C-1 Canal	Job	Lump	Sum	$2,000,000	
b	Replace Existing Water Control Structures along Pierson Road	Job	Lump	Sum	$1,075,000	
c	Internal Culvert and Canal Improvments	Job	Lump	Sum	$2,067,000	
3	Additional Enlargement of C-51 West Canal	260000	cu. yd.	$3.50	$910,000	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$10,912,900**	**$10,900,000**
Planning, Engineering & Design		10 %			$1,091,290	**$1,090,000**
Program & Construction Management		10 %			$1,091,290	**$1,090,000**
Total Estimated Cost, Without Contingency					**$13,095,480**	**$13,080,000**
Contingency		30 %			$3,928,644	**$3,920,000**
TOTAL ESTIMATED CAPITAL COST					**$17,024,124**	**$17,000,000**

The above opinion of capital cost is stated in FY 2003 dollars. While markedly increased from the opinion of capital cost presented in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, it remains $4.81 million below the estimated capital cost of the next most cost effective alternative (Alternative 3, Biological Treatment on Section 24) presented in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins*. Again, it is anticipated that final selection of the water quality improvement strategy and implementation schedule for Acme Basin B will be made through the CERP planning process.

It is recommended that this Long-Term Plan include funding in an amount of $50,000 per year in FY 2005 and 2006 (in escalated dollars) to assist the Village of Wellington in developing, evaluating and implementing source control programs.

3.1.4. Opinion of Incremental Operation and Maintenance Cost

The following is a summary listing of the anticipated incremental operation and maintenance requirements for the redirection of Acme Basin B discharges to the C-51 West Canal and STA-1E (e.g., requirements in addition to those for operation and maintenance of STA-1E and the C-51 West Canal Enlargement as presently planned). With one exception, those costs are all associated with operation and maintenance of the new inflow pumping station to STA-1E, which is anticipated to consist of a single diesel engine driven pump. Pumping Station S-319, which will operate in parallel with this new pump station, will be equipped with a total of five pumps ranging in capacity from 550 to 960 cfs. That exception is the inclusion of additional fuel consumption at S-362 (outflow pumping station for STA-1E) resulting from the additional discharges from Basin B.

- Mechanical maintenance of the new pumping unit and diesel engine drive;
- Maintenance of the additional pump station building;
- Fuel consumption in the new pumping station;
- Operating personnel (as the new pump station will operate in parallel with and in close proximity to S-319, it is anticipated that one full-time equivalent, or FTE, engine operator will need to be added to the operations team for S-319);
- Additional fuel consumption at S-362.

An opinion of the incremental operation and maintenance cost for diversion of Acme Basin B discharges is presented in Table 3.3, and is stated in FY 2003 dollars. It is not anticipated that any incremental operation and maintenance requirements will be experienced by the Village of Wellington, nor for the C-51 West Canal Enlargement.

Table 3.3 Opinion of Incremental O&M Cost, Acme Basin B

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Mechanical Maintenance, New Pumping Unit	1	Ea.	$45,000	$45,000	
2	Maintenance, building	1	Ea.	$12,000	$12,000	Unit cost from Evaluation Methodology
3	Fuel Consumption, New Pumping Unit	38654	Ac. Ft.	$0.50	$19,327	Unit cost from Evaluation Methodology
4	Engine Operator/Maintenance Mechanic	1	Ea.	$100,000	$100,000	Unit cost from Evaluation Methodology
5	Additional Fuel Consumption at S-362	38654	Ac. Ft.	$0.50	$19,327	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$195,654**	
Contingency		30	%		$58,696	
TOTAL INCREMENTAL O&M COST					**$254,350**	**$250,000**

3.1.5. Implementation Schedule

The C-51 West Canal enlargement is scheduled to be constructed during Fiscal Year (FY) 2004, with the result that it will be necessary to coordinate the necessary additional hydraulic analyses (and redesign, if necessary) with the Jacksonville District, U.S. Army Corps of Engineers so that any necessary modification in design can be completed in FY 2003. It will be necessary to confirm this schedule with the Jacksonville District. Planning, engineering and design of the remaining improvements could occur in FY 2004, with construction of those improvements in FY 2005 and 2006 (e.g., completion by October 1, 2006). Final definition of the implementation schedule will be made through the CERP planning process.

3.1.6. Projected Expenditures

A summary of the projected expenditures through FY 2016 (in FY 2003 dollars) for redirection of Acme Basin B discharges to the C-51 West Canal and STA-1E is presented in Table 3.4.

Table 3.4 Projected Expenditures, Acme Improvement District Basin B

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	
2004	$1,090,000	$90,000	$900,000		$620,000		$2,700,000
2005		$500,000	$5,000,000		$1,650,000		$7,150,000
2006		$500,000	$5,000,000		$1,650,000		$7,150,000
2007						$250,000	$250,000
2008						$250,000	$250,000
2009						$250,000	$250,000
2010						$250,000	$250,000
2011						$250,000	$250,000
2012						$250,000	$250,000
2013						$250,000	$250,000
2014						$250,000	$250,000
2015						$250,000	$250,000
2016						$250,000	$250,000
Total	**$1,090,000**	**$1,090,000**	**$10,900,000**	**$0**	**$3,920,000**	**$2,500,000**	**$19,500,000**

Again, final selection of the strategy for Acme Basin B, as well as its implementation schedule and funding, will be made through the CERP planning process.

3.2. North Springs Improvement District (NSID) [Bc71]

The NSID Basin covers an area of approximately 7,400 acres (11 square miles) in northern Broward County. The basin is bounded on the north by the Palm Beach County line and on the west by the L-36 Borrow Canal and Water Conservation Area (WCA) 2A. The Sawgrass Expressway (Florida Highway 869) runs in an east-west direction through the basin, turning south along the basin's western border as it approaches WCA-2A. The City of Coral Springs comprises much of the southern half of the basin. The City of Parkland comprises much of the northern half of the basin. A map illustrating the boundaries of the NSID Basin is presented in Figure 3.4.

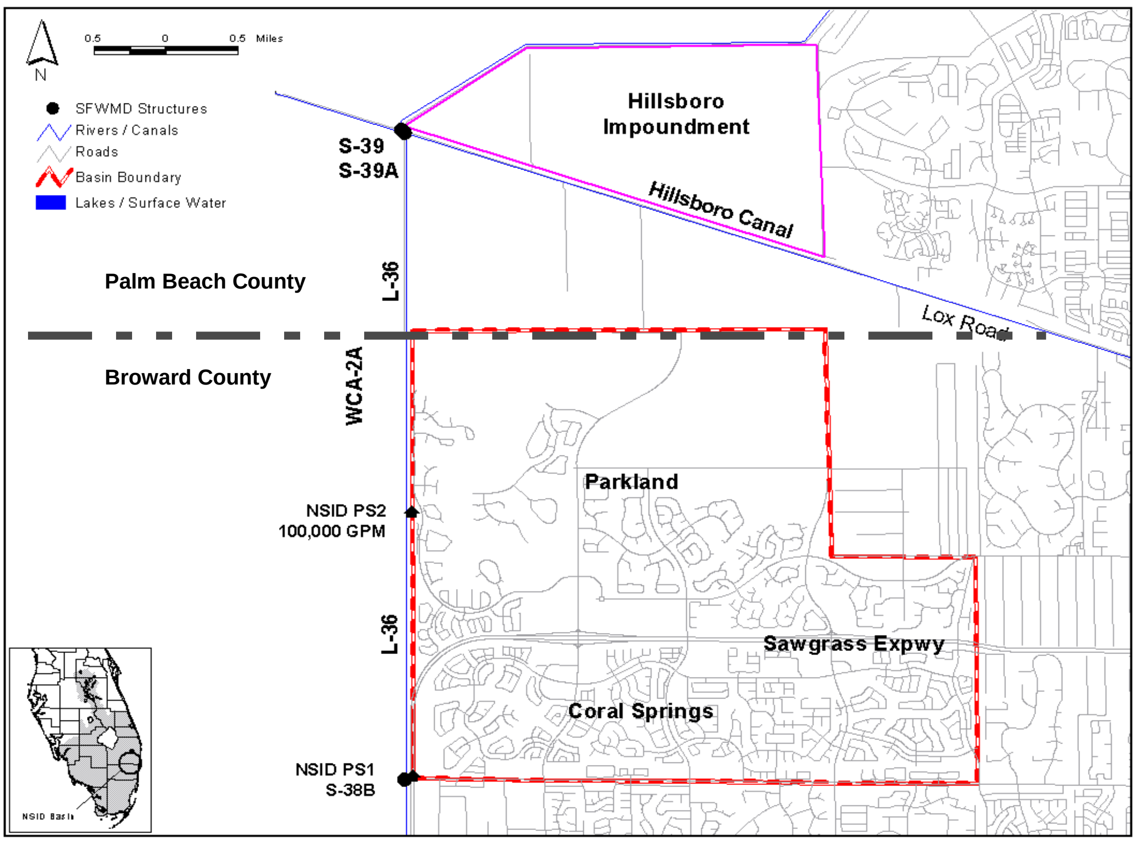


Figure 3.4 North Springs Improvement District Basin Map

Land use in the NSID Basin consists primarily of urban residential development and agriculture. Most of the land in the southern half of the basin is heavily developed with residential subdivisions. The northern half of the basin is currently in the process of being converted from agricultural to urban land use as new residential development continues. It is expected that over the next 5 to 10 years, most of the remaining undeveloped agricultural land in the basin will be developed into urban residential land use.

Drainage from the NSID Basin is managed in a network of interconnected lakes and canals that are operated by the NSID to provide flood protection throughout the basin. Two pumping stations, NSID Pump Station No. 1 and NSID Pump Station No. 2, are used to discharge stormwater north through the L-36 Borrow Canal (L-36N) and then into the Hillsboro Canal through a series of culverts (S-39A). The Hillsboro Canal conveys stormwater to the east, eventually discharging excess flow to tide. However, when the L-36N Canal and the Hillsboro Canal are not capable of accepting additional flow, water from the NSID Basin is discharged into WCA-2A through NSID Pump Station No. 1.

A large water impoundment is being planned on the north side of the Hillsboro Canal, just north of the NSID Basin, as part of the Comprehensive Everglades Restoration Plan (CERP). This impoundment is known as the Hillsboro Site 1 Impoundment, and is part of CERP Component M, Part 1. Hereinafter, the CERP project is referred to as the Hillsboro Site 1 Project. This CERP project will supplement water deliveries to the Hillsboro Canal during dry periods, thereby reducing demands on Lake Okeechobee and the Loxahatchee National Wildlife Refuge. Water from the Hillsboro Canal will be pumped into the reservoir during the wet season or periods when excess water is available. Water will be released back to the Hillsboro Canal to help maintain canal stages during the dry-season. Construction completion for the Hillsboro Site 1 Project is currently scheduled for late 2007.

3.2.1. Recommended Improvements and Strategies

A total of three alternatives for the NSID were evaluated in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins*. Alternative No. 3 as presented in that reference is recommended for implementation. Component elements of that alternative include:

- Implementation of source controls;
- Diversion of current NSID releases made to WCA-2A from WCA-2A to the CERP Hillsboro Site 1 Project.

In response to a request from Broward County Department of Planning and Environmental Protection, reduction of phosphorus through source controls (i.e., urban BMPs) is of highest priority for discharges from Broward County basins to achieve compliance with the phosphorus criterion. The District currently has cooperative agreements with all local water control districts in the County, and these include water quality provisions. The District will assist Broward County in coordinating a county-wide working group to develop a comprehensive pollution prevention plan with specific water quality goals and milestones.

More detailed planning and design of the Hillsboro Site 1 project is included in the overall scope of the October, 2001 *Central and Southern Florida Project, Water Preserve Areas, Draft Integrated Feasibility Report, Supplemental Environmental Impact Statement*. The relationship of the North Springs Improvement District to the Hillsboro Site 1 Project is defined in the following excerpt from that document:

> *"This separable element includes canal and structure relocations, canal conveyance improvements, water control structures and an aboveground impoundment with a total storage capacity of approximately 13,500 acre-feet located in the Hillsboro Canal Basin in southern Palm Beach County. The design of the impoundment included one compartment totaling 1,600 acres with water levels fluctuating up to eight feet above grade. The S-39A structure will be replaced and redesignated as S-527B. North Springs Improvement District flows were redirected from Water Conservation Area (WCA) 3 into the Hillsboro Canal and then to the impoundment. The conveyance capacity of the Hillsboro Canal will be increased from the impoundment inflow structure east to the Lake Worth Drainage District E-1 canal to allow backpumping of additional flows from the western Hillsboro Canal basin."*

3.2.2. Estimated Cost and Projected Expenditures [Bc71]

The conveyance of NSID flows to the Hillsboro Site 1 Project is part of the Water Preserve Areas CERP component. Accordingly, it is assumed that all such conveyance improvements, including any required modifications or expansions to the existing NSID pumping stations, improvements to the L-36N and Hillsboro Canals, and improvements to existing water control structures will be made by CERP. Under this assumption, there would be no additional project elements necessary to implement this alternative.

Projected expenditures under this Long-Term Plan for the NSID Basin are limited to those necessary for the conduct of an hydraulic evaluation of storm events in the basin to determine if there will be any negative impacts from redirecting water currently discharged to WCA-2A to the Hillsboro Canal east of S-39. That evaluation will include an assessment of the potential for connecting adjacent sand mines to the NSID water management system for additional surface water storage. The results of the evaluation will be provided to the CERP PDT for consideration in the CERP planning process. Projected expenditures for that evaluation are summarized in Table 3.12 (FY 2003 dollars), and extend from Fiscal Year (FY) 2004 through FY 2006.

3.3. North New River Canal Basin (NNRC) [Bc72]

The NNRC Basin covers an area of about 19,000 acres (30 square miles) in eastern Broward County. The basin is located southeast of Water Conservation Area (WCA) 2B, west of the Florida Turnpike and north of Interstate 595, in Broward County. The NNRC Basin is located immediately to the north of the C-11 West Basin, separated from that basin by the North New River Canal which runs generally east-west along the southern boundary of the NNRC Basin.

Land use in the NNRC Basin is almost entirely urban residential and commercial development. Portions of the Cities of Sunrise and Plantation comprise the area of the basin north of the North New River Canal. Bonaventure, a densely developed commercial and residential area, makes up the small area located south of the North New River Canal. Small amounts of agricultural and undeveloped land still exist, but land values in the basin continue to rise as development continues.

A map of the NNRC Basin is presented in Figure 3.5.

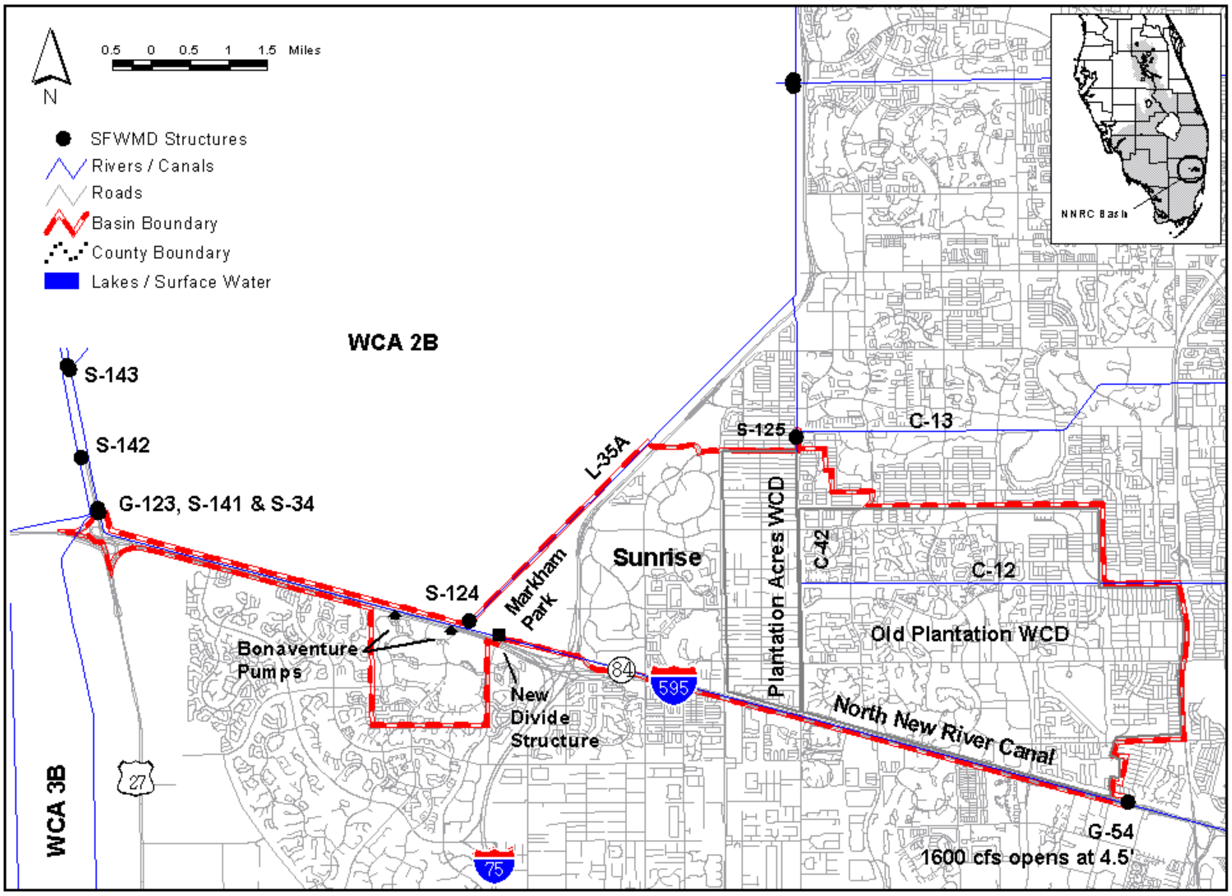


Figure 3.5 North New River Canal Basin Map

The G-123 structure, located at SR 27 and I-595, discharges water from this basin to WCA-3A. This structure is mainly used for water supply to WCA-3A and is not intended to be used for flood control. However, during large storm events, when storage is available in the water conservation areas, G-123 may be turned on to provide some relief. This basin is primarily served by the G-54 structure located just west of the turnpike, which discharges to tide.

This basin has not been modeled to date to determine the volume of runoff from the developed area of the basin that actually reaches the G-123 pump station. Since the basin is also served by G-54 (design capacity of 1600 cfs) to the east during rainfall events and drainage from the developed area west to G-123 (design capacity of 400 cfs) is hampered by the seepage from WCA-2B for approximately one-half the distance, it is doubtful that much of the runoff reaches the G-123 pump station. It is also doubtful that this pump station aids flood mitigation for the same reasons.

A Comprehensive Everglades Restoration Plan (CERP) Project will impact future management of surface water flows from the NNRC Basin. The WCA 2 and WCA 3 Diversion Project (CERP Component YY4), to be completed by 2018, includes the construction of a new basin divide structure across the North New River Canal at Markham Park. The CERP project also will include canals to reroute urban runoff from the Bonaventure pump stations to the North New River Canal downstream (east) of the new divide structure. The new divide structure will effectively eliminate urban runoff from the NNRC Basin from discharging to the EPA. Seepage from WCA 2B that is collected in the L-35 Borrow Canal will be redirected into new canals which will convey it south to the Everglades National Park. After the CERP project is completed in 2018, all flows to WCA 3A through the G-123 pump station will be eliminated.

3.3.1. Recommended Improvements and Strategies

A total of three alternatives for the NNRC Basin were evaluated in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins*. Alternative No. 3, as presented in that reference with certain adjustments, is recommended for implementation. Component elements of that alternative include:

- Implementation of source controls;
- Discontinuation in the use of G-123 until completion of the CERP project (2018).

In response to a request from Broward County Department of Planning and Environmental Protection, reduction of phosphorus through source controls (i.e., urban BMPs) is of highest priority for discharges from Broward County basins to achieve compliance with the phosphorus criterion. The District currently has cooperative agreements with all local water control districts in the County, and these include water quality provisions. The District will assist Broward County in coordinating a county-wide working group to develop a comprehensive pollution prevention plan with specific water quality goals and milestones.

The recommended adjustment to Alternative 3 is to discontinue use of G-123 after December 31, 2006, other than as may be absolutely necessary for water supply emergencies.

Basin stakeholders have expressed concerns that discontinuing the use of the G-123 pump station may reduce flood protection in the basin. Prior to discontinuing the use of the G-123 pump station, a detailed flood impact analysis will be performed to ensure that the basin's current level of flood protection is maintained.

3.3.2. Estimated Cost and Projected Expenditures [Bc72]

Projected expenditures for the NNRC Basin are limited to funding the necessary detailed flood impact analysis, estimated in the amount of $59,002 in Fiscal Year (FY) 2004.

3.4. C-11 West Basin [Bc73]

The C-11 West Basin covers an area of about 46,000 acres (72 square miles) in south central Broward County. Current water management activities in the basin provide flood protection, drainage, water supply, protection from saltwater intrusion and seepage collection from Water Conservation Area (WCA) 3A. The four primary canals in the basin are the C-11 West, the C-11 South, the L-37 Borrow Canal, and the section of the L-33 Borrow Canal between the C-11 West Canal and Pines Boulevard. Currently, stormwater runoff from the C-11 West Basin is pumped into WCA 3A through the District's S-9 pump station. Seepage flows from WCA 3A are also returned through the S-9 pump station. A map of the C-11 West Basin is presented in Figure 3.6.

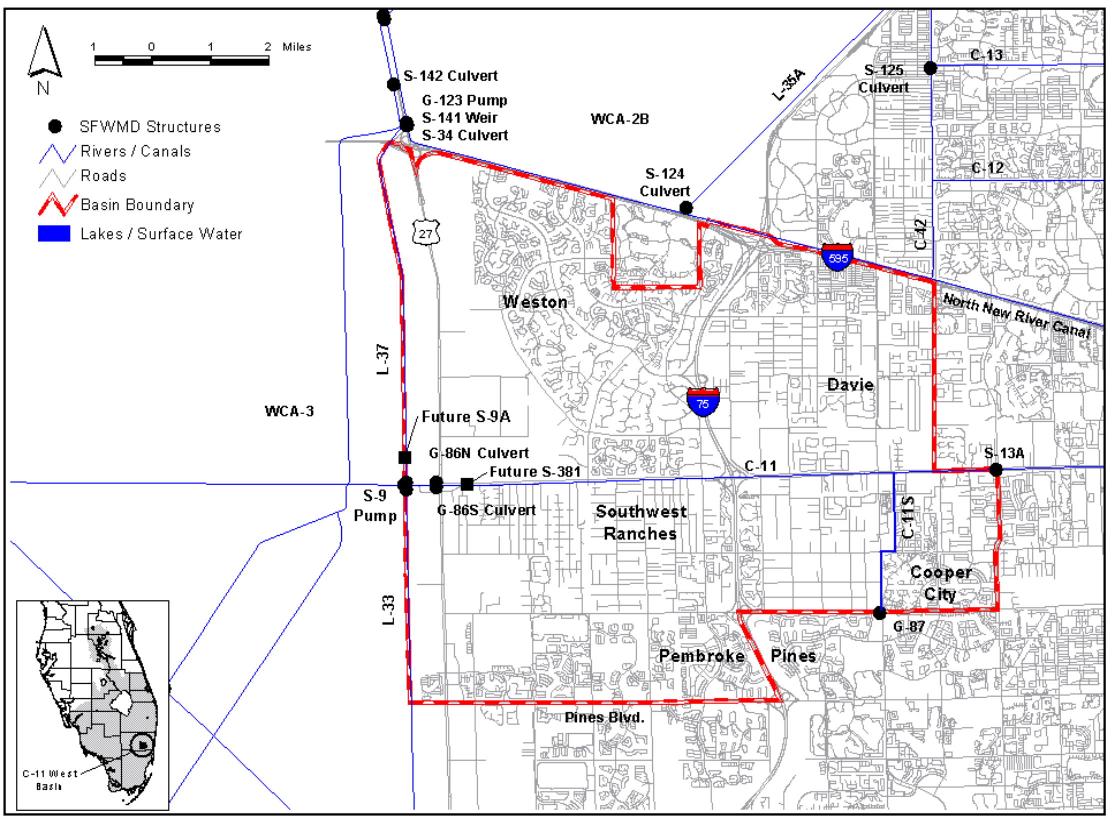


Figure 3.6 C-11 West Basin Map

Land use in the C-11 West Basin is primarily urban residential and commercial development. Agricultural and rural land uses continue to be converted to urban land uses as development continues in the basin. However, there is very little undeveloped land currently available in the basin and land values have increased dramatically in recent years.

An ongoing project (the C-11 West Basin Critical Project) is scheduled for completion by the end of 2004 that includes structural and operational changes to the water management system by isolating WCA 3A seepage from C-11 West Basin runoff. A proposed divide structure (S-381) and a proposed set of smaller pumps (S-9A) will contain and return seepage to WCA 3A. During non-storm conditions, the S-9A pumps would operate continuously and would maintain C-11 West Canal elevations. Therefore, it is expected that the phosphorus levels going into WCA 3A will be reduced by back pumping clean seepage water and by decreasing operation of the larger S-9 pumps, which cause scour and drawdown.

Two future Comprehensive Everglades Restoration Plan (CERP) projects will also affect surface water management in the C-11 West Basin. The Western C-11 Impoundment and Diversion Canal CERP Project, scheduled for completion in January 2006, consists of a 1,600-acre stormwater treatment area/impoundment within the C-11 West Basin and approximately 8 miles of canal that will divert flood waters to other CERP storage areas. This impoundment will be located north of the C-11 West Canal and east of U.S. Highway 27. In addition, the North Lake Belt Storage CERP Project, scheduled for completion in June 2036, will also affect the amount of stormwater flows pumped into WCA-3A through S-9 and seepage flows returned to WCA 3A through S-9A.

3.4.1. Recommended Improvements and Strategies

A total of three alternatives for the C-11 West Basin were evaluated in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins*. Alternative No. 3 as presented in that reference, with certain adjustments, is recommended for implementation. Component elements of that alternative include:

- Implementation of source controls;

- Reliance on the CERP projects as the primary means of reducing total phosphorus loads discharged to WCA-3A from the C-11 West Basin.

In response to a request from Broward County Department of Planning and Environmental Protection, reduction of phosphorus through source controls (i.e., urban BMPs) is of highest priority for discharges from Broward County basins to achieve compliance with the phosphorus criterion. The District currently has cooperative agreements with all local water control districts in the County, and these include water quality provisions. The District will assist Broward County in coordinating a county-wide working group to develop a comprehensive pollution prevention plan with specific water quality goals and milestones.

Analyses presented in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins* suggest that the total phosphorus loads discharged to WCA-3A at S-9 under current conditions will be reduced as follows as a result of the CERP projects:

- Following completion of the ongoing Critical Project and the Western C-11 Impoundment and Diversion Canal CERP Project (2006), average annual phosphorus loads would be reduced from approximately 4,100 kilograms per year (reference: May, 2001 *Baseline Data for the Basin-Specific Feasibility Studies*, SFWMD) to approximately 500 kilograms per year. Additional discussion of this reduction is presented in Table 4.2 in Part 4 of this Long-Term Plan.
- Following the subsequent completion of the North Lake Belt Storage CERP Project, average annual phosphorus loads would be further reduced to approximately 30 kilograms per year.

One objective of the CERP projects is to eliminate discharges to WCA-3A at Pumping Station S-9. Hydrologic simulations conducted for the Basin Specific Feasibility Studies indicate that objective is not fully met, although it is anticipated this issue will be addressed during future design phases of the CERP project. The recommended adjustment to Alternative 3 of the Basin Specific Feasibility Studies is to further evaluate the potential for modification to the CERP projects in the area to fully meet that objective.

One possible modification would be to adjust both the Western C-11 Impoundment and Diversion Canal CERP Project and the WCA 3A/3B Levee Seepage Management CERP Project (both components of the overall Broward County Water Preserve Area, or WPA). At present, there is no direct hydraulic connection between those two projects. It is recommended that, during preparation of the Project Implementation Plan (PIR) for those projects, the potential for diverting excess inflows from the Western C-11 Impoundment to the levee seepage management area west of U.S. Highway 27 generally adjacent to the impoundment be investigated. In essence, those inflows not directly accommodated by the Western C-11 Impoundment (and which would otherwise bypass untreated to S-9 and WCA-3A) might be passed through the impoundment to the levee seepage management area. Those excess inflows could then be carried through that area (with attendant improvement in water quality) prior to being returned to the C-11 Canal immediately upstream (east) of Pumping Station S-9.

3.4.2. Estimated Cost and Projected Expenditures [Bc73]

Projected Expenditures for the C-11 West Basin include:

- Funding to assist local communities in developing, evaluating and implementing source controls (Best Management Practices);
- Funding for evaluation of the potential connection between the Western C-11 Impoundment and the WCA 3A/3B Levee Seepage Management CERP projects and potential internal enhancements to the C-11 West impoundment for water quality improvement. The results of those evaluations will be forwarded to the CERP PDT for consideration in the Western C-11 Project Implementation Report (PIR).

Projected expenditures for the above purposes in the C-11 West Basin are summarized in Table 3.12 (FY 2003 dollars).

3.5. L-28 Basin

The L-28 Basin covers an area of about 72,000 acres (113 square miles). It is located west of Water Conservation Area (WCA) 3A and south of the Everglades Agricultural Area (EAA) at the northeast corner of the Big Cypress National Preserve in Broward, Hendry and Collier Counties. Two of the largest landowners within this basin are the Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida. A small portion of the Big Cypress National Preserve is also located in the basin.

The L-28 Basin is entirely occupied by four landowners. The C-139 Annex (approximately 25% of the basin) is comprised of the U.S. Sugar Corporation's Southern Division Ranch, Unit 1. The Seminole Tribe's Big Cypress Reservation occupies approximately 34% of the basin. Approximately 28% of the basin is situated in the Miccosukee Indian Reservation. The remaining 13% of the basin is within the Big Cypress National Preserve.

The surface water management system in the L-28 Basin provides drainage and flood protection in addition to providing water to WCA-3A when necessary for water supply purposes. The L-28 Borrow Canal is the primary drainage canal, running north/south for a distance of approximately 10 miles along the eastern border of the basin. The L-28 Borrow Canal conveys stormwater runoff to the S-140 pump station which discharges it directly into WCA-3A. The S-140 pump station has three pumps with a combined pumping capacity of 1,300 cubic feet per second (cfs). The nominal capacity of S-140 was established to provide an average removal rate from the L-28 Basin of 7/16" per day. The L-28 Interceptor Canal, which borders the basin on the southwest, conveys discharges from the S-190 Structure (Feeder Canal Basin) to WCA-3A and is separated from the L-28 Basin by a levee. Wetland and agricultural land uses account for approximately 96 percent of the basin area.

A map of the L-28 Basin is presented in Figure 3.7.

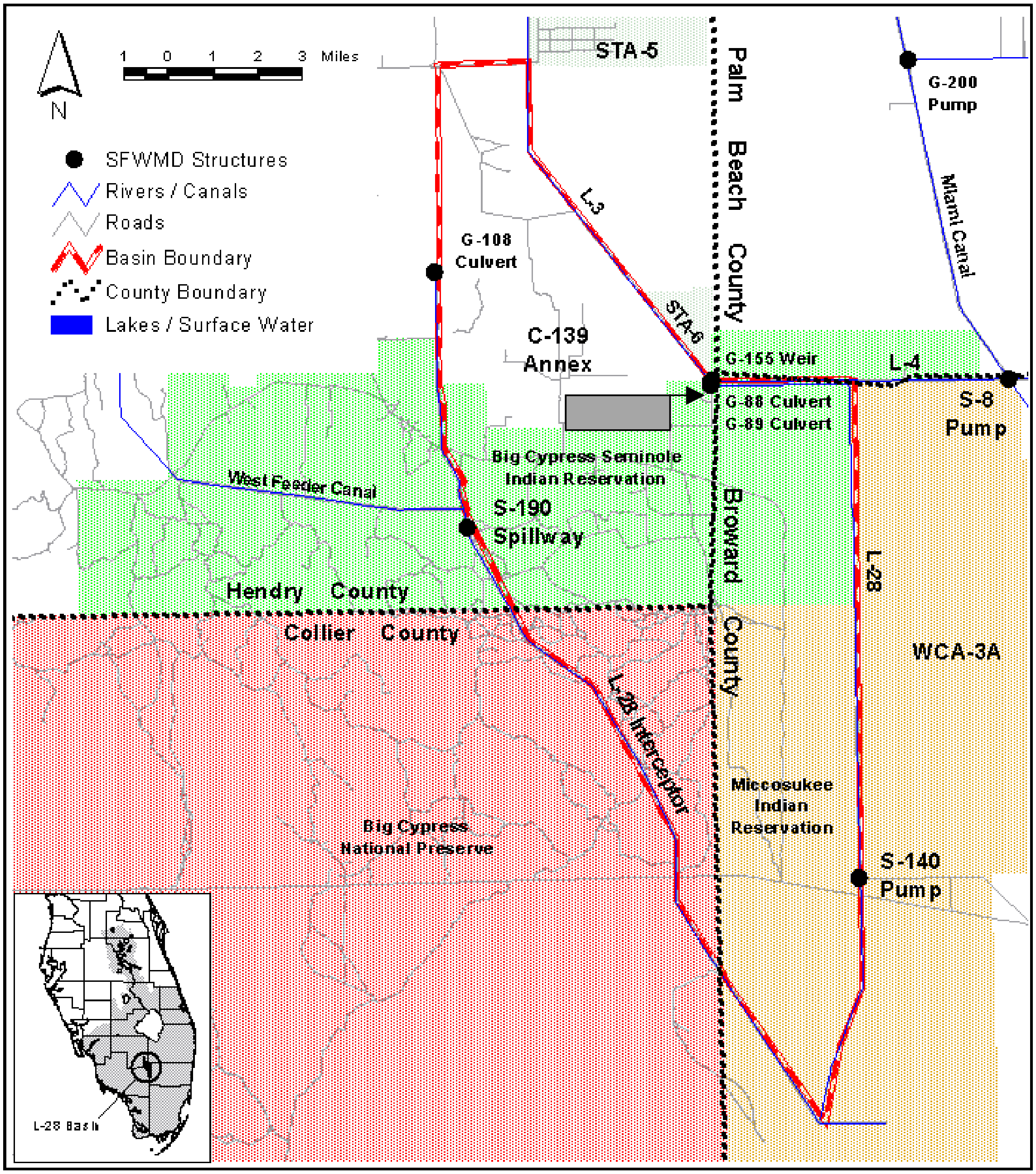


Figure 3.7 L-28 Basin Map

The C-139 Annex presently drains to the L-28 Borrow Canal at the north line of the Big Cypress Reservation. Runoff from that area will be diverted to STA-6 in concert with the presently planned construction of STA-6, Section 2 (scheduled for completion before

December 31, 2006). Upon that diversion, the total area of the L-28 Basin will be effectively reduced to approximately 53,000 acres.

There are two Central and South Florida Restoration Critical Projects planned for the L-28 Basin, the Miccosukee Water Management Plan (WMP) and a Comprehensive Everglades Restoration Plan (CERP) project planned to expand and relocate the S-140 pump station. In addition, the Big Cypress-Seminole Indian Reservation Water Conservation Plan (WCP) is to be implemented under the National Resource Conservation Service (NRCS) PL 83-566 Small Watershed Project Program.

The basic nature of the overall plan on the Big Cypress Reservation was originally defined in a February 6, 1995 *Conceptual Water Conservation System Design*, prepared for the Seminole Tribe of Florida by AMS Engineering and Environmental of Punta Gorda, Florida. That document suggests the development of three Water Resource Areas (WRAs) in that part of the Big Cypress Reservation lying in the L-28 Basin. Those areas (WRA-5, WRA-6 and WRA-7) were intended to treat an average annual volume of 32,418 acre-feet per year, consisting of runoff from a total contributing area of 13,957 acres. The total phosphorus load in those inflows was estimated to average 12.327 tons (11,183 kilograms) per year, equivalent to a flow-weighted mean TP concentration of 280 ppb. However, that estimated TP inflow load was based on generalized estimates of runoff concentration by land use; the primary land use in lands tributary to these three WRA's is improved pasture, which was assigned a mean TP concentration in runoff of 300 ppb. The total area identified for the three WRA's was 3,835 acres (with 3,257 in the largest, WRA-7). These WRA's are not included in either Phase I or Phase II of the Critical Restoration Project, and are not currently scheduled or funded for construction.

The Miccosukee WMP is a Critical Project to construct a managed wetland on the Miccosukee Tribe's 76,800-acre reservation in western Broward County. The project will convert 900 acres of pastureland on the reservation into wetland retention and detention areas. The project will provide water storage capacity as well as water quality enhancement for water that will be discharged to WCA 3A through the S-140 pump station. This project is being designed to accommodate flows and loads from reservation lands only. Completion of improvements is currently planned for 2010.

CERP Component RR4 includes expanding the S-140 pump station from a capacity of 1,300 cfs to a capacity of 2,000 cfs and relocating it approximately 8 miles to the south. The purpose of the project is to improve hydropattern in the western area of WCA 3A and to provide increased water supply to the area. An estimated 285,000 acre-feet per year of additional water from STA-3/4 will be conveyed to the new S-140 pump station. The planning process for determination of the manner in which this flow will be conveyed to the new S-140 pump station is not complete.

3.5.1. Alternatives Considered in Basin-Specific Feasibility Studies

The following is a discussion of alternatives for the L-28 Basin considered in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins*, Brown & Caldwell. Those alternatives consisted of hypothetical projects developed and evaluated for comparison purposes only.

In that study, it was not considered possible to quantify the effects of the two Critical Projects on the future quantity and quality of stormwater discharges from the L-28 Basin. Therefore for the purposes of evaluating alternatives in that investigation, it was assumed that there would be no reduction in either the baseline flows or phosphorus loads predicted for the L-28 Basin over the 31-year period of simulation as a result of these projects.

The SFWMD used historical rainfall, flow and water quality data to develop simulated 31-year baseline flows and TP loads from the L-28 Basin *(Baseline Data for the Basin Specific Feasibility Studies to Achieve the Long-Term Water Quality Goals for the Everglades, SFWMD, May 2001).* Simulated flows ranged from about 50,000 to 130,000 acre-feet per year (average 83,806 acre-feet per year). (**Note:** Stormwater runoff from the C-139 Annex was conveyed to STA 6 in the model simulation used for the *Basin Specific Feasibility Studies*.) Simulated phosphorus loads ranged from about 2,300 to 6,200 kilograms (kg) TP per year (average 3,982 kg TP per year). The flow-weighted mean TP concentration over the 31-year period of simulation was estimated to be 39 ppb. That estimate was based on analysis of available water quantity and quality data over the period encompassing water years 1990 to 1999.

Two alternatives were considered in the *Basin Specific Feasibility Studies*. Alternative 1 combined source controls with biological treatment in an STA to reduce phosphorus loads in discharges from the L-28 Basin. Alternative 2 considered source controls only, and is not further discussed herein.

As structured in the *Basin Specific Feasibility Studies*, the STA in Alternative 1 was intended to treat all discharges from the L-28 Basin in a single facility. That facility was estimated to require an effective treatment area of 1,088 acres, the upstream half of which would be developed in Submerged Aquatic Vegetation (SAV), with the remainder developed as a Periphyton Stormwater Treatment Area (PSTA). The estimated capital cost of the STA was $35.70 million; average annual operation and maintenance costs were estimated to average $0.40 million. The estimated implementation schedule suggested that the facility could not be fully operational (e.g., meeting final water quality standards) until mid-2011, given a January 2003 start.

Because so few details associated with the CERP Projects and non-CERP Projects in this basin were available at the time of the *Basin Specific Feasibility Studies*, an assumption was made that the proposed STA would need to treat all of the basin flows and loads, even though it was suspected that these projects will have an impact on these flows and loads. For this reason, it was concluded that a potential exists for cost savings by integrating with the CERP and Critical Projects to meet the goals of all the projects.

3.5.2. Recommended Strategy

There remains considerable uncertainty in the scope, schedule, funding and interaction of the various CERP projects in the L-28 Basin. The basic strategy recommended for this basin is to continue reliance on CERP. However, an additional alternative has been developed and should be forwarded to the CERP Project Development Team (PDT) for its specific consideration. That alternative contemplates two primary components:

- Accelerated construction of the Miccosukee 900-acre STA by the USACE (currently planned for completion in 2010). That STA will capture and treat runoff from Miccosukee tribal lands. Preliminary construction costs were estimated in the CERP documents as approximately $25 million, with a 50/50 cost share between the federal government and the Miccosukee Tribe. The Tribe has indicated its intent to dedicate a 900-acre parcel of land located north of Interstate 75 and just west of the existing S-140 Pumping Station;
- The Seminole Tribe has just executed a scope of work with the NRCS for the development of a project that will route, detain and treat runoff from the Big Cypress Seminole Indian Reservation prior to its discharges to (1) Big Cypress National Preserve (BCNP), (2) BCNP and Miccosukee Tribe of Indians lands, and (3) the L-28 Borrow Canal, through WRAs 5, 6, and 7, respectively. This project, proposed for implementation under the NRCS PL 83-566 Small Watershed Project Program, has not yet been authorized or funded. This project is being designed to accommodate flows and loads only from reservation lands.

The District initiated coordination with the tribes, the USACE and the federal interest in the Big Cypress National Preserve in June, 2003. Additional coordination is still necessary to integrate the various projects in the basin. The remaining discussion of the L-28 Basin presented in the following sections is intended to generally suggest technical steps necessary in that coordination, and to preliminarily quantify probable costs.

Final selection of the specific plan of improvement in the L-28 Basin and determination of the implementation schedule will be accomplished through the CERP and NRCS planning processes. In the L-28 Basin, the two tribes are expected to fulfill the role of local sponsor to the federal initiatives.

3.5.3. Review and Disaggregation of Baseline Data

As noted earlier, the District's *Baseline Data* for the L-28 Basin suggests a simulated average annual discharge from the L-28 Basin of 83,806 acre feet at a flow-weighted mean TP concentration of 39 ppb (3,982 kg TP per year). The 31-year simulation on which the hydrologic data is based was conducted assuming that the C-139 Annex had been diverted to STA-6. No runoff from that part of the (historic) L-28 Basin was considered in the simulation. The estimated flow-weighted mean TP concentration was based on analysis of actual discharge from the entire L-28 Basin (including the C-139 Annex) over the period water years 1990-1999.

During development of final water quality improvement strategies in the L-28 Basin, it will be necessary to further refine estimated runoff volumes and loads to be treated in (1) the Miccosukee Tribe's STA; and (2) the Seminole Tribe's STA, discussed herein as a potential addition to, or addition within, the Seminole Tribe's proposed WRAs 5, 6 and 7, which are scheduled to be implemented under NRCS PL 83-566 Small Watershed Project Program, due to the following:

- The flow-weighted mean concentration in L-28 Basin discharges was developed including discharges from the C-139 Annex, which, for much of the period considered, had been developed in citrus and fitted with an extensive stormwater management system;
- Approximately half of the overall area of the L-28 Basin consists of natural areas, primarily wetlands. It would be expected that these natural areas contribute but a small fraction of the overall TP load discharged from the basin;
- Given the anticipated presence of at least two STAs in the overall plan of improvement, it will be necessary to develop separate estimates of inflows to be accommodated in those treatment areas.

That further refinement of estimated runoff and TP loads to be accommodated in the treatment areas will require the conduct of a detailed watershed assessment prior to finalizing plans for improvement. A starting point for that watershed assessment is available in the January, 1993, *Western Basins Environmental Assessment*, prepared for SFWMD by Mock, Roos & Associates, Inc. of West Palm Beach. That updated watershed assessment would benefit greatly from use of extensive water quality data that is believed to have been accumulated by both the Miccosukee and Seminole tribes over the almost ten years subsequent to publication of the *Environmental Assessment*.

The following is an initial approximation of the runoff volumes and loads to be treated in those STAs. It can be considered only an initial approximation due to the significant assumptions necessarily made in the absence of more definitive data. The most significant assumptions include:

- An assumption that it will not be necessary to treat runoff from native lands on which no external source of phosphorus is present (e.g., water quality in runoff from those areas generally parallels that prior to drainage and development in the basin);
- An assumption that the overall flow-weighted mean TP concentration in basin runoff (including native areas) will be approximately 39 ppb, but that the bulk of the associated TP load is discharged from agricultural areas in the basin;
- An assumption that each tribal STA will treat only runoff from the respective tribe's lands.

Data presented in the 1993 *Western Basins Environmental Assessment* indicates that a total of 26,532 acres are tributary to the L-28 Borrow Canal on and adjacent to the Seminole Tribe's Big Cypress Reservation (tertiary basins b51-b55, inclusive and b63). A total of 26,926 acres are shown as being tributary to the L-28 Borrow Canal along the Miccosukee Tribe's Reservation (tertiary basins b66-b86). Given an average annual runoff of 83,806 acre-feet (taken from the District's *Baseline Data*) from the entire 52,504-acre area, the average annual runoff depth from the basin is estimated to be 1.65 ft. (19.8"). In the absence of more definitive data, that average annual depth of runoff is considered as uniformly applied to the entire basin.

Of the 26,926 acres tributary to the L-28 Borrow Canal along the Miccosukee Reservation, approximately 16,160 acres are considered to be native lands for which no treatment is required. Those lands include approximately 7,880 acres in tertiary basin b80 (primarily the Big Cypress Federal Preserve; roughly 1,520 acres of Tribal lands in this basin west of Snake Road are improved pasture for which treatment is needed) and tertiary basins b82, b84 and b86 (native lands south of Alligator Alley). As a result, it is presently anticipated that the Miccosukee Tribal STA will need to treat runoff from a total contributing area (including the STA itself) of 10,766 acres (primarily improved pasture).

Of the 26,532 acres tributary to the L-28 Borrow Canal on and adjacent to the Big Cypress Reservation, approximately 8,740 acres are considered to be native lands for which no treatment is required (primarily in tertiary basin b55). As a result, it is anticipated that the Seminole Tribal STA will need to treat runoff from a total contributing area (including the STA itself) of 17,792 acres (primarily improved pasture).

For the basin as a whole, 24,900 acres are considered to be native lands for which no treatment is required, with the remaining 28,558 acres effectively contributing to the two tribal STAs. The average annual runoff volume to be accommodated in the two STAs is then estimated to be approximately 44,800 acre-feet (53% of the simulated discharge volume at Pumping Station S-140). In the absence of more definitive data, the <u>entire</u> estimated average annual TP load of 3,982 kg per year discharged at S-140 in the *Baseline Data* is <u>assigned</u> to those inflows, yielding a flow-weighted mean inflow concentration of approximately 72 ppb.

3.5.4. Initial Conceptual Design, Miccosukee Tribal STA

Given the above approximations, it is presently anticipated that the Miccosukee Tribal STA may be required to treat an average annual inflow volume of approximately 15,260 acre-feet per year (20.1% of the total simulated runoff volume from the L-28 Basin) at a flow-weighted mean inflow TP concentration of approximately 72 ppb.

It is assumed that the Miccosukee Tribal STA will be developed on a 900-acre parcel of land lying adjacent to the L-28 Borrow Canal just north of Interstate 75 and west of existing Pumping Station S-140. It is anticipated that approximately 800 acres of effective treatment area can be developed on that site. The treatment area would consist of three parallel flow paths, with two cells in series in each flow path. The most upstream cells (approximately 40% of the effective area) are assumed to consist of emergent macrophyte vegetation. The downstream cells (approximately 60% of the effective area) would be developed in Submerged Aquatic Vegetation (SAV).

The majority of lands served by this STA presently drain directly to the L-28 Borrow Canal. It is anticipated that the project would include approximately 4.5 miles of interceptor canal along the west side of and immediately adjacent to the L-28 Borrow Canal. The function of that canal would be to intercept runoff from the Tribal lands prior to its discharge to the L-28 Borrow Canal, and convey that runoff to the STA for treatment.

A preliminary treatment projection was prepared employing the same analytical tool (the DMSTA model) employed in the *Basin Specific Feasibility Studies*. Daily inflows to the STA over the 31-year period of simulation were established at 20.1% of the S-140 daily discharge, and assigned a uniform TP concentration of 72 ppb. In that analysis, the treatment parameter data set for NEWS (Nonemergent Wetland Systems) was employed in the downstream SAV cells. Based on that analysis, it was concluded that, given the assigned inflow data, the long-term mean concentrations in discharges from the STA would meet the planning objective (10 ppb geometric mean), and would result in a flow-weighted mean TP concentration of 14 ppb (lowest sustainable concentration anticipated in the biological treatment system). The actual computed values were a geometric mean TP concentration of 9.6 ppb, and a flow-weighted mean TP concentration of 12.2 ppb.

For reasons subsequently discussed in this section, it is recommended that additional watershed assessment and analysis be conducted prior to finalizing the design of the

Miccosukee Tribal STA. However, the results of the preliminary treatment performance projection suggests that it would not be unreasonable to establish projected expenditures for development of the Miccosukee Tribal STA on the basis of the analyses presented herein.

An opinion of the probable capital cost for the Miccosukee Tribal STA (stated in FY 2003 dollars) is presented in Table 3.5.

Table 3.5 Opinion of Probable Capital Cost, Miccosukee Tribal STA

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Inflow Pumping Station	260	cfs	$9,900	$2,574,000	
2	Gated Water Control Culverts	12	Ea.	$25,000	$300,000	Approx. 48" dia. With gates
3	Outlet Control Structures	6	Ea.	$30,000	$180,000	Approx. 48" diameter with control weir structures
4	Power Line to Pump Station	1.5	Mi.	$80,000	$120,000	Assumed to come from Snake Road to vic. L-28
5	Exterior Levee, 9' Height	2.8	Mi.	$562,000	$1,573,600	
6	Exterior Levee, 8' Height	3.3	Mi.	$485,000	$1,600,500	
7	Interior Levee, 7' Height	3.3	Mi.	$390,000	$1,287,000	
8	Interior Land Preparation	800	Ac.	$60	$48,000	
9	Interceptor Canal along L-28, approx. 4.5 Mi. length	200000	Cu. Yd.	$3.50	$700,000	
Subtotal, Estimated Construction Costs					**$8,383,100**	**$8,400,000**
Planning, Engineering & Design		10 %			$838,310	**$840,000**
Program & Construction Management		10 %			$838,310	**$840,000**
Total Estimated Cost, Without Contingency					**$10,059,720**	**$10,080,000**
Contingency		30 %			$3,017,916	**$3,000,000**
Land Acquisition		900	Ac.	$1,000	**$900,000**	**$1,100,000**
Land Acquistion Contingency		20 %			$180,000	
TOTAL ESTIMATED CAPITAL COST					**$14,157,636**	**$14,180,000**

An opinion of the probable average annual cost for operation and maintenance of the Miccosukee Tribal STA (stated in FY 2003 dollars) is presented in Table 3.6.

Table 3.6 Opinion of Ave. Annual O&M Cost, Miccosukee Tribal STA

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Mechanical Maintenance, New Pumping Units	3	Ea.	$10,000	$30,000	Unit cost from Evaluation Methodology
2	Pumping Station Building Maintenance	1	Ea.	$12,000	$12,000	Unit cost from Evaluation Methodology
3	Pumping Station Fuel Consumption	15260	Ac. Ft.	$0.50	$7,630	Unit cost from Evaluation Methodology
4	Pumping Station Lead Operator	1	Ea.	$100,000	$100,000	
5	Engine Operator/Maintenance Mechanic	1	Ea.	$100,000	$100,000	
6	Site Manager	1	FTE	$125,000.00	$125,000	
7	Levee Maintenance	9.4	Mi.	$3,300.00	$31,020	
8	Vegetation Control (Base for Emergent Systems)	800	Ac.	$50	$40,000	
9	Additional Vegetation Control for SAV Cells	480	Ac.	$30	$14,400	
10	Water Control Structure Maintenance	18	Ea.	$2,000	$36,000	Reduced from Evaluation Methodology, Simpler Structures
11	Flow Monitoring; water quality sampling and testing	Job	Lump	Allow	$60,000	
Subtotal, Estimated Operation & Maintenance Costs					**$556,050**	
Contingency		30	%		$166,815	
TOTAL INCREMENTAL O&M COST					**$722,865**	**$720,000**

3.5.5. Initial Conceptual Design, Seminole Tribal STA

Given the approximations discussed earlier, it is presently anticipated that the Seminole Tribal STA may be required to treat an average annual inflow volume of approximately 29,540 acre-feet per year (35.2% of the total simulated runoff volume from the L-28 Basin) at a flow-weighted mean inflow concentration of approximately 72 ppb.

For this analysis, a total of five preliminary alternatives were considered. Each alternative was developed assuming that the Seminole Tribal STA could be developed on and adjacent to lands shown in the Tribe's February 6, 1995, *Conceptual Water Conservation System Design* as the East Cell of WRA-7.

- Alternative 1 considered an effective treatment area of 2,500 acres, all in emergent macrophyte vegetation, on a total land area of 2,800 acres. For that alternative, the East Cell in total was used, and extended easterly to abut the L-28 Borrow Canal;
- Alternative 2 considered an effective treatment area of 2,500 acres, occupying the same general footprint as Alternative 1. The upstream 40% of the treatment area was considered to consist of emergent macrophyte vegetation, with the downstream 60% in Submerged Aquatic Vegetation (SAV);
- Alternative 3 was similar to Alternative 2, with the exception that the footprint was limited to those areas lying north of the Tribe's E-1 and E-2 ditches. The estimated effective treatment area was 1,660 acres on a total land area of approximately 1,870 acres;
- Alternative 4 was similar to Alternative 3, with the exception that the lands considered were limited to those shown in the East Cell of WRA-7 north of the Tribe's E-1 and E-2 ditches. The estimated effective treatment area was 1,050 acres;
- Alternative 5 assumed that the total effective treatment area was established at 3,582 acres on a total land area of 3,835 acres, distributed among three Water Resource Areas as developed in the *Conceptual Water Conservation System Design*. For analysis, those three areas were conceptualized as a single area similar in footprint to Alternative 1.

Preliminary treatment projections were prepared for each alternative employing the same analytical tool (the DMSTA model) employed in the *Basin Specific Feasibility Studies*. Daily inflows to the STA over the 31-year period of simulation were established at 35.2% of the S-140 daily discharge, and assigned a uniform TP concentration of 72 ppb. In that analysis, the treatment parameter data set for NEWS (Nonemergent Wetland Systems) was employed in the downstream SAV cells.

A summary of the results of those analyses is presented in Table 3.7.

Table 3.7 Preliminary Treatment Estimates, Seminole Tribal STA

Alt. No.	Effective Area (ac.)	Vegetation Type	Long-Term TP Conc. (ppb)	
			F.W. Mean	Geo. Mean
1	2,500	100% Emergent	18.7	18.0
2	2,500	40% Emergent, 60% NEWS	14*	10*
3	1,660	40% Emergent, 60% NEWS	14*	10*
4	1,050	40% Emergent, 60% NEWS	14.2	11.1
5	3,582	100% Emergent	15.5	14.9

* Computed value outside calibration range, used lowest sustainable concentration

On the basis of those preliminary treatment projections, Alternative 3 was selected as representative of the requirements for a possible Seminole Tribal STA. The basic layout of the STA was assumed to present three parallel flow paths, with two cells in series in each flow path. The most downstream cells (approximately 60% of the total effective treatment area) would be developed in SAV; the upstream cells were considered to consist of emergent macrophyte vegetation.

It should here be noted that Alternative 5 as generally described above represents the current conceptual design for the Seminole Tribe's projects scheduled to be implemented under the NRCS PL 83-566 Small Watershed Project Program.

For reasons subsequently discussed in this section, it is recommended that additional watershed assessment and analysis be conducted prior to finalizing the design of the Seminole Tribal STA. However, the results of the preliminary treatment performance projection suggests that it would not be unreasonable to establish projected expenditures for development of the Seminole Tribal STA on the basis of the analyses presented herein.

An opinion of the probable capital cost for a possible Seminole Tribal STA (stated in FY 2003 dollars), if structured as described above for Alternative 3, is presented in Table 3.8. The Seminole Tribe's presently intended project (e.g., Alternative 5 as described above) has not yet been authorized or funded under the NRCS PL 83-566 Small Watershed Project Program, thus no concrete financial or design details are available at this time. The Seminole Tribe is moving forward with the study of the features represented in Alternative 5 to implement its project in this basin. As such, the information presented in Table 3.8 is different from those under consideration by the Seminole Tribe.

Table 3.8 Opinion of Probable Capital Cost, Seminole Tribal STA

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Inflow Pumping Station	460	cfs	$9,900	$4,554,000	
2	Gated Water Control Culverts	12	Ea.	$30,000	$360,000	Approx. 60" dia. With gates
3	Outlet Control Structures	6	Ea.	$35,000	$210,000	Approx. 60" diameter with control weir structures
4	Power Line to Pump Station	0.1	Mi.	$80,000	$8,000	Assumed available in close proximity to pump station
5	Exterior Levee, 9' Height	4	Mi.	$562,000	$2,248,000	
6	Exterior Levee, 8' Height	4	Mi.	$485,000	$1,940,000	
7	Interior Levee, 7' Height	4	Mi.	$390,000	$1,560,000	
8	Interior Land Preparation	1660	Ac.	$60	$99,600	
Subtotal, Estimated Construction Costs					**$10,979,600**	**$11,000,000**
Planning, Engineering & Design		10 %			$1,097,960	**$1,100,000**
Program & Construction Management		10 %			$1,097,960	**$1,100,000**
Total Estimated Cost, Without Contingency					**$13,175,520**	**$13,200,000**
Contingency		30 %			$3,952,656	**$4,000,000**
Land Acquisition		1870	Ac.	$1,000	**$1,870,000**	**$2,200,000**
Land Acquistion Contingency		20 %			$374,000	
TOTAL ESTIMATED CAPITAL COST					**$19,372,176**	**$19,400,000**

An opinion of the probable average annual cost for operation and maintenance of a possible Seminole Tribal STA (stated in FY 2003 dollars), structured as described above for Alternative 3, is presented in Table 3.9. The Seminole Tribe's presently intended project (e.g., Alternative 5 as described above) has not yet been authorized or funded under the NRCS PL 83-566 Small Watershed Project Program, thus no concrete financial or design details are available at this time. The Seminole Tribe is moving forward with the study of the features represented in Alternative 5 to implement its project in this basin. As such, the information presented in Table 3.9 is different from those under consideration by the Seminole Tribe.

Table 3.9 Opinion of Ave. Annual O&M Cost, Seminole Tribal STA

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Mechanical Maintenance, New Pumping Units	3	Ea.	$10,000	$30,000	Unit cost from Evaluation Methodology
2	Pumping Station Building Maintenance	1	Ea.	$12,000	$12,000	Unit cost from Evaluation Methodology
3	Pumping Station Fuel Consumption	29540	Ac. Ft.	$0.50	$14,770	Unit cost from Evaluation Methodology
4	Pumping Station Lead Operator	1	Ea.	$100,000	$100,000	
5	Engine Operator/Maintenance Mechanic	1	Ea.	$100,000	$100,000	
6	Site Manager	1	FTE	$125,000.00	$125,000	
7	Levee Maintenance	12	Mi.	$3,300.00	$39,600	
8	Vegetation Control (Base for Emergent Systems)	1660	Ac.	$50	$83,000	
9	Additional Vegetation Control for SAV Cells	996	Ac.	$30	$29,880	
10	Water Control Structure Maintenance	18	Ea.	$2,000	$36,000	Reduced from Evaluation Methodology, Simpler Structures
11	Flow Monitoring; water quality sampling and testing	Job	Lump	Allow	$60,000	
Subtotal, Estimated Operation & Maintenance Costs					**$630,250**	
Contingency		30	%		$189,075	
TOTAL INCREMENTAL O&M COST					**$819,325**	**$820,000**

3.5.6. Proposed Implementation Schedule

The proposed schedule for implementation of the above-described water quality improvement strategy in the L-28 Basin is driven by the anticipated need for close coordination with Tribal, state, and federal agencies, in particular the U.S. Army Corps of Engineers. Final selection of the strategy in the L-28 Basin and definition of the implementation schedule will result from the Comprehensive Everglades Restoration Plan (CERP) planning process.

As noted earlier, the Miccosukee Tribal STA project is considered to closely parallel the scope and intent of the currently authorized Critical Project scheduled for completion in 2010. The Seminole Tribe's WRAs 5, 6 and 7, scheduled to be implemented under the NRCS PL 83-566 Small Watershed Project Program, have not yet been authorized or funded. Thus no tentative completion date is available for this project at this time. The following is considered the earliest feasible schedule for implementation of the water quality improvement strategy in the L-28 Basin:

- By 12/31/03, define the proposed strategy for water quality improvement initiatives in the L-28 Basin for inclusion in the Long Term permit application required by the Everglades Forever Act. This will require close coordination with the appropriate Tribal, state and federal agencies. That strategy should either confirm or modify the remainder of this proposed implementation schedule;
- Seek federal authorization for the Seminole Tribal STA as a component of the Seminole Tribe's WRAs 5, 6 and 7, which are scheduled to be implemented pursuant to the NRCS PL 83-566 Small Watershed Project Program;
- In Fiscal Year (FY) 2005, conduct the necessary additional watershed assessment and necessary planning documents to permit the two projects to proceed into detailed design;
- In FY 2006, complete all necessary planning, engineering and design for the two projects. All necessary lands should be dedicated or acquired;
- In FY 2007-2008, complete construction of both projects.

Following completion of construction, it is anticipated that an additional period of approximately two years would be required for full maturation and stabilization of the biological treatment process. Given the above schedule, it is anticipated that both projects could be fully operational and performing as intended in 2010.

The watershed assessment and planning efforts in FY 2005 are considered critical to the proper development of both projects. Development of the initial conceptual designs of the two Tribal STAs presented herein required a number of key assumptions, approximations and generalizations. It is the intent that the watershed assessment and related planning work further define and more fully document the requirements for these projects and their projected performance.

That assessment should take full advantage of all available water quality data that can be obtained from the two Tribes, and should consider in detail the influence of seepage from

WCA-3A to the L-28 Borrow Canal on both measured and simulated discharges from Pumping Station S-140. In addition, that assessment should consider the influence of the Tribes' water conservation plans and intended Reservation operations on the overall water and phosphorus load balance in the L-28 Basin.

3.5.7. Projected Expenditures

Summaries of the projected expenditures through FY 2016 (in FY 2003 dollars) for the Miccosukee Tribal STA and the Seminole Tribal STA are presented in Tables 3.10 and 3.11, respectively. In each instance, the opinions of capital cost (see Tables 3.5 and 3.8) have been increased by approximately 3% of the estimated construction cost for the conduct of the watershed assessments and planning efforts recommended to be conducted in FY 2005.

Table 3.10 Projected Expenditures, Miccosukee Tribal STA in L-28 Basin

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	O&M Cost	
2004							$0
2005	$250,000						$250,000
2006	$840,000			$1,100,000	$250,000		$2,190,000
2007		$420,000	$4,200,000		$1,375,000		$5,995,000
2008		$420,000	$4,200,000		$1,375,000		$5,995,000
2009						$720,000	$720,000
2010						$720,000	$720,000
2011						$720,000	$720,000
2012						$720,000	$720,000
2013						$720,000	$720,000
2014						$720,000	$720,000
2015						$720,000	$720,000
2016						$720,000	$720,000
Total	**$1,090,000**	**$840,000**	**$8,400,000**	**$1,100,000**	**$3,000,000**	**$5,760,000**	**$20,190,000**

Table 3.11 Projected Expenditures, Seminole Tribal STA in L-28 Basin

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	O&M Cost	
2004							$0
2005	$330,000						$330,000
2006	$1,100,000			$2,200,000	$330,000		$3,630,000
2007		$550,000	$5,500,000		$1,835,000		$7,885,000
2008		$550,000	$5,500,000		$1,835,000		$7,885,000
2009						$820,000	$820,000
2010						$820,000	$820,000
2011						$820,000	$820,000
2012						$820,000	$820,000
2013						$820,000	$820,000
2014						$820,000	$820,000
2015						$820,000	$820,000
2016						$820,000	$820,000
Total	**$1,430,000**	**$1,100,000**	**$11,000,000**	**$2,200,000**	**$4,000,000**	**$6,560,000**	**$26,290,000**

It is anticipated that more detailed planning and design of the water quality improvement strategy in the L-28 Basin will be effected through the CERP and NRCS planning processes, involving the two tribes as local sponsors. The information presented in this section was developed to assist the CERP Project Development Team (PDT) and the NRCS in their development, evaluation and final definition of the strategy, implementation schedule, and projection of expenditures.

3.6. Feeder Canal Basin [Bc74]

The Feeder Canal Basin covers an area of about 72,000 acres (113 square miles) in southeastern Hendry County. It is located west of Water Conservation Area (WCA) 3A, southwest of the Everglades Agricultural Area (EAA), and north of the Big Cypress National Preserve. A portion of the Big Cypress Seminole Indian Reservation (approximately 10,000 acres) is located in the southeast corner of the basin. A map of the Feeder Canal Basin is presented in Figure 3.8.

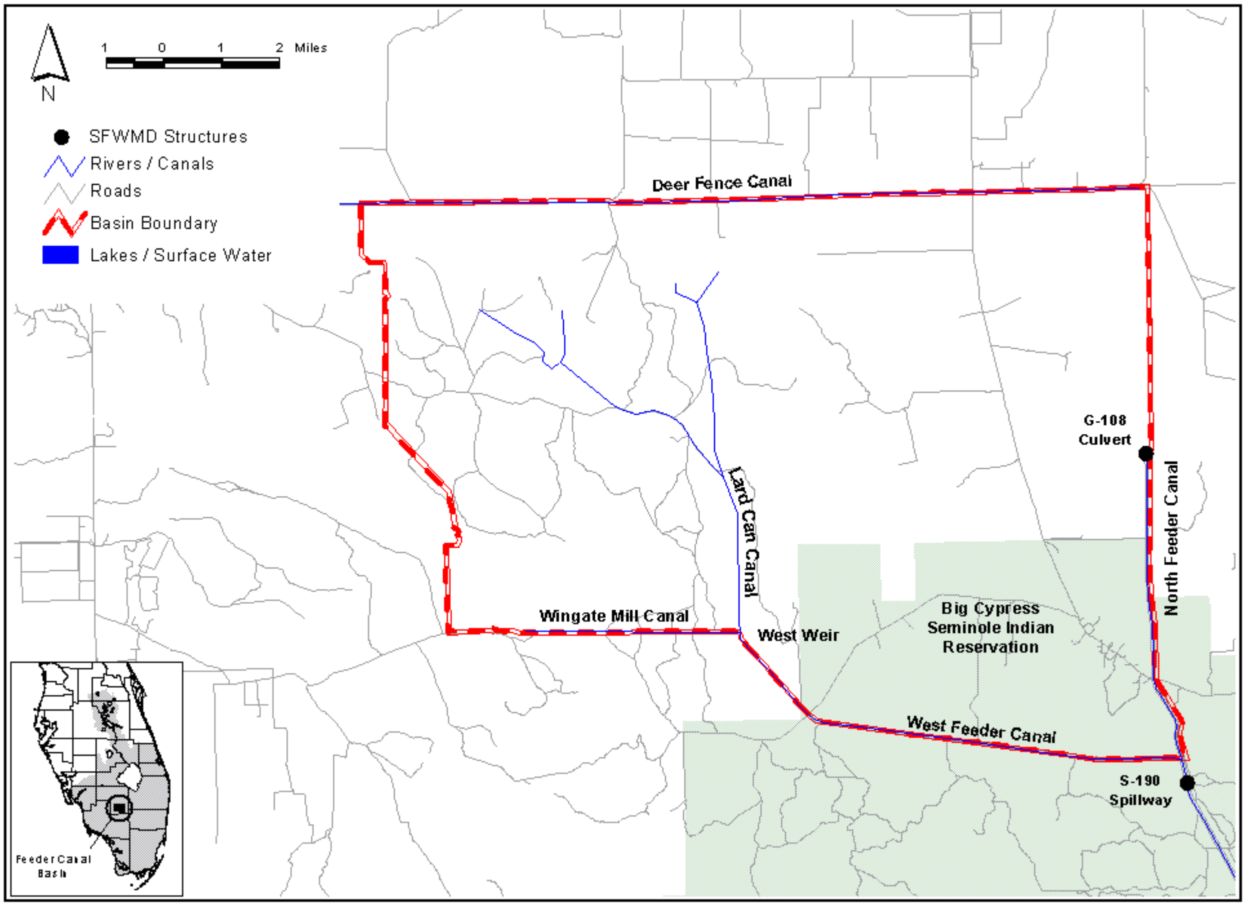


Figure 3.8 Feeder Canal Basin Map

A number of ongoing and planned future projects have the potential to significantly reduce the baseline phosphorus load currently being generated in the Feeder Canal Basin. These include (1) a major source control project on the McDaniel Ranch property, (2) a Central and South Florida Restoration Critical Project on the Big Cypress Seminole Indian Reservation, and (3) the Big Cypress/L-28 Interceptor Canal Modifications Comprehensive Everglades Restoration Plan (CERP) Project.

McDaniel Ranch is a large area of privately owned land (34.5 sections) in the northeastern portion of the basin that is a primary contributor of runoff to the North Feeder Canal. Historically, TP concentrations in runoff from this area have been very high as well. Recently, McDaniel Ranch executed a landowners' agreement with the Seminole Tribe that requires the implementation of BMPs on the McDaniel Ranch, and further requires stormwater discharges to meet a 50 ppb TP concentration limit. A system to provide stormwater detention and pre-treatment prior to discharge is currently being implemented. Construction is scheduled to be complete by December 2006.

The Seminole Tribe Big Cypress Reservation Water Conservation Plan (WCP) is a Federal Critical Restoration Project being funded by the U.S. Army Corps of Engineers (USACE) under Section 528 of the Water Resources Development Act (WRDA) of 1996. Phase I of the WCP, substantially completed in July, 2003, includes canal improvements designed to ensure delivery of water supply from the G-409 pump station to the reservation. Phase II of the WCP, scheduled for completion by late 2006, involves improvements designed to improve water quality, restore wetland hydrology, increase water storage capacity and enhance flood protection within the reservation. Phase II improvements include a number of Water Resource Areas (WRAs) and related water storage facilities in the Feeder Canal Basin to provide detention of stormwater for various flood protection and ecological purposes, and to provide treatment of runoff to be discharged from the Reservation. Following completion of the WCP, discharges from the Big Cypress Seminole Indian Reservation are expected to comply with the 50 ppb TP concentration limit included in the USACE permit for the project. Phase II improvements are presently being designed by the Jacksonville District, U.S. Army Corps of Engineers, and are scheduled for completion in late 2006.

The basic nature of the overall plan on the Big Cypress Reservation was originally defined in a February 6, 1995 *Conceptual Water Conservation System Design*, prepared for the Seminole Tribe of Florida by AMS Engineering and Environmental of Punta Gorda, Florida. That document suggests the development of four Water Resource Areas (WRAs) in that part of the Big Cypress Reservation lying in the Feeder Canal Basin. Those areas (WRA-1, WRA-2, WRA-3 and WRA-4) were intended to treat an average annual volume of 19,126 acre-feet per year, consisting of runoff from a total contributing area of 7,998 acres. The total phosphorus load in those inflows was estimated to average 3.936 tons (3.57 tonnes) per year, equivalent to a flow-weighted mean TP concentration of 151 ppb. However, that estimated TP inflow load was based on generalized estimates of runoff concentration by land use. The total area identified for the four WRA’s was 1,291 acres.

The current planning for the Phase II improvements includes the construction of three inverted siphons to carry discharges from the three most southerly WRA's beneath the West Feeder Canal, discharging to forested wetland systems on the Reservation immediately south of the West Feeder Canal. Those discharges will then be carried south across that part of the Reservation lying south of the West Feeder Canal approximately 2.5 miles to the Big Cypress National Preserve.

The Big Cypress/L-28 Interceptor Modifications CERP Project is scheduled to be completed in June 2015 and is intended to work in conjunction with the Seminole Tribe's WCP. As currently planned, this project would include three primary components: (1) degradation of berms along the L-28 Interceptor Canal to allow for the sheet flow of water into the Big Cypress National Preserve south of the Big Cypress Reservation, (2) conversion of the S-190 Structure from a gated spillway to a pump station, and (3) construction of two STAs to meet applicable water quality standards in downstream receiving water bodies including WCA 3A.

3.6.1. Alternatives Considered in Basin-Specific Feasibility Studies

The following is a discussion of alternatives for the Feeder Canal Basin considered in the October 23, 2002 Basin *Specific Feasibility Studies, Everglades Stormwater Program Basins*, Brown & Caldwell. Those alternatives consisted of hypothetical projects developed and evaluated for comparison purposes only.

In that study, it was not considered possible to quantify the effects of the presently planned projects on the future quantity and quality of stormwater discharges from the Feeder Canal Basin. For the purpose of evaluating alternatives in that investigation, it was assumed that there would be no reduction in the 31 years (1956-1995) of SFWMM simulated flows. It was further assumed that TP concentrations in future discharges from the entire Feeder Canal Basin (after December 31, 2006) would be consistent with the limits established in the landowners' agreement for the McDaniel Ranch and the discharge permit for the Seminole Tribe's WCP. Based on those assumptions, the SFWMD projected an average annual phosphorus load of 5,563 kg per year from the

Feeder Canal Basin for use in the evaluation of alternatives. That average annual load equates to a long-term flow-weighted mean concentration of 58 ppb in the estimated average annual discharge of 77,179 acre-feet per year from the Feeder Canal Basin. In comparison, the estimated long-term flow-weighted mean TP concentration prior to completion of those planned efforts was 156 ppb.

Two alternatives were considered in the *Basin Specific Feasibility Studies*. Alternative 1 combined the above described source controls with biological treatment in an STA to reduce phosphorus loads in discharges from the Feeder Canal Basin. Alternative 2 considered the above-described source controls only, and is not further discussed herein.

As structured in the *Basin Specific Feasibility Studies*, the STA in Alternative 1 was intended to treat all discharges from the Feeder Canal Basin in a single facility. The conceptual design of the STA was developed to result in a long-term geometric mean TP concentration in discharges from the Feeder Canal Basin of 10 ppb (the estimated long-term flow-weighted mean concentration was 26 ppb). The STA in Alternative 1 was structured to provide an effective treatment area of 865 acres preceded by a 1,442-acre reservoir (flow-equalization basin). The 865-acre effective treatment area was structured to consist of Submerged Aquatic Vegetation (SAV). The estimated capital cost of the STA was $91.95 million; average annual operation and maintenance costs were estimated at $0.66 million per year. The estimated implementation schedule suggested that the facility could not be fully operational (e.g., meeting the phosphorus criterion established in Rule 62-302.540 F.A.C.) until mid-2010, assuming a January 2003 start.

No information was provided in the *Basin Specific Feasibility Studies* to identify a proposed location for the STA, which could only be considered as a hypothetical alternative to the CERP Critical Project described earlier. No further investigation of this alternative is presently underway or planned.

3.6.2. Recommended Strategy

The District initiated coordination with the Seminole Tribe, the USACE and the federal interest in the Big Cypress National Preserve in June 2003. Additional coordination is still necessary to integrate the various projects in the basin. The remaining discussion of the Feeder Canal Basin presented in the following sections is intended to generally suggest technical steps necessary in that coordination, and to preliminarily quantify probable costs.

Final selection of the specific plan of improvement in the Feeder Canal Basin and determination of the implementation schedule will be accomplished through the CERP planning process. The Seminole Tribe is expected to fulfill the role of local sponsor to the federal initiative.

A basic criterion employed in the conduct of the *Basin Specific Feasibility Studies* was that the water quality improvement strategy in the Feeder Canal Basin be structured to obtain a long-term geometric mean TP concentration in basin discharges of 10 ppb. That criterion results from the observation that, in advance of the completion of the Big Cypress/L-28 Interceptor Modifications CERP Project (presently scheduled for 2015), discharges from the Feeder Canal Basin would continue to be directed to WCA-3A as a point-source discharge down the L-28 Interceptor Canal. Upon completion of the Big Cypress/L-28 Interceptor Modifications CERP Project, those point-source discharges would be eliminated; all Feeder Canal Basin discharges would be distributed to the Seminole Reservation native areas and the Big Cypress National Preserve downstream (south) of the West Feeder Canal. Those discharges would then be carried in the natural system in those areas (undisturbed cypress domes and wet prairie sloughs), eventually discharging to WCA-3A in the “Gap” area (an approximate seven-mile long uncontrolled connection between the L-28 Tieback Basin, which consists primarily of the Big Cypress National Preserve, and WCA-3A).

The basic strategy for the Feeder Canal Basin recommended herein is based on the principal assumption that long-term water quality standards for discharges to the undisturbed cypress domes and wet prairie sloughs downstream of the West Feeder Canal will not be as restrictive as those for discharges to the Everglades Protection Area. The primary basis for this assumption is recognition that the surface water quality standard for the Big Cypress Seminole Indian Reservation is a narrative criterion which states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. The USACE permit for the Seminole Tribe WCP does not *require* that discharges from the project meet a long-term flow weighted mean TP concentration of 50 ppb. The WCP, which is designed to accommodate flows and loads from reservation lands only, has a project *goal* to achieve discharges of 50 ppb. Only those direct discharges to the EPA from the Feeder Canal Basin will be required to comply with the 10 ppb phosphorus criterion adopted by the Environmental Regulation Commission on July 8, 2003. The recommended strategy includes the following primary components:

- Accelerated completion of Big Cypress/L-28 Interceptor Modifications CERP Project;
- Confirmation of the acceptability of the assumed 50-ppb flow-weighted mean TP concentration as a target for discharges to the undisturbed areas south of the West Feeder Canal. Should a substantially lower TP concentration be found necessary, it would be necessary to develop additional treatment capacity in the basin, potentially similar in nature to the alternative discussed in Section 3.6.1 of this Long-Term Plan;
- Confirmation that, after having passed through the presently undisturbed cypress domes and wet prairie slough systems downstream of the West Feeder Canal, the discharges to WCA-3A in the “Gap” area would be projected to meet final water quality standards for discharges to the Everglades Protection Area;
- Implementation of the additional measures necessary to reduce the mean TP concentration in discharges from the Feeder Canal Basin to the assumed long-term flow-weighted mean target of 50 ppb.

Upon completion of the McDaniel Ranch project and the Seminole WCP in the basin, it can be reasonably anticipated that, with the single exception of those discharges to the West Feeder Canal from lands tributary to the Wingate Mill Canal and Lard Can Canal (see Figure 3.8), Feeder Canal Basin discharges will meet the assumed target. Discharges from the Wingate Mill Canal and Lard Can Canal all enter the West Feeder Canal across a weir structure at its westerly end, just downstream of the confluence of the Wingate Mill and Lard Can canals.

3.6.3. West Feeder Canal Subbasin

The December 31, 2001 (Draft) Seventh Semiannual Progress Report, *Total Phosphorus Load Calculations for Sites Stipulated in the SFWMD/Seminole Tribe Agreement* (for the period of May 1, 2000 to April 30, 2001) reports the flow weighted mean concentration in discharges from those areas (at site "wweir") to have been 68 ppb. The total discharge over that one-year period was 16.1 million cubic meters (13,100 acre-feet). Additional data contained in a District-furnished spreadsheet (c139l28tpreport.xls, dated 10/03/02) reports a flow-weighted mean TP concentration (in flow-proportional composite samples) of 62 ppb in a total discharge volume of 182.2 million cubic meters (147,700 acre-feet) over the period May 1, 1997 through April 30, 2001. Combining data from those two sources, the average annual discharge volume over the western weir was approximately 32,200 acre-feet per year over the five water years considered. The overall flow-weighted mean TP concentration over that five-year period was 62 ppb.

Over the 4-year period May 1997 – April 2001, the average annual discharge volume at site L28IN (flow-proportional water quality samples obtained and reported by the Seminole Tribe), was 72.15 million cubic meters feet (58,492 acre-feet) at a flow-weighted mean TP concentration of 121 ppb. Site L28IN is in the L-28 Interceptor downstream of Structure S-190. Data reported for that same period at S-190 indicates an average annual discharge volume of 77.9 million cubic meters (63,154 acre-feet) at a flow-weighted mean TP concentration of 157 ppb. It should be anticipated that data at S-190 and L28IN would be more consistent. Discrepancies between those two sites remain the subject of investigation. For the purpose of this recommended strategy, it is concluded that average TP concentrations measured in discharges from the Feeder Canal Basin over the last 4-5 years generally parallel the long-term means developed in the District's *Baseline Data,* although average annual discharge volumes were less than those reported in the *Baseline Data*. It is further concluded that measured TP concentrations in discharges from the West Feeder Canal subbasin over that same period are representative of those that might be expected long-term, given no other changes in the basin.

It therefore appears that a reduction of roughly 20% in total phosphorus loads discharged from the West Feeder Canal subbasin (e.g., from 62 ppb to 50 ppb) is necessary. That level of reduction is considered within the probable range of performance that might be anticipated from the implementation of a broad program of Best Management Practices (BMPs) in the subbasin. Accordingly, it is recommended that the water quality improvement strategy in the West Feeder Canal subbasin be comprised of a BMP program directed to achieving a long-term flow-weighted mean TP concentration in subbasin discharges of 50 ppb.

A short-term BMP grant program has been initiated in this basin to aid landowners in the construction of structural BMPs on their lands. Work associated with the development and implementation of BMPs under that grant program is underway. The following project in the Feeder Canal Basin was selected for grant funding in FY 2003:

➢ The Toney Strand Water Quality/Drainage Improvement Project, consisting of:
    - Cleaning 12 miles of canal;
    - Placement of eight structures, including sediment boards, sumps, and cattle crossings;
    - Erosion/sediment controls.

3.6.4. Proposed Implementation Schedule

The following is the proposed schedule for implementation of the recommended water quality improvement strategies in the Feeder Canal Basin.

- By 12/31/03, define the proposed strategy for water quality improvement initiatives in the Feeder Canal Basin for inclusion in the long-term permit application required by the Everglades Forever Act. This will require close coordination with the appropriate Tribal, state and federal agencies, as well as other stakeholders in the West Feeder Canal subbasin. That strategy should either confirm or modify the remainder of this proposed implementation schedule;
- Over Fiscal Years (FY) 2004-2006, develop and implement a broad program of Best Management Practices in the West Feeder Canal subbasin (e.g., those lands tributary to the Wingate Mill and Lard Can canals) directed to achieving a long-term flow-weighted mean TP concentration in subbasin discharges not greater than 50 ppb. This program should be fully implemented before December 31, 2006;
- Seek acceleration of the Big Cypress/L-28 Interceptor Modifications CERP Project, Component (CCC). The following is a preliminary projection of the accelerated schedule:
    - Seek authorization, if necessary, for the acceleration of this project in the Water Resources Development Act (WRDA) of 2004.
    - During FY 2005 and 2006, complete the necessary planning documents (Project Implementation Report or PIR) for the project.
    - Seek authorization for detailed design and construction of the project in the Water Resources Development Act (WRDA) of 2006.
    - Complete detailed design of the project in FY 2007.
    - Complete construction of the Big Cypress/L-28 Interceptor Modifications CERP Project, Component (CCC) in FY 2008 and 2009.

- During FY 2004 and 2005 (e.g., on a schedule to permit incorporation into the PIR for the Big Cypress/L-28 Interceptor Modifications CERP Project, Component (CCC)), conduct such research and analysis as may be necessary for:
    - Confirmation of the acceptability of the assumed 50-ppb flow-weighted mean TP concentration as a target for discharges to the undisturbed areas south of the West Feeder Canal. A discussion of additional steps that may be necessary should that concentration level prove unacceptable is included in Part 6 of this Long-Term Plan.
    - Confirmation that, after having passed through the presently undisturbed cypress domes and wet prairie slough systems downstream of the West Feeder Canal, the discharges to WCA-3A in the "Gap" area would be projected to meet final water quality standards for discharges to the Everglades Protection Area.

3.6.5. Projected Expenditures [Bc74]

With the exception of development and implementation of the recommended program for implementation of Best Management Practices in the West Feeder Canal subbasin, each of the recommended components of the overall water quality improvement strategy for the Feeder Canal Subbasin can properly be considered as base requirements for the Big Cypress/L-28 Interceptor Modifications CERP Project, Component (CCC). **As a result, final determination of the strategy, implementation schedule and projected expenditures for the Feeder Canal Basin will result from the CERP planning process.**

It is recommended that funding to assist in the development and implementation of the BMP program in the West Feeder Canal subbasin be provided. Projected expenditures for that purpose are summarized in Table 3.12 (FY 2003 dollars), and extend from FY 2004 through FY 2006.

3.7. Summary Opinion of Cost and Expenditures

A summary opinion of the total estimated expenditures for the recommended water quality improvement strategies in the Everglades Stormwater Program basins (in FY 2003 dollars) is presented in Table 3.12. Those expenditures include an allowance for Program Management [Bc90] computed as 3% of the projected expenditures in the individual basins.

Table 3.12 Projected Long-Term Plan Expenditures, ESP Basins (FY 2003 $)

Fiscal Year	Projected Expenditure by Basin (FY 2003 Dollars) NSID [Bc71]	NNRC Basin [Bc72]	C-11 West [Bc73]	Feeder Basin [Bc74]	Acme Basin B [Bc75]	Program Management [Bc90]	Total Fiscal Year Expenditure
2004	$82,052	$57,284	$132,045	$217,556	$0	$15,000	$503,937
2005	$80,399		$317,488	$266,755	$47,130	$21,000	$732,772
2006	$78,057		$262,483	$228,785	$45,757	$18,000	$633,082
Total	**$240,508**	**$57,284**	**$712,016**	**$713,096**	**$92,887**	**$54,000**	**$1,869,791**
Note:	All projected expenditures are in FY 2003 dollars						

The above projected expenditures <u>exclude</u> those for completion of CERP projects in the ESP basins on which the water quality improvement strategies in this Part 3 are based. Should one or more of those projects eventually not proceed to completion as envisioned herein, the projected expenditures for attaining water quality standards in discharges from the ESP basins would increase dramatically. A more complete discussion of the potential range of costs under such an eventuality is included in Part 6 of this Long-Term Plan.

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4. PROJECTED TREATMENT PERFORMANCE

Parts 2 and 3 of this Long-Term Plan present recommendations for actions to be taken in the Everglades Construction Project (ECP) and Everglades Stormwater Program (ESP) basins, respectively, to comply with water quality standards and the improvement goals established in Florida's 1994 Everglades Forever Act (EFA), as amended in 2003. Specifically, it is the intent of this Long-Term Plan to achieve compliance with the phosphorus criterion established in Rule 62-302.540 F.A.C. In large part, those recommendations are based on analyses and evaluations included in the following reference documents:

- October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, Burns & McDonnell;
- October 23, 2002, *Basin-Specific Feasibility Studies, Everglades Stormwater Program Basins*, Brown & Caldwell.

Specifically with respect to total phosphorus (TP) concentrations in discharges to the EPA, those recommendations are directed to achieving the phosphorus criterion established in Rule 62-302.540 F.A.C.

For the purposes of the *Basin-Specific Feasibility Studies*, "long-term" was taken as that represented by a 31-year geometric mean based on model simulations. As applied in the *Basin-Specific Feasibility Studies* and this Long-Term Plan, the geometric mean is computed as the geometric mean concentration of 7-day flow-weighted mean concentrations.

In the absence of more specific planning guidance, the objective adopted in the development and evaluation of alternatives for the *Basin-Specific Feasibility Studies* was to obtain a predicted long-term geometric mean total phosphorus concentration of 10 ppb in discharges to the EPA. The *Basin-Specific Feasibility Studies* were a fact-finding exercise, and not intended to define the final arrangement, location and character of water quality improvement strategies in the various basins; no specific recommendations were made for alternatives to be selected and carried forward to implementation.

The alternatives and evaluations presented in the above-listed references were based on analysis of 31-years of daily data in each basin. The data were taken from simulations developed by the SFWMD employing the South Florida Water Management Model (SFWMM). The results of two separate simulations were considered. The first simulation was based on regional hydrography expected to exist upon completion of the Everglades Construction Project, but prior to substantial modification as a result of the Comprehensive Everglades Restoration Plan (CERP). The second simulation was based on regional hydrography presently expected to exist upon full completion of CERP. The SFWMD coupled the results of the first simulation with analysis of available historic data relative to total phosphorus concentrations in each basin to develop the May, 2001 *Baseline Data for the Basin-Specific Feasibility Studies*, Goforth and Piccone. That *Baseline Data*, with some adjustment and update in certain of the basins, was subsequently employed in the analyses presented in the *Basin-Specific Feasibility Studies*.

The analyses and evaluations contained in the *Basin-Specific Feasibility Studies*, and on which the recommendations in Parts 2 and 3 of this Long-Term Plan are generally based, were prepared using the best available information. However, a number of significant uncertainties remain, with the result that the water quality improvement intended by the recommended projects is subject to a range of predicted performance. The **Process Development and Engineering (PDE)** component of the overall strategy 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 various elements of the PDE component, described in detail in Part 5 of this Long-Term Plan, are directed towards:

- Identifying opportunities to maintain and improve upon the performance of source controls (BMPs) in reducing overall pollutant loads;
- Enhancing the control and monitoring of water quality improvement measures now in place, and which form the foundation of the recommended additional measures;
- Continued improvement in analytical and forecasting tools used to project treatment performance;
- Identification of specific means and methods to replicate on a reliable long-term basis the performance of the SAV community on which the more favorable performance projections are based (e.g., optimization of SAV performance);

- Development of engineering criteria and forecasting tools for additional water quality improvement measures, including the possible implementation of Periphyton-Based Stormwater Treatment Areas (PSTA);
- Improving the reliability of estimated treatment facility inflow volumes and pollutant loads, particularly in those basins for which current data is limited;
- Refining the estimated impact of CERP projects on basin discharge volumes and pollutant loads, including in particular the influence of the EAA Storage Reservoir projects, as well as long-term trends in the quality and quantity of water discharged from Lake Okeechobee;
- Determining the relationship between the quality of surface water discharged into, and the water quality within, the Everglades Protection Area (EPA).

Given the complexity and scale of the overall water quality improvement strategy recommended herein, it should be considered probable that some additional measures will be needed after completion of the strategies recommended in Parts 2 and 3. Part 6 of this Long-Term Plan presents a discussion of some candidate efforts that might eventually be needed to fully comply with the long-term water quality goals established in the EFA, and presents recommendations for the conduct of an adaptive implementation of new information as it is developed. The purpose of the adaptive implementation strategy is to expeditiously implement those additional enhancements found (as a result of the PDE Process) to be scientifically defensible, short of an irreversible commitment to major investments which might not otherwise be necessary.

4.1. Projected Performance in TP Reduction

In the ECP Basins, the basic strategy employed in development of the recommendations in Part 2 of this Long-Term Plan is the conversion of large parts of the existing (and under construction) stormwater treatment areas (STAs) from emergent macrophytic vegetation to Submerged Aquatic Vegetation (SAV). In the ESP Basins, the basic strategy employed in development of the recommendations in Part 3 of this Long-Term Plan is primarily reliance on source controls and the estimated performance of presently scheduled CERP projects in reducing total phosphorus loads discharged to the EPA.

Additional guidance for implementation of the recommended strategy was provided by the Florida Legislature in its 2003 amendment of the Everglades Forever Act (373.4592 F.S.), which states:

> *(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).*

Analyses of the projected performance of biological systems (STAs) in reducing total phosphorus concentrations were conducted employing the April, 2002 version of the *Dynamic Model for Stormwater Treatment Areas* (DMSTA) software, Walker and Kadlec.

4.1.1. Everglades Construction Project (ECP) Basins

A summary of the estimated performance of the recommended strategies in Part 2 of this Long-Term Plan in reducing long-term total phosphorus concentrations and loads discharged to the EPA is presented in Table 4.1. The performance ranges in that table reflect two alternative interpretations of available data on the performance of Submerged Aquatic Vegetation (SAV), which is a principal component in the recommended strategy for the ECP Basins. Given favorable performance of that community, the pre-2006 projects in the ECP Basins afford the potential for achieving the water quality standards (including the numeric phosphorus criterion, Rule 62-302.540, F.A.C.) within the existing treatment areas, consistent with the requirements of the EFA, which states:

> *The district shall optimize the design and construction of the STAs described in the Everglades Construction Project prior to expanding their size. Additional methods to achieve compliance with water quality standards shall not be limited to more intensive management of the STAs.*

Nonetheless, there remains a significant degree of uncertainty as to whether or not that potential can be realized without additional measures. Aside from the ranges in SAV performance reflected in Table 4.1, other sources of modeling uncertainty could impact projected long-term mean concentrations and TP loads in discharges from biological treatment areas by plus or minus 20%. Even that possible range of performance cannot be assured with certainty in biological treatment systems. Recent performance of SAV in the STAs suggests that additional efforts may be needed to address full-scale implementation difficulties. A primary purpose of the PDE effort (Part 5 of this Long-Term Plan) is to reduce the uncertainty in these performance forecasts.

Table 4.1 Projected TP Reductions in the ECP Basins

Basin	Period		Est. Ave. Annual Discharge		Estimated TP Concentrations		Remarks
	From	Through	Volume (ac-ft)	TP Load (metric tons)	Flow-Weight Mean (ppb)	Geometric Mean (ppb)	
STA-1E	2004	2006	148,400	7.03	38	34	For Current Design of STA-1E
	2007	2056	175,000	3.31 - 3.64	15 - 24	10 - 11	After Enhancement of STA-1E and Diversion of Acme Basin B
STA-1W	2004	2006	188,100	5.65 - 6.12	24 - 30	24 - 26	For Existing STA-1W
	2007	2056	183,300	3.15 - 4.09	14 - 22	10 - 13	After Enhancement of STA-1W
STA-2	2004	2006	223,300	9.08 - 9.63	33 - 37	33 - 35	For Existing STA-2
	2007	2014	222,600	4.59 - 6.42	17 - 28	10 - 14	After Enhancement of STA-2
	2014	2056	197,500	3.52 - 4.58	14 - 24	10 - 13	After Full Completion of CERP
STA-3/4	2004	2006	623,700	28.01	36	36	For Current Design of STA-3/4
	2007	2014	621,200	10.98 - 15.37	14 - 21	10 - 14	After Enhancement of STA-3/4
	2015	2056	588,600	10.19 - 15.28	14 - 21	10 - 15	After Full Completion of CERP
STA-5	2004	2006	125,900	6.93 - 7.36	45 - 50	32 - 34	For Existing STA-5
	2007	2014	125,500	3.03 - 3.94	20 - 30	10 - 13	After Enhancement of STA-5
	2015	2056	125,500	3.03 - 3.94	20 - 30	10 - 13	After Full Completion of CERP
STA-6	2004	2006	35,300	1.23	28	20	For Existing STA-6 (With Section 2 Completed)
	2007	2014	35,100	0.75 - 0.97	17 - 24	10 - 13	After Enhancement of STA-5
	2015	2056	57,600	1.20 - 1.44	17 - 22	10 - 12	After Full Completion of CERP
All	2004	2006	1,344,700	57.93 - 59.39	35 - 36	20 - 36	Existing (No Project) Conditions
ECP	2007	2014	1,362,700	25.80 - 34.44	15 - 20	10 - 14	After STA Enhancements
Basins	2015	2056	1,327,500	24.40 - 32.97	15 - 20	10 - 15	After Full Completion of CERP

In the above tabulation, the estimated average annual discharge is based on analysis of 31 years of data, and as a result represents an average of those 31 years applied to the (foreshortened) periods indicated. Total phosphorus loads are reported in metric tons (one metric ton is equal to 1,000 kilograms). Substantial variation in performance can be expected from year to year, with the result that the actual average annual performance during the periods indicated can be expected to vary from the averages reported above. It should also be noted that the simulated performances of the STAs after 2006 result in lower concentrations than have yet been demonstrated for large-scale systems.

In addition, it should be noted that the estimated performance of each STA during the period 2004-2006 reflects the completion of the 1994 Everglades Construction Project and implementation of source controls (BMPs) in the Everglades Agricultural Area

(EAA), all as required by the EFA. The estimated long-term flow-weighted mean TP concentrations in discharges from the STAs vary from 24 to 50 ppb, as compared to the interim goal of 50 ppb established in the EFA. In total for all STAs, the estimated long-term flow-weighted mean TP concentration during the period 2004-2006 is roughly 35 ppb. During that same period, the estimated long-term geometric mean TP concentrations in the combined discharges from the STAs vary from 20-36 ppb.

While the intent of the strategies recommended in Part 2 is to obtain the planning objective in discharges from each STA, it should be noted that objective may not fully apply to discharges from STA-5, only parts of which can be expected to be released (somewhat indirectly) to the EPA. A substantial proportion of STA-5 discharges will be directed to the Rotenberger Wildlife Management Area (not included in the EPA) for restoration of that tract. Additional discharges from STA-5 will serve as a source of water supply to the Seminole Tribe’s Big Cypress Reservation, while yet others will serve as a source of water supply to the Holey Land Wildlife Management Area (as for the Rotenberger WMA, not included in the EPA).

4.1.2. Everglades Stormwater Program (ESP) Basins

A summary of the estimated performance of the recommended strategies in Part 3 of this Long-Term Plan in reducing total phosphorus concentrations and loads discharged to the EPA is presented in Table 4.2.

In that tabulation, the estimated average annual discharge is based on analysis of 31 years of data, and as a result represents an average of those 31 years applied to the (foreshortened) periods indicated. Substantial variation in performance can be expected from year to year, with the result that the actual average annual performance during the periods indicated can be expected to vary from the averages reported below.

The implementation schedules and time-variant performance implicit in Table 4.2 are based on the schedules presented in Part 3, and reflect what is considered to be the earliest feasible completion of the strategies recommended in each ESP basin.

Table 4.2 Projected TP Reductions in the ESP Basins

Basin	Period		Est. Ave. Annual Discharge		Estimated TP Concentrations		Remarks
	From	Through	Volume (ac-ft)	TP Load (metric tons)	Flow-Weight Mean (ppb)	Geometric Mean (ppb)	
Acme	2004	2006	31,500	2.75	71		Existing Conditions, with 25% reduction in TP load due to BMPs
Basin B	2007	2056	0	0.00	N/A		After Diversion to STA-1E (Included in STA-1E Discharge Summary)
NSID	2004	2007	6,800	0.29	39		Existing Conditions Discharge to WCA-2A
	2008	2056	0	0.00	N/A		After Diversion to Hillsboro Site 1
NNRC	2004	2006	1,800	0.04	18		Existing Conditions Discharge to WCA-3A
	2007	2018	0	0.00	N/A		Assumes Discontinuation of G-123 Does Not Reduce Flood Protection
	2018	2056	0	0.00	N/A		After Completion of WCA-2 and WCA-3 Diversion Project
C-11	2004	2006	194,000	4.06	17		Current Discharges Prior to Completion of Critical Project at S-9 (S-9A); Some Reduction Prior to 2006
	2007	2036	18,300	0.49	22		After Critical Project and Diversion to Western C-11 Impoundment; Excludes Seepage Return at S-9A
	2037	2056	900	0.03	28		After Completion of North Lake Belt Storage Project; Excludes Seepage Return at S-9A
L-28	2004	2010	84,000	3.98	39		Existing Conditions, Flows and Loads Adjusted to Reflect C-139 Annex Discharges Directed to STA-6
	2011	2056	84,000	1.43	14	10	Following Completion and Full Stabilization of Miccosukee & Seminole Tribal STAs
Feeder	2004	2006	77,000	14.85	156		Existing Conditions
Canal	2007	2010	77,000	4.76	50		Following Completion of Seminole Big Cypress WCP; McDaniel Ranch BMPs; West Feeder Basin BMPs
	2011	2056	0	0.00	N/A		Full Diversion to Big Cypress National Preserve (Big Cypress/L-28 Interceptor Modifications)
All ESP Basins	2004	2006	395,100	25.98	53		
		2007	186,100	9.53	42		
	2008	2010	179,300	9.24	42		
	2011	2036	102,300	1.92	15		
	2037	2056	84,900	1.46	14		

4.1.3. Summary Projection, All Basins

A summary of the estimated performance of all projects recommended in Parts 2 and 3 of this Long-Term Plan in reducing total phosphorus concentrations and loads discharged to the EPA is presented in Table 4.3.

Table 4.3 Estimated TP Reduction Performance of Pre-2006 Projects

Period		Estimated Average Annual Discharges										
From	Thru	All ECP Basins				All ESP Basins			All Basins		
		Volume (ac-ft)	Load (metric tons)	TP Conc. (ppb) F.W. Mean	TP Conc. (ppb) Geo. Mean	Volume (ac-ft)	TP Load (metric tons)	FW TP Conc (ppb)	Volume (ac-ft)	Load (metric tons)	FW TP Conc (ppb)
2004	12/30/06	1,344,700	57.9 - 59.4	35 - 36	20 - 36	395,100	26.0	53	1,739,800	83.9 - 85.4	39 - 40
12/31/06	12/31/07	1,362,700	25.8 - 34.4	15 - 20	10 - 14	186,100	9.5	42	1,548,800	35.3 - 44.0	18 - 23
2008	2010	1,362,700	25.8 - 34.4	15 - 20	10 - 14	179,300	9.2	42	1,542,000	35.0 - 43.7	18 - 23
2011	2014	1,362,700	25.8 - 34.4	15 - 20	10 - 14	102,300	1.9	15	1,465,000	27.7 - 36.4	15 - 20
2015	2036	1,327,500	24.4 - 33.0	15 - 20	10 - 15	102,300	1.9	15	1,429,800	26.3 - 34.9	15 - 20
2037	2056	1,327,500	24.4 - 33.0	15 - 20	10 - 15	84,900	1.5	14	1,412,400	25.9 - 34.4	15 - 20

The ranges in this table reflect only two alternative interpretations of SAV performance data currently available. A more descriptive presentation of the possible range of performance of the recommended projects, accounting for additional sources of modeling uncertainty (plus or minus 20%), is shown in Figure 4-1.

In Table 4.3 (and Figure 4-1) the estimated average annual discharge is based on analysis of 31 years of data, and as a result represents an average of those 31 years applied to the (foreshortened) periods indicated. Substantial variation in performance can be expected from year to year, with the result that the actual average annual performance during the periods indicated can be expected to vary from the averages reported above.

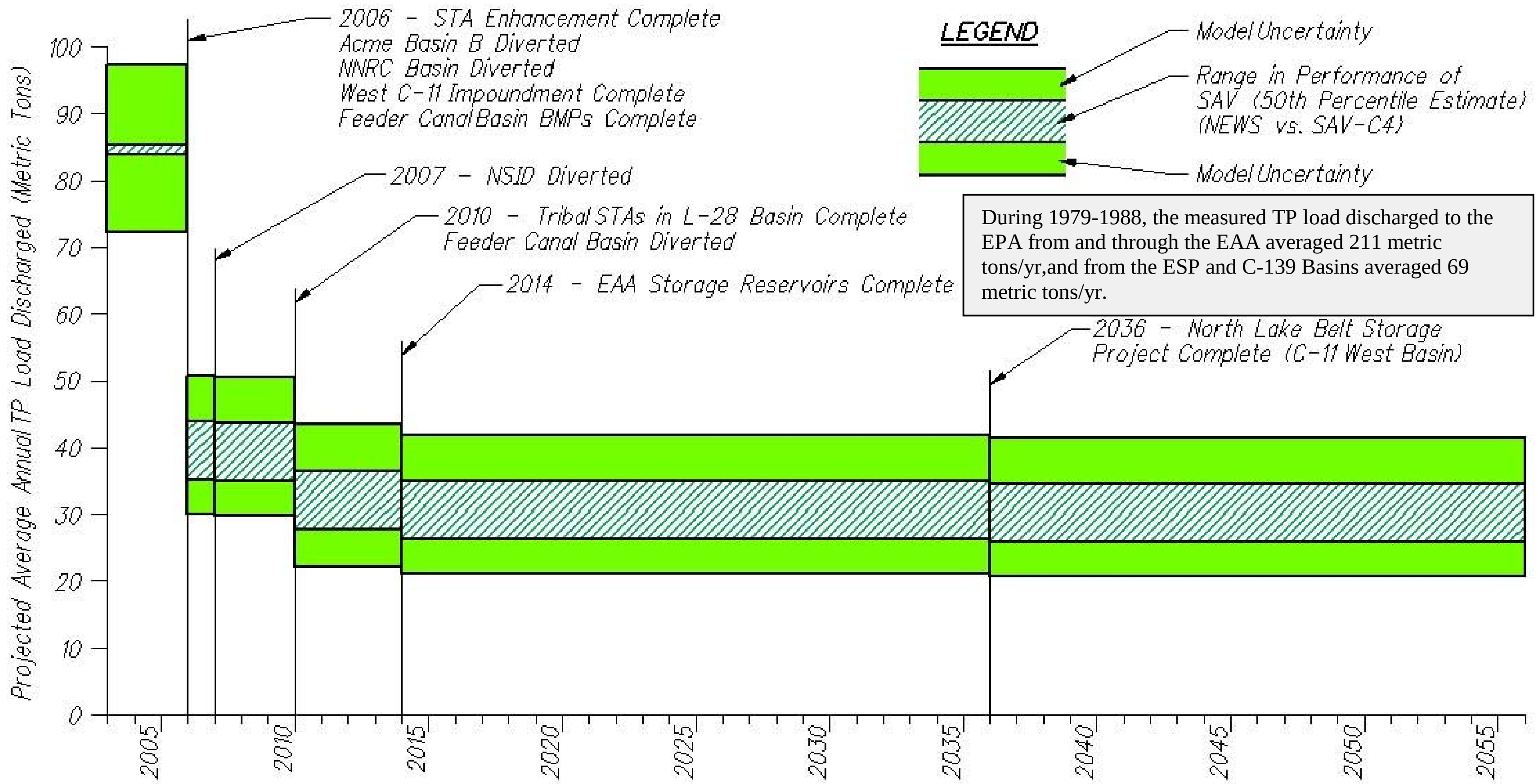

Figure 4-1 Potential TP Load Reductions under Long-Term Plan

4.2. Other Water Quality Parameters

The water quality improvement objectives established in the EFA are not limited to a reduction in the total phosphorus concentrations and loads discharged to the EPA. The following is excerpted from the EFA as amended in 2003:

> ***(10) LONG-TERM COMPLIANCE PERMITS.—****By December 31, 2006, the department and the district shall take such action as may be necessary to implement the pre-2006 projects and strategies of the Long-Term Plan so that water delivered to the Everglades Protection Area achieves in all parts of the Everglades Protection Area state water quality standards, including the phosphorus criterion and moderating provisions.*
>
> > *(a) By December 31, 2003, the district shall submit to the department an application for permit modification to incorporate proposed changes to the Everglades Construction Project and other district works delivering water to the Everglades Protection Area as needed to implement the pre-2006 projects and strategies of the Long-Term Plan in all permits issued by the department, including the permits issued pursuant to subsection (9). These changes shall be designed to achieve state water quality standards, including the phosphorus criterion and moderating provisions. During the implementation of the initial phase of the Long-Term Plan, permits issued by the department shall be based on BAPRT, and shall include technology-based effluent limitations consistent with the Long-Term Plan, as provided in subparagraph (4)(e)3.*
> >
> > *(b) If the Everglades Construction Project or other discharges to the Everglades Protection Area are in compliance with state water quality standards, including the phosphorus criterion, the permit application shall include:*
> >
> > > *1. A plan for maintaining compliance with the phosphorus criterion in the Everglades Protection Area.*
> > >
> > > *2. A plan for maintaining compliance in the Everglades Protection Area with state water quality standards other than the phosphorus criterion.*

The tools necessary for quantitative analysis of the performance of the recommended projects in meeting water quality standards other than the total phosphorus criterion have not been developed. In addition, full numeric definition of those standards has not been established. As a result, it is necessary to assess the performance of the recommended projects on other parameters of interest on a qualitative basis.

In a number of the ESP basins, the primary strategy recommended in Part 3 of this Long-Term Plan is source controls and diversion to essentially eliminate or greatly reduce direct discharges to the EPA. It is therefore assumed that, in those basins, the EFA's directive for achieving compliance in the Everglades Protection Area with state water quality standards other than the phosphorus criterion will be met.

In all other basins, primary reliance is placed on the inclusion of Submerged Aquatic Vegetation (SAV) as a principal component in biological treatment areas such as the STAs. The following discussion of the influence of SAV on other water quality parameters of interest is excerpted from Part 1 of the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, Burns & McDonnell. A total of 19 non-phosphorus parameters were considered, consistent with environmental analysis criteria presented in Attachment B to the June 13, 2000, *Evaluation Methodology for Comparison of Supplemental Technology Demonstration Projects*, SFWMD. The basis for the analysis presented in Part 1 of the *Evaluation of Alternatives for the ECP Basins* was data presented in the February 2002 *Conceptual Design and Planning Level Cost Estimates for a Full-Scale Submerged Aquatic Macrophyte/Limerock System*, DB Environmental (hereinafter referred to as the SAV-STSOC, or Supplemental Technology Standard of Comparison).

The SAV STSOC lists all 19 non-phosphorus parameters for three systems: North Test Cell 15 and South Test Cell 9 of ENR, and Cell 4 of STA-1W. Table 4.4 tabulates the average, standard deviations and number of samples for each inflow and outflow non-phosphorus measurements for SAV technology.

Based on the STSOC data, Burns & McDonnell's best professional judgment for the environmental criterion rating for Level of Improvement in Non-Phosphorus Parameters for the SAV technology was reported as the following:

0 for 17 parameters with no significant change
+2* for significant decrease in Ammonia Nitrogen, and Color
0 for no significant increase
+2 for overall rating

*although Dissolved Iron has decreased significantly, it is well within the FDEP Class III Standards thus, no significant benefit is gained in its further reduction; thus its value = 0

Table 4.4 Level of Improvement of Non-phosphorus Parameters for SAV Technology

			NTC-15			STC-9			Cell 4			
			Avg	Stdev	n	Avg	Stdev	n	Avg	Stdev	n	Value
Nutrients												
	Total Kjeldahl Nitrogen (TKN)	Inflow	2.8	0.3	2	2.5	0.2	5	1.2	0.2	2	0
	(mg/L)	Outflow	2.7	0.5	2	2.4	0.3	6	1.4	0.2	2	
	Ammonia Nitrogen (NH3-N)	Inflow	0.36	0.1	2	0.2	0.08	5	0.07	0	2	+1
	(mg/L)	Outflow	0.13	0.01	3	0.14	0.06	6	<.05	0	2	
	Nitrate-Nitrite Nitrogen (NOx-N)	Inflow	<.05	0	2	<.05	0	2	0.05	0.04	2	0
	(mg/L)	Outflow	<.05	0	2	<.05	0	2	<.05	0	2	
Metered Parameters												
	Dissolved Oxygen	Inflow	0.4	0.4	5	5.1	4.2	5	5.7	1	8	0
	(mg/L)	Outflow	14.8	2.1	5	5.6	4.4	5	4	2.1	8	
	Temperature	Inflow	29.9	1	6	29.3	1.4	6	23.5*	3.6	10	0
	(Celsius)	Outflow	31.7	2.2	6	30.1	1	6	20.9	3.7	10	
	pH	Inflow	7.22	0.12	6	7.47	0.3	6	7.9	0.05	10	0
	(units)	Outflow	7.99	0.12	6	8.56	0.28	6	7.75	0.15	10	
	Specific Conductance	Inflow	1031	66	5	1014	50	13	681	95	8	0
	(µs/cm)	Outflow	987	42	5	872	65	13	755	151	8	
	Turbidity	Inflow	2	1.4	4	1.2	0.8	12	1	0.2	8	0
	(NTU)	Outflow	1.4	0.5	4	1.9	1.1	12	0.9	0.2	8	
	Color	Inflow	389	31	5	329	21	13	240	20	8	+1
	(CPU)	Outflow	355	12	5	262	22	12	228	20	8	
Dissolved Ions												
	Sulfate	Inflow	73	2	6	64	8	6	38	17	4	0
	(mg/L)	Outflow	69	2	5	47	8	5	47	24	4	
	Silica	Inflow	6	10	6	14	13	6	13	4	4	0
	(mg/L)	Outflow	5	11	5	15	19	5	13	2	4	
	Chloride	Inflow	125	10	6	128	11	6	92	16	4	0
	(mg/L)	Outflow	123	11	5	134	7	5	104	32	4	
	Calcium	Inflow	98	2	6	91	8	6	68	18	4	0
	(mg/L)	Outflow	82	2	5	50	5	5	68	14	4	
	Magnesium	Inflow	25	1	3	25	1	6	18	0	3	0
	(mg/L)	Outflow	26	1	3	27	1	6	21	1	3	
	Sodium	Inflow	102	12	6	104	8	6	78	33	4	0
	(mg/L)	Outflow	101	13	5	106	9	5	92	34	4	
	Potassium	Inflow	8.4	0.4	6	9.8	0.5	6	11	5	4	0
	(mg/L)	Outflow	8.4	0.4	5	9.7	0.8	5	14	5	4	
Misc. Parameters												
	Alkalinity	Inflow	284	0	2	274	8	5	183	28	3	0
	(mg $CaCO_3$ /L)	Outflow	251	1	2	200	22	5	186	15	3	
Metals												
	Dissolved Iron	Inflow	54	14	6	14	5.6	6	14	2	4	0
	(µg/L)	Outflow	31	7	5	2.5	0.7	5	7	1	4	
	Dissolved Aluminum	Inflow	<.02	0	6	<.02	0	6	<.02	?*	?*	0
	(mg/L)	Outflow	<.02	0	5	<.02	0	5	<.02	?*	?*	

*reported as 33.5, but exceeds maximum value listed in table; therefore taken as 23.5
?* reported as <.02; therefore unknown

A slightly different conclusion was reached by Brown & Caldwell in the October 23, 2002, *Basin-Specific Feasibility Studies, Everglades Stormwater Program Basins*, in which it is stated that:

"The STSOC report for SAV prepared by DB Environmental, Inc. includes information on non-phosphorus water quality parameters collected during research activities. Information from ENR Cell 4, South Test Cell 9, and North Test Cell 15 indicated the following: an improvement in ammonia, dissolved oxygen, iron, specific conductance, turbidity and color, a deterioration in pH, and no significant change in the other 12 non-P water quality parameters."

In the absence of a current means to quantitatively assess the influence of the STAs on non-phosphorus water quality parameters, reliance is placed on the following wording excerpted from the EFA. This provision directly concerned the STAs to be constructed under the Everglades Construction Project, and is in this analysis assumed to be applicable.

(h) Discharges shall be allowed, provided the STAs are operated in accordance with this section, if, after a stabilization period:

1) *The STAs achieve the design objectives of the Everglades Construction Project for phosphorus;*
2) *For water quality parameters other than phosphorus, the quality of water discharged from the STAs is of equal or better quality than inflows; and*
3) *Discharges from the STAs do not pose a serious danger to the public health, safety, or welfare.*

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5. PROCESS DEVELOPMENT AND ENGINEERING (PDE)

The **Process Development and Engineering (PDE)** component of the recommended overall water quality improvement strategy includes activities designed to:

- Further understanding and increase certainty in the optimization of phosphorus reduction performance in existing and proposed facilities;
- Enhance integration with the Comprehensive Everglades Restoration Plan (CERP);
- Maintain and improve upon the contribution of source controls to overall water quality improvement goals.

The PDE component is a central element of the overall strategy, and is developed in recognition that:

- Achieving long-term water quality goals will involve an adaptive management approach, whereby the best available information is used to develop and expeditiously implement incremental improvement measures in a cost-effective manner;
- Continued engineering evaluations are necessary to increase certainty in the overall operation and performance of integrated water quality improvement strategies;
- Significant technical and economic benefits can be realized by integrating Everglades water quality performance measures with CERP projects, even to the extent that existing schedules should be re-evaluated in some basins and synchronized with CERP project schedules.

As indicated in Part 4, there exists a range of estimated performance of the projects recommended for immediate implementation. The most significant single variable considered in that range is the uncertainty in performance of Submerged Aquatic Vegetation (SAV), which is a principal component in the recommended strategy for the ECP Basins. Optimizing the performance of SAV in the pre-2006 projects in the ECP Basins affords the greatest potential for achieving compliance with water quality standards, including the numeric phosphorus criterion (Rule 62-302.540, F.A.C.) within the existing treatment areas, consistent with the requirements of the EFA.

Nonetheless, there remains a significant degree of uncertainty as to whether or not that potential can be realized without additional measures, as preliminarily outlined in Part 6 of this Long-Term Plan. As noted in Part 4, there exists a range of plus or minus 20% in the predicted performance of biological systems resulting from modeling uncertainties alone. The Process Development and Engineering (PDE) component consists of a series of focused efforts directed towards increasing the certainty that the planning objective can be met by completion of the recommended measures.

The various elements of the PDE component, described in detail in subsequent sections of this Part 5, are directed towards:

- Identifying opportunities to maintain and improve upon the performance of source controls (BMPs) in reducing overall pollutant loads;
- Enhancing the control and monitoring of water quality improvement measures now in place, and which form the foundation of the recommended additional measures;
- Continued improvement in analytical and forecasting tools used to project treatment performance;
- Identification of specific means and methods to replicate on a reliable long-term basis the performance of the SAV community on which the more favorable performance projections in Part 4 are based (e.g., optimization of SAV performance);
- Development of engineering criteria and forecasting tools for additional water quality improvement measures, including the possible implementation of Periphyton-Based Stormwater Treatment Areas (PSTA);
- Improving the reliability of estimated treatment facility inflow volumes and pollutant loads, particularly in those basins for which current data is limited;
- Refining the estimated impact of CERP projects on basin discharge volumes and pollutant loads, including in particular the influence of the EAA Storage Reservoir projects, as well as long-term trends in the quality and quantity of water discharged from Lake Okeechobee;
- Determining the relationship between the quality of surface water discharged into, and the water quality within, the Everglades Protection Area (EPA).

Given the complexity and scale of the overall water quality improvement strategy recommended in this Long-Term Plan, it should be considered probable that, even with proper development and implementation of the PDE effort, measures in addition to those recommended in Parts 2 and 3 will eventually be needed. A discussion of some possible additional measures that may or may not be eventually recommended as a result of the PDE effort is included in Part 6 of this Long-Term Plan. Part 6 also presents recommendations for institution of an adaptive implementation strategy. The intent is that additional enhancements found to be scientifically defensible as a result of the PDE effort are implemented in a cost-effective manner as soon as their need and utility is confirmed.

It should be noted that other uncertainties might appear in the future. Implementation of the PDE component should include adaptively adjusting the scope of investigations beyond what is identified at this time as may be necessary to properly address those uncertainties as they are identified.

This 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 this Long-Term Plan that additional steps, once identified and their need confirmed, be expeditiously implemented. Documentation of any additional measures (the **Post-2006 Projects**) will be to a level of detail not less than that presented herein for the Pre-2006 Projects.

It is the intent of this Long-Term Plan to fully evaluate the actual performance of pre-2006 steps, commencing in January 2007 and extending over a two-year period, during which the required performance information is acquired and analyzed. 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 recommended herein. 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 this 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, including STA expansion as described in Part 6, necessary to achieve or maintain the planning objective and the goals of the EFA, together with an evaluation of the cost-effectiveness of those measures.

It is intended that science and engineering factors will drive the decision process for the adaptive implementation of additional measures. The funding needs projected herein include an **allowance** of $36 million in funds for the adaptive implementation process recommended herein, 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. The actual expenditure schedule may vary based on the decision process for the adaptive implementation of additional measures.

5.1. Source Controls (BMPs) [Bc81]

The development and implementation of source controls (e.g., urban and agricultural Best Management Practices, or BMPs) is considered the highest priority in each of the ESP basins. The implementation of source controls in the various basins discharging to the Everglades Protection Area (EPA) is an integral element of the overall water quality improvement strategy recommended herein. The PDE component of that strategy includes efforts directed toward maintaining, and improving, the effectiveness of source controls in reducing total phosphorus loads discharged to the EPA.

Toward that end, it is recommended to fund additional investigations directed to:

- Identification of urban and agricultural discharges that are candidates for cost-effective implementation of source controls.
- Characterization of management practices on lands or processes tributary to those discharges.
- Acting in concert with affected landowners or municipalities, implementation of cost-effective source controls.
- Identification of the existing combinations of BMP practices in agricultural basins with either high or low phosphorus discharges.

The District has prepared documents titled “Best Management Practices for South Florida Urban Stormwater Management Systems” and “Turf and Landscape Best Management Practices for the C-11 West Canal Basin” to increase public awareness about the management of urban stormwater runoff and how Best Management Practices (BMPs) can be used to improve water quality. The documents provide a general overview of stormwater runoff, the sources affecting water quality, and what can be done to improve the quality of stormwater discharges. The documents serve as important educational tools designed to describe the various opportunities for improving water quality in urban areas of South Florida. The documents can be found at the following Internet links:

http://www.sfwmd.gov/org/reg/evg/bmp_manual.pdf
http://www.sfwmd.gov/org/exo/broward/c11bmp

One of the initial efforts to educate and disseminate the needs and methods for improving water quality and other conservation efforts is through an educational effort referred to as “Know the Flow”. This existing program has been expanded through a cooperative effort with the District, Broward County Cooperative Extension Education Division, Broward County’s Mobile Irrigation Lab, and independent water control districts, specifically the Central Broward County Water Control District within the C-11 West basin. The on-going seminar type program primarily targets property managers by providing required Continuing Education Units (CEUs) for their licenses but will also target homeowner associations, municipal staff, legislative delegation staff and other applicable entities.

The program is designed to educate local residents about water management in South Florida, how they can properly manage their neighborhood water management system and how to implement source control BMPs in their yards, common areas, swales, conservation areas, roadways, etc. Primary BMPs include proper irrigation, fertilizer application, pesticide application, landscape material disposal, lake and swale maintenance, and erosion controls.

5.1.1. EAA Basins [Bc81(1)]

Hydrologic basins in the Everglades Agricultural Area (EAA) are subject to the provisions of Chapter 40E-63 of the Florida Administrative Code. The EAA Basins include the S-5A, S-6/S-2, S-7/S-2, and S-8/S-3 basins. In simplistic terms, that rule requires that the total phosphorus (TP) load in discharges and runoff from those basins be reduced not less than 25% from historic (1979-1988) levels. Actual experience since full implementation of the regulatory program established in that rule indicates that, to date, a reduction of slightly more than 50% in TP loads discharged from those basins has been achieved.

Estimated average annual TP loads in inflows to STA-1E, STA-1W, STA-2, STA-3/4 and STA-6 from the EAA Basins summarized in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, Burns & McDonnell, aggregate to 104,450 kilograms per year. That aggregate estimate is applicable to the period following full implementation of the Everglades Construction Project (ECP), but prior to completion of the Comprehensive Everglades Restoration Plan (CERP). It is based on a continuation of the actual performance of the BMP program in the EAA since full implementation of the Chapter 40E-63 rule (e.g., a 50% reduction in TP loads, as compared to historic levels).

A reduction of 25% in TP loads discharged from the EAA Basins would result in an average annual TP load in basin discharges to the receiving STAs of approximately 157,000 kilograms per year (e.g., an average annual inflow TP load 50% greater than that considered in the *Evaluation of Alternative for the ECP Basins*). Sensitivity analyses presented in that reference suggest that, should TP load reductions due to BMPs in the EAA Basins achieve only a 25% reduction, the long-term flow-weighted and geometric mean TP concentrations in discharges from STA-1W, STA-2, STA-3/4 and STA-6, enhanced as recommended in Part 2 of this Long-Term Plan, could be expected to increase by roughly 2 ppb (equivalent to roughly 15% of the predicted outflow concentrations with a 50% load reduction). There would be little impact on estimated discharges from STA-1E, as a relatively small proportion of its total inflow derives from the EAA Basins. As a result, maintenance of the current level of performance is considered necessary to this Long-Term Plan.

The recommended funding is an amount (in FY 2003 dollars) of $77,500 in FY 2004, and an average annual amount (again in FY 2003 dollars) of $50,000 during FY 2005-2009, inclusive. FY 2009 was selected as the end point of this activity as it coincides with the presently scheduled completion date of the EAA Storage Reservoir Phase 1 CERP Project.

5.1.2. C-139 Basin [Bc81(2)]

Estimated average annual TP loads in inflows to STA-5, STA-6 and STA-3/4 from the C-139 Basin summarized in the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, Burns & McDonnell, aggregate to 32,610 kilograms per year (an overall flow-weighted mean concentration of 176 ppb in an average annual discharge volume of 149,820 acre-feet). That aggregate estimate is applicable to the period following full implementation of the Everglades Construction Project (ECP), but prior to completion of the Comprehensive Everglades Restoration Plan (CERP).

Information presented in the *2003 Everglades Consolidated Report* indicates that, for water year 2002 (12-month period ending April 30, 2002), the total of inflows to STA-5 and bypasses at G-406 aggregated to 188,086 acre-feet and 58,900 kilograms of total phosphorus (flow-weighted mean TP concentration of 254 ppb). Those inflows markedly exceed the average annual inflows and concentrations considered in *the Evaluation of Alternatives for the ECP Basins*. Therefore, the implementation of effective source controls in the C-139 Basin will be needed to assure proper performance of STA-5 and

STA-6. As of 2002, the C-139 Basin is subject to the provisions of Chapter 40E-63 of the Florida Administrative Code. In simplistic terms, that rule requires the implementation of BMPs such that the total phosphorus load in discharges from the C-139 Basin not increase from historic (1979-1988) levels, after adjustment for hydrologic variability. Since the C-139 Basin rule has been in effect for only a short time, water quality improvements resulting from its implementation have yet to be quantified. In addition, there is at present an undefined potential impact to basin runoff loads resulting from an ongoing major state acquisition of lands.

It is recommended that funding in an annual amount (in FY 2003 dollars) of $250,000 during FY 2004-2006, inclusive, followed by an annual amount (again in FY 2003 dollars) of $100,000 during FY 2007-2014 (presently scheduled completion date of the EAA Storage Reservoir Phase 2 CERP Project) be established to assist in the identification and implementation of cost-effective source controls in the C-139 Basin, including identification of the effectiveness of the selected combinations of BMP practices through site visits.

5.1.3. ESP Basins

The intended inclusion of source controls as integral elements of the overall water quality improvement strategy in the Everglades Stormwater Program (ESP) Basins is discussed in detail in Part 3 of this Long-Term Plan, which includes all proposed funding for those efforts. The general nature of that source control effort is summarized in the following paragraphs. There are at present no District rules in place or development requiring the implementation of BMPs in any of the ESP Basins.

Acme Improvement District, Basin B: In 2000, the Village of Wellington passed a BMP ordinance as part of the Village's cooperative efforts with SFWMD to improve water quality in discharges to the Everglades. The ordinance places controls on the storage and application of fertilizer and includes an educational component on the proper use of fertilizers and irrigation practices, but does not require a specific load reduction.

Of particular importance in Basin B are requirements for the storage, handling and transport of waste materials from livestock operations, including horse farms and equestrian facilities. Since the Village's BMP ordinance has been in effect for only a short time, water quality improvements resulting from its implementation have yet to be quantified. The recommended strategy outlined in Part 3 includes funding to assist the Village of Wellington in developing, evaluating and implementing source controls.

C-11 West, North New River Canal and North Springs Improvement District Basins: The recommended strategy outlined in Part 3 includes funding to assist local communities in developing, evaluating and implementing source controls.

In response to a request from Broward County Department of Planning and Environmental Protection, reduction of phosphorus through source controls (i.e., urban BMPs) is of highest priority for discharges from Broward County basins to achieve compliance with the phosphorus criterion. The District currently has cooperative agreements with all local water control districts in the County, and these include water quality provisions. The District will assist Broward County in coordinating a county-wide working group to develop a comprehensive pollution prevention plan with specific water quality goals and milestones.

Feeder Canal Basin: The recommended strategy in Part 3 for this basin includes funding to assist landowners in the West Feeder Canal subbasin in implementing source controls directed toward reducing the long-term flow-weighted mean TP concentration in discharges across the Western Weir to 50 ppb (roughly a 20 percent reduction in TP loads, as compared to five years of recent data).

5.2. Enhanced Control and Monitoring [Bc82]

Operations monitoring is that set of samples, chemical analyses, flow measurements, soil chemistry determinations and vegetation assays, which is the basis for understanding the removal performance in the STAs. Compliance monitoring is a subset of operations monitoring. The balance of operations monitoring constitutes operational assessment measurements.

Compliance monitoring is not sufficient for fully characterizing removal performance, because it typically only addresses selected water quality parameters at selected (and few) points in any given STA. Nonetheless, compliance monitoring supplies important pieces of the information needed to fully characterize and optimize the STAs.

Operational assessment provides the data upon which STA control is based. It also provides the information with which potential or actual STA modifications may be evaluated.

This element of the PDE Component is structured to enhance the control and monitoring of the ECP STAs so that:

- The performance of each cell of each STA can be tracked on a continuing basis, permitting modification of ongoing operations to improve performance.
- An increased degree of confidence in the accuracy of water quantity and quality data can be realized;
- Water quality performance data can be regularly updated and summarized for incorporation in the continued improvement and calibration of analytical and forecasting tools.

Realization of the above objectives will require:

- The acquisition of additional topographic and control survey data;
- Installation of additional flow and water quality monitoring stations;
- Review and correction of flow measurement anomalies;
- Tracking the extent, character and performance of vegetative communities;
- Regular update and maintenance of comprehensive hydraulic models of each STA;
- Added staff resources for analysis and summary of flow and water quality monitoring data for the improved level of understanding necessary to obtain maximum benefit from the completed treatment works.

The component parts of operations monitoring are sample collection, sample analysis, data compilation, data analysis, and interpretation of results. Costs for sample collection and analysis are included in the estimated monitoring costs presented in Part 8 of this Long-Term Plan. Part 8 also includes costs for limited data analysis necessary for documentation of permit compliance and for developing water budgets and overall phosphorus fluxes in the treatment areas. The acquisition and analysis of that data is crucial not only to the ongoing operation of the treatment areas, but also to the improved level of understanding of system performance and optimization that is central to this PDE component.

5.2.1. Acquisition of Survey Data [Bc82(1)]

Additional topographic surveys are needed within the footprint of the STAs to more clearly delineate ground surface elevations between interior levees and control structures. In addition, it is necessary to conduct additional vertical control surveys at flow measurement stations to confirm, and correct where necessary, gage datum elevations. It is recommended to fund this activity in the annual amount of $250,000 (in FY 2003 dollars) in FY 2004-2005, inclusive. That amount is roughly equivalent to the cost for one full-time survey crew (and associated office analysis and summary of survey results) over that two-year period.

5.2.2. Additional Flow and Water Quality Monitoring Stations [Bc82(2)]

The specific location of new flow and water quality monitoring stations recommended for the STAs are identified in Part 8 of this Long-Term Plan. Those flow and water quality stations associated with the additional operations monitoring recommended in this Part 5, as well as the schedule for their implementation, are identified in Table 8.14. Estimated average annual costs for acquisition and laboratory analyses of water quality samples at those stations are included in Part 8 as well.

Forty-seven new stations (e.g., stations not now existing, other than permit compliance stations) are needed to support the additional monitoring necessary for the PDE component; a total of twenty-seven now exist. Of that total number of stations, 13 should be installed in FY 2004 (2 in STA-1W, 11 in STA-3/4); 25 in FY 2005 (19 in STA-1E, 2 in STA-1W, and 4 in STA-3/4); 4 in FY 2006 (2 each in STA-1W and STA-2); and 5 in FY 2007 (1 in STA-2, and 4 in STA-6). Two existing stations (both in STA-6) will be discontinued in FY 2007. The total number of flow and water quality monitoring stations (other than permit compliance stations) is expected to increase from 27 to 72.

The estimated average cost for establishment of each station (not included in Part 8) varies by type of structure. The estimated cost for establishment of the stations at gated structures is approximately $20,500 each; that estimated cost increases to approximately $51,500 at pumping stations. Of the 47 new stations, all but two (the seepage pumping stations at STA-3/4, to be established in FY 2004) are gated structures. At one of those structures (G-258 in STA-1W, scheduled for establishment in FY 2004), only a new gate position sensor is needed, at an estimated cost of approximately $2,500.

A summary of the projected expenditures (in FY 2003 dollars) for this activity is presented in Table 5.1. Costs for establishment of new permit compliance flow and water quality monitoring stations are included in Part 8.

Table 5.1 Projected Expenditures for Additional Flow and Water Quality Monitoring Stations [Bc82(2]

Fiscal Year	Scheduled Expenditure by Location (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	STA-1E	STA-1W	STA-2	STA-3/4	STA-5	STA-6	
2004		$23,000		$287,500			$310,500
2005	$389,500	$41,000		$82,000			$512,500
2006		$41,000	$41,000				$82,000
2007			$20,500			$82,000	$102,500
Total	**$389,500**	**$105,000**	**$61,500**	**$369,500**	**$0**	**$82,000**	**$1,007,500**

5.2.3. Review and Correction of Flow Measurement Anomalies [Bc82(3)]

The proper development and long-term use of the multiple flow measurement sites necessary in operation of the STAs requires a regular and continuing program to address anomalies in discharge measurements. It is recommended that an average annual budget of $100,000 (in FY 2003 dollars) be established for that regular and continuing need. That need would extend from FY 2004 through the end of the planning period considered in this Long-Term Plan (FY 2016). In addition, there is an early need to address current flow measurement anomalies in the existing STAs. An incremental annual budget (again in FY 2003 dollars) of $150,000 is recommended in FY 2004 and FY 2005 for that purpose. The highest priority in those first two years of the program is to address inflow and outflow control structures.

5.2.4. Analysis and Interpretation [Bc82(4)]

The key elements of analysis and interpretation for enhanced understanding are:

- A closed water budget for each cell of each STA. This information spells out how much seepage inflow and/or outflow is occurring, and where; the contributions of rain and ET to the overland flow; and what the hydraulic loading and hydraulic detention time have been. This water budget forms an important part of the basis for the phosphorus budget. Prerequisites for this analysis are a complete set of flow sampling stations (see section 5.2.2), and adequate calibrations (see section 5.2.3);
- A closed phosphorus budget for each cell of each STA. In addition to detailing the concentrations leaving each cell, the mass of phosphorus retained in the cells is determined from this set of computations (see section 5.2.2);
- An inventory of the phosphorus storage in each cell of each STA, estimated from vegetation and soil sampling. For vegetation, this proceeds from aerial imagery (to obtain cover density) and field sampling of the dominant cover types for biomass and phosphorus content. For soils and sediments, soil cores are vertically sectioned and analyzed for bulk density, solids and phosphorus content (see section 5.2.4);
- A stage-volume relationship for each cell of each STA. A principal use of the new survey data described in section 5.2.1 is to develop the water storage potential in those systems. This aids directly in management of water volumes and indirectly in the correct determination of hydraulic detention times in the STAs. Additionally, the wetted fraction of area may be developed, and used to forecast the loss of effectiveness at low stages (see section 5.2.1). An accurate stage-volume relationship

becomes more critical as shallower depth operations come under consideration, because issues of short-circuiting and areal water coverage become more important at low stages;

- Development of STA operational support, via operational experience and existing or revised models. Each year's data from the STAs is to be used to update performance models – such as DMSTA – via calibration and validation. STAs 1W, 2, 5 and 6 are now producing some of the required data, and STA1E and 3/4 will do so in the future. They are to be used to develop an operating strategy that optimizes phosphorus removal for a given runoff sequence, while maintaining adequate hydraulic and hydrologic operation (see section 5.2.5).

It is proposed to fund this activity in the amount of $1,915,000 in FY 2004, increasing to an average of $3,140,000 in FY 2007 (both in FY 2003 dollars) after STA-3/4, STA-1E and STA-6, Section 2 come on line.

The estimated average annual funding of $3,140,000 (in FY 2003 dollars) in FY 2007 through FY 2008 includes:

- Approximately $742,000 in existing staff costs (includes $301,000 for staff coded to SFWMD budget activity codes BB08 and BB99 in FY 2004);
- Additional contract staffing costs of approximately $204,000 for addition of STA-1E and STA-3/4 to current efforts;
- An annual amount of $250,000 for the addition of two Full Time Equivalent (FTE) staff positions for water quality analysis in support of operations decisions and similar activities (e.g., short-term phosphorus analyses not included in current activities).
- Approximately $765,000 for sediment and vegetation sample collection;
- Approximately $880,000 for analytical costs associated with sediment and vegetation samples;
- Approximately $130,000 for semi-annual vegetation surveys;

- Approximately $94,000 for test cell operation and maintenance (ends in FY 2008);
- Approximately $49,000 for test cell sediment analytical costs;
- Approximately $17,000 for maintenance of the STA-1W trailer;
- Approximately $9,000 for field supplies and other minor overhead costs.

That overall program would continue through FY 2009, at which time an adequate understanding of the performance of the biological treatment systems should be achieved. Estimated expenditures in FY 2004-FY 2006 and in FY 2009 vary slightly, and are adjusted to reflect changing requirements in each fiscal year. Estimated expenditures in each fiscal year are summarized in Table 5.2.

In contrast, the operational monitoring and data acquisition and summary on which it is based is expected to continue through 2016, with the result that the average annual funding of $250,000 (in FY 2003 dollars) for the additional two FTEs would continue through FY 2016. That extension in the period of data acquisition and analysis is considered necessary to assure that the treatment systems continue to perform as projected. Should that prove to be the case, it may be possible to substantially reduce the extent of operational monitoring in future years.

5.2.5. Update and Maintenance of Hydraulic Models [Bc82(5)]

Available hydraulic models of the existing and under construction STAs vary widely in degree of detail. Detailed hydraulic models are needed to predict and control changes in flow distribution as the STAs mature and change with time. The models should be regularly updated and calibrated as revised information on the character and extent of vegetative communities is received. It is anticipated that one Full Time Equivalent (FTE) staff will be needed for that purpose, at an average annual cost (in FY 2003 dollars) of roughly $100,000. That need would extend through at least FY 2009, at which time it should be possible to reduce the necessary level of expenditure. In addition, it will be necessary to initially update the current hydraulic models with the additional topographic survey data obtained during FY 2004 and 2005. One additional FTE would be needed for that purpose during those same fiscal years, again at an estimated cost of $100,000 per year (FY 2003 dollars).

5.2.6. Summary of Funding Needs for Enhanced Control and Monitoring [Bc82]

A summary of the projected funding needs for enhanced control and monitoring of the Everglades Construction Project STAs is presented in Table 5.2.

Table 5.2 Opinion of Cost for Enhanced Control and Monitoring [Bc82]

Fiscal Year	Scheduled Expenditure by Function (FY 2003 $)					Fiscal Year Total Bc82, all (FY 2003 $)
	Additional Surveys [Bc82(1)]	Flow & WQ Stations [Bc82(2)]	Maintain Flow Measurement [Bc82(3)]	Analysis & Interpretation [Bc82(4)]	Hydraulic Models [Bc82(5)]	
2004	$250,000	$310,500	$250,000	$1,915,000	$200,000	$2,925,500
2005	$250,000	$512,500	$250,000	$3,148,000	$200,000	$4,360,500
2006		$82,000	$100,000	$3,078,000	$100,000	$3,360,000
2007		$102,500	$100,000	$3,140,000	$100,000	$3,442,500
2008			$100,000	$3,140,000	$100,000	$3,340,000
2009			$100,000	$3,046,000	$100,000	$3,246,000
2010			$100,000	$250,000	$35,000	$385,000
2011			$100,000	$250,000	$35,000	$385,000
2012			$100,000	$250,000	$35,000	$385,000
2013			$100,000	$250,000	$35,000	$385,000
2014			$100,000	$250,000	$35,000	$385,000
2015			$100,000	$250,000	$35,000	$385,000
2016			$100,000	$250,000	$35,000	$385,000
Total	**$500,000**	**$1,007,500**	**$1,600,000**	**$19,217,000**	**$1,045,000**	**$23,369,500**

5.3. Improved Analytical and Forecasting Tools

As stated in the previous section, models are a material aid to STA operations. But additionally, models are to be used to forecast performance of alternative or modified designs. One such modification is intentional replacement of one vegetative community with another in a given cell of an STA. A second use of an improved, calibrated and validated model is to forecast the efficacy of added STA acreage. Because of a paucity of full-scale, long-term operational data for constructed systems in the low P concentration ranges, the uncertainty in model calibration in those ranges is large.

A third use is to explore the interactions between CERP reservoirs and STAs. There are known to be strong effects of reservoir hydrologic operation and STA performance, even in the absence of reservoir water quality benefits. As a consequence, significant additional effort should be expended in improving the reservoir components of DMSTA. An incorporated task is the assembly and analysis of relevant reservoir water quality performances.

Projections of treatment performance reported in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins* (Brown & Caldwell) and *Evaluation of Alternatives for the ECP Basins* (Burns & McDonnell) were developed employing an April, 2002 version of the DMSTA (Dynamic Model for Stormwater Treatment Areas), Walker and Kadlec. Parametric definition and calibration reflected in that version of the model remain under development; as a result, those projections (summarized in Part 4) are simply the best estimates currently available. In addition, the future performance of STA-3/4, and potentially, STA-5, STA-6, and STA-2, will be substantially affected by the final nature and operation of the CERP EAA Storage Reservoir Projects (both Phase 1 and Phase 2). The potential influence of those projects on the quality, quantity and timing of inflows to the STAs discussed in the *Evaluation of Alternatives for the ECP Basins* was but an initial approximation.

This element of the PDE component includes the continued development and refinement of the analytical tools necessary for increased confidence in:

- Predicting the water quality improvement performance of the STAs.
- Predicting the influence of upstream storage reservoirs (in particular, the EAA Storage Reservoirs) on water quality in reservoir discharges, particularly to the STAs.

5.3.1. Continued Development and Refinement of DMSTA [Bc83(1)]

The DMSTA is considered an appropriate platform for projection of the water quality improvement performance of the various vegetative communities and STAs. However, increased certainty in the accuracy of projected performance, particularly as related to phosphorus reduction, requires that the model be continually updated and calibrated as additional data becomes available.

DMSTA is undergoing refinements to improve its ability to describe STA performance. Some improvements will rely upon the acquisition of new information, such as the expected P removal capabilities of reservoirs. Of particular importance is an increased calibration basis for large-scale systems operating in the event-driven mode that is characteristic of the STAs. Other model enhancements may include such things as addition of a sediment/floc compartment and phosphorus speciation. Such increased complexity will not be added if it does not provide material improvement in model calibration.

It is recommended that the DMSTA model(s) of the STAs be continually refined and updated as additional full-scale data becomes available. An initial funding amount of $242,750 in FY 2004, followed by $325,000 in each of FY 2005 and FY 2006 is recommended for that purpose, followed by an average annual expenditure of $300,000 extending from FY 2007 through at least FY 2010 (all proposed funding amounts are in FY 2003 dollars).

5.3.2. Water Quality Impacts of Reservoirs [Bc83(2)]

It is anticipated that the CERP Project Delivery Teams (PDTs) for the EAA Storage Reservoir Projects (both Phase 1 and Phase 2) will include detailed consideration of the impact of those projects on the quality of water entering the treatment areas downstream of the reservoirs. It is recommended that the Phase 1 PDT be assisted in the consideration of water quality impacts associated with the reservoir(s). It is anticipated that the PDT will select the specific analytical platform for use in those projections. Once that platform is selected, it would be desirable to calibrate the model to data obtained from similar water bodies in central and southern Florida. Example water bodies could include Lake Apopka, Lake Jessup, the Brevard County Stick Marsh and the Sun Ag reservoir (all in the St. Johns River Water Management District), as well as Lake Istokpoga and other large-scale water supply reservoirs in South Florida. An amount of $340,000 (in FY 2003 dollars) is recommended in FY 2004, followed by $575,000 (again in FY 2003 dollars) in both FY 2005 and FY 2006 to assist the CERP PDTs in the acquisition and analysis of calibration data sets.

5.3.3. PSTA Investigations [Bc83(3)and Bc83(4)]

Non-emergent wetland systems, which include mixtures of submerged aquatic vegetation and periphyton in varying proportions, are the only known ecosystems that have demonstrated the potential to achieve the extremely low phosphorus concentrations necessary to meet the phosphorus criterion for the Everglades. Extensive efforts directed to optimizing the performance of Submerged Aquatic Vegetation (SAV) are included in this PDE effort, and are discussed in Section 5.4. It is also considered necessary to explore the efficacy and possible function of Periphyton-Based Stormwater Treatment Areas (PSTA) in achieving the phosphorus criterion.

To date, approximately $12 million has been expended over the past five years investigating PSTA in nine research projects ranging in size from 0.001 to 5 acres. A comprehensive description of the nature of those research projects, including a summary of available results, may be found in the August 8, 2003 *(Draft) Technology Review of Periphyton Stormwater Treatment*, R.H. Kadlec and W.W. Walker. Despite the substantial information developed as a result of those research projects, significant uncertainties remain in scaling up data obtained to date to full-scale designs. In addition, information to date indicates that area requirements may be very high, low phosphorus concentrations may not be easily achieved, required hydraulics are problematic, capital costs are high and vegetation maintenance may be very difficult.

Nonetheless, it is considered necessary to continue efforts directed toward the future implementation of PSTA in the event it is not possible to achieve the phosphorus criterion in SAV-dominated wetlands. Those efforts will include a combination of:

- Continued operation and monitoring of certain of the District's existing PSTA research projects.
- Implementation, operation and monitoring of large-scale demonstration projects.
- Tracking of related projects.

Continued Operation and Monitoring of Existing PSTA Research Projects [Bc83(3)]: In 1997, the SFWMD initiated a comprehensive PSTA research project for advanced levels of phosphorus removal from EAA waters. CH2M Hill was selected as the District's contractor. This project proceeded in three phases over the period 1999-2002. This project addressed research issues at three scales: 6 and 18 sq. m. mesocosms; one-half acre test cells; and five-acre field cells. The District is at present continuing data collection for one of the half-acre test cells, and for three of the four field-scale cells (the operation of a field scale cell developed on peat substrate has been discontinued).

The continued operation of the one-half acre test cell and one of the five-acre field scale cells (that cell which demonstrates the greatest promise) is included in this element of the overall PDE effort. It is proposed to continue operation and monitoring of those platforms through FY 2006, at an estimated annual cost (in FY 2003 dollars) of $325,000.

Large-Scale Demonstration Projects [Bc83(4)]: Both the SFWMD and the Jacksonville District, USACE are proceeding with planning for the construction and operation of large-scale PSTA demonstration projects. SFWMD's demonstration project will consist of roughly a 100-acre PSTA cell in STA-3/4. The USACE demonstration project will be conducted in STA-1E. Little information on the USACE demonstration project is presently available.

The SFWMD's PSTA demonstration project is the subject of the August 18, 2003 *Conceptual Design of a PSTA Demonstration Project in STA-3/4 (Final Draft)*, prepared for SFWMD by Burns & McDonnell. As presented therein, the demonstration project will consist of a 107-acre PSTA cell constructed in the southwesterly corner of Cell 2B of STA-3/4, as shown in Figure 5.1.

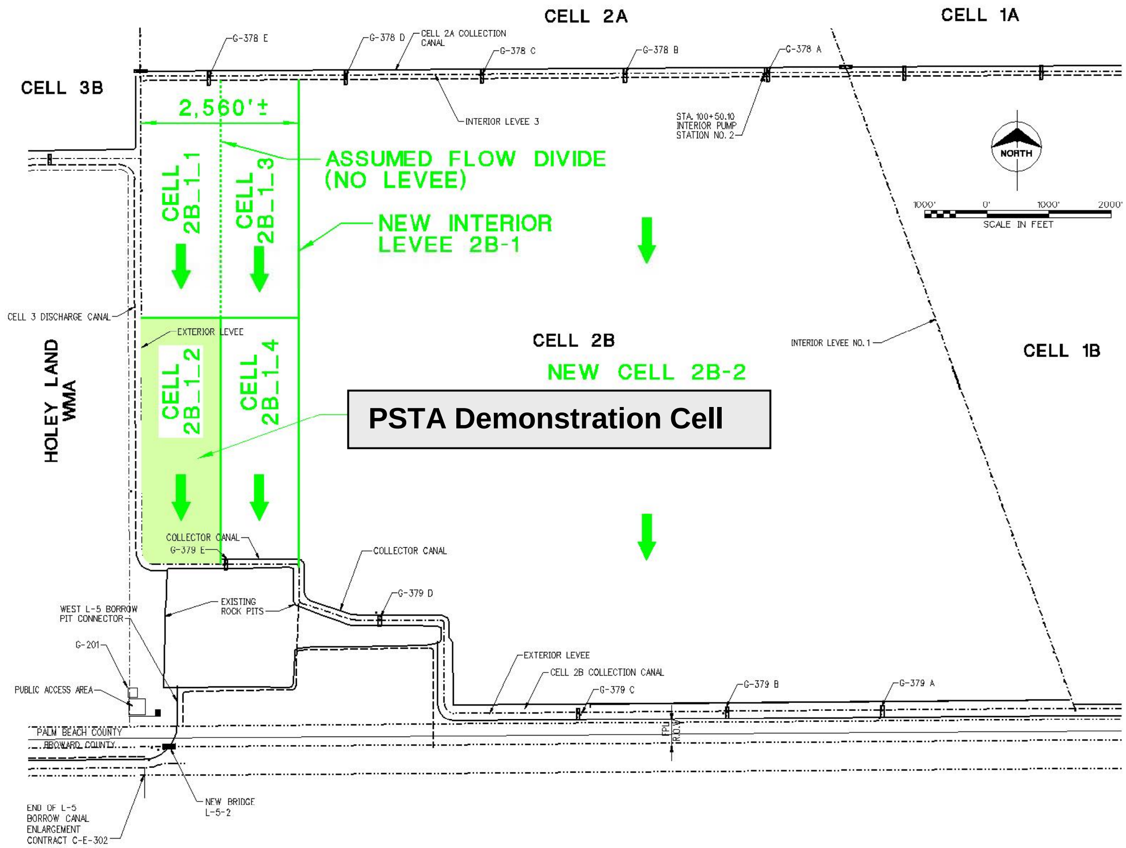

Figure 5.1 Conceptual Plan, PSTA Demonstration Project in STA-3/4

As presented in that *Conceptual Design*, the substrate in the PSTA Demonstration Cell will consist of the native limestone caprock, which will be exposed by removal of the overlying muck soils. The design and intended operation of that project has been developed to obtain full-scale operating results not only from the PSTA Cell itself, but also from the SAV cells that both precede and parallel the PSTA cell.

The following opinion of the capital cost for construction of that demonstration project in STA-3/4 is based on information in the above-referenced *Conceptual Design*.

Table 5.3 Opinion of Capital Cost, PSTA Demonstration Project in STA-3/4 [Bc83(4)]

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Total Estimated Cost
1	Clearing (light brush)	115	Acres	$300	$34,500
2	Peat Excavation				
	Excavate and Load	234,000	Cu. Yd.	$0.50	$117,000
	Haul to East Perimeter Levee, ave. 600’ one-way haul	78,000	Cu. Yd.	$1.50	$117,000
	Place, Spread and Compact at East Perimeter Levee	78,000	Cu. Yd.	$0.35	$27,300
	Haul to Levee 2B_1, ave. 3,800’ one-way haul	156,000	Cu. Yd.	$2.50	$390,000
	Place, Spread and Compact in Levee 2B_1	156,000	Cu. Yd.	$0.35	$54,600
3	Degrade Existing Roads along Levee 2B_1, Fill Existing Canal (Note 1)	34,000	Cu. Yd.	$0.50	$17,000
4	Degrade Existing Roads along east-west ditches in Cells 2B_1_2, 2B_1_4 (Note 1)	15,200	Cu. Yd.	$0.50	$7,600
5	Inflow Control Levee				
	Drill and Blast for Canal Excavation	44,800	Cu. Yd.	$0.75	$33,600
	Canal Excavation	44,800	Cu. Yd.	$1.50	$67,200
	Place, Spread and Compact in Levee Embankment	41,600	Cu. Yd.	$0.75	$31,200
	Haul to East Perimeter Levee for Revetment, ave. 1,900’ one-way	3,200	Cu. Yd.	$2.00	$6,400
6	East Perimeter Levee Revetment				
	Geotextile Fabric	9,600	Sq.Yd.	$1.50	$14,400
	Place Rock	3,200	Cu. Yd.	$2.00	$6,400
7	Cell 2B_1_2 Inflow Control Structures, 6’x6’ RCB with Slide Gates	2	Ea.	$125,000	$250,000
8	Electrical and Controls for Cell 2B_1_2 Inflow Control Structures	2	Ea.	$43,000	$86,000
9	Single-phase Power Line to Cell 2B_1_2 Inflow Control Structures	1.0	Mi.	$80,000	$80,000
10	Cell 2B_1_4 Inflow Structures, 84" CMP	2	Ea.	$25,000	$50,000
11	Outflow Pumping Station (Note 2)	210	cfs	5,000	$1,050,000
12	Three-phase Power Line to Outflow Pumping Station (Note 3)	0.4	Mi.	$100,000	$40,000
13	Stilling Wells (HW & TW at Cell 2B_1_2 Inflow Structures, HW at Pump Station, HW & TW at G-379E and G-378E)	7	Ea.	$9,000.00	$63,000
14	Dewatering During Construction	Job	Lump	Allow	$75,000
15	Emergent Plantings	24,000	Ea.	$2.00	$48,000
	Subtotal, Estimated Construction Cost				**$2,666,200**
	Planning, Engineering & Design @ 8%				$213,296
	Construction Management @ 7%				$186,634
	Contingency @ 25%				$766,533
	Total Estimated Capital Cost				**$3,832,663**
Notes	1. This item of construction is presently included in the scope of Contract C-E307 2. Assumes temporary construction 3. Replaces single-phase power to G-379E currently planned				

Construction of this project is presently expected to begin in FY 2004, and to be completed during FY 2005. The budgeted first cost for this project reflected in this Long-Term Plan is $3,800,000 (FY 2003 dollars), with roughly half expended in each of FY 2004 and FY 2005.

It was projected in that *Conceptual Design* that, after allowance of roughly one year for vegetation grow in and initial startup, full operation of the PSTA Demonstration Project in STA-3/4 could commence in October, 2005. It is anticipated that operation and monitoring of the PSTA demonstration project will extend at least through Fiscal Year 2008 (e.g., through September 30, 2008). However, development of any conceptual plans for subsequent efforts that may be included in the December 31, 2008 report will of necessity be primarily developed on the basis of data obtained prior to the end of calendar year 2007, updated as may be necessary with the additional information obtained in calendar year 2008.

An opinion of the average annual cost (in FY 2003 dollars) for operation and maintenance of the PSTA Demonstration Project in STA-3/4 is presented in Table 5.4.

Table 5.4 Opinion of Average Annual O&M Cost, PSTA Project in STA-3/4 [Bc83(4)]

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Site Manager	1	FTE	$125,000	$125,000	
2	New Internal Levees	2.7	Mi.	$3,300	$8,910	
3	New Gated Inflow Control Culverts	2	Ea.	$8,000	$16,000	
4	Pump Station Building Maintenance	1	Ea.	$10,000	$10,000	Simple temporary structure
5	Mech. Maintenance, Outflow Pumping Station, 4 units assumed	4	Ea.	$2,500	$10,000	Electric motor driven pumps assumed.
6	Power Consumption, Outflow Pumping Station	18,100.00	Ac-Ft.	$0.60	$10,860	
7	Vegetation Control	107	ac	$80	$8,560	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$189,330**	
Contingency			30 %		$56,799	
TOTAL INCREMENTAL O&M COST					**$246,129**	**$250,000**

That estimated average annual cost of $250,000 (in FY 2003 dollars) is applied in each of FY 2006-2008 for operation and maintenance of this demonstration project. Those costs <u>exclude</u> expenditures for establishing the necessary additional flow and water quality monitoring stations, and for subsequent monitoring and maintenance of those stations.

It is anticipated that five new flow and water quality monitoring stations will be required for this project (G-378E, G-379E, two new inflow control structures for the PSTA cell, and the PSTA cell outflow pumping station). In addition, it will be desirable to regularly obtain grab samples at the (uncontrolled) culverts at the upstream end of Cell 2B_1_4. The budget for this project includes $133,500 in FY 2005 for establishing the five new flow and water quality monitoring stations (four gated structures and one pump station, see p. 5-11), and $200,000 per year thereafter (through FY 2008) for sample acquisition, testing, analysis, and flow and water quality station maintenance (five stations at an estimated average cost of $40,000 each, see Part 8). In addition, the budget includes $250,000 in each of FY 2006-2008 for special investigations and tests (such as Tracer Studies) that may prove desirable.

Tracking Related Projects [Bc83(3)]: There continue to be a number of related phosphorus removal projects, at different locations and scales that are outside or peripheral to this Long-Term Plan. There is a possibility that future results from these related projects could bring new structural or operational modifications into consideration. Some of these related projects are identified below; project descriptions are taken from the August, 2003 *(Draft) Technology Review* referenced earlier.

- In 1998, the USACE began the planning and design of a PSTA pilot study located within the footprint of STA-1E. The facility design was specified by R.D. Jones, and operation is by Florida International University. This facility was structurally completed on February 9, 2000, and became operational in 2002, and reportedly began producing data in 2003.
- In 1998, DB Environmental Laboratories began a raceway mesocosm study of the use of periphyton for phosphorus removal. This project continued through 2001 under the auspices of SFWMD, and continues under funding from the EAA Environmental Protection District (EPD).
- In early 2000, a full-scale, scraped down detention basin in the C-111 area was completed and began operation, serving the S-332B pumping station. This 150-acre

USACE project continues in operation. Inflow and outflow phosphorus data are collected.

- In 2001, CH2M Hill started an integrated STA project for the Village of Wellington, under the direction of R.D. Jones, which included PSTA cells. Data were acquired from November 2001 through early 2003, at which time the facility was decommissioned.
- In 2002, the USACE built two more full-scale, scraped down detention basins in the C-111 area. These were completed and began operation in the summer of 2002, serving the S-332C and S-332D pump stations. Inflow and outflow phosphorus data are collected.

In addition, as earlier discussed, the USACE is now in the planning process for the addition of a large-scale demonstration project in STA-1E.

A commitment of $100,000 per year is recommended to track the performance of these PSTA projects in Fiscal Years 2004 through 2006, and the results will be factored into the improved analytical and forecasting tools recommended herein.

Companion studies of related wetland ecosystems would go forth under the Recovery section of this plan (see Part 7). Some portions of the work on recovery will bear upon other tasks, such as the improvement of model calibrations. Information gained from ancillary studies of impacted and unimpacted areas will be used as appropriate in the PDE effort.

Other STAs are currently in design or operation at locations that do not directly affect the Everglades Protection Area. These include several STAs planned for the area north of Lake Okeechobee, as well as in the St. John's River Water Management District. Data from these projects will continue to be utilized as supporting data for model calibration.

5.3.4. Summary of Funding Needs for Improved Analytical and Forecasting Tools [Bc83]

A summary of the projected funding needs for improved analytical and forecasting tools (all in FY 2003 dollars) is presented in Table 5.5.

Table 5.5 Opinion of Cost for Improved Analytical and Forecasting Tools [Bc83]

Fiscal Year	Scheduled Expenditure by Function (FY 2003 $)							Fiscal Year Total Bc82, all (FY 2003 $)
	DMSTA Refinement [Bc83(1)]	WQ Impacts of Reservoirs [Bc83(2)]	PSTA Investigations [Bc83(3)]		PSTA Demonstration Project in STA-3/4 [Bc83(4)]			
			Continue Test & Field Scale	Track Related Projects	Capital Cost	O&M Cost	Monitoring	
2004	$242,750	$340,000	$325,000	$100,000	$1,900,000			$2,907,750
2005	$325,000	$575,000	$325,000	$100,000	$1,900,000		$133,500	$3,358,500
2006	$325,000	$575,000	$325,000	$100,000		$250,000	$450,000	$2,025,000
2007	$300,000					$250,000	$450,000	$1,000,000
2008	$300,000					$250,000	$450,000	$1,000,000
2009	$300,000							$300,000
2010	$300,000							$300,000
Total	**$2,092,750**	**$1,490,000**	**$975,000**	**$300,000**	**$3,800,000**	**$750,000**	**$1,483,500**	**$10,891,250**

5.4. Optimizing SAV Performance [Bc84]

The single greatest variant in the current projections of treatment performance is the extent to which the performance of Cell 4 of the Everglades Nutrient Removal Project (ENRP) during its best two years of operation can be replicated at full scale. That conclusion is stated in both the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins* (Brown & Caldwell) and the *Evaluation of Alternatives for the ECP Basins* (Burns & McDonnell). From the analyses presented in those references, the potential variation in both the long-term flow-weighted and the long-term geometric mean TP concentration associated with the observed range in performance of SAV communities is approximately 5 ppb. This element of the PDE Component is directed toward optimizing SV performance at large-scale and with long-term reliability.

Substantial portions of the expenditures necessary to support this demonstration are included in performance monitoring, as both compliance monitoring and operational assessment. The calibration of models to the data from this replication study is included elsewhere, under model development (see section 5.3). However, there are anticipated to be additional expenses related to vegetation management, operations management and more detailed ecosystem investigations. It is presently anticipated that STA-2 Cell 3 will provide this demonstration, because it has healthy SAV communities already in place, and has undergone startup and stabilization.

The following subset of tasks not covered elsewhere includes those measurements and reflect actions that were conducted for STA-1W Cell 4 in support of the use of that data in the Basin-Specific Feasibility Studies.

5.4.1. Operational Strategy [Bc84(1)]

SAV is most easily maintained if water depths are controlled to exclude emergent plants such as cattails. Further, prolonged dry-out is perceived to be detrimental to SAV communities. As a consequence, operational decisions must accommodate these constraints. Insofar as feasible, the hydraulic and P loadings to STA2 Cell 3 should be constrained to low values, in an attempt to achieve low outlet P concentrations. No additional funds are needed for this activity, but an operational plan must be put in place by FY 2005.

5.4.2. Vegetation Maintenance [Bc84(2)]

STA2 Cell 3 has, at least through the majority of 2002, thus far maintained the appearance of a healthy SAV system. However, invasion by emergents or other “less desirable” species cannot be ruled out, and should be controlled in order to optimize SAV performance. In accordance with the NEWS concept, it is anticipated that periphyton will be a significant component of the SAV community. Costs for maintenance of vegetation in STA2 Cell 3 are included in Part 2 (for conversion of approximately 500 acres of emergent to SAV and subsequent maintenance of that area) and Part 8 (for ongoing maintenance of the balance of Cell 3).

5.4.3. Hydrologic and Hydraulic Assessment [Bc84(3)]

Performance monitoring will provide the general framework for hydrologic and hydraulic interpretation of STA2 Cell 3 data. However, tracer testing of STA1W Cell 4 proved extremely valuable in identification of short-circuiting, and such testing is therefore essential to the replication attempt. Testing should occur at least once prior to the addition of the internal levee contemplated in the pre-2006 strategy, and at least once subsequent. As that construction is recommended for the dry season in FY 2006, the testing is projected to take place in FY 2004 and again in FY 2007.

The estimated cost for each of these studies, based upon similar efforts in STA1W Cells 1,2, and 4, is $300,000 (in FY 2003 dollars).

5.4.4. Internal Measurements [Bc84(4)]

Performance monitoring will identify the overall efficacy of STA2 Cell 3. However, additional internal synoptic measurements were of great value in interpretation of STA1W Cell 4 data. The speciation of the SAV (NEWS) communities along the gradient is a prerequisite to understanding, as are the physical and chemical characteristics of the accreted sediments which contain the removed phosphorus. Phosphorus speciation in the water column yields critical information about the mechanisms of phosphorus removal at various locations along that gradient. The estimated cost for these studies, based upon similar efforts in STA1W Cells 1and 4, is $100,000 (in FY 2003 dollars) per year for five years, extending from FY 2004 through FY 2008.

5.4.5. Comparative Analysis [Bc84(5)]

The extent to which the attempt at optimization of SAV performance meets with success or failure must be documented. This report is required no later than 2008, at which time critical decisions on future necessary steps are to be taken. The cost for this comparison analysis and report is estimated to be $100,000 (FY 2003 dollars), incurred in 2008.

5.4.6. Summary of Funding Needs for Optimizing SAV Performance [Bc84]

A summary of the projected funding needs for optimizing SAV performance is presented in Table 5.6.

Table 5.6 Opinion of Cost for Optimizing SAV Performance [Bc84]

Fiscal Year	Scheduled Expenditure by Function (FY 2003 $)			Fiscal Year Total Bc84, all (FY 2003 $)
	Hydrologic & Hydraulic Assess [Bc84(3)]	Internal Measurements [Bc84(4)]	Comparative Analysis [Bc84(5)]	
2004	$300,000	$100,000		$400,000
2005		$100,000		$100,000
2006		$100,000		$100,000
2007	$300,000	$100,000		$400,000
2008		$100,000	$100,000	$200,000
Total	**$600,000**	**$500,000**	**$100,000**	**$1,200,000**

The effort recommended in this section for optimizing SAV performance is expected to be further enhanced as a result of the PSTA Demonstration Project in STA-3/4 discussed in Section 5.3.3.

5.5. Additional Structural and Operational Measures

As discussed above, the single greatest need presently identified in increasing the certainty that the strategies recommended in this Long-Term Plan will result in compliance with water quality standards (and in particular the numeric phosphorus criterion in Rule 62-302.540, F.A.C.) is the ability to reliably optimize SAV performance. However, it is not certain that the desired results will be fully realized by the steps included in that element of the PDE Component. It is therefore considered both necessary and prudent to investigate additional structural and operational measures that may prove of benefit in improving the treatment performance of the STAs within their existing or currently proposed footprints.

5.5.1. Evaluation of Full-Scale STA Enhancements [Bc25]

The SFWMD, with funding assistance from FDEP and the USEPA through DEP Grant Agreement No. G0040, has completed the construction of a limerock berm in Cell 5B of STA-1W; the construction of that facility was accomplished under SFWMD Contract No. C-15861. The following description of the purpose and intent of the Limerock Berm project is excerpted from the DEP Grant Agreement:

> *One of the more promising Advanced Treatment Technologies (ATTs) is the submerged aquatic vegetation and limerock (SAV/LR) technology. Results of projects implemented to date have shown that limerock berms may contribute to transformation of particulate phosphorus to SRP that is subsequently removed by downstream plant communities. It is possible that a combination of vegetation types with strategically placed limerock berms could be used to maximize phosphorus reduction to the lowest levels possible. While the specific physical, chemical, and biological processes involved in these transformations remain undefined, the results to date have been promising enough to warrant full-scale implementation. Such limerock berms may also provide hydraulic benefits similar to those forecast for cells in series by redistributing the water flow across a treatment cell. Full-scale implementation is needed to evaluate the TP removal capacity of SAV/LR systems under realistic environmental conditions.*
>
> *Other major issues related to STA system optimization, however, transcend the type of dominant vegetation within the STA. For example, there is not yet full-scale demonstration of the potential benefits of improved hydraulics within the STAs through compartmentalization. Projects to date have attempted to address the benefits of improved hydraulics in terms of improved treatment performance, but these have largely consisted of correlation of treatment performance with residence time demonstrated through tracer projects.*
>
> *The original performance forecast modeling of treatment wetlands was based on the concept that these systems behave as plug-flow reactors. However, tracer projects conducted with emergent, floating and submerged macrophyte-dominated treatment wetlands reveal that flow patterns may depart widely from ideal plug-flow characteristics. The heterogeneous and "clumped" nature of vegetation, and uneven micro- and macro-topographical features result in the development of rapid flow paths and internal dispersion and mixing. The net outcome is that some of the influent water reaches the outflow end of the system before the calculated hydraulic retention time (HRT), and a compensating amount is held longer than the calculated HRT. From a performance-forecasting standpoint, these deviations from plug-flow have been addressed by using different hydraulic reactor models, for example, several continuously stirred tank*

reactors (CSTRs) in series, or a plug-flow reactor followed by multiple CSTRs. The various community types have exhibited from one to more than six tanks in series at scales ranging from mesocosms to full-scale STAs.

Recognition of "non-ideal" flow characteristics, as documented by full-scale tracer projects has led to most treatment wetlands being designed with a means of evenly distributing the influent across the entire width of the wetland. Once water enters the wetland, however, flows coalesce into small rills, which then combine to create large short-circuiting channels. These flow channels typically remain intact until the water is redistributed by structural means. Both deep channels and earthen berms perpendicular to flow have been used to redistribute water in wetlands. However, neither rational design parameters nor performance benefits for these structural modifications have been rigorously characterized. Presently, each of the STAs is configured with several large cells (in some cases exceeding 2,000 acres in size) with minimal compartmentalization. This project is intended to demonstrate the benefits of improved hydraulics through compartmentalization at full scale.

Additional studies associated with the DEP Grant Agreement include a hydraulic analysis of Cell 5 and a vegetation management demonstration project. The DEP Grant Agreement is scheduled for completion in FY 2005; the total amount of the grant agreement is $1,862,268. The total FY 2003 expenditure of $560,744 is excluded from the projection of costs in this Long-Term Plan, as it occurred prior to the FY 2004 through FY 2006 planning period considered herein. An expenditure of $1,234,024 is scheduled for FY 2004 ($1,198,082 in FY 2003 dollars), followed by a final expenditure of $67,500 in FY 2005 ($65,534 in FY 2003 dollars).

5.6. Improved Reliability of Inflow Forecasts [Bc86]

All PDE elements discussed to this point have been directed to increasing the certainty in water quality improvement performance of the treatment areas and other project works. However, a significant degree of uncertainty yet remains with respect to the volumes, total phosphorus concentrations, and timing of inflows to be accommodated. Inflow volumes and timing on which the analyses in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins* (Brown & Caldwell) and the *Evaluation of Alternatives for the ECP Basins* (Burns & McDonnell) are based were taken from SFWMM simulations. Those simulations were performed on a daily basis for a 31-year period. Two separate simulations were prepared. One simulation was for hydrologic conditions expected to exist upon completion of the Everglades Construction Project as it is presently formulated. A second simulation was prepared for hydrologic conditions expected to exist upon completion of the full CERP. No simulations were prepared for intermediate conditions.

There has been a relatively high degree of confidence in the extent to which the simulation of conditions following completion of the ECP is representative of the range of inflows to which the projects will be subjected. That degree of confidence reduces for simulations of future conditions. In addition, comparison of historic flows since 1995 to the simulation results suggests that, in some basins, average flows from 1995-2003 were somewhat higher than those projected by the SFWMM simulations for randomly selected eight-year periods.

Of perhaps greater significance than the hydrologic simulations is the degree of uncertainty in the total phosphorus concentrations and loads contained in the inflows. The manner in which those time and flow dependent concentrations and loads were estimated is described in detail in the May 2001 *Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-Term Water Quality Goals for the Everglades*, SFWMD (hereafter referred to as the *Baseline Data*). Those estimates would, in each of the thirteen basins addressed in this Long-Term Plan, improve as additional record data on actual discharges and concentrations becomes available.

5.6.1. Update Baseline Data Sets [Bc86(1)]

It is recommended that the analyses presented in the *Baseline Data* be regularly updated to continually improve the degree of confidence in the projected total phosphorus loads in inflows to the treatment areas (or, in some instances, discharged directly to the EPA). The *Baseline Data* employed available flow and water quality data from the period 1989-1999; in some basins, little record data was available at that time. It is recommended that the inflow projections of the *Baseline Data* be updated not less frequently than once every two years, with the first such regularly scheduled update to be completed by December 31, 2003, and the updated inflow projections reentered in the projected treatment analyses. It is recommended that funding in the amount of $150,000 (in FY

2003 dollars) be established for that purpose in alternating years extending from FY 2005 through FY 2015.

The subsequent paragraphs of this section address additional, specific areas of uncertainty for which additional effort is considered appropriate.

5.6.2. Basins With Limited Current Data [Bc86(2)]

In certain of the basins addressed in this Long-Term Plan, little quantitative water quality data was available for use in development of the *Baseline Data*. The following steps are recommended in certain of those basins, and are intended to supplement the regular updates described above.

C-51 West Basin: Of all the basins considered in this Long-Term Plan, the greatest uncertainty in the relationship between discharge volumes, season and water quality exists in the C-51 West Basin. Little substantive improvement has been made in understanding those relationships since completion of the February 1994 *Everglades Protection Project Conceptual Design*, which relied on a total of fourteen data points to project long-term flow-weighted mean TP concentrations in runoff from this basin. The *Baseline Data* simply applied that estimated concentration to all discharges from the basin, with the result that no variability in concentration as a result of either season or daily discharge was considered.

Once STA-1E and Pumping Station S-319 come on line, it will be possible to begin development of a more comprehensive and representative data set for this basin. However, that will not occur until 2004. In the interim, it is recommended that an analysis of existing flow and phosphorus data in the C-51 West basin be undertaken to generate a more representative estimate of water quality in discharges for incorporation in subsequent analyses of STA-1E.

It is recommended that funding in the amount of $225,000 (in FY 2003 dollars) be provided for the conduct of those analyses, with all analyses to be completed during FY 2004 and 2005. Analyses during FY 2004 ($125,000) would focus on water quality and quantity data available prior to operation of S-319; analyses during FY 2005 ($100,000) would update and refine those analyses based on newly acquired data at S-319.

L-28 Basin: The *Baseline Data* in this basin was developed to exclude simulated discharges from the C-139 Annex, and made no distinction in either the volume or quality of discharge by source. It is presumed that a disproportionately large percentage of total discharges from this basin is comprised of seepage inflows from WCA-3A to the L-28 Borrow Canal. Specific recommendations for additional analysis in this basin, together with recommended budget and schedule for completion, are included in Part 3 of this Long-Term Plan and are not further addressed herein.

C-11 West Basin: Discharges from the C-11 West Basin to WCA-3A at Pumping Station S-9 are expected to be substantially altered following completion of the Critical Project for separation of WCA-3A seepage from basin runoff and construction of Pumping Station S-9A. While the data employed in the October 23, 2002, *Basin Specific Feasibility Studies, Everglades Stormwater Program Basins* was developed attempting to reflect that separation and change, adjustments to basin discharges were necessarily approximate in nature. It is recommended that, following at least two years of data acquisition during 2005 and 2006 (following completion of the basin divide structure included in this Critical Project, presently expected in November 2004), the basin discharge estimates from the C-11 West Basin be updated during FY 2007. The estimated cost for that update (in FY 2003 dollars) is approximately $75,000.

5.6.3. Influence of CERP Projects on Inflow Volumes and Loads [Bc86(3)]

As the CERP projects proceed through planning and implementation, it will be desirable to update the projected impact of those projects on inflow volumes and loads to receiving water bodies. This is particularly true of the EAA Storage Reservoir projects (both Phase

1 and Phase 2), which have the potential to markedly impact inflows to most, if not all, of the ECP stormwater treatment areas. It is recommended that, at a minimum, estimated inflows to the STAs be fully redressed following completion of initial planning, hydrologic analyses, plan selection, and water quality change projections by the PDTs for these two projects. The first such update and redress should be completed in FY 2005, and would address the Phase 1 CERP Project. The second such update and redress is projected to occur in FY 2010, and would address the Phase 2 CERP Project. The estimated cost for each update (in FY 2003 dollars) is $75,000.

5.6.4. Lake Okeechobee Long-Term Trends [Bc86(4)]

For hydrologic conditions expected to prevail upon completion of the ECP, approximately 18.9% of the estimated average annual inflow volume and 12.4% of the average annual inflow TP load to the six STAs of the ECP consist of Lake Okeechobee releases. Upon full completion of CERP, those proportional inflows are estimated to increase to 35.7% and 21.2%, respectively. As a result, there is a need to better understand the relationship between Lake Okeechobee nutrient status and operation (depth regulation, choice of outflow point) on phosphorus loads discharged to the STAs.

Development of that understanding would include an update of the modeling and trend analyses that were performed for established of the Lake Okeechobee TMDL for total phosphorus, and an assessment of the relationship between phosphorus concentrations in the pelagic zone and concentrations at the outflow points used to deliver water to the STAs and reservoirs. To be of maximum value to the CERP PDTs, the PDTs should complete those updated analyses roughly concurrently with the associated planning studies. A budget amount of $75,000 (in FY 2003 dollars) is recommended in FY 2004 and again in FY 2009 for this purpose.

5.6.5. Determine Relationship Between Discharges and Water Quality Within the EPA [Bc86(5)]

At present, the relationship between the quality of water discharged into, and the water quality within, the Everglades Protection Area (EPA) has not been established. It is recommended that the PDE component of this Long-Term Plan include an activity intended to define that relationship.

This activity fulfills a requirement of the Everglades Forever Act (Section 2.(4).e.3&4). DEP, District staff, stakeholders and consultants will use best available information, primarily water quality monitoring data, to examine statistical relationships between surface water discharges and downstream P concentrations in water bodies of the EPA. The same data sets will be used to calibrate and validate empirical P models, such as DMSTA or EPGM. These, or other, models may be used to develop scenarios for the long-term responses of receiving water P to spatial and temporal changes in P concentrations and loads in surface water inflows. The results of the data analysis and modeling will be written into a consensus technical publication and circulated for agency and public review. Following this review, a public workshop on the findings and P dynamics seen in the EPA will be conducted and the publication will be finalized. It is recommended that this activity be funded in the amount of $200,000 (in FY 2003 dollars) in both FY 2004 and FY 2005.

5.6.6. Summary of Funding Needs for Improved Inflow Forecasts [Bc86]

A summary of the projected funding needs (in FY 2003 dollars) for improving the reliability of inflow forecasts is presented in Table 5.7.

Table 5.7 Opinion of Cost for Improved Inflow Forecasts [Bc86]

Fiscal Year	Scheduled Expenditure by Function (FY 2003 $)					Fiscal Year Total Bc86, all (FY 2003 $)
	Update Baseline Data [Bc86(1)]	Basins w/ Limited Data [Bc86(2)]	Influence of CERP Projects [Bc86(3)]	Okeechobee Trends [Bc86(4)]	WQ Relations in EPA [Bc86(5)]	
2004		$125,000		$75,000	$200,000	$400,000
2005	$150,000	$100,000	$75,000		$200,000	$525,000
2006						$0
2007	$150,000	$75,000				$225,000
2008						$0
2009	$150,000			$75,000		$225,000
2010			$75,000			$75,000
2011	$150,000					$150,000
2012						$0
2013	$150,000					$150,000
2014						$0
2015	$150,000					$150,000
Total	**$900,000**	**$300,000**	**$150,000**	**$150,000**	**$400,000**	**$1,900,000**

5.7. Summary of Projected Expenditures

A summary of the projected expenditures for the Process Development and Engineering (PDE) component of the overall water quality improvement strategy recommended in this Long-Term Plan is presented in Table 5.8. That summary includes all estimated costs developed in the earlier sections of this Part 5, plus Program Management costs [Bc90] established at three percent of the estimated annual expenditures.

A total expenditure (in FY 2003 dollars) of $41.72 million is projected for FY 2004-2016, inclusive. When the actual expenditure under Bc25 (limerock berm) of $0.56 million in FY 2003 is included, the total estimated cost of the PDE component (in FY 2003 dollars) is $42.18 million.

Table 5.8 Projected Expenditures for PDE Component (FY 2003 Dollars)

Fiscal Year	Scheduled Expenditure by Function (FY 2003 $)								Fiscal Year Total
	Invest. Struct. Modifications [Bc25]*	BMP Investigations EAA [Bc81(1)]	BMP Investigations C-139 [Bc81(2)]	Control & Monitoring [Bc82, all]	Analytical & Forecast Tools [Bc83, all]	Optimize SAV [Bc84, all]	Inflow Forecasts [Bc86, all]	Program Management [Bc90]	(FY 2003 $)
2004	$1,198,082	$77,500	$250,000	$2,925,500	$2,907,750	$400,000	$400,000	$245,000	$8,403,832
2005	$65,534	$50,000	$250,000	$4,360,500	$3,358,500	$100,000	$525,000	$261,000	$8,970,534
2006		$50,000	$250,000	$3,360,000	$2,025,000	$100,000	$0	$174,000	$5,959,000
2007		$50,000	$100,000	$3,442,500	$1,000,000	$400,000	$225,000	$157,000	$5,374,500
2008		$50,000	$100,000	$3,340,000	$1,000,000	$200,000	$0	$141,000	$4,831,000
2009		$50,000	$100,000	$3,246,000	$300,000		$225,000	$118,000	$4,039,000
2010			$100,000	$385,000	$300,000		$75,000	$26,000	$886,000
2011			$100,000	$385,000			$150,000	$19,000	$654,000
2012			$100,000	$385,000			$0	$15,000	$500,000
2013			$100,000	$385,000			$150,000	$19,000	$654,000
2014			$100,000	$385,000			$0	$15,000	$500,000
2015				$385,000			$150,000	$16,000	$551,000
2016				$385,000				$12,000	$397,000
Total	**$1,263,616**	**$327,500**	**$1,550,000**	**$23,369,500**	**$10,891,250**	**$1,200,000**	**$1,900,000**	**$1,218,000**	**$41,719,866**
See Also				**Table 5.2**	**Table 5.5**	**Table 5.6**	**Table 5.7**	**3% of total**	

* Listing excludes $560,744 expended in FY 2003

* * * * *

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6. POST-2006 STRATEGIES

The Everglades Forever Act (EFA), Section 373.4592, Florida Statutes, sets out general and specific goals for Everglades restoration, including a specific timetable for construction, research and regulation. However, the Legislature recognized that, although the EFA provided a sound blueprint for restoration of the Everglades, the process would of necessity be iterative in nature, with the possibility that additional steps would be needed to achieve the water quality requirements of the EFA by the 12/31/06 deadline set out in the EFA (or at any point in the future). Specifically, in 1994, the legislature found that the combined program of agricultural BMPs, STAs and requirements of the EFA were the best available technology for achieving the interim water quality goals of the Everglades Program and provided a foundation on which to build the long term program to ultimately achieve water quality requirements.

The EFA also required that the SFWMD conduct a research and monitoring program to optimize the design and operation of the STAs prior to expanding their size, and identify other treatment and management methods that are superior to STAs in achieving optimum water quality and water quantity for the Everglades. The Legislature also recognized that, during the construction of the STAs, superior technology may become available and authorized the SFWMD to pursue those alternatives if the alternative allows for compliance with water quality standards and the other goals of the restoration.

Due to the anticipated iterative nature of the restoration process and the unknown future steps that may be needed to restore the Everglades, in 1994 the Legislature identified funding mechanisms in the EFA for the 1994 Everglades Construction Project only, leaving open the need for additional funding if additional steps, including STA optimization, were needed.

Part 2 of this *Long-Term Plan* identifies the next steps of the ECP, to be implemented prior to December 31, 2006, and projects the funding requirements for those steps. Part 3 of this *Long-Term Plan* identifies recommended steps to be taken in the Everglades Stormwater Program (ESP) Basins, and projects the funding requirements for those steps. As for the ECP, the intent in the ESP Basins is that all steps that can be completed prior to December 31, 2006 be completed, and that all other steps be completed as expeditiously as possible.

Given the iterative nature of this restoration and the restoration goals of the EFA, as sources of funding are identified to implement the pre-2006 steps identified in this Long-Term Plan, funding sources should also be identified to continue the restoration efforts beyond 2006, should that need arise.

In support of the present and potentially continuing need to seek improvement in water quality entering the Everglades, this Long-Term Plan includes the establishment and maintenance of a program of process development and engineering (PDE). This program is discussed in detail in Part 5, and includes both activities focused on the period ending December 31, 2006 (intended for direct incorporation into detailed planning for post-2006), and ongoing activities extending beyond 2006. It is intended that the SFWMD prepare a comprehensive report as described in Part 5 regarding the PDE program and progress toward meeting water quality requirements, which should be submitted no later than December 31, 2008, to the Governor and the Legislature.

Monitoring of projects completed by December 2006 may demonstrate that they are entirely sufficient to achieve the long-term water quality goals for the Everglades. However, there is a distinct possibility that one or more of the projects outlined in Parts 2 and 3 will not achieve the long-term water quality goals. In the event that goals are not met, the District must be prepared to develop additional means of improving water quality.

Because hydropattern restoration has been deferred pending achievement of better water quality, there will unavoidably be a need to reconsider existing designs, construct the required works, and develop adequate monitoring. Those potential (largely post-2006) needs are discussed in Part 7 of this *Long-Term Plan*, which includes recommended steps for accelerating the recovery of previously impacted areas in the EPA.

Additional water quality improvement measures that may be implemented after December 31, 2006 to better achieve the long-term water quality and quantity goals for the Everglades could include:

- Further improvements to enhance the flow distribution within each STA, based on the understanding that improvements in hydraulic efficiency will result in improvements in nutrient removal performance;

- Interbasin transfer of water among the STAs for more balanced and integrated operation;
- Integration of STA operations with CERP projects, including the EAA Reservoirs, based upon the ability to modify the timing and location of water distributions to the STAs, while preserving other intended CERP functions, to the extent that this is consistent with state and federal authorization and will require close coordination with the PDT process;
- Integration of water quality improvement features into CERP projects, while preserving their intended CERP functions;
- Vegetation management based on potential opportunities to enhance phosphorus removal performance via conversion of portions of the STAs to more effective types of vegetation;
- Expansion of STA areas, if needed and proven effective.

This Part 6 explores possible further modifications and improvements that may be necessary to achieve the planning objective (compliance with the phosphorus criterion established in Rule 62-302.540 F.A.C.), in the event that the strategies outlined in preceding parts of this Long-Term Plan prove inadequate to that end.

Section 6.1 develops a current basis for such projects in the Everglades Construction Project (ECP) basins, should the primary pre-2006 strategy (conversion to SAV performing in a favorable fashion) prove unattainable. Section 6.2 develops a current basis for such projects in the Everglades Stormwater Program (ESP) basins should the primary strategy in those basins (reliance on presently identified and scheduled CERP projects) fail. For a variety of reasons, none of those projects are presently recommended for implementation.

Instead, it is recommended that current planning proceed with reliance on a strategy of adaptive implementation, in which all scientifically defensible steps are expeditiously implemented. That strategy is outlined in additional detail in Section 6.3.

6.1. Possible Future Projects, ECP Basins

This section identifies possible future projects in the ECP Basins which might eventually prove necessary should the pre-2006 strategies (Part 2 of this Long-Term Plan) acting together with the Process Development and Engineering (PDE) component prove insufficient to achieve the planning objective. These possible projects are structured upon the primary assumption that the SAV communities eventually perform more as Nonemergent Wetland Systems (NEWS) than as SAV_C4. In essence, these possible future projects are identified as a means to quantify the impact of an inability to obtain satisfactory results from the primary strategies set forth in this Long-Term Plan. In addition, the possible implementation schedules for these projects are developed in recognition of the need to coordinate these projects with other initiatives, primarily the Comprehensive Everglades Restoration Plan (CERP). These projects are not presently recommended for implementation as their bases are not considered scientifically defensible to a degree that would warrant the irreversible and substantial commitment of resources necessary for their implementation.

6.1.1. STA-1W and STA-1E

STA-1W and STA-1E are hydraulically connected and interdependent. For that reason, they are considered together.

6.1.1.1 Possible Future Modifications, STA-1W

As discussed in Part 2 of this *Long-Term Plan*, the pre-2006 strategy for STA-1W is to further compartmentalize Cells 1 and 2, forming new cells 1B and 2B, and to convert Cells 1B, 2B, and 3 from emergent macrophyte to submerged aquatic vegetation (SAV). In addition, structure additions and replacements are recommended for improved control. If the SAV can be made to perform as intended (e.g., as SAV_C4), the projected treatment performance is capable of meeting the assigned objective of a long-term geometric mean concentration of 10 ppb. However, the extent to which the SAV community can be made to reliably replicate on a long-term basis the SAV_C4 level of performance remains uncertain.

In this section, possible future modifications and enhancements to STA-1W are considered. It is not recommended that any such additional modifications and enhancements be considered for implementation until such time as additional information resulting from the PDE component (see Part 5 of this Long-Term Plan) is available and demonstrates:

- The need for additional modifications or enhancements;
- The extent to which the additional modifications or enhancements can be reliably demonstrated to contribute to an ability to meet the phosphorus criterion;
- That the estimated performance of a NEWS community can reliably extend to the range of inflow concentrations anticipated in STA-1W (projected inflow concentrations exceed the calibration range for NEWS).

A summary of the possible future alternatives for STA-1W is presented in Table 6.1.

Table 6.1 Possible Post-2006 Alternatives, STA-1W

Alt. No.	Description	Long-Term Mean TP Concentration (ppb)		Ave. Annual Outflow	
		Flow-Weighted	Geometric	Volume (ac-ft/yr)	TP Load (kg/yr)
1	As recommended in Part 2; Add'l compartmentalization and control; Cells 1B, 2B, 3, 4 and 5B as SAV_C4; no additional actions post-2006	13.3*	9.3*	183,000	2,992*
2	As recommended in Part 2; Add'l compartmentalization and control; Cells 1B, 2B, 3, 4 and 5B as NEWS; no additional actions post-2006	22.2	12.9	183,000	5,013
3	As recommended in Part 2; Add'l compartmentalization and control; Cells 1B, 2B, 3, 4 and 5B as NEWS; convert Cells 1A, 2A and 5A to NEWS post-2006	18.5	11.0	183,000	4,177
4	As for Alt. 3, but divert 12% of the inflow volume and load to STA-1E	17.0	10.5	163,900	3,441
* Computed value; 10 ppb taken as lowest sustainable long-term geometric mean concentration; 14 ppb taken as lowest sustainable long-term flow-weighted mean					

Tables 6.2 through 6.5 present additional detail on the estimated treatment performance of Alternatives 1-4, respectively, and consist of screen information taken directly from the DMSTA analyses.

Alternative 4 for STA-1W (diversion of a part of the projected inflow volume and load) is included as, should the SAV communities perform as NEWS in lieu of as SAV_C4, the objective of a long-term geometric mean of 10 ppb in outflows from STA-1W could not otherwise be achieved, even after conversion of the entire footprint of STA-1W to SAV.

The analysis for Alternative 4 was developed by simply limiting total inflows to STA-1W to 88% of the total estimated inflows, with the balance assumed to be diverted to STA-1E. This is a relatively simplistic approach. In practice, should this alternative be eventually considered necessary, it would be appropriate to identify a maximum rate of inflow to STA-1W, above which inflows would be diverted to STA-1E. That approach would be expected to slightly increase, as compared to the analysis summarized in Table 6.5, the beneficial impact on the projected treatment performance in STA-1W.

Table 6.2 Estimated Treatment Performance, STA-1W Alternative 1

Input Variable	Units	Value	Case Description:	Filename: 1W_Alt3_Data.xls	
Design Case Name	-	W Alternative2	Existing, Cells 1,2 & 5A--Emergent & Cell 3,4 & 5B--SAV_C4		
Starting Date for Simulation	-	01/01/65	Alternative 2		
Ending Date for Simulation	-	12/31/95	Redistributed inflows -- Balanced Outflow Concentrations		
Starting Date for Output	-	01/01/65	Reduction of Cell 1 Area, Increase Cell 3 Area		
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	13.3
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	13.3
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	9.3
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	16.9
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	41%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1	2	3	4	5A	5B
Vegetation Type	------->	EMERG	EMERG	SAV_C4	SAV_C4	EMERG	SAV_C4
Inflow Fraction	-	0.39	0.2	0	0	0.41	0
Downstream Cell Number	-	3	4	0	0	6	0
Surface Area	km2	3.015	1.906	5.850	2.914	2.274	9.279
Mean Width of Flow Path	km	1.10	1.74	2.48	1.83	1.78	2.34
Number of Tanks in Series	-	2	2	4	6	2	3
Outflow Control Depth	cm	55	67	46	60	60	60
Outflow Coefficient - Exponent	-	2.35	2.51	2.5	2.5	2.49	2.25
Outflow Coefficient - Intercept	-	1.24	1.38	1.03	1.28	2.75	3.78
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.01038	0.00547	0.00676	0.00485	0	0
Inflow Seepage Control Elev	cm	183	101	163	82	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00346	0	0.00173	0	0.01577	0.00496
Outflow Seepage Control Elev	cm	43	0	40	0	-46	-46
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0	0	0	0	0.91	0.8
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*16*	*80.10*	*80.10*	*15.66*	*80.10*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
C1 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
K - Periphyton	1/yr	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.81	1.55	2.87	4.84	5.55	6.58	6.58
Run Date	-	07/05/02	07/05/02	07/05/02	07/05/02	07/05/02	07/05/02	07/05/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4	5A	5B	otal Outflow
Downstream Cell Label		3	4	Outflow	Outflow	5B	Outflow	-
Surface Area	km2	3.015	1.906	5.85	2.914	2.274	9.279	25.2
Mean Water Load	cm/d	7.0	5.7	4.2	3.8	9.8	2.4	2.1
Max Water Load	cm/d	40.4	32.8	22.4	23.3	56.3	14.5	12.4
Inflow Volume	hm3/yr	77.2	39.6	90.6	41.0	81.2	80.0	197.9
Inflow Load	kg/yr	10693.5	5483.9	7379.5	3254.4	11241.9	7379.8	27419.3
Inflow Conc	ppb	138.5	138.5	81.4	79.5	138.5	92.3	138.5
Treated Outflow Volume	hm3/yr	90.6	41.0	106.7	42.2	80.0	76.8	225.7
Treated Outflow Load	kg/yr	7379.5	3254.4	1410.3	554.0	7379.8	1027.2	2991.5
Treated FWM Outflow Conc	ppb	81.4	79.5	13.2	13.1	92.3	13.4	13.3
Total Outflow Volume	hm3/yr	90.6	41.0	106.7	42.2	80.0	76.8	225.7
Total Outflow Load	kg/yr	7379.5	3254.4	1410.3	554.0	7379.8	1027.2	2991.5
Total FWM Outflow Conc	ppb	81.4	79.5	13.2	13.1	92.3	13.4	13.3
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 6.3 Estimated Treatment Performance, STA-1W Alternative 2

Input Variable	Units	Value	Case Description:	Filename:	1W_Alt2_Data.xls
Design Case Name	-	1W Alt2 NEWS	Existing, Cells 1,2 & 5A--Emergent & Cell 3,4 & 5B--NEWS		
Starting Date for Simulation	-	01/01/65	Alternative 2		
Ending Date for Simulation	-	12/31/95	Redistributed inflows -- Balanced Outflow Concentrations		
Starting Date for Output	-	01/01/65	Reduction of Cell 1 Area, Increase Cell 3 Area		
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	22.2
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	22.2
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	12.9
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	30.9
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	61%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		**1**	**2**	**3**	**4**	**5**	**6**
Cell Label	-	1	2	3	4	5A	5B
Vegetation Type	------->	EMERG	EMERG	NEWS	NEWS	EMERG	NEWS
Inflow Fraction	-	0.39	0.2	0	0	0.41	0
Downstream Cell Number	-	3	4	0	0	6	0
Surface Area	km2	3.015	1.906	5.850	2.914	2.274	9.279
Mean Width of Flow Path	km	1.10	1.74	2.48	1.83	1.78	2.34
Number of Tanks in Series	-	2	2	4	6	2	3
Outflow Control Depth	cm	55	67	46	60	60	60
Outflow Coefficient - Exponent	-	2.35	2.51	2.5	2.5	2.49	2.25
Outflow Coefficient - Intercept	-	1.24	1.38	1.03	1.28	2.75	3.78
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.01038	0.00547	0.00676	0.00485	0	0
Inflow Seepage Control Elev	cm	183	101	163	82	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00346	0	0.00173	0	0.01577	0.00496
Outflow Seepage Control Elev	cm	43	0	40	0	-46	-46
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0	0	0	0	0.91	0.8
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*4*	*12*	*12*	*4*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*16*	*128.70*	*128.70*	*15.66*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*0*	*4*	*4*	*0*	*4*
C1 - Periphyton	ppb	*0*	*0*	*22*	*22*	*0*	*22*
K - Periphyton	1/yr	*0.00*	*0.00*	*23.80*	*23.80*	*0.00*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*0*	*400*	*400*	*0*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*0*	*80*	*80*	*0*	*80*

Output Variables	**Units**	**1**	**2**	**3**	**4**	**5**	**6**	**Overall**
Execution Time	seconds/yr	0.71	1.39	2.68	4.52	5.19	6.16	6.16
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4	5A	5B	otal Outflow
Downstream Cell Label		3	4	Outflow	Outflow	5B	Outflow	-
Surface Area	km2	3.015	1.906	5.85	2.914	2.274	9.279	25.2
Mean Water Load	cm/d	7.0	5.7	4.2	3.8	9.8	2.4	2.1
Max Water Load	cm/d	40.4	32.8	22.4	23.3	56.3	14.5	12.4
Inflow Volume	hm3/yr	77.2	39.6	90.6	41.0	81.2	80.0	197.9
Inflow Load	kg/yr	10693.5	5483.9	7379.5	3254.4	11241.9	7379.8	27419.3
Inflow Conc	ppb	138.5	138.5	81.4	79.5	138.5	92.3	138.5
Treated Outflow Volume	hm3/yr	90.6	41.0	106.7	42.2	80.0	76.8	225.7
Treated Outflow Load	kg/yr	7379.5	3254.4	2318.1	960.1	7379.8	1734.5	5012.8
Treated FWM Outflow Conc	ppb	81.4	79.5	21.7	22.7	92.3	22.6	22.2
Total Outflow Volume	hm3/yr	90.6	41.0	106.7	42.2	80.0	76.8	225.7
Total Outflow Load	kg/yr	7379.5	3254.4	2318.1	960.1	7379.8	1734.5	5012.8
Total FWM Outflow Conc	ppb	81.4	79.5	21.7	22.7	92.3	22.6	22.2
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.4 Estimated Treatment Performance, STA-1W Alternative 3

Case Description: All Cells as NEWS; Alternative 2; Redistributed inflows -- Balanced Outflow Concentrations; Reduction of Cell 1 Area, Increase Cell 3 Area

Filename: 1W_Alt2_Data.xls

Input Variable	Units	Value
Design Case Name	-	Alt2 ALL NEW
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	18.5
Flow-Wtd Conc - Without Bypass	ppb	18.5
Geometric Mean Conc	ppb	11.0
95th Percentile Conc	ppb	27.0
Freq Cell Outflow > 10 ppb	%	54%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1	2	3	4	5A	5B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.39	0.2	0	0	0.41	0
Downstream Cell Number	-	3	4	0	0	6	0
Surface Area	km2	3.015	1.906	5.850	2.914	2.274	9.279
Mean Width of Flow Path	km	1.10	1.74	2.48	1.83	1.78	2.34
Number of Tanks in Series	-	2	2	4	6	2	3
Outflow Control Depth	cm	55	67	46	60	60	60
Outflow Coefficient - Exponent	-	2.35	2.51	2.5	2.5	2.49	2.25
Outflow Coefficient - Intercept	-	1.24	1.38	1.03	1.28	2.75	3.78
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.01038	0.00547	0.00676	0.00485	0	0
Inflow Seepage Control Elev	cm	183	101	163	82	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00346	0	0.00173	0	0.01577	0.00496
Outflow Seepage Control Elev	cm	43	0	40	0	-46	-46
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0	0	0	0	0.91	0.8
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.77	1.45	2.74	4.58	5.29	6.32	6.32
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4	5A	5B	otal Outflow
Downstream Cell Label		3	4	Outflow	Outflow	5B	Outflow	-
Surface Area	km2	3.015	1.906	5.85	2.914	2.274	9.279	25.2
Mean Water Load	cm/d	7.0	5.7	4.2	3.8	9.8	2.4	2.1
Max Water Load	cm/d	40.4	32.8	22.4	23.3	56.3	14.5	12.4
Inflow Volume	hm3/yr	77.2	39.6	90.6	41.0	81.2	80.0	197.9
Inflow Load	kg/yr	10693.5	5483.9	3735.6	1665.6	11241.9	4208.6	27419.3
Inflow Conc	ppb	138.5	138.5	41.2	40.7	138.5	52.6	138.5
Treated Outflow Volume	hm3/yr	90.6	41.0	106.7	42.2	80.0	76.8	225.7
Treated Outflow Load	kg/yr	3735.6	1665.6	1974.1	773.1	4208.6	1429.5	4176.7
Treated FWM Outflow Conc	ppb	41.2	40.7	18.5	18.3	52.6	18.6	18.5
Total Outflow Volume	hm3/yr	90.6	41.0	106.7	42.2	80.0	76.8	225.7
Total Outflow Load	kg/yr	3735.6	1665.6	1974.1	773.1	4208.6	1429.5	4176.7
Total FWM Outflow Conc	ppb	41.2	40.7	18.5	18.3	52.6	18.6	18.5
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.5 Estimated Treatment Performance, STA-1W Alternative 4

Input Variable	Units	Value
Design Case Name	-	LL NEWS w D
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: Filename: 1W_Alt2_Data.xls

All Cells as NEWS
Alternative 2
Redistributed inflows -- Assume Addl. 12% Of InflowDiverted
Reduction of Cell 1 Area, Increase Cell 3 Area

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	17.0
Flow-Wtd Conc - Without Bypass	ppb	17.0
Geometric Mean Conc	ppb	10.5
95th Percentile Conc	ppb	24.8
Freq Cell Outflow > 10 ppb	%	52%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1	2	3	4	5A	5B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.343	0.176	0	0	0.361	0
Downstream Cell Number	-	3	4	0	0	6	0
Surface Area	km2	3.015	1.906	5.850	2.914	2.274	9.279
Mean Width of Flow Path	km	1.10	1.74	2.48	1.83	1.78	2.34
Number of Tanks in Series	-	2	2	4	6	2	3
Outflow Control Depth	cm	55	67	46	60	60	60
Outflow Coefficient - Exponent	-	2.35	2.51	2.5	2.5	2.49	2.25
Outflow Coefficient - Intercept	-	1.24	1.38	1.03	1.28	2.75	3.78
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.01038	0.00547	0.00676	0.00485	0	0
Inflow Seepage Control Elev	cm	183	101	163	82	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00346	0	0.00173	0	0.01577	0.00496
Outflow Seepage Control Elev	cm	43	0	40	0	-46	-46
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0	0	0	0	0.91	0.8
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.77	1.45	2.74	4.58	5.26	6.26	6.26
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4	5A	5B	otal Outflow
Downstream Cell Label		3	4	Outflow	Outflow	5B	Outflow	-
Surface Area	km2	3.015	1.906	5.85	2.914	2.274	9.279	25.2
Mean Water Load	cm/d	6.2	5.0	3.8	3.4	8.6	2.1	1.9
Max Water Load	cm/d	35.5	28.8	19.9	20.6	49.6	12.8	12.4
Inflow Volume	hm3/yr	67.9	34.8	81.4	36.2	71.5	70.3	174.2
Inflow Load	kg/yr	9404.8	4825.8	3171.2	1389.1	9898.4	3517.3	24129.0
Inflow Conc	ppb	138.5	138.5	38.9	38.4	138.5	50.0	138.5
Treated Outflow Volume	hm3/yr	81.4	36.2	97.6	37.5	70.3	67.1	202.2
Treated Outflow Load	kg/yr	3171.2	1389.1	1669.8	625.4	3517.3	1145.5	3440.7
Treated FWM Outflow Conc	ppb	38.9	38.4	17.1	16.7	50.0	17.1	17.0
Total Outflow Volume	hm3/yr	81.4	36.2	97.6	37.5	70.3	67.1	202.2
Total Outflow Load	kg/yr	3171.2	1389.1	1669.8	625.4	3517.3	1145.5	3440.7
Total FWM Outflow Conc	ppb	38.9	38.4	17.1	16.7	50.0	17.1	17.0
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

6.1.1.2 Possible Future Modifications, STA-1E

As discussed in Parts 2 and 3 of this *Long-Term Plan*, the pre-2006 strategy for STA-1E is to convert Cells 2, 4N, 4S, and 6 from emergent macrophyte to submerged aquatic vegetation (SAV), and to divert discharges from Acme Improvement District Basin B to STA-1E for treatment. Additional coordination will occur between the District and the Corps in full accord with the Project Cooperation Agreement for STA-1E executed on April 29, 1999. If the SAV can be made to perform as intended (e.g., as SAV_C4), the projected treatment performance is capable of meeting the assigned objective of a long-term geometric mean concentration of 10 ppb. However, in the instance of STA-1E, a number of uncertainties remain. The most significant of those uncertainties include:

- The extent to which the SAV community can be made to reliably replicate on a long-term basis the SAV_C4 level of performance;
- Substantial uncertainty in the inflow volumes and TP concentrations to STA-1E;
- The extent to which inflow patterns can be relied upon to maintain the SAV communities in STA-1E in a hydrated condition;
- The extent to which it may eventually be found necessary to partially divert STA-1W inflow volumes and loads to STA-1E.

In this section, possible future modifications and enhancements to STA-1E are considered. It is not recommended that any such additional modifications and enhancements be considered for implementation until such time as additional information resulting from the PDE component (see Part 5 of this Long-Term Plan) is available and demonstrates:

- The need for additional modifications or enhancements;
- The extent to which the additional modifications or enhancements can be reliably demonstrated to contribute to an ability to meet the phosphorus criterion.

A summary of the possible future alternatives for STA-1E is presented in Table 6.6.

Table 6.6 Possible Post-2006 Alternatives, STA-1E

Alt. No.	Description	Long-Term Mean TP Concentration (ppb)		Ave. Annual Outflow	
		Flow-Weighted	Geometric	Volume (ac-ft/yr)	TP Load (kg/yr)
1	As recommended in Parts 2 & 3; Cells 2, 4N, 4S, and 6 as SAV_C4; no additional actions post-2006	15.4	8.4*	175,000	3,329
2	As recommended in Parts 2 & 3; Cells 2, 4N, 4S, and 6 as NEWS; no additional actions post-2006	24.3	11.5	175,000	5,246
3	As recommended in Parts 2 & 3; Cells 2, 4N, 4S, and 6 as NEWS; convert Cells 1, 3, 5 & 7 to NEWS post-2006	22.0	10.0	175,000	4,749
4	As recommended in Parts 2 & 3; add 320 acres ** effective area in Section 24-44-40 to eastern flow path (new Cell 2S); Cells 2, 2S, 4N, 4S and 6 as NEWS	23.0	11.0	174,100	4,950
5	As for Alt. 4; also convert Cells 1, 3, 5 & 7 to NEWS	21.2	9.7*	174,100	4,547
6	As for Alt. 3; add flows and loads diverted from STA-1W	23.2	10.3	195,500	5,590
7	As for Alt. 5; add flows and loads diverted from STA-1W	22.2	10.0	193,300	5,303
* Computed value; 10 ppb taken as lowest sustainable long-term geometric mean concentration					
** Estimated max. additional effective area that can be developed on total of 415 acres					

Tables 6.7 through 6.13 present additional detail on the estimated treatment performance of Alternatives 1-7, respectively. For alternatives 1 through 5, inflows to the treatment area are taken as the estimated outflows and TP concentrations from the Distribution Cells (consistent with Table 2.14 of the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, Burns & McDonnell). Analyses for Alternatives 6 and 7 are approximate in nature; the estimated outflow volumes from the Distribution Cells were simply increased on a daily basis as necessary to reflect the possible diversion of 12% of the STA-1W inflows to STA-1E. Daily TP concentrations in those outflows were maintained at those reflected in the analyses for Alternatives 1 through 5. Future analyses should be conducted in a more rigorous fashion. The errors introduced by this simplification can be considered generally compensating in nature, with the result that the projected treatment performance is considered representative.

Table 6.7 Estimated Treatment Performance, STA-1E Alternative 1

Case Description: ACME inflow and concentrations added to original inflows; Redistributed flows for cells 3 and 5; SAV_C4 in cells 2, 4, and 6; 25% BMP controls

Filename: 1E_Alt2_SAV_C4_p2_Data.xls

Input Variable	Units	Value
Design Case Name	-	E Alt 2 SAV_C4
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	2
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.0%
Flow-Wtd Conc - With Bypass	ppb	15.4
Flow-Wtd Conc - Without Bypass	ppb	15.4
Geometric Mean Conc	ppb	8.4
95th Percentile Conc	ppb	18.6
Freq Cell Outflow > 10 ppb	%	44%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1	2	3	4NS	5,7	6
Vegetation Type	------->	EMERG	SAV_C4	EMERG	SAV_C4	EMERG	SAV_C4
Inflow Fraction	-	0.2	0	0.39	0	0.41	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.250	2.233	2.384	5.653	4.002	4.245
Mean Width of Flow Path	km	1.55	1.46	1.56	1.55	2.50	1.99
Number of Tanks in Series	-	3	3	3	8	3	3
Outflow Control Depth	cm	40	60	40	60	40	60
Outflow Coefficient - Exponent	-	2.36	2.31	2.29	2.33	2.32	2.34
Outflow Coefficient - Intercept	-	2.44	2.94	1.12	1.41	0.79	1.15
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0.00361	0.00335	0.00443	0.01121
Inflow Seepage Control Elev	cm	0	0	122	100	87	129
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00765	0.01537	0.00361	0.00539	0	0
Outflow Seepage Control Elev	cm	-69	-38	30	-17	0	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.77	0.81	0	0.31	0	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*80*	*15.66*	*80.10*	*15.66*	*80.10*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
C1 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
K - Periphyton	1/yr	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.74	1.42	2.13	3.84	4.58	5.26	5.26
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4NS	5,7	6	otal Outflow
Downstream Cell Label		2	Outflow	4NS	Outflow	6	Outflow	-
Surface Area	km2	2.250	2.233	2.384	5.653	4.002	4.245	20.8
Mean Water Load	cm/d	5.0	4.8	9.1	4.0	5.7	5.6	2.7
Max Water Load	cm/d	63.8	64.8	117.5	47.7	73.6	65.1	34.6
Inflow Volume	hm3/yr	40.8	39.5	79.6	81.7	83.7	86.8	204.0
Inflow Load	kg/yr	4620.7	2742.2	9010.4	6722.5	9472.5	6105.6	23103.6
Inflow Conc	ppb	113.2	69.4	113.2	82.2	113.2	70.4	113.2
Treated Outflow Volume	hm3/yr	39.5	37.6	81.7	79.3	86.8	99.0	215.9
Treated Outflow Load	kg/yr	2742.2	686.4	6722.5	1036.0	6105.6	1606.8	3329.2
Treated FWM Outflow Conc	ppb	69.4	18.3	82.2	13.1	70.4	16.2	15.4
Total Outflow Volume	hm3/yr	39.5	37.6	81.7	79.3	86.8	99.0	215.9
Total Outflow Load	kg/yr	2742.2	686.4	6722.5	1036.0	6105.6	1606.8	3329.2
Total FWM Outflow Conc	ppb	69.4	18.3	82.2	13.1	70.4	16.2	15.4
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.8 Estimated Treatment Performance, STA-1E Alternative 2

Input Variable	Units	Value	Case Description:	Filename:	1E_Alt2_SAV_C4_p2_Data.xls
Design Case Name	-	1E Alt 2 NEWS	ACME inflow and concentrations added to original inflows		
Starting Date for Simulation	-	01/01/65	Redistributed flows for cells 3 and 5		
Ending Date for Simulation	-	12/31/95	SAV_C4 in cells 2, 4, and 6		
Starting Date for Output	-	01/01/65	25% BMP controls		
Steps Per Day	-	2	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	24.3
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	24.3
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	11.5
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	31.4
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	56%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1	2	3	4NS	5,7	6
Vegetation Type	------->	EMERG	NEWS	EMERG	NEWS	EMERG	NEWS
Inflow Fraction	-	0.2	0	0.39	0	0.41	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.250	2.233	2.384	5.653	4.002	4.245
Mean Width of Flow Path	km	1.55	1.46	1.56	1.55	2.50	1.99
Number of Tanks in Series	-	3	3	3	8	3	3
Outflow Control Depth	cm	40	60	40	60	40	60
Outflow Coefficient - Exponent	-	2.36	2.31	2.29	2.33	2.32	2.34
Outflow Coefficient - Intercept	-	2.44	2.94	1.12	1.41	0.79	1.15
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0.00361	0.00335	0.00443	0.01121
Inflow Seepage Control Elev	cm	0	0	122	100	87	129
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00765	0.01537	0.00361	0.00539	0	0
Outflow Seepage Control Elev	cm	-69	-38	30	-17	0	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.77	0.81	0	0.31	0	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*4*	*12*	*4*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*15.66*	*128.70*	*15.66*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*0*	*4*	*0*	*4*
C1 - Periphyton	ppb	*0*	*22*	*0*	*22*	*0*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*0.00*	*23.80*	*0.00*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*0*	*400*	*0*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*0*	*80*	*0*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.77	1.48	2.19	3.94	4.61	5.32	5.32
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4NS	5,7	6	otal Outflow
Downstream Cell Label		2	Outflow	4NS	Outflow	6	Outflow	-
Surface Area	km2	2.250	2.233	2.384	5.653	4.002	4.245	20.8
Mean Water Load	cm/d	5.0	4.8	9.1	4.0	5.7	5.6	2.7
Max Water Load	cm/d	63.8	64.8	117.5	47.7	73.6	65.1	34.6
Inflow Volume	hm3/yr	40.8	39.5	79.6	81.7	83.7	86.8	204.0
Inflow Load	kg/yr	4620.7	2742.2	9010.4	6722.5	9472.5	6105.6	23103.6
Inflow Conc	ppb	113.2	69.4	113.2	82.2	113.2	70.4	113.2
Treated Outflow Volume	hm3/yr	39.5	37.6	81.7	79.3	86.8	99.0	215.9
Treated Outflow Load	kg/yr	2742.2	1068.7	6722.5	1778.3	6105.6	2399.1	5246.1
Treated FWM Outflow Conc	ppb	69.4	28.4	82.2	22.4	70.4	24.2	24.3
Total Outflow Volume	hm3/yr	39.5	37.6	81.7	79.3	86.8	99.0	215.9
Total Outflow Load	kg/yr	2742.2	1068.7	6722.5	1778.3	6105.6	2399.1	5246.1
Total FWM Outflow Conc	ppb	69.4	28.4	82.2	22.4	70.4	24.2	24.3
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.9Estimated Treatment Performance, STA-1E Alternative 3

Input Variable	Units	Value	Case Description:	Filename: 1E_Alt2_SAV_C4_p2_Data.xls
Design Case Name	-	Alt 2 ALL NEW	ACME inflow and concentrations added to original inflows	
Starting Date for Simulation	-	01/01/65	Redistributed flows for cells 3 and 5	
Ending Date for Simulation	-	12/31/95	SAV_C4 in cells 2, 4, and 6	
Starting Date for Output	-	01/01/65	25% BMP controls	
Steps Per Day	-	2		
Number of Iterations	-	2		
Output Averaging Interval	days	7		
Reservoir H2O Residence Time	days	0		
Max Inflow / Mean Inflow	-	0		
Max Reservoir Storage	hm3	0		
Reservoir P Decay Rate	1/yr/ppb	0		
Rainfall P Conc	ppb	10		
Atmospheric P Load (Dry)	mg/m2-yr	20		

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	22.0
Flow-Wtd Conc - Without Bypass	ppb	22.0
Geometric Mean Conc	ppb	10.0
95th Percentile Conc	ppb	28.9
Freq Cell Outflow > 10 ppb	%	41%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1	2	3	4NS	5,7	6
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.2	0	0.39	0	0.41	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.250	2.233	2.384	5.653	4.002	4.245
Mean Width of Flow Path	km	1.55	1.46	1.56	1.55	2.50	1.99
Number of Tanks in Series	-	3	3	3	8	3	3
Outflow Control Depth	cm	40	60	40	60	40	60
Outflow Coefficient - Exponent	-	2.36	2.31	2.29	2.33	2.32	2.34
Outflow Coefficient - Intercept	-	2.44	2.94	1.12	1.41	0.79	1.15
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0.00361	0.00335	0.00443	0.01121
Inflow Seepage Control Elev	cm	0	0	122	100	87	129
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00765	0.01537	0.00361	0.00539	0	0
Outflow Seepage Control Elev	cm	-69	-38	30	-17	0	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.77	0.81	0	0.31	0	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.81	1.52	2.23	3.97	4.68	5.42	5.42
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4NS	5,7	6	otal Outflow
Downstream Cell Label		2	Outflow	4NS	Outflow	6	Outflow	-
Surface Area	km2	2.250	2.233	2.384	5.653	4.002	4.245	20.8
Mean Water Load	cm/d	5.0	4.8	9.1	4.0	5.7	5.6	2.7
Max Water Load	cm/d	63.8	64.8	117.5	47.7	73.6	65.1	34.6
Inflow Volume	hm3/yr	40.8	39.5	79.6	81.7	83.7	86.8	204.0
Inflow Load	kg/yr	4620.7	1677.0	9010.4	3560.4	9472.5	3156.2	23103.6
Inflow Conc	ppb	113.2	42.4	113.2	43.6	113.2	36.4	113.2
Treated Outflow Volume	hm3/yr	39.5	37.6	81.7	79.3	86.8	99.0	215.9
Treated Outflow Load	kg/yr	1677.0	964.4	3560.4	1677.6	3156.2	2107.4	4749.4
Treated FWM Outflow Conc	ppb	42.4	25.7	43.6	21.2	36.4	21.3	22.0
Total Outflow Volume	hm3/yr	39.5	37.6	81.7	79.3	86.8	99.0	215.9
Total Outflow Load	kg/yr	1677.0	964.4	3560.4	1677.6	3156.2	2107.4	4749.4
Total FWM Outflow Conc	ppb	42.4	25.7	43.6	21.2	36.4	21.3	22.0
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.10 Estimated Treatment Performance, STA-1E Alternative 4

Input Variable	Units	Value
Design Case Name	-	Add Section 24
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	2
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: **Filename:** **1E_Alt2_SAV_C4_p2_Data.xls**

ACME inflow and concentrations added to original inflows
Redistributed flows for cells 3 and 5; added Section 24
NEWS in cells 2, 4, and 6
25% BMP controls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	23.0
Flow-Wtd Conc - Without Bypass	ppb	23.0
Geometric Mean Conc	ppb	11.0
95th Percentile Conc	ppb	29.8
Freq Cell Outflow > 10 ppb	%	53%
Bypass Load	%	0.0%

Cell Number -->		**1**	**2**	**3**	**4**	**5**	**6**
Cell Label	-	1	2	3	4NS	5,7	6
Vegetation Type	------->	EMERG	NEWS	EMERG	NEWS	EMERG	NEWS
Inflow Fraction	-	0.23	0	0.41	0	0.36	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.250	3.528	2.384	5.653	4.002	4.245
Mean Width of Flow Path	km	1.55	1.46	1.56	1.55	2.50	1.99
Number of Tanks in Series	-	3	6	3	8	3	3
Outflow Control Depth	cm	40	60	40	60	40	60
Outflow Coefficient - Exponent	-	2.36	2.31	2.29	2.33	2.32	2.34
Outflow Coefficient - Intercept	-	2.44	2.94	1.12	1.41	0.79	1.15
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0.00361	0.00335	0.00443	0.01121
Inflow Seepage Control Elev	cm	0	0	122	100	87	129
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00765	0.01537	0.00361	0.00539	0	0
Outflow Seepage Control Elev	cm	-69	-38	30	-17	0	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.77	0.81	0	0.31	0	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*4*	*12*	*4*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*15.66*	*128.70*	*15.66*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*0*	*4*	*0*	*4*
C1 - Periphyton	ppb	*0*	*22*	*0*	*22*	*0*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*0.00*	*23.80*	*0.00*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*0*	*400*	*0*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*0*	*80*	*0*	*80*

Output Variables	**Units**	**1**	**2**	**3**	**4**	**5**	**6**	**Overall**
Execution Time	seconds/yr	0.81	2.13	2.81	4.58	5.26	6.00	6.00
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4NS	5,7	6	otal Outflow
Downstream Cell Label		2	Outflow	4NS	Outflow	6	Outflow	-
Surface Area	km2	2.250	3.528	2.384	5.653	4.002	4.245	22.1
Mean Water Load	cm/d	5.7	3.5	9.6	4.2	5.0	4.9	2.5
Max Water Load	cm/d	73.4	46.9	123.5	50.2	64.6	57.0	32.5
Inflow Volume	hm3/yr	46.9	45.6	83.7	85.8	73.5	76.6	204.0
Inflow Load	kg/yr	5313.8	3321.7	9472.5	7141.1	8317.3	5147.9	23103.6
Inflow Conc	ppb	113.2	72.8	113.2	83.2	113.2	67.2	113.2
Treated Outflow Volume	hm3/yr	45.6	42.6	85.8	83.3	76.6	88.9	214.8
Treated Outflow Load	kg/yr	3321.7	1019.3	7141.1	1916.0	5147.9	2014.5	4949.8
Treated FWM Outflow Conc	ppb	72.8	23.9	83.2	23.0	67.2	22.7	23.0
Total Outflow Volume	hm3/yr	45.6	42.6	85.8	83.3	76.6	88.9	214.8
Total Outflow Load	kg/yr	3321.7	1019.3	7141.1	1916.0	5147.9	2014.5	4949.8
Total FWM Outflow Conc	ppb	72.8	23.9	83.2	23.0	67.2	22.7	23.0
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.11 Estimated Treatment Performance, STA-1E Alternative 5

Input Variable	Units	Value
Design Case Name	-	ection 24 All NE
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	2
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: **Filename:** **1E_Alt2_SAV_C4_p2_Data.xls**

ACME inflow and concentrations added to original inflows
Redistributed flows for cells 3 and 5; added Section 24
NEWS in all cells
25% BMP controls in Acme Basin B

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	21.2
Flow-Wtd Conc - Without Bypass	ppb	21.2
Geometric Mean Conc	ppb	9.7
95th Percentile Conc	ppb	27.8
Freq Cell Outflow > 10 ppb	%	37%
Bypass Load	%	0.0%

Cell Number -->		**1**	**2**	**3**	**4**	**5**	**6**
Cell Label	-	1	2	3	4NS	5,7	6
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.23	0	0.41	0	0.36	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.250	3.528	2.384	5.653	4.002	4.245
Mean Width of Flow Path	km	1.55	1.46	1.56	1.55	2.50	1.99
Number of Tanks in Series	-	3	6	3	8	3	3
Outflow Control Depth	cm	40	60	40	60	40	60
Outflow Coefficient - Exponent	-	2.36	2.31	2.29	2.33	2.32	2.34
Outflow Coefficient - Intercept	-	2.44	2.94	1.12	1.41	0.79	1.15
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0.00361	0.00335	0.00443	0.01121
Inflow Seepage Control Elev	cm	0	0	122	100	87	129
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00765	0.01537	0.00361	0.00539	0	0
Outflow Seepage Control Elev	cm	-69	-38	30	-17	0	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.77	0.81	0	0.31	0	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.77	2.13	2.84	4.58	5.29	6.00	6.00
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4NS	5,7	6	otal Outflow
Downstream Cell Label		2	Outflow	4NS	Outflow	6	Outflow	-
Surface Area	km2	2.250	3.528	2.384	5.653	4.002	4.245	22.1
Mean Water Load	cm/d	5.7	3.5	9.6	4.2	5.0	4.9	2.5
Max Water Load	cm/d	73.4	46.9	123.5	50.2	64.6	57.0	32.5
Inflow Volume	hm3/yr	46.9	45.6	83.7	85.8	73.5	76.6	204.0
Inflow Load	kg/yr	5313.8	2012.7	9472.5	3785.8	8317.3	2688.4	23103.6
Inflow Conc	ppb	113.2	44.1	113.2	44.1	113.2	35.1	113.2
Treated Outflow Volume	hm3/yr	45.6	42.6	85.8	83.3	76.6	88.9	214.8
Treated Outflow Load	kg/yr	2012.7	962.9	3785.8	1802.7	2688.4	1781.3	4546.9
Treated FWM Outflow Conc	ppb	44.1	22.6	44.1	21.6	35.1	20.0	21.2
Total Outflow Volume	hm3/yr	45.6	42.6	85.8	83.3	76.6	88.9	214.8
Total Outflow Load	kg/yr	2012.7	962.9	3785.8	1802.7	2688.4	1781.3	4546.9
Total FWM Outflow Conc	ppb	44.1	22.6	44.1	21.6	35.1	20.0	21.2
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.12 Estimated Treatment Performance, STA-1E Alternative 6

Case Description:
ACME inflow and concentrations added to original inflows
Redistributed flows for cells 3 and 5
NEWS in all cells; include 12% diversion from STA-1W
25% BMP controls

Filename: 1E_Alt2_SAV_C4_p2_Data.xls

Input Variable	Units	Value
Design Case Name	-	LL NEWS w ST
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	2
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	23.2
Flow-Wtd Conc - Without Bypass	ppb	23.2
Geometric Mean Conc	ppb	10.3
95th Percentile Conc	ppb	30.7
Freq Cell Outflow > 10 ppb	%	43%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1	2	3	4NS	5,7	6
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.232	0	0.435	0	0.458	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.250	2.233	2.384	5.653	4.002	4.245
Mean Width of Flow Path	km	1.55	1.46	1.56	1.55	2.50	1.99
Number of Tanks in Series	-	3	3	3	8	3	3
Outflow Control Depth	cm	40	60	40	60	40	60
Outflow Coefficient - Exponent	-	2.36	2.31	2.29	2.33	2.32	2.34
Outflow Coefficient - Intercept	-	2.44	2.94	1.12	1.41	0.79	1.15
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0.00361	0.00335	0.00443	0.01121
Inflow Seepage Control Elev	cm	0	0	122	100	87	129
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00765	0.01537	0.00361	0.00539	0	0
Outflow Seepage Control Elev	cm	-69	-38	30	-17	0	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.77	0.81	0	0.31	0	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.77	1.48	2.19	3.94	4.71	5.42	5.42
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4NS	5,7	6	otal Outflow
Downstream Cell Label		2	Outflow	4NS	Outflow	6	Outflow	-
Surface Area	km2	2.250	2.233	2.384	5.653	4.002	4.245	20.8
Mean Water Load	cm/d	5.8	5.6	10.2	4.4	6.4	6.2	3.0
Max Water Load	cm/d	74.0	74.7	131.0	53.3	82.2	72.9	34.6
Inflow Volume	hm3/yr	47.3	46.0	88.8	90.9	93.5	96.5	229.6
Inflow Load	kg/yr	5360.0	2035.3	10050.1	4072.5	10581.5	3616.2	25991.6
Inflow Conc	ppb	113.2	44.2	113.2	44.8	113.2	37.5	113.2
Treated Outflow Volume	hm3/yr	46.0	44.1	90.9	88.4	96.5	108.7	241.1
Treated Outflow Load	kg/yr	2035.3	1195.3	4072.5	1962.5	3616.2	2432.2	5589.9
Treated FWM Outflow Conc	ppb	44.2	27.1	44.8	22.2	37.5	22.4	23.2
Total Outflow Volume	hm3/yr	46.0	44.1	90.9	88.4	96.5	108.7	241.1
Total Outflow Load	kg/yr	2035.3	1195.3	4072.5	1962.5	3616.2	2432.2	5589.9
Total FWM Outflow Conc	ppb	44.2	27.1	44.8	22.2	37.5	22.4	23.2
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.13 Estimated Treatment Performance, STA-1E Alternative 7

Input Variable	Units	Value
Design Case Name	-	24 All NEWS w
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	2
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: **Filename:** **1E_Alt2_SAV_C4_p2_Data.xls**

ACME inflow and concentrations added to original inflows
Redistributed flows for cells 3 and 5; added Section 24
NEWS in all cells
25% BMP controls in Acme Basin B

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	22.2
Flow-Wtd Conc - Without Bypass	ppb	22.2
Geometric Mean Conc	ppb	10.0
95th Percentile Conc	ppb	29.4
Freq Cell Outflow > 10 ppb	%	40%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1	2	3	4NS	5,7	6
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.257	0	0.458	0	0.402	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.250	3.528	2.384	5.653	4.002	4.245
Mean Width of Flow Path	km	1.55	1.46	1.56	1.55	2.50	1.99
Number of Tanks in Series	-	3	6	3	8	3	3
Outflow Control Depth	cm	40	60	40	60	40	60
Outflow Coefficient - Exponent	-	2.36	2.31	2.29	2.33	2.32	2.34
Outflow Coefficient - Intercept	-	2.44	2.94	1.12	1.41	0.79	1.15
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0.00361	0.00335	0.00443	0.01121
Inflow Seepage Control Elev	cm	0	0	122	100	87	129
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.00765	0.01537	0.00361	0.00539	0	0
Outflow Seepage Control Elev	cm	-69	-38	30	-17	0	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.77	0.81	0	0.31	0	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	0.74	2.10	2.81	4.55	5.26	6.00	6.00
Run Date	-	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02	12/02/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1	2	3	4NS	5,7	6	otal Outflow
Downstream Cell Label		2	Outflow	4NS	Outflow	6	Outflow	-
Surface Area	km2	2.250	3.528	2.384	5.653	4.002	4.245	22.1
Mean Water Load	cm/d	6.4	4.0	10.7	4.6	5.6	5.5	2.8
Max Water Load	cm/d	82.0	52.1	137.9	56.2	72.1	63.8	32.5
Inflow Volume	hm3/yr	52.4	51.1	93.5	95.5	82.0	85.2	227.9
Inflow Load	kg/yr	5937.6	2321.2	10581.5	4341.1	9287.7	3080.6	25806.7
Inflow Conc	ppb	113.2	45.4	113.2	45.4	113.2	36.2	113.2
Treated Outflow Volume	hm3/yr	51.1	48.1	95.5	93.0	85.2	97.4	238.4
Treated Outflow Load	kg/yr	2321.2	1136.4	4341.1	2112.5	3080.6	2054.4	5303.4
Treated FWM Outflow Conc	ppb	45.4	23.6	45.4	22.7	36.2	21.1	22.2
Total Outflow Volume	hm3/yr	51.1	48.1	95.5	93.0	85.2	97.4	238.4
Total Outflow Load	kg/yr	2321.2	1136.4	4341.1	2112.5	3080.6	2054.4	5303.4
Total FWM Outflow Conc	ppb	45.4	23.6	45.4	22.7	36.2	21.1	22.2
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

As indicated in Table 6.6, in the event that the recommended SAV communities in Cells 2, 4N, 4S and 6 perform more as NEWS than as SAV_C4, the best treatment performance that could be projected as obtainable within the footprint of STA-1E, expanded to include all available agricultural lands west of Flying Cow Road, is that for Alternative 5. Should it eventually be found necessary to divert a part of the STA-1W inflows to STA-1E, the best treatment performance that could be projected is that for Alternative 7. The remainder of the discussion of possible future modifications to STA-1W and STA-1E in this section is based on an assumption of a future need for Alternative 4 in STA-1W, and Alternative 7 in STA-1E. However, it should be noted that the addition of available lands in Section 24 impacts but nominally the projected treatment performance, and as a result should be contemplated only as a final step.

6.1.1.3 Summary of Possible Future Enhancements

The following is a summary listing of all presently identified possible future enhancements and modifications to STA-1W, excluding only diversion of some part of the projected inflow volumes and loads to some other (presently unidentified) receiving water body, in addition to the potential diversion to STA-1E. These modifications are consistent with Alternatives 3 and 4 as summarized in Table 6.1.

- Conversion of Cells 1A, 2A and 5A from emergent macrophyte vegetation to submerged aquatic vegetation (SAV).

Sufficient infrastructure will be present in STA-1W and STA-1E to accommodate the potential diversion of inflows from STA-1W to STA-1E, should that eventually be found necessary.

The following is a summary listing of all presently identified possible future enhancements and modifications to STA-1E, excluding only diversion of some part of the projected inflow volumes and loads to some other (presently unidentified) receiving water body. These modifications are consistent with Alternatives 5 and 7 as summarized in Table 6.6.

- Expansion of the easterly flow path (Cells 1 and 2) of STA-1E to include all available lands within Section 24, T44S, R40E. Those additional lands include 375 acres previously acquired by SFWMD, together with an additional 40-acre parcel. This expansion is estimated to add approximately 320 acres of effective treatment area to the easterly flow path, and is expected to require:
  - Addition of one outflow control structure to Cell 2 (S-365C);
  - Reconstruction of Levee L-85 around the perimeter of the new cell (total length of approximately 2.6 miles, levee height of approximately 10 feet above grade);
  - Addition of approximately 2.1 miles of east-west interior levees, extending east from existing Interior Levee 6 to the relocated L-85 along Flying Cow Road;
  - Construction of approximately 6 new water control structures (3 inflow control, 3 outflow control) to serve the new cell, together with approximately 2.1 miles of new power distribution lines to serve those structures;
  - Construction of approximately 1.0 mile of new Access Road to Pumping Station S-362 along the south line of the new cell;
  - Development of a new seepage collection canal along the north, east, and south lines of the new cell;
  - Addition of a new seepage return pumping station serving the north, east and south lines of the new cell (estimated capacity of approximately 30 cfs, including 10 cfs in standby capacity);
  - Degradation of the following elements of STA-1E as presently designed along the west line of the new cell:
    - Access road to Pumping Station S-362;
    - Seepage Collection Canal;
    - Levee L-85;

- Discharge Canal (the existing discharge canal would be terminated near the northwest corner of the new cell, then extended easterly adjacent to and south of new Levee L-85 to form an Inflow Canal along the north line of the new cell).

- Construction of a new discharge canal along the south line of the new cell, reconnecting to the existing Discharge Canal near the southwesterly corner of the new cell;
- Conversion of approximately 2,134 acres of emergent macrophyte vegetation in Cells 1, 3, 5 and 7 to SAV;
- Development of the new cell (Cell 2S) in SAV.

6.1.1.4 Opinion of Capital Cost

An opinion of the probable capital cost for implementation of the possible future Alternative 3 (and 4) at STA-1W is presented in Table 6.14. That opinion of capital cost is stated in FY 2003 dollars.

Table 6.14 Opinion of Capital Cost, Future STA-1W Enhancements, Alt. 3

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Eradication of Existing Vegetation	1778	ac	$200	$355,600	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$355,600**	**$360,000**
Planning, Engineering & Design		10	%		$35,560	**$36,000**
Program & Construction Management		10	%		$35,560	**$36,000**
Total Estimated Cost, Without Contingency					**$426,720**	**$432,000**
Contingency		30	%		$128,016	**$118,000**
TOTAL ESTIMATED CAPITAL COST					**$554,736**	**$550,000**

An opinion of the probable capital cost for implementation of the possible future Alternative 5 (and 7) at STA-1E is presented in Table 6.15. That opinion of capital cost is stated in FY 2003 dollars.

Table 6.15 Opinion of Capital Cost, Future STA-1E Enhancements, Alt. 5

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Reconstruct Levee L-85 along north, east and south lines of new Cell 2S (10' height)	2.6	Mi.	$703,000	$1,827,800	Unit cost from Evaluation Methodology
2	New Internal Levees, 8' height	2.1	Mi.	$485,000	$1,018,500	Unit cost from Evaluation Methodology
3	Blasting for New Levee and Canals	4.7	Mi.	$48,000	$225,600	
4	New Water Control Structures in Cell 2S, Cell 2 (S-365C) (8'x8' similar to G-381, Gated)	7	Ea.	$190,000	$1,330,000	
5	Degrade Exist Levee L-85, Discharge Canal, Seepage Canal, and Access Road	0.6	Mi.	$450,000	$270,000	
6	Internal Disking and Land Prep	320	Ac.	$60	$19,200	Roughly equivalent to two 8'x8' RCBs
7	Water Control Structure Electrical (Includes Telemetry)	7	Ea.	$43,000	$301,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
8	Stilling Wells (Includes Electrical and Telemetry)	4	Ea.	$9,000	$36,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
9	Establish New Flow & Water Quality Monintoring Sites	2	Ea.	$10,000	$20,000	
10	Electrical Power Distribution	2.1	Mi.	$80,000	$168,000	Unit cost from Evaluation Methodology
11	Construct New Access Road	1.0	Mi.	$1,500,000	$1,500,000	
12	Interior Grading in Cell 2S	Job	Lump	Allow	$400,000	
13	Seepage Return Pumping Station	30	cfs	$7,600	$228,000	Unit cost from Evaluation Methodology
14	Eradication of Existing Vegetation, Cells 1, 3, 5 and 7	2134	ac	$200	$426,800	Unit cost from 02/2002 STSOC for SAV/LR
	Subtotal, Estimated Construction Costs				**$7,770,900**	**7,800,000**
	Planning, Engineering & Design	10	%		$777,090	**780,000**
	Program & Construction Management	10	%		$777,090	**780,000**
	Total Estimated Cost, Without Contingency				**$9,325,080**	**9,360,000**
	Contingency	30	%		$2,797,524	**2,770,000**
	Land Acquisition (Previous)	375	Ac.	$11,000	**$4,125,000**	**5,800,000**
	Land Acquisition (New)	40	Ac.	$30,000	**$1,200,000**	
	Land Acquisition Contingency	40	Ac.	$12,000	$480,000	
	TOTAL ESTIMATED CAPITAL COST				**$17,927,604**	**$17,930,000**

Should it be determined, as a result of the PDE component, that simple conversion of Cells 1, 3 5 and 7 to SAV (e.g., Alternative 3 as summarized in Tables 6.1 and 6.4) would provide adequate assurance of meeting the phosphorus criterion, the above opinion of capital cost would reduce from $17.93 million to $670,000 (again, all estimated costs expressed in FY 2003 dollars).

6.1.1.5 Opinion of Incremental Operation and Maintenance Costs

An opinion of the probable incremental average annual operations and maintenance cost for implementation of the possible future Alternative 3 (and 4) at STA-1W is presented in Table 6.16. That opinion of incremental cost is stated in FY 2003 dollars.

Table 6.16 Opinion of Incremental O&M Cost, Future STA-1W Enhancements, Alt. 3

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Incremental Cost forAnnual Vegetation Control	1778	ac	$30	$53,340	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$53,340**	
Contingency		30	%		$16,002	
TOTAL INCREMENTAL O&M COST					**$69,342**	**$70,000**

An opinion of the probable incremental average annual operations and maintenance cost for implementation of the possible future Alternative 5 (and 7) at STA-1E is presented in Table 6.17. That opinion of incremental cost is stated in FY 2003 dollars.

Table 6.17 Opinion of Incremental O&M Cost, Future STA-1E Enhancements, Alt. 5

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Levees	4.1	Mi.	$3,300	$13,530	Net increase in length after degradation of Levee L-85
2	New Water Control Structures	7	Ea.	$8,000	$56,000	
3	Mech. Maintenance, Seepage Pumping Station, 3 units assumed	3	Ea.	$2,500	$7,500	
4	Power Consumption, Seepage Pumping Station	10000	Ac-ft	$0.60	$6,000	See text for basis of estimated unit cost
5	Pumping Station Building Maintenance	Job	Lump	Allow	$12,000	
6	Incremental Cost forAnnual Vegetation Control, Cells 1, 3, 5 & 7	2134	ac	$30	$64,020	
7	Annual Cost for Vegetation Control, New Cell 2S	320	Ac.	$80	$25,600	
8	Opns Monitoring Sites, New	2	Ea.	$40,000	$80,000	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$264,650**	
Contingency		30	%		$79,395	
TOTAL INCREMENTAL O&M COST					**$344,045**	**$340,000**

Should it be determined, as a result of the PDE component, that simple conversion of Cells 1, 3 5 and 7 to SAV (e.g., Alternative 3 as summarized in Tables 6.1 and 6.4), the above opinion of incremental average annual operations and maintenance cost would reduce from $340,000 per year to $83,000 per year (again, all estimated costs expressed in FY 2003 dollars).

6.1.1.6 Possible Implementation Schedule and Expenditures

The possible future enhancements and modifications to STA-1W and STA-1E discussed previously in this section should only be implemented once their need is conclusively demonstrated and adequate assurance exists that the phosphorus criterion can be achieved thereby. In particular, the potential expansion of STA-1E to include potentially available lands in Section 24-44-40 represents a substantial incremental expenditure for a relatively nominal increase in projected treatment performance. Accordingly, it is anticipated that the additional enhancements, if needed, would be implemented incrementally, based on the continually improving understanding of performance and need resulting from the PDE component described in Part 5 of this *Long-Term Plan*. As a result, the following possible implementation schedule is highly conjectural in nature, as it is based on the principal assumption that the results of the PDE component will not increase treatment performance projections markedly beyond the more conservative present estimates.

More definitive estimates of the projected treatment performance of the enhanced STA-1W should be in hand by December 31, 2006, permitting identification of any additional steps that might be taken in STA-1W, short of conversion of remaining emergent cells to SAV and partial diversion to STA-1E. Should it be determined that the conversion is needed, and that remaining uncertainties relative to the suitability of SAV to projected inflow concentrations and the ability to maintain the entire STA in a hydrated condition can be satisfactorily addressed, the conversion of the remaining cells in STA-1W to SAV would be planned in Fiscal Year (FY) 2007, and implemented in FY 2008. The remaining steps and possible implementation schedule for STA-1W are based on the assumption that the additional SAV cells would be fully functional and performing as intended by the end of calendar year 2009.

The final remaining step for STA-1W would be implementation of a partial diversion of its inflows to STA-1E. However, that diversion should not be effected until it is determined that STA-1E can properly accommodate the additional inflows.

Unlike STA-1W, which has been in at least partial operation since 1993, STA-1E is presently under construction. Substantial uncertainty remains as to:

- Inflow volumes and TP loads from the C-51 West Basin and the Acme Improvement District, Basin B;
- The actual performance of the Distribution Cells in dampening discharge rates and reducing TP concentrations in the inflows to the STA-1E treatment cells.

In addition, the enhancements to STA-1E recommended in Parts 2 and 3 of this *Long-Term Plan* will have been in place an insufficient period of time at the end of 2006 to permit full understanding of their performance.

It is anticipated that, concurrent with its December 31, 2008, report to the Governor and Legislature, the SFWMD will be in a position to more fully address those uncertainties. Should it be determined that conversion of Cells 1, 3 5 and 7 to SAV is warranted and supportable, that conversion would be planned in FY 2008 and implemented in FY 2009. The remaining steps and possible implementation schedule for STA-1E are based on the assumption that the additional SAV cells would be fully functional and performing as intended by the end of calendar year 2010. The partial diversion of STA-1W inflows to STA-1E, if necessary for the proper performance of STA-1W, should be implemented no earlier than that date.

The final possible step in STA-1E (addition of effective treatment area in Section 24-44-40), given its relatively high cost for but a nominal increase in overall treatment performance, should be implemented only after its need is conclusively demonstrated. It is recommended that STA-1E be operated, with or without the potential diversion of inflows from STA-1W, for a minimum of two years (e.g., 2011 and 2012) prior to an irreversible commitment for addition of the lands in Section 24. Detailed planning and design for the expansion should be undertaken in FY 2013. The construction of the additional works necessary for that conversion could then take place in FY 2014 and 2015.

A summary of the projected expenditures for the possible future additional enhancements to STA-1W and STA-1E through FY 2016 is presented in Table 6.18. That projection of possible expenditures is in FY 2003 dollars.

Table 6.18 Projected Expenditures, Possible Future Enhancement of STA-1W & STA-1E

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	
2004							$0
2005							$0
2006							$0
2007	$36,000						$36,000
2008	$43,000	$36,000	$360,000		$118,000		$557,000
2009		$43,000	$430,000		$154,000	$25,000	$652,000
2010						$70,000	$70,000
2011						$70,000	$70,000
2012						$70,000	$70,000
2013	$737,000			$5,800,000	$70,000	$70,000	$6,677,000
2014		$368,500	$3,685,000		$1,273,000	$70,000	$5,396,500
2015		$368,500	$3,685,000		$1,273,000	$70,000	$5,396,500
2016						$410,000	$410,000
Total	**$816,000**	**$816,000**	**$8,160,000**	**$5,800,000**	**$2,888,000**	**$855,000**	**$19,335,000**

6.1.2. STA-2 and STA-3/4

STA-2 and STA-3/4 are not presently hydraulically connected. The existing (relatively slight) degree of interdependence may increase as a result of CERP projects in their tributary basins. For that reason, they are considered together.

6.1.2.1 Possible Future Modifications, STA-2

As discussed in Part 2 of this *Long-Term Plan*, the pre-2006 strategy for STA-2 is to further compartmentalize Cells 1, 2 and 3, forming new cells 1B, 2B, and 3B, and to convert Cells 1B and 2B from emergent macrophyte to submerged aquatic vegetation (SAV). Cell 3B is now being developed in SAV. If the SAV can be made to perform as intended (e.g., as SAV_C4), the projected treatment performance is capable of meeting the assigned objective of a long-term geometric mean concentration of 10 ppb. However, the extent to which the SAV community can be made to reliably replicate on a long-term basis the SAV_C4 level of performance remains uncertain.

In this section, possible future modifications and enhancements to STA-2 are considered. It is not recommended that any such additional modifications and enhancements be considered for implementation until such time as additional information resulting from the PDE component (see Part 5 of this Long-Term Plan) is available and demonstrates:

- The need for additional modifications or enhancements;
- The extent to which the additional modifications or enhancements can be reliably demonstrated to contribute to an ability to meet the phosphorus criterion;
- The extent to which projected inflow volumes and loads to STA-2 may be adjusted in the future as a result of CERP implementation.

A summary of the possible future alternatives for STA-2 is presented in Table 6.19.

Table 6.19 Possible Post-2006 Alternatives, STA-2

Alt. No.	Description	Long-Term Mean TP Concentration (ppb)		Ave. Annual Outflow	
		Flow-Weighted	Geometric	Volume (ac-ft/yr)	TP Load (kg/yr)
1	As recommended in Part 2; Add'l compartmentalization; Cells 1B, 2B, 3A, and 3B as SAV_C4; no additional actions post-2006; Inflows pre-CERP	16.6	8.8*	222,600	4,568
1	As recommended in Part 2; Add'l compartmentalization; Cells 1B, 2B, 3A, and 3B as SAV_C4; no additional actions post-2006; Inflows post-CERP	14.5	8.1*	197,500	2,992
2	As recommended in Part 2; Add'l compartmentalization; Cells 1B, 2B, 3A, and 3B as NEWS; no additional actions post-2006; Inflows post-CERP	23.8	13.1	197,500	5,809
3	As recommended in Part 2; Add'l compartmentalization; Cells 1B, 2B, 3A, and 3B as NEWS; convert Cells 1A and 2A to NEWS post-2006; Inflows post-CERP	21.5	11.6	197,500	5,246
4	As for Alternative 2; divert 43% of inflows to other treatment works; Inflows post-CERP	17.1	10.4	109,000	2,297
5	As for Alt. 3, but divert 22% of the inflow volume and load to other treatment works; Inflows post-CERP	18.8	10.5	152,200	3,523
* Computed value; 10 ppb taken as lowest sustainable long-term geometric mean concentration.					

Tables 6.20 through 6.24 present additional detail on the estimated treatment performance of Alternatives 1-5, respectively, and consist of screen information taken directly from the DMSTA analyses. Those analyses are all for projected inflows to STA-2 following full implementation of CERP. A comparison of Alternative 1 (base condition) for pre-CERP and post-CERP inflows is presented in the above Table 6.19 for reference purposes.

Table 6.20 Estimated Treatment Performance, STA-2 Alternative 1

Input Variable	Units	Value	Case Description:	Filename: 2FU_Data.xls
Design Case Name	-	ALT1	Existing, Cells 1A & 2A--Emergent & Cell 1B, 2B, 3A & 3B--SAV_C4	
Starting Date for Simulation	-	01/01/65	40/60 Split	
Ending Date for Simulation	-	12/31/95		
Starting Date for Output	-	01/01/65		
Steps Per Day	-	3		
Number of Iterations	-	2		
Output Averaging Interval	days	7		
Reservoir H2O Residence Time	days	0		
Max Inflow / Mean Inflow	-	0		
Max Reservoir Storage	hm3	0		
Reservoir P Decay Rate	1/yr/ppb	0		
Rainfall P Conc	ppb	10		
Atmospheric P Load (Dry)	mg/m2-yr	20		

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.0%
Flow-Wtd Conc - With Bypass	ppb	14.5
Flow-Wtd Conc - Without Bypass	ppb	14.5
Geometric Mean Conc	ppb	8.1
95th Percentile Conc	ppb	20.3
Freq Cell Outflow > 10 ppb	%	28%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	EMERG	SAV_C4	EMERG	SAV_C4	SAV_C4	SAV_C4
Inflow Fraction	-	0.28	0	0.36	0	0.36	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514
Mean Width of Flow Path	km	1.58	1.58	3.10	1.65	2.00	2.00
Number of Tanks in Series	-	3	3	3	3	3	3
Outflow Control Depth	cm	40	60	40	60	60	60
Outflow Coefficient - Exponent	-	2.48	2.53	2.92	1.99	2.93	3.05
Outflow Coefficient - Intercept	-	0.48	0.62	0.39	1.28	0.48	0.64
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.008	0.008	0	0	0	0
Inflow Seepage Control Elev	cm	76	76	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.009	0	0.015	0	0.015	0.006
Outflow Seepage Control Elev	cm	-61	0	-61	0	-30	-30
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.78	0	0.78	0	0.78	0.79
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*80*	*15.66*	*80.10*	*80.10*	*80.10*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
C1 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
K - Periphyton	1/yr	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	7.39	13.52	19.97	26.68	32.84	39.00	39.00
Run Date	-	07/14/02	07/14/02	07/14/02	07/14/02	07/14/02	07/14/02	07/14/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514	25.7
Mean Water Load	cm/d	6.8	4.5	6.9	4.3	6.9	4.4	2.7
Max Water Load	cm/d	63.8	42.0	65.0	43.4	65.0	43.7	25.9
Inflow Volume	hm3/yr	72.0	71.3	92.6	87.2	92.6	87.9	257.3
Inflow Load	kg/yr	7460.0	4430.2	9591.5	5305.6	9591.5	2284.3	26642.9
Inflow Conc	ppb	103.6	62.1	103.6	60.8	103.6	26.0	103.6
Treated Outflow Volume	hm3/yr	71.3	72.5	87.2	86.4	87.9	84.8	243.6
Treated Outflow Load	kg/yr	4430.2	1069.6	5305.6	1392.2	2284.3	1059.8	3521.6
Treated FWM Outflow Conc	ppb	62.1	14.8	60.8	16.1	26.0	12.5	14.5
Total Outflow Volume	hm3/yr	71.3	72.5	87.2	86.4	87.9	84.8	243.6
Total Outflow Load	kg/yr	4430.2	1069.6	5305.6	1392.2	2284.3	1059.8	3521.6
Total FWM Outflow Conc	ppb	62.1	14.8	60.8	16.1	26.0	12.5	14.5
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.21 Estimated Treatment Performance, STA-2 Alternative 2

Input Variable	Units	Value	Case Description:	Filename:	2FU_Data.xls
Design Case Name	-	ALT1 w NEWS	Existing, Cells 1A & 2A--Emergent & Cell 1B, 2B, 3A & 3B--SAV_C4		
Starting Date for Simulation	-	01/01/65	40/60 Split		
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	23.8
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	23.8
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	13.1
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	34.0
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	61%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	EMERG	NEWS	EMERG	NEWS	NEWS	NEWS
Inflow Fraction	-	0.28	0	0.36	0	0.36	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514
Mean Width of Flow Path	km	1.58	1.58	3.10	1.65	2.00	2.00
Number of Tanks in Series	-	3	3	3	3	3	3
Outflow Control Depth	cm	40	60	40	60	60	60
Outflow Coefficient - Exponent	-	2.48	2.53	2.92	1.99	2.93	3.05
Outflow Coefficient - Intercept	-	0.48	0.62	0.39	1.28	0.48	0.64
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.008	0.008	0	0	0	0
Inflow Seepage Control Elev	cm	76	76	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.009	0	0.015	0	0.015	0.006
Outflow Seepage Control Elev	cm	-61	0	-61	0	-30	-30
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.78	0	0.78	0	0.78	0.79
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*4*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*15.66*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*0*	*4*	*4*	*4*
C1 - Periphyton	ppb	*0*	*22*	*0*	*22*	*22*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*0.00*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*0*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*0*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.00	1.97	2.90	3.87	4.84	5.81	5.81
Run Date	-	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514	25.7
Mean Water Load	cm/d	6.8	4.5	6.9	4.3	6.9	4.4	2.7
Max Water Load	cm/d	63.8	42.0	65.0	43.4	65.0	43.7	25.9
Inflow Volume	hm3/yr	72.0	71.3	92.6	87.2	92.6	87.9	257.3
Inflow Load	kg/yr	7460.0	4430.2	9591.5	5305.6	9591.5	3304.8	26642.9
Inflow Conc	ppb	103.6	62.1	103.6	60.8	103.6	37.6	103.6
Treated Outflow Volume	hm3/yr	71.3	72.5	87.2	86.4	87.9	84.8	243.6
Treated Outflow Load	kg/yr	4430.2	1739.2	5305.6	2222.8	3304.8	1846.9	5808.9
Treated FWM Outflow Conc	ppb	62.1	24.0	60.8	25.7	37.6	21.8	23.8
Total Outflow Volume	hm3/yr	71.3	72.5	87.2	86.4	87.9	84.8	243.6
Total Outflow Load	kg/yr	4430.2	1739.2	5305.6	2222.8	3304.8	1846.9	5808.9
Total FWM Outflow Conc	ppb	62.1	24.0	60.8	25.7	37.6	21.8	23.8
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.22 Estimated Treatment Performance, STA-2 Alternative 3

Input Variable	Units	Value
Design Case Name	-	LT1 w All NEWS
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: All cells as NEWS
Filename: 2FU_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	21.5
Flow-Wtd Conc - Without Bypass	ppb	21.5
Geometric Mean Conc	ppb	11.6
95th Percentile Conc	ppb	31.8
Freq Cell Outflow > 10 ppb	%	61%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.28	0	0.36	0	0.36	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514
Mean Width of Flow Path	km	1.58	1.58	3.10	1.65	2.00	2.00
Number of Tanks in Series	-	3	3	3	3	3	3
Outflow Control Depth	cm	40	60	40	60	60	60
Outflow Coefficient - Exponent	-	2.48	2.53	2.92	1.99	2.93	3.05
Outflow Coefficient - Intercept	-	0.48	0.62	0.39	1.28	0.48	0.64
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.008	0.008	0	0	0	0
Inflow Seepage Control Elev	cm	76	76	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.009	0	0.015	0	0.015	0.006
Outflow Seepage Control Elev	cm	-61	0	-61	0	-30	-30
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.78	0	0.78	0	0.78	0.79
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.06	2.03	3.00	3.97	4.94	5.90	5.90
Run Date	-	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514	25.7
Mean Water Load	cm/d	6.8	4.5	6.9	4.3	6.9	4.4	2.7
Max Water Load	cm/d	63.8	42.0	65.0	43.4	65.0	43.7	25.9
Inflow Volume	hm3/yr	72.0	71.3	92.6	87.2	92.6	87.9	257.3
Inflow Load	kg/yr	7460.0	2626.1	9591.5	3360.0	9591.5	3304.8	26642.9
Inflow Conc	ppb	103.6	36.8	103.6	38.5	103.6	37.6	103.6
Treated Outflow Volume	hm3/yr	71.3	72.5	87.2	86.4	87.9	84.8	243.6
Treated Outflow Load	kg/yr	2626.1	1489.2	3360.0	1910.0	3304.8	1846.9	5246.2
Treated FWM Outflow Conc	ppb	36.8	20.5	38.5	22.1	37.6	21.8	21.5
Total Outflow Volume	hm3/yr	71.3	72.5	87.2	86.4	87.9	84.8	243.6
Total Outflow Load	kg/yr	2626.1	1489.2	3360.0	1910.0	3304.8	1846.9	5246.2
Total FWM Outflow Conc	ppb	36.8	20.5	38.5	22.1	37.6	21.8	21.5
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.23 Estimated Treatment Performance, STA-2 Alternative 4

Input Variable	Units	Value	Case Description: Filename: 2FU_Data.xls		
Design Case Name	-	1 w NEWS, w D	Future, Cells 1A & 2A--Emergent & Cell 1B, 2B, 3A & 3B--NEWS		
Starting Date for Simulation	-	01/01/65	40/60 Split		
Ending Date for Simulation	-	12/31/95	43% of Inflow Diverted		
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.0%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	17.1
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	17.1
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	10.4
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	24.2
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	48%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		**1**	**2**	**3**	**4**	**5**	**6**
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	EMERG	NEWS	EMERG	NEWS	NEWS	NEWS
Inflow Fraction	-	0.16	0	0.205	0	0.205	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514
Mean Width of Flow Path	km	1.58	1.58	3.10	1.65	2.00	2.00
Number of Tanks in Series	-	3	3	3	3	3	3
Outflow Control Depth	cm	40	60	40	60	60	60
Outflow Coefficient - Exponent	-	2.48	2.53	2.92	1.99	2.93	3.05
Outflow Coefficient - Intercept	-	0.48	0.62	0.39	1.28	0.48	0.64
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.008	0.008	0	0	0	0
Inflow Seepage Control Elev	cm	76	76	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.009	0	0.015	0	0.015	0.006
Outflow Seepage Control Elev	cm	-61	0	-61	0	-30	-30
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.78	0	0.78	0	0.78	0.79
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*4*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*15.66*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*0*	*4*	*4*	*4*
C1 - Periphyton	ppb	*0*	*22*	*0*	*22*	*22*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*0.00*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*0*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*0*	*80*	*80*	*80*

Output Variables	**Units**	**1**	**2**	**3**	**4**	**5**	**6**	**Overall**
Execution Time	seconds/yr	1.03	2.03	2.97	3.94	4.90	5.90	5.90
Run Date	-	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514	25.7
Mean Water Load	cm/d	3.9	2.6	3.9	2.4	3.9	2.4	1.6
Max Water Load	cm/d	36.5	23.4	37.0	24.0	37.0	24.6	25.9
Inflow Volume	hm3/yr	41.2	40.9	52.7	47.7	52.7	48.3	146.6
Inflow Load	kg/yr	4262.9	2002.0	5461.8	2288.9	5461.8	1475.1	15186.5
Inflow Conc	ppb	103.6	48.9	103.6	48.0	103.6	30.5	103.6
Treated Outflow Volume	hm3/yr	40.9	42.3	47.7	46.9	48.3	45.4	134.5
Treated Outflow Load	kg/yr	2002.0	717.7	2288.9	854.5	1475.1	724.5	2296.7
Treated FWM Outflow Conc	ppb	48.9	17.0	48.0	18.2	30.5	16.0	17.1
Total Outflow Volume	hm3/yr	40.9	42.3	47.7	46.9	48.3	45.4	134.5
Total Outflow Load	kg/yr	2002.0	717.7	2288.9	854.5	1475.1	724.5	2296.7
Total FWM Outflow Conc	ppb	48.9	17.0	48.0	18.2	30.5	16.0	17.1
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.24 Estimated Treatment Performance, STA-2 Alternative 5

Input Variable	Units	Value
Design Case Name	-	1 w All NEWS &
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: All cells as NEWS
Divert 22% of inflow

Filename: 2FU_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	18.8
Flow-Wtd Conc - Without Bypass	ppb	18.8
Geometric Mean Conc	ppb	10.5
95th Percentile Conc	ppb	27.7
Freq Cell Outflow > 10 ppb	%	57%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.218	0	0.281	0	0.281	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514
Mean Width of Flow Path	km	1.58	1.58	3.10	1.65	2.00	2.00
Number of Tanks in Series	-	3	3	3	3	3	3
Outflow Control Depth	cm	40	60	40	60	60	60
Outflow Coefficient - Exponent	-	2.48	2.53	2.92	1.99	2.93	3.05
Outflow Coefficient - Intercept	-	0.48	0.62	0.39	1.28	0.48	0.64
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0.008	0.008	0	0	0	0
Inflow Seepage Control Elev	cm	76	76	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.009	0	0.015	0	0.015	0.006
Outflow Seepage Control Elev	cm	-61	0	-61	0	-30	-30
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.78	0	0.78	0	0.78	0.79
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.06	2.03	3.06	4.03	5.00	6.00	6.00
Run Date	-	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02	12/03/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	2.912	4.368	3.676	5.514	3.676	5.514	25.7
Mean Water Load	cm/d	5.3	3.5	5.4	3.3	5.4	3.4	2.1
Max Water Load	cm/d	49.7	32.4	50.7	33.6	50.7	34.0	25.9
Inflow Volume	hm3/yr	56.1	55.6	72.3	67.1	72.3	67.7	200.7
Inflow Load	kg/yr	5808.2	1878.5	7486.7	2391.6	7486.7	2330.6	20781.5
Inflow Conc	ppb	103.6	33.8	103.6	35.7	103.6	34.4	103.6
Treated Outflow Volume	hm3/yr	55.6	56.8	67.1	66.2	67.7	64.7	187.7
Treated Outflow Load	kg/yr	1878.5	1013.1	2391.6	1278.3	2330.6	1231.9	3523.3
Treated FWM Outflow Conc	ppb	33.8	17.8	35.7	19.3	34.4	19.1	18.8
Total Outflow Volume	hm3/yr	55.6	56.8	67.1	66.2	67.7	64.7	187.7
Total Outflow Load	kg/yr	1878.5	1013.1	2391.6	1278.3	2330.6	1231.9	3523.3
Total FWM Outflow Conc	ppb	33.8	17.8	35.7	19.3	34.4	19.1	18.8
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Alternatives 4 and 5 for STA-2 (diversion of a part of the projected inflow volume and load) is included as, should the SAV communities perform as NEWS in lieu of as SAV_C4, a long-term geometric mean of 10 ppb in outflows from STA-2 could not otherwise be achieved, even after conversion of the entire footprint of STA-2 to SAV.

The analyses for Alternatives 4 and 5 were developed by simply limiting total inflows to STA-2 to the indicated percentages of the total estimated inflows, with the balance assumed to be diverted to other treatment works. Those other treatment works could potentially include newly developed treatment areas or STA-3/4. This is a relatively simplistic approach. In practice, should either of these alternatives be eventually considered necessary, it would be appropriate to consider other possible operational strategies for effecting the necessary diversions.

6.1.2.2 Possible Future Modifications, STA-3/4

As discussed in Part 2 of this *Long-Term Plan*, the pre-2006 strategy for STA-3/4 is to further compartmentalize Cell 3, creating new cells 3A and 3B, and to convert Cells 1B, 2B, and (new) Cell 3B from emergent macrophyte to submerged aquatic vegetation (SAV). If the SAV can be made to perform as intended (e.g., as SAV_C4), the projected treatment performance is capable of meeting a long-term geometric mean concentration of 10 ppb. However, in the instance of STA-3/4, a number of uncertainties remain. The most significant of those uncertainties include:

- The extent to which the SAV community can be made to reliably replicate on a long-term basis the SAV_C4 level of performance;
- The influence of CERP projects (in particular the EAA Storage Reservoir Project, Phase 1) on inflow volumes and TP concentrations to STA-3/4;
- The extent to which inflow patterns can be relied upon to maintain the SAV communities in STA-3/4 in a hydrated condition;
- The extent to which it may eventually be found necessary to partially divert STA-2 inflow volumes and loads to STA-3/4.

In this section, possible future modifications and enhancements to STA-3/4 are considered. It is not recommended that any such additional modifications and enhancements be considered for implementation until such time as additional information resulting from the PDE component (see Part 5 of this Long-Term Plan) is available and demonstrates:

- The need for additional modifications or enhancements;
- The extent to which the additional modifications or enhancements can be reliably demonstrated to contribute to an ability to meet the phosphorus criterion.

A summary of the possible future alternatives for STA-3/4 is presented in Table 6.25.

For alternatives 1 through 3, inflows to the treatment area are taken as the estimated outflows and TP concentrations from the EAA Storage Reservoirs Projects, coupled with other estimated direct inflows to STA-3/4 (consistent with Table 4.10 of the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, Burns & McDonnell). Analyses for Alternatives 4 and 5 are approximate in nature; the estimated inflows to STA-3/4 were simply increased on a daily basis as necessary to reflect the possible diversion of varying percentages of the STA-2 inflows to STA-3/4. Daily TP concentrations in those inflows were maintained at those reflected in the analyses for Alternatives 1 through 3. Future analyses should be conducted in a more rigorous fashion. The errors introduced by this simplification can be considered generally compensating in nature, with the result that the projected treatment performance may be considered representative.

Tables 6.26 through 6.30 present additional detail on the estimated treatment performance of Alternatives 1-5, respectively. Those analyses are all for projected inflows to STA-3/4 following full implementation of CERP. A comparison of Alternative 1 (base condition) for pre-CERP and post-CERP inflows is presented in Table 6.25 for reference purposes.

Table 6.25 Possible Post-2006 Alternatives, STA-3/4

Alt. No.	Description	Long-Term Mean TP Concentration (ppb)		Ave. Annual Outflow	
		Flow-Weighted	Geometric	Volume (ac-ft/yr)	TP Load (kg/yr)
1	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as SAV_C4; no additional actions post-2006; Inflows pre-CERP	14.3	9.8*	621,200	10,980
1	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as SAV_C4; no additional actions post-2006; Inflows post-CERP	13.9*	10.1	588,600	10,106*
2	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as NEWS; no additional actions post-2006; Inflows post-CERP	20.6	15.0	588,600	14,498
3	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as NEWS; convert cells 1A, 2A, and 3A to NEWS post-2006; Inflows post-CERP	15.6	11.4	588,600	11,298
4	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as NEWS; convert cells 1A, 2A, and 3A to NEWS post-2006; Inflows post-CERP, increased by 7.3% to accommodate diversion of 22% of STA-2 inflows (ave. of approx. 45,800 ac-ft/yr)	16.2	11.8	634,200	12,711
5	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as NEWS; convert cells 1A, 2A, and 3A to NEWS post-2006; Inflows post-CERP, increased by 14.3% to accommodate diversion of 43% of STA-2 inflows (ave. of approx. 89,600 ac-ft/yr)	16.9	12.1	678,000	14,123
* Computed value; 10 ppb taken as lowest sustainable long-term geometric mean concentration; 14 ppb taken as lowest sustainable long-term flow-weighted mean concentration					

Table 6.26 Estimated Treatment Performance, STA-3/4 Alternative 1

Input Variable	Units	Value
Design Case Name	-	Alt 1
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: STA-3/4 Alternative 1 **Filename:** 34FU_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	13.9
Flow-Wtd Conc - Without Bypass	ppb	13.9
Geometric Mean Conc	ppb	10.1
95th Percentile Conc	ppb	19.2
Freq Cell Outflow > 10 ppb	%	44%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	EMERG	SAV_C4	EMERG	SAV_C4	EMERG	SAV_C4
Inflow Fraction	-	0.48	0	0.28	0	0.24	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*80*	*15.66*	*80.10*	*15.66*	*80.10*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
C1 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
K - Periphyton	1/yr	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	12.19	18.29	29.84	35.94	43.84	51.81	51.81
Run Date	-	04/17/02	04/17/02	04/17/02	04/17/02	04/17/02	04/17/02	04/17/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	8.3	6.9	5.8	4.9	5.8	4.9	3.2
Max Water Load	cm/d	47.7	38.7	33.3	27.6	33.7	28.3	18.3
Inflow Volume	hm3/yr	372.4	353.8	217.3	211.5	186.2	176.3	775.9
Inflow Load	kg/yr	28148.0	17952.2	16419.7	9436.9	14074.0	8002.5	58641.8
Inflow Conc	ppb	75.6	50.7	75.6	44.6	75.6	45.4	75.6
Treated Outflow Volume	hm3/yr	353.8	342.3	211.5	209.2	176.3	174.4	726.0
Treated Outflow Load	kg/yr	17952.2	5429.4	9436.9	2587.4	8002.5	2088.7	10105.5
Treated FWM Outflow Conc	ppb	50.7	15.9	44.6	12.4	45.4	12.0	13.9
Total Outflow Volume	hm3/yr	353.8	342.3	211.5	209.2	176.3	174.4	726.0
Total Outflow Load	kg/yr	17952.2	5429.4	9436.9	2587.4	8002.5	2088.7	10105.5
Total FWM Outflow Conc	ppb	50.7	15.9	44.6	12.4	45.4	12.0	13.9
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.27 Estimated Treatment Performance, STA-3/4 Alternative 2

Input Variable	Units	Value
Design Case Name	-	Fut Alt 2
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: STA-3/4 Post-2006 Alternative 2 **Filename:** 34FU_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	20.6
Flow-Wtd Conc - Without Bypass	ppb	20.6
Geometric Mean Conc	ppb	15.0
95th Percentile Conc	ppb	28.1
Freq Cell Outflow > 10 ppb	%	77%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	EMERG	NEWS	EMERG	NEWS	EMERG	NEWS
Inflow Fraction	-	0.48	0	0.28	0	0.24	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*4*	*12*	*4*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*15.66*	*128.70*	*15.66*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*0*	*4*	*0*	*4*
C1 - Periphyton	ppb	*0*	*22*	*0*	*22*	*0*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*0.00*	*23.80*	*0.00*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*0*	*400*	*0*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*0*	*80*	*0*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.84	2.77	4.58	5.55	6.77	8.03	8.03
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	8.3	6.9	5.8	4.9	5.8	4.9	3.2
Max Water Load	cm/d	47.7	38.7	33.3	27.6	33.7	28.3	18.3
Inflow Volume	hm3/yr	372.4	353.8	217.3	211.5	186.2	176.3	775.9
Inflow Load	kg/yr	28148.0	17952.2	16419.7	9436.9	14074.0	8002.5	58641.8
Inflow Conc	ppb	75.6	50.7	75.6	44.6	75.6	45.4	75.6
Treated Outflow Volume	hm3/yr	353.8	342.3	211.5	209.2	176.3	174.4	726.0
Treated Outflow Load	kg/yr	17952.2	7774.0	9436.9	3934.0	8002.5	3240.3	14948.4
Treated FWM Outflow Conc	ppb	50.7	22.7	44.6	18.8	45.4	18.6	20.6
Total Outflow Volume	hm3/yr	353.8	342.3	211.5	209.2	176.3	174.4	726.0
Total Outflow Load	kg/yr	17952.2	7774.0	9436.9	3934.0	8002.5	3240.3	14948.4
Total FWM Outflow Conc	ppb	50.7	22.7	44.6	18.8	45.4	18.6	20.6
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.28 Estimated Treatment Performance, STA-3/4 Alternative 3

Case Description: STA-3/4 Post-2006 Alternative 3 **Filename:** 34FU_Data.xls

Input Variable	Units	Value	Output Variable	Units	Value
Design Case Name	-	Fut Alt 3			
Starting Date for Simulation	-	01/01/65			
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3			
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.2%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	15.6
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	15.6
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	11.4
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	23.3
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	52%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.48	0	0.28	0	0.24	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.90	2.87	4.77	5.74	7.00	8.26	8.26
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	8.3	6.9	5.8	4.9	5.8	4.9	3.2
Max Water Load	cm/d	47.7	38.7	33.3	27.6	33.7	28.3	18.3
Inflow Volume	hm3/yr	372.4	353.8	217.3	211.5	186.2	176.3	775.9
Inflow Load	kg/yr	28148.0	9850.9	16419.7	4952.8	14074.0	4483.0	58641.8
Inflow Conc	ppb	75.6	27.8	75.6	23.4	75.6	25.4	75.6
Treated Outflow Volume	hm3/yr	353.8	342.3	211.5	209.2	176.3	174.4	726.0
Treated Outflow Load	kg/yr	9850.9	5895.9	4952.8	2903.9	4483.0	2497.9	11297.6
Treated FWM Outflow Conc	ppb	27.8	17.2	23.4	13.9	25.4	14.3	15.6
Total Outflow Volume	hm3/yr	353.8	342.3	211.5	209.2	176.3	174.4	726.0
Total Outflow Load	kg/yr	9850.9	5895.9	4952.8	2903.9	4483.0	2497.9	11297.6
Total FWM Outflow Conc	ppb	27.8	17.2	23.4	13.9	25.4	14.3	15.6
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.29 Estimated Treatment Performance, STA-3/4 Alternative 4

Input Variable	Units	Value	Case Description:	Filename:	34FU_Data.xls
Design Case Name	-	Fut Alt 4	STA-3/4 Post-2006 Alternative 4		
Starting Date for Simulation	-	01/01/65			
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.2%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	16.2
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	16.2
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	11.8
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	24.2
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	56%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.515	0	0.3	0	0.258	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.97	2.94	4.81	5.77	7.03	8.29	8.29
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	8.9	7.4	6.2	5.3	6.3	5.3	3.4
Max Water Load	cm/d	51.2	41.7	35.7	29.7	36.2	30.5	18.3
Inflow Volume	hm3/yr	399.6	380.8	232.8	227.0	200.2	190.2	832.5
Inflow Load	kg/yr	30200.5	10952.8	17592.5	5512.2	15129.6	5004.9	62922.6
Inflow Conc	ppb	75.6	28.8	75.6	24.3	75.6	26.3	75.6
Treated Outflow Volume	hm3/yr	380.8	369.2	227.0	224.7	190.2	188.3	782.3
Treated Outflow Load	kg/yr	10952.8	6630.3	5512.2	3259.6	5004.9	2821.5	12711.4
Treated FWM Outflow Conc	ppb	28.8	18.0	24.3	14.5	26.3	15.0	16.2
Total Outflow Volume	hm3/yr	380.8	369.2	227.0	224.7	190.2	188.3	782.3
Total Outflow Load	kg/yr	10952.8	6630.3	5512.2	3259.6	5004.9	2821.5	12711.4
Total FWM Outflow Conc	ppb	28.8	18.0	24.3	14.5	26.3	15.0	16.2
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.30 Estimated Treatment Performance, STA-3/4 Alternative 5

Case Description: STA-3/4 Post-2006 Alternative 5 **Filename:** 34FU_Data.xls

Input Variable	Units	Value
Design Case Name	-	Fut Alt 5
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.2%
Flow-Wtd Conc - With Bypass	ppb	16.9
Flow-Wtd Conc - Without Bypass	ppb	16.9
Geometric Mean Conc	ppb	12.1
95th Percentile Conc	ppb	25.1
Freq Cell Outflow > 10 ppb	%	60%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.549	0	0.32	0	0.274	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.97	2.94	4.77	5.74	7.00	8.26	8.26
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	9.5	7.9	6.6	5.7	6.7	5.6	3.6
Max Water Load	cm/d	54.6	44.5	38.0	31.7	38.5	32.6	18.3
Inflow Volume	hm3/yr	426.0	407.0	248.3	242.5	212.6	202.6	886.8
Inflow Load	kg/yr	32194.3	12052.4	18765.4	6087.9	16067.8	5480.5	67027.5
Inflow Conc	ppb	75.6	29.6	75.6	25.1	75.6	27.1	75.6
Treated Outflow Volume	hm3/yr	407.0	395.4	242.5	240.2	202.6	200.7	836.3
Treated Outflow Load	kg/yr	12052.4	7371.5	6087.9	3630.8	5480.5	3120.7	14123.0
Treated FWM Outflow Conc	ppb	29.6	18.6	25.1	15.1	27.1	15.5	16.9
Total Outflow Volume	hm3/yr	407.0	395.4	242.5	240.2	202.6	200.7	836.3
Total Outflow Load	kg/yr	12052.4	7371.5	6087.9	3630.8	5480.5	3120.7	14123.0
Total FWM Outflow Conc	ppb	29.6	18.6	25.1	15.1	27.1	15.5	16.9
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

As indicated in Table 6.25, should the SAV community in Cells 1B, 2B, and 3B behave as NEWS in lieu of SAV_C4, the projected long-term geometric mean TP concentration in discharges from STA-3/4 would be expected to increase from 10.1 to 15.0 ppb. Even with conversion of Cells 1A, 2A and 3A to NEWS, the projected long-term geometric mean concentration would be 11.4 ppb, still above the planning target. It would therefore not appear possible to divert any of the STA-2 inflows to STA-3/4 without further diverging from the planning objective. However, all inflows to STA-3/4 considered for Alternatives 1 through 5 are consistent with those presented in Part 4 of the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, Burns & McDonnell. As concluded therein, those inflows can be substantially influenced by the design and operation of the EAA Storage Reservoirs CERP projects. The inflow volumes and total phosphorus concentrations considered to this point in analysis of STA-3/4 were developed using the hydrologic results of the 2050wPROJ SFWMM simulation, which considered the EAA Storage Reservoirs to be designed and operated largely as contemplated in the analysis of Alternative D13R for the April 1999 *Central and Southern Florida Project, Comprehensive Review Study* prepared by the Jacksonville District, U.S. Army Corps of Engineers and the SFWMD (the *Restudy*).

Part 6 of the *Evaluation of Alternatives for the ECP Basins* explored at least one alternative to the design and operation of the EAA Storage Reservoirs projects that was considered to beneficially impact the overall water quality performance of STA-3/4. The Project Development Team (PDT) for the EAA Storage Reservoirs Phase 1 CERP project is currently developing and evaluating alternatives to the project formulation reflected in the Alternative D13R simulation. For this Long-Term Plan, additional analyses of the projected future performance of STA-3/4 were prepared in which it was assumed that the EAA Storage Reservoir Project would be modified in a manner generally consistent with that presented in Part 6 of the *Evaluation of Alternatives for the ECP Basins*. The results of those additional analyses are summarized in Table 6.31. Tables 6.32 through 6.37 present additional detail on the estimated treatment performance of Alternatives 6-11, respectively.

Table 6.31 Possible Post-2006 Alternatives, STA-3/4 & EAA Reservoir

Alt. No.	Description	Long-Term Mean TP Concentration (ppb)		Ave. Annual Outflow	
		Flow-Weighted	Geometric	Volume (ac-ft/yr)	TP Load (kg/yr)
6	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as SAV_C4; no additional actions post-2006; Inflows post-CERP, with modified EAA Storage Reservoirs projects	12.6*	8.4*	584,400	9,088
7	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as NEWS; no additional actions post-2006; Inflows post-CERP, with modified EAA Storage Reservoirs projects	18.5	12.9	584,400	13,348
8	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as NEWS; convert cells 1A, 2A, and 3A to NEWS post-2006; Inflows post-CERP, with modified EAA Storage Reservoirs projects	15.6	10.4	584,400	11,214
9	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as NEWS; convert cells 1A, 2A, and 3A to NEWS post-2006; Inflows post-CERP, with modified EAA Storage Reservoirs projects, increased by 7.3% to accommodate diversion of 22% of STA-2 inflows (ave. of approx. 45,800 ac-ft/yr)	16.1	10.6	629,700	12,492
10	As for Alt. 9; inflows redistributed to obtain more balanced outflow concentrations from flow paths	16.0	10.4	630,200	12,413
11	As recommended in Part 2; compartmentalize Cell 3; Cells 1B, 2B, and 3B as NEWS; convert cells 1A, 2A, and 3A to NEWS post-2006; Inflows post-CERP, with modified EAA Storage Reservoirs projects, increased by 14.3% to accommodate diversion of 43% of STA-2 inflows (ave. of approx. 89,600 ac-ft/yr); inflows redistributed to obtain more balanced outflow concentrations from flow paths	16.5	10.6	673,500	13,669
* Computed value; 10 ppb taken as lowest sustainable long-term geometric mean concentration; 14 ppb taken as lowest sustainable long-term flow-weighted mean concentration					

Table 6.32 Estimated Treatment Performance, STA-3/4 Alternative 6

Input Variable	Units	Value
Design Case Name	-	AltInt1
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: Cells 1A, 2A & 3A--Emergent & Cells 1B, 2B & 3B--SAV_C4
Integrated STAs (Compartment A)

Filename: 34ALTInt1_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.0%
Flow-Wtd Conc - With Bypass	ppb	12.6
Flow-Wtd Conc - Without Bypass	ppb	12.6
Geometric Mean Conc	ppb	8.4
95th Percentile Conc	ppb	16.5
Freq Cell Outflow > 10 ppb	%	26%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	EMERG	SAV_C4	EMERG	SAV_C4	EMERG	SAV_C4
Inflow Fraction	-	0.48	0	0.28	0	0.24	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*80*	*15.66*	*80.10*	*15.66*	*80.10*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
C1 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	*0*
K - Periphyton	1/yr	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*0*	*0*	*0*	*0*	*0*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	12.07	18.42	33.58	40.52	49.07	57.65	57.65
Run Date	-	06/28/02	06/28/02	06/28/02	06/28/02	06/28/02	06/28/02	06/28/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	8.2	6.8	5.7	4.9	5.8	4.9	3.1
Max Water Load	cm/d	61.5	53.3	42.9	37.8	43.4	38.2	23.6
Inflow Volume	hm3/yr	369.5	351.2	215.5	209.8	184.7	175.1	769.7
Inflow Load	kg/yr	19210.4	12788.4	11206.1	6796.4	9605.2	5756.4	40021.6
Inflow Conc	ppb	52.0	36.4	52.0	32.4	52.0	32.9	52.0
Treated Outflow Volume	hm3/yr	351.2	340.2	209.8	207.6	175.1	173.2	720.9
Treated Outflow Load	kg/yr	12788.4	4765.2	6796.4	2372.8	5756.4	1949.5	9087.5
Treated FWM Outflow Conc	ppb	36.4	14.0	32.4	11.4	32.9	11.3	12.6
Total Outflow Volume	hm3/yr	351.2	340.2	209.8	207.6	175.1	173.2	720.9
Total Outflow Load	kg/yr	12788.4	4765.2	6796.4	2372.8	5756.4	1949.5	9087.5
Total FWM Outflow Conc	ppb	36.4	14.0	32.4	11.4	32.9	11.3	12.6
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.33 Estimated Treatment Performance, STA-3/4 Alternative 7

Input Variable	**Units**	**Value**	**Case Description:**	**Filename:**	**34ALTINT1_Data.xls**
Design Case Name	-	Fut Alt 7	Future (Post-2006) Alternative 7		
Starting Date for Simulation	-	01/01/65			
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.0%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	18.5
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	18.5
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	12.9
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	24.9
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	67%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		**1**	**2**	**3**	**4**	**5**	**6**
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	EMERG	NEWS	EMERG	NEWS	EMERG	NEWS
Inflow Fraction	-	0.48	0	0.28	0	0.24	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*4*	*12*	*4*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*15.66*	*128.70*	*15.66*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*0*	*4*	*0*	*4*
C1 - Periphyton	ppb	*0*	*22*	*0*	*22*	*0*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*0.00*	*23.80*	*0.00*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*0*	*400*	*0*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*0*	*80*	*0*	*80*

Output Variables	**Units**	**1**	**2**	**3**	**4**	**5**	**6**	**Overall**
Execution Time	seconds/yr	1.87	2.84	4.61	5.61	6.87	8.16	8.16
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	8.2	6.8	5.7	4.9	5.8	4.9	3.1
Max Water Load	cm/d	61.5	53.3	42.9	37.8	43.4	38.2	23.6
Inflow Volume	hm3/yr	369.5	351.2	215.5	209.8	184.7	175.1	769.7
Inflow Load	kg/yr	19210.4	12788.4	11206.1	6796.4	9605.2	5756.4	40021.6
Inflow Conc	ppb	52.0	36.4	52.0	32.4	52.0	32.9	52.0
Treated Outflow Volume	hm3/yr	351.2	340.2	209.8	207.6	175.1	173.2	720.9
Treated Outflow Load	kg/yr	12788.4	6874.8	6796.4	3529.8	5756.4	2943.2	13347.8
Treated FWM Outflow Conc	ppb	36.4	20.2	32.4	17.0	32.9	17.0	18.5
Total Outflow Volume	hm3/yr	351.2	340.2	209.8	207.6	175.1	173.2	720.9
Total Outflow Load	kg/yr	12788.4	6874.8	6796.4	3529.8	5756.4	2943.2	13347.8
Total FWM Outflow Conc	ppb	36.4	20.2	32.4	17.0	32.9	17.0	18.5
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.34 Estimated Treatment Performance, STA-3/4 Alternative 8

Input Variable	Units	Value	Case Description:	Filename:	34ALTINT1_Data.xls
Design Case Name	-	Fut Alt 8	Future (Post-2006) Alternative 8		
Starting Date for Simulation	-	01/01/65			
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	15.6
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	15.6
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	10.4
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	22.4
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	45%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.48	0	0.28	0	0.24	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.90	2.90	4.74	5.71	6.97	8.23	8.23
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	8.2	6.8	5.7	4.9	5.8	4.9	3.1
Max Water Load	cm/d	61.5	53.3	42.9	37.8	43.4	38.2	23.6
Inflow Volume	hm3/yr	369.5	351.2	215.5	209.8	184.7	175.1	769.7
Inflow Load	kg/yr	19210.4	8522.9	11206.1	4415.6	9605.2	3898.6	40021.6
Inflow Conc	ppb	52.0	24.3	52.0	21.0	52.0	22.3	52.0
Treated Outflow Volume	hm3/yr	351.2	340.2	209.8	207.6	175.1	173.2	720.9
Treated Outflow Load	kg/yr	8522.9	5754.3	4415.6	2943.6	3898.6	2516.5	11214.3
Treated FWM Outflow Conc	ppb	24.3	16.9	21.0	14.2	22.3	14.5	15.6
Total Outflow Volume	hm3/yr	351.2	340.2	209.8	207.6	175.1	173.2	720.9
Total Outflow Load	kg/yr	8522.9	5754.3	4415.6	2943.6	3898.6	2516.5	11214.3
Total FWM Outflow Conc	ppb	24.3	16.9	21.0	14.2	22.3	14.5	15.6
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.35 Estimated Treatment Performance, STA-3/4 Alternative 9

Input Variable	Units	Value
Design Case Name	-	Fut Alt 9
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: Future (Post-2006) Alternative 9 **Filename:** 34ALTINT1_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	16.1
Flow-Wtd Conc - Without Bypass	ppb	16.1
Geometric Mean Conc	ppb	10.6
95th Percentile Conc	ppb	22.8
Freq Cell Outflow > 10 ppb	%	49%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.515	0	0.3	0	0.258	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.94	2.90	4.74	5.71	6.97	8.23	8.23
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	8.8	7.3	6.1	5.3	6.2	5.3	3.4
Max Water Load	cm/d	66.0	57.2	46.0	40.5	46.7	41.1	23.6
Inflow Volume	hm3/yr	396.4	378.0	230.9	225.2	198.6	188.9	825.9
Inflow Load	kg/yr	20611.1	9407.5	12006.5	4875.1	10325.6	4320.9	42943.2
Inflow Conc	ppb	52.0	24.9	52.0	21.6	52.0	22.9	52.0
Treated Outflow Volume	hm3/yr	378.0	366.9	225.2	222.9	188.9	187.0	776.7
Treated Outflow Load	kg/yr	9407.5	6407.5	4875.1	3271.1	4320.9	2813.4	12492.0
Treated FWM Outflow Conc	ppb	24.9	17.5	21.6	14.7	22.9	15.0	16.1
Total Outflow Volume	hm3/yr	378.0	366.9	225.2	222.9	188.9	187.0	776.7
Total Outflow Load	kg/yr	9407.5	6407.5	4875.1	3271.1	4320.9	2813.4	12492.0
Total FWM Outflow Conc	ppb	24.9	17.5	21.6	14.7	22.9	15.0	16.1
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.36 Estimated Treatment Performance, STA-3/4 Alternative 10

Input Variable	Units	Value
Design Case Name	-	Fut Alt 10
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: Future (Post-2006) Alternative 10 **Filename:** 34ALTINT1_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.1%
Flow-Wtd Conc - With Bypass	ppb	16.0
Flow-Wtd Conc - Without Bypass	ppb	16.0
Geometric Mean Conc	ppb	10.4
95th Percentile Conc	ppb	22.5
Freq Cell Outflow > 10 ppb	%	54%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.43	0	0.355	0	0.288	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.94	2.90	4.77	5.74	7.03	8.29	8.29
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	7.4	6.1	7.3	6.3	7.0	5.9	3.4
Max Water Load	cm/d	55.1	47.6	54.4	48.0	52.1	46.0	23.6
Inflow Volume	hm3/yr	331.0	313.0	273.2	267.5	221.7	211.8	825.9
Inflow Load	kg/yr	17209.3	7294.1	14207.7	6190.2	11526.2	5044.6	42943.2
Inflow Conc	ppb	52.0	23.3	52.0	23.1	52.0	23.8	52.0
Treated Outflow Volume	hm3/yr	313.0	302.1	267.5	265.2	211.8	210.0	777.3
Treated Outflow Load	kg/yr	7294.1	4858.0	6190.2	4225.1	5044.6	3329.8	12412.9
Treated FWM Outflow Conc	ppb	23.3	16.1	23.1	15.9	23.8	15.9	16.0
Total Outflow Volume	hm3/yr	313.0	302.1	267.5	265.2	211.8	210.0	777.3
Total Outflow Load	kg/yr	7294.1	4858.0	6190.2	4225.1	5044.6	3329.8	12412.9
Total FWM Outflow Conc	ppb	23.3	16.1	23.1	15.9	23.8	15.9	16.0
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.37 Estimated Treatment Performance, STA-3/4 Alternative 11

Input Variable	Units	Value	Case Description:	Filename:	34ALTINT1_Data.xls
Design Case Name	-	Fut Alt 11	Future (Post-2006) Alternative 11		
Starting Date for Simulation	-	01/01/65			
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	16.5
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	16.5
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	10.6
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	23.2
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	57%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B	3A	3B
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	NEWS
Inflow Fraction	-	0.458	0	0.378	0	0.307	0
Downstream Cell Number	-	2	0	4	0	6	0
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88
Number of Tanks in Series	-	6	3	6	3	4	4
Outflow Control Depth	cm	60	60	60	60	60	60
Outflow Coefficient - Exponent	-	2.45	2.9	2.6	3	2.1	2.1
Outflow Coefficient - Intercept	-	0.68	0.77	0.85	1.05	0.52	0.52
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014	0	0.0038	0
Outflow Seepage Control Elev	cm	-56	-56	-67	0	-64	0
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.51	0.52	0.46	0	0.46	0
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	*4*
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.94	2.90	4.77	5.74	7.06	8.32	8.32
Run Date	-	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02	12/04/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1A	1B	2A	2B	3A	3B	otal Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	-
Surface Area	km2	12.298	14.115	10.287	11.712	8.713	9.822	66.9
Mean Water Load	cm/d	7.8	6.5	7.7	6.7	7.4	6.3	3.6
Max Water Load	cm/d	58.7	50.8	57.9	51.1	55.6	49.0	23.6
Inflow Volume	hm3/yr	352.5	334.4	290.9	285.1	236.3	226.4	879.8
Inflow Load	kg/yr	18329.9	7977.0	15128.2	6760.4	12286.6	5514.7	45744.7
Inflow Conc	ppb	52.0	23.9	52.0	23.7	52.0	24.4	52.0
Treated Outflow Volume	hm3/yr	334.4	323.4	285.1	282.9	226.4	224.5	830.8
Treated Outflow Load	kg/yr	7977.0	5354.3	6760.4	4645.3	5514.7	3669.6	13669.3
Treated FWM Outflow Conc	ppb	23.9	16.6	23.7	16.4	24.4	16.3	16.5
Total Outflow Volume	hm3/yr	334.4	323.4	285.1	282.9	226.4	224.5	830.8
Total Outflow Load	kg/yr	7977.0	5354.3	6760.4	4645.3	5514.7	3669.6	13669.3
Total FWM Outflow Conc	ppb	23.9	16.6	23.7	16.4	24.4	16.3	16.5
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

In summary, a diversion of approximately 43% of the total inflows to STA-2 to other treatment works would necessary to achieve the planning objective in STA-2 outflows, if the SAV community in STA-2 performs as NEWS in lieu of SAV_C4, and if the entire footprint of STA-2 is converted to SAV. Inspection of the data summarized in Table 6.31 indicates that, given the following basic assumptions, STA-3/4 could receive roughly one-half of those diverted flows:

- The design and operation of the EAA Storage Reservoir Project is modified to parallel the alternative design presented in Part 6 of the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*;
- The SAV community in STA-3/4 performs as NEWS in lieu of SAV_C4;
- The entire footprint of STA-3/4 is converted to SAV;
- The distribution of inflows to the various flow paths in STA-3/4 is modified to result in a greater degree of balance in projected outflow concentrations.

Part 6 of the *Evaluation of Alternatives for the ECP Basins* also presents at least one alternative for STA-2, acting in combination with Component B of the EAA Storage Reservoirs Project, in which the planning objective (long-term flow-weighted geometric mean concentration of 10 ppb) can be met, even if the SAV community in STA-2 performs as NEWS in lieu of as SAV_C4. However, that alternative would require dedication of the entire 9,302-acre area of Component B to use as a flow equalization basin for STA-2. It is far from certain that those lands would be available for such dedicated use, or that such a dedicated use would be the most appropriate use of those lands. As a result, it is contemplated in this Long-Term Plan that, should it eventually be found necessary to reduce the loading on STA-2, that reduction in loading could be accomplished by either:

- Diverting roughly 22% of the STA-2 inflow volumes and loads to STA-3/4;
- Developing additional treatment area to accommodate roughly 22% of the projected total inflow volumes and loads to STA-2.

Given that the potential for partial diversion of STA-2 inflows to STA-3/4 is highly dependent upon the extent to which the design and operation of the EAA Storage Reservoirs projects will be developed to contribute to water quality improvement, it would be imprudent to simply assume such a diversion would be effected. As a result, it is contemplated herein that, should it eventually be found necessary to reduce the loading on STA-2, that reduction in loading would be accomplished through development of additional treatment area.

It is anticipated that the additional treatment area would be developed as a fourth parallel flow path for STA-2. The total effective treatment area in the new flow path would be approximately 1,800 acres, developed in two cells in series each vegetated with SAV.

6.1.2.3 Summary of Possible Future Enhancements

The following is a summary listing of all presently identified possible future enhancements and modifications to STA-3/4. These modifications are consistent with Alternative 3 as summarized in Table 6.25.

- Conversion of Cells 1A, 2A and 3A from emergent macrophyte vegetation to submerged aquatic vegetation (SAV).

The following is a summary listing of all presently identified possible future enhancements and modifications to STA-2. These modifications are consistent with Alternative 5 as summarized in Table 6.19.

- Convert Cells 1A and 2A from emergent macrophyte vegetation to SAV;
- Develop a fourth parallel flow path in STA-2, providing an increase in effective treatment area of approximately 1,800 acres. Additional discussion of this fourth flow path is presented below.

The simplest location for an expansion of STA-2 would be to develop the new flow path immediately adjacent to and west of the existing treatment area. However, that would require use of lands acquired under the Talisman Land Exchange, and presently considered potentially available for use in the EAA Storage Reservoirs projects. For the purpose of projecting possible expenditures for such an expansion, it is assumed that the expansion would take place along the Hillsboro Canal upstream of Pumping Station S-6, and would incorporate certain public lands (e.g., the 1,380-acre “Snail Farm”) within the overall treatment area footprint. The fourth flow path would be developed entirely in SAV, and would be structured for a hydraulic capacity of roughly 650 cfs (approximately 22% of the capacity of Pumping Station S-6). It is anticipated that a total land area of approximately 2,020 acres would be needed for this fourth flow path, which would discharge to the Arthur R. Marshall Loxahatchee National Wildlife Refuge immediately north of existing Pumping Station S-6.

6.1.2.4 Opinion of Capital Cost

An opinion of the probable capital cost for implementation of the possible future Alternative 3 at STA-3/4 is presented in Table 6.38. That opinion of capital cost is stated in FY 2003 dollars.

Table 6.38 Opinion of Capital Cost, Future STA-3/4 Enhancements, Alt. 3

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Eradication of Existing Vegetation	7734	ac	$200	$1,546,800	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$1,546,800**	**$1,550,000**
Planning, Engineering & Design		10 %			$154,680	**$155,000**
Program & Construction Management		10 %			$154,680	**$155,000**
Total Estimated Cost, Without Contingency					**$1,856,160**	**$1,860,000**
Contingency		30 %			$556,848	**$550,000**
TOTAL ESTIMATED CAPITAL COST					**$2,413,008**	**$2,410,000**

An opinion of the probable capital cost for implementation of the possible future Alternative 5 at STA-2 is presented in Table 6.39. That opinion of capital cost is stated in FY 2003 dollars.

Table 6.39 Opinion of Capital Cost, Future STA-2 Enhancements, Alt. 5

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Inflow Pumping Station	650	cfs	$7,500	$4,875,000	
2	New Outflow Pumping Station	650	cfs	$7,500	$4,875,000	
3	New Seepage Return Pumping Station	60	cfs	$9,500	$570,000	
4	Exterior Levee, 9' Above Grade	1	Mi.	$562,000	$562,000	
5	Exterior Levee, 8' Above Grade	5	Mi.	$485,000	$2,425,000	
6	Interior Levee, 7' Above Grade	2	Mi.	$390,000	$780,000	
7	Blasting for Levees and Canals	7	Mi.	$48,000	$336,000	
8	New Water Control Structures	4	Ea.	$190,000	$760,000	
9	Stilling Wells (Includes Electrical and Telemetry)	4	Ea.	$9,000	$36,000	
10	Water Control Structure Electrical (Includes Telemetry)	4	Ea.	$43,000	$172,000	
11	Establish New Flow & Water Quality Monintoring Sites	2	Ea.	$10,000	$20,000	
12	Electrical Power Distribution	4	Mi.	$80,000	$320,000	
13	Clearing	1000	Ac.	$500	$500,000	
14	Disking and Land Prep.	1800	Ac.	$60	$108,000	
15	Eradication of Existing Vegetation, Cells 1A and 2A	1630	ac	$200	$326,000	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$16,665,000**	**16,700,000**
Planning, Engineering & Design		10	%		$1,666,500	**1,670,000**
Program & Construction Management		10	%		$1,666,500	**1,670,000**
Total Estimated Cost, Without Contingency					**$19,998,000**	**20,040,000**
Contingency		30	%		$5,999,400	**6,000,000**
Land Acquisition		2020	Ac.	$2,800	**$5,656,000**	**7,350,000**
Land Acquisition Contingency		30	%		$1,696,800	
TOTAL ESTIMATED CAPITAL COST					**$33,350,200**	**$33,390,000**

6.1.2.5 Opinion of Incremental Operation and Maintenance Costs

An opinion of the probable incremental average annual operations and maintenance cost for implementation of the possible future Alternative 3 at STA-3/4 is presented in Table 6.40. That opinion of incremental cost is stated in FY 2003 dollars.

Table 6.40 Opinion of Incremental O&M Cost, Future STA-3/4 Enhancements, Alt. 3

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Incremental Cost forAnnual Vegetation Control	7734	ac	$30	$232,020	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$232,020**	
Contingency		30	%		$69,606	
TOTAL INCREMENTAL O&M COST					**$301,626**	**$300,000**

An opinion of the probable incremental average annual operations and maintenance cost for implementation of the possible future Alternative 5 at STA-2 is presented in Table 6.41. That opinion of incremental cost is stated in FY 2003 dollars.

Table 6.41 Opinion of Incremental O&M Cost, Future STA-2 Enhancements, Alt. 5

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Levees	8	Mi.	$3,300	$26,400	
2	New Water Control Structures	4	Ea.	$8,000	$32,000	
3	Mech. Maintenance, Seepage Pumping Station, 3 units assumed	3	Ea.	$2,500	$7,500	
4	Mech. Maintenance, New Inflow and Outflow Pump Stations, 2 Units Each Assumed	4	Ea.	$23,000	$92,000	
5	Building Maintenance, Pump Stations, per primary unit	4	Ea.	$12,000	$48,000	
6	Engine Operator/Maintenance Mechanic	4	Ea.	$50,000	$200,000	
7	Power Consumption, Seepage Pumping Station	20000	Ac-ft	$0.60	$12,000	
8	Diesel fuel consumption, primary pumping stations	0	Ac-ft	$0.50	$0	No increase in overall pumped volumes, inflow or outflow
9	Annual Cost for Vegetation Control, New Cell 2S	1800	ac	$80	$144,000	
10	Monitoring of Permit Compliance Sites, New	2	Ea.	$54,500	$109,000	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$670,900**	
Contingency		30	%		$201,270	
TOTAL INCREMENTAL O&M COST					**$872,170**	**$870,000**

6.1.2.6 Possible Implementation Schedule and Expenditures

The possible future enhancements and modifications to STA-2 and STA-3/4 discussed previously in this section should only be implemented once their need is conclusively demonstrated and adequate assurance that the phosphorus criterion can be obtained thereby. In particular, the potential expansion of STA-2 to create a fourth parallel flow path represents a substantial incremental expenditure. Accordingly, it is anticipated that the additional enhancements, if needed, would be implemented incrementally, based on the continually improving understanding of performance and need resulting from the PDE component described in Part 5 of this *Long-Term Plan*, and as additional certainty is gained relative to the nature of CERP projects directly impacting these two STAs. As a result, the following possible implementation schedule is highly conjectural in nature, as it is based on the principal assumption that the results of the PDE component will not increase treatment performance projections markedly beyond the more conservative present estimates.

By December 31, 2006, more definitive estimates of the projected treatment performance of the enhanced STA-2 should be in hand, and it should be possible to identify any additional steps that might be taken in STA-2, short of conversion of remaining emergent cells to SAV and partial diversion to other treatment areas. Should it be determined that the conversion is needed, and that remaining uncertainties relative to the ability to maintain the entire STA in a hydrated condition can be satisfactorily addressed, the conversion of the remaining cells in STA-2 to SAV would be planned in Fiscal Year (FY) 2007, and implemented in FY 2008.

The final remaining step for STA-2 would be implementation of a partial diversion of its inflows to other treatment areas, which might be either STA-3/4 or a newly developed fourth parallel cell for STA-2.

Unlike STA-2, which has been in at least partial operation since 2000, STA-3/4 is presently under construction. Substantial uncertainty remains as to the influence of CERP projects, in particular the EAA Storage Reservoirs projects, on inflow volumes and loads to STA-3/4. In addition, the enhancements to STA-3/4 recommended in Parts 2 and 3 of this *Long-Term Plan* will have been in place an insufficient period of time at the end of 2006 to permit full understanding of their performance.

It is anticipated that, concurrent with its December 31, 2008, report to the Governor and Legislature, the SFWMD will be in a position to more fully address those uncertainties. The STA will have been operating for a period of 4 years, and in an enhanced condition as recommended in Part 2 for just over 2 years. In addition, the Project Implementation Report (PIR) for the EAA Storage Reservoirs Project, Phase 1 will have been completed. That project is presently scheduled for approval in the Water Resources Development Act (WRDA) of 2004, and for completion in 2009. Should it be determined that conversion of Cells 1A, 2A and 3A to SAV is warranted and supportable, that conversion would be planned in FY 2007 and implemented in FY 2008. The remaining steps and possible implementation schedule for STA-3/4 are based on the assumption that the additional SAV cells would be fully functional and performing as intended by the end of calendar year 2009. The partial diversion of STA-2 inflows to STA-3/4, if necessary for the proper performance of STA-2, should be implemented no earlier than that date.

The final possible step in STA-2 (addition of a fourth parallel flow path), given its relatively high cost, should be implemented only after its need is conclusively demonstrated. It is recommended that STA-3/4 be operated, with or without the potential diversion of inflows from STA-2, for a minimum of two years (e.g., 2010 and 2011) prior to an irreversible commitment for addition of the fourth flow path.

The location of the fourth flow path can be substantially influenced by the results of detailed planning for the EAA Storage Reservoir, Phase 2 project. That project is presently scheduled for completion in 2014; it is anticipated that the PIR for that project will have been completed on a schedule that will allow the Congress to consider authorization and appropriation for the project in WRDA 2010. The results of that planning process can be expected to directly impact both the projected capital cost and average annual operations and maintenance cost for the expansion. The opinions of cost presented in Tables 6.39 and 6.41 are for development of the fourth flow path north of the Hillsboro Canal. Should lands adjacent to and immediately west of STA-2 (e.g., lands acquired under the Talisman Land Exchange) remain available for use in the STA-2 expansion, it would be possible to eliminate the need for the new inflow and outflow pumping stations. The estimated capital cost of the project would be reduced by roughly

$16 million; the estimated average annual cost for operation and maintenance would be reduced by roughly $450,000 per year (all costs in FY 2003 dollars).

Detailed planning and design for the expansion, if needed, should be undertaken no earlier than FY 2011. The construction of the additional works necessary for that conversion could then take place no earlier than FY 2012 and 2013. A summary of the projected expenditures for the possible future additional enhancements to STA-2 and STA-3/4 through FY 2016 is presented in Table 6.42. That projection of possible Expenditures contemplates an average annual rate of cost escalation of 3% over the period FY 2003-2016.

Table 6.42 Projected Expenditures, Possible Future Enhancement of STA-2 & STA-3/4

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	
2004							$0
2005							$0
2006							$0
2007	$188,000				$60,000		$248,000
2008		$188,000	$1,880,000		$600,000		$2,668,000
2009						$300,000	$300,000
2010						$300,000	$300,000
2011	$1,657,000			$7,350,000		$300,000	$9,307,000
2012		$808,500	$8,185,000		$2,945,000	$300,000	$12,238,500
2013		$808,500	$8,185,000		$2,945,000	$300,000	$12,238,500
2014						$1,170,000	$1,170,000
2015						$2,040,000	$2,040,000
2016						$2,910,000	$2,910,000
Total	**$1,845,000**	**$1,805,000**	**$18,250,000**	**$7,350,000**	**$6,550,000**	**$7,620,000**	**$43,420,000**

6.1.3. STA-5 and STA-6

STA-5 and STA-6 are hydraulically connected and potentially interdependent. For that reason, they are considered together.

6.1.3.1 Possible Future Modifications, STA-6

As discussed in Part 2 of this *Long-Term Plan*, the pre-2006 strategy for STA-6 (which is considered to initially include both Section 1 and Section 2) is to further compartmentalize Cell 5, forming new cells 5A and 5B, and to convert Cells 4B and 5B from emergent macrophyte to submerged aquatic vegetation (SAV). In addition, new structures for improved control and irrigation supply to the STA are recommended. If the SAV can be made to perform as intended (e.g., as SAV_C4), the projected treatment performance is capable of meeting the planning objective. However, the extent to which the SAV community can be made to reliably replicate on a long-term basis the SAV_C4 level of performance remains uncertain.

In this section, possible future modifications and enhancements to STA-6 are considered. It is not recommended that any such additional modifications and enhancements be considered for implementation until such time as additional information resulting from the PDE component (see Part 5 of this Long-Term Plan) is available and demonstrates:

- The need for additional modifications or enhancements;
- The extent to which the additional modifications or enhancements can be reliably demonstrated to contribute to an ability to meet the phosphorus criterion;
- The extent to which projected inflow volumes and loads to STA-6 may be adjusted in the future as a result of CERP implementation.

A summary of the possible future alternatives for STA-6 is presented in Table 6.43.

Tables 6.44 through 6.46 present additional detail on the estimated treatment performance of Alternatives 1-3, respectively, and consist of screen information taken directly from the DMSTA analyses. Those analyses are all for projected inflows to STA-6 prior to full implementation of CERP. A comparison of the performance of each alternative for pre-CERP and post-CERP inflows is also presented in Table 6.43 for reference purposes. Post-CERP inflows were developed employing the 2050wPROJ SFWMM simulation prepared by the District, in which the western lands acquired under the Talisman Land Exchange (previously U.S. Sugar Corporation's Southern Division Ranch, Unit 2) were considered as converted to use in the EAA Storage Reservoirs projects. This assumption is not necessarily valid, as it is dependent upon the results of the EAA Storage Reservoirs Phase 1 and Phase 2 projects.

Table 6.43 Possible Post-2006 Alternatives, STA-6

Alt. No.	Description	Long-Term Mean TP Concentration (ppb)		Ave. Annual Outflow	
		Flow-Weighted	Geometric	Volume (ac-ft/yr)	TP Load (kg/yr)
1	As recommended in Part 2; Add'l compartmentalization; Cells 4B and 5B as SAV_C4; no additional actions post-2006; Inflows pre-CERP	17.3	8.9*	35,100	746
1	As recommended in Part 2; Add'l compartmentalization; Cells 4B and 5B as SAV_C4; no additional actions post-2006; Inflows post-CERP	16.9	9.9*	57,600	1,197
2	As recommended in Part 2; Add'l compartmentalization; Cells 4B and 5B as NEWS; no additional actions post-2006; Inflows pre-CERP	23.7	12.5	35,100	1,024
2	As recommended in Part 2; Add'l compartmentalization; Cells 4B and 5B as NEWS; no additional actions post-2006; Inflows post-CERP	23.8	14.1	57,600	1,690
3	As recommended in Part 2; Add'l compartmentalization; Cells 4B and 5B as NEWS; convert all remaining cells to NEWS post-2006; Inflows pre-CERP; Redistribute inflows for balanced outflow performance	22.5	9.0*	35,000	975
3	As recommended in Part 2; Add'l compartmentalization; Cells 4B and 5B as NEWS; convert all remaining cells to NEWS post-2006; Inflows post-CERP	21.2	10.1	57,200	1,497
* Computed value; 10 ppb taken as lowest sustainable long-term geometric mean concentration.					

Table 6.44 Estimated Treatment Performance, STA-6 Alternative 1

Input Variable	Units	Value
Design Case Name	-	Alt2
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: Cells 2,3 & 5a--Emergent and Cells 4 & 5b--SAV_C4 **Filename:** 6EX_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	0.0%
Flow-Wtd Conc - With Bypass	ppb	17.3
Flow-Wtd Conc - Without Bypass	ppb	17.3
Geometric Mean Conc	ppb	8.9
95th Percentile Conc	ppb	22.1
Freq Cell Outflow > 10 ppb	%	14%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	2	4	3	5a	5b	
Vegetation Type	------->	EMERG	SAV_C4	EMERG	EMERG	SAV_C4	
Inflow Fraction	-	0.6	0	0.11	0.29	0	
Downstream Cell Number	-	2	0	0	5	0	
Surface Area	km2	2.242	3.363	0.991	1.056	1.582	
Mean Width of Flow Path	km	2.34	2.32	0.61	1.12	1.48	
Number of Tanks in Series	-	3	3	3	3	3	
Outflow Control Depth	cm	40	60	40	40	60	
Outflow Coefficient - Exponent	-	1.67	1.67	3.08	3.56	5.07	
Outflow Coefficient - Intercept	-	0.18	0.2	0.63	0.29	0.24	
Bypass Depth	cm	0	0	0	0	0	
Maximum Inflow	hm3/day	0	0	0	0	0	
Maximum Outflow	hm3/day	0	0	0	0	0	
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	
Inflow Seepage Control Elev	cm	0	0	0	0	0	
Inflow Seepage Conc	ppb	20	20	20	20	20	
Outflow Seepage Rate	(cm/d) / cm	0.0059	0.0017	0	0	0	
Outflow Seepage Control Elev	cm	-46	-46	0	0	0	
Max Outflow Seepage Conc	ppb	20	20	20	20	20	
Seepage Recycle Fraction	-	0.5	0.5	0	0	0	
Seepage Discharge Fraction	-	0	0	0	0	0	
Initial Water Column Conc	ppb	30	30	30	30	30	
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	
Initial Water Column Depth	cm	50	50	50	50	50	
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*4*	*4*	*4*	*4*	
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	
K = Net Settling Rate at Steady State	m/yr	*16*	*80*	*15.66*	*15.66*	*80.10*	
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	
C0 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	
C1 - Periphyton	ppb	*0*	*0*	*0*	*0*	*0*	
K - Periphyton	1/yr	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	
Sm = Transition Storage Midpoint	mg/m2	*0*	*0*	*0*	*0*	*0*	
Sb = Transition Storage Bandwidth	mg/m2	*0*	*0*	*0*	*0*	*0*	

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	7.87	14.00	20.19	26.39	32.81		32.81
Run Date	-	06/11/02	06/11/02	06/11/02	06/11/02	06/11/02		06/11/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65		01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65		01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95		12/31/95
Output Duration	days	11322	11322	11322	11322	11322		11322
Cell Label		2	4	3	5a	5b		Total Outflow
Downstream Cell Label		4	Outflow	Outflow	5b	Outflow		-
Surface Area	km2	2.242	3.363	0.991	1.056	1.582		9.2
Mean Water Load	cm/d	3.4	2.1	1.4	3.5	2.3		1.4
Max Water Load	cm/d	86.3	58.9	35.8	88.5	61.1		34.9
Inflow Volume	hm3/yr	28.1	25.9	5.1	13.6	13.5		46.8
Inflow Load	kg/yr	2427.3	1274.9	445.0	1173.2	655.8		4045.4
Inflow Conc	ppb	86.5	49.3	86.5	86.5	48.5		86.5
Treated Outflow Volume	hm3/yr	25.9	24.7	5.1	13.5	13.4		43.3
Treated Outflow Load	kg/yr	1274.9	372.0	174.9	655.8	199.3		746.3
Treated FWM Outflow Conc	ppb	49.3	15.1	34.3	48.5	14.8		17.3
Total Outflow Volume	hm3/yr	25.9	24.7	5.1	13.5	13.4		43.3
Total Outflow Load	kg/yr	1274.9	372.0	174.9	655.8	199.3		746.3
Total FWM Outflow Conc	ppb	49.3	15.1	34.3	48.5	14.8		17.3
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00		0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00		0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0		0.0
Bypass Load	%	0%	0%	0%	0%	0%		0%

Table 6.45 Estimated Treatment Performance, STA-6 Alternative 2

Input Variable	Units	Value	Case Description:	Filename:	6EX_Data.xls
Design Case Name	-	Fut Alt2	Cells 2,3 & 5a--Emergent and Cells 4 & 5b--NEWS		
Starting Date for Simulation	-	01/01/65			
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	23.7
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	23.7
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	12.5
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	25.7
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	44%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	2	4	3	5a	5b	
Vegetation Type	------->	EMERG	NEWS	EMERG	EMERG	NEWS	
Inflow Fraction	-	0.6	0	0.11	0.29	0	
Downstream Cell Number	-	2	0	0	5	0	
Surface Area	km2	2.242	3.363	0.991	1.056	1.582	
Mean Width of Flow Path	km	2.34	2.32	0.61	1.12	1.48	
Number of Tanks in Series	-	3	3	3	3	3	
Outflow Control Depth	cm	40	60	40	40	60	
Outflow Coefficient - Exponent	-	1.67	1.67	3.08	3.56	5.07	
Outflow Coefficient - Intercept	-	0.18	0.2	0.63	0.29	0.24	
Bypass Depth	cm	0	0	0	0	0	
Maximum Inflow	hm3/day	0	0	0	0	0	
Maximum Outflow	hm3/day	0	0	0	0	0	
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	
Inflow Seepage Control Elev	cm	0	0	0	0	0	
Inflow Seepage Conc	ppb	20	20	20	20	20	
Outflow Seepage Rate	(cm/d) / cm	0.0059	0.0017	0	0	0	
Outflow Seepage Control Elev	cm	-46	-46	0	0	0	
Max Outflow Seepage Conc	ppb	20	20	20	20	20	
Seepage Recycle Fraction	-	0.5	0.5	0	0	0	
Seepage Discharge Fraction	-	0	0	0	0	0	
Initial Water Column Conc	ppb	30	30	30	30	30	
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	
Initial Water Column Depth	cm	50	50	50	50	50	
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*4*	*4*	*12*	
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*15.66*	*15.66*	*128.70*	
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	
C0 - Periphyton	ppb	*0*	*4*	*0*	*0*	*4*	
C1 - Periphyton	ppb	*0*	*22*	*0*	*0*	*22*	
K - Periphyton	1/yr	*0.00*	*23.80*	*0.00*	*0.00*	*23.80*	
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*0*	*0*	*400*	
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*0*	*0*	*80*	

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.00	1.97	2.90	3.84	4.81		4.81
Run Date	-	12/05/02	12/05/02	12/05/02	12/05/02	12/05/02		12/05/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65		01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65		01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95		12/31/95
Output Duration	days	11322	11322	11322	11322	11322		11322
Cell Label		2	4	3	5a	5b		Total Outflow
Downstream Cell Label		4	Outflow	Outflow	5b	Outflow		-
Surface Area	km2	2.242	3.363	0.991	1.056	1.582		9.2
Mean Water Load	cm/d	3.4	2.1	1.4	3.5	2.3		1.4
Max Water Load	cm/d	86.3	58.9	35.8	88.5	61.1		34.9
Inflow Volume	hm3/yr	28.1	25.9	5.1	13.6	13.5		46.8
Inflow Load	kg/yr	2427.3	1274.9	445.0	1173.2	655.8		4045.4
Inflow Conc	ppb	86.5	49.3	86.5	86.5	48.5		86.5
Treated Outflow Volume	hm3/yr	25.9	24.7	5.1	13.5	13.4		43.3
Treated Outflow Load	kg/yr	1274.9	554.9	174.9	655.8	294.4		1024.3
Treated FWM Outflow Conc	ppb	49.3	22.5	34.3	48.5	21.9		23.7
Total Outflow Volume	hm3/yr	25.9	24.7	5.1	13.5	13.4		43.3
Total Outflow Load	kg/yr	1274.9	554.9	174.9	655.8	294.4		1024.3
Total FWM Outflow Conc	ppb	49.3	22.5	34.3	48.5	21.9		23.7
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00		0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00		0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0		0.0
Bypass Load	%	0%	0%	0%	0%	0%		0%

Table 6.46 Estimated Treatment Performance, STA-6 Alternative 3

Input Variable	Units	Value
Design Case Name	-	Fut Alt3
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: All cells as NEWS
Redistribute inflows

Filename: 6EX_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	-0.1%
Flow-Wtd Conc - With Bypass	ppb	22.5
Flow-Wtd Conc - Without Bypass	ppb	22.5
Geometric Mean Conc	ppb	8.9
95th Percentile Conc	ppb	23.8
Freq Cell Outflow > 10 ppb	%	34%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	2	4	3	5a	5b	
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS	NEWS	
Inflow Fraction	-	0.61	0	0.07	0.32	0	
Downstream Cell Number	-	2	0	0	5	0	
Surface Area	km2	2.242	3.363	0.991	1.056	1.582	
Mean Width of Flow Path	km	2.34	2.32	0.61	1.12	1.48	
Number of Tanks in Series	-	3	3	3	3	3	
Outflow Control Depth	cm	60	60	60	60	60	
Outflow Coefficient - Exponent	-	1.67	1.67	3.08	3.56	5.07	
Outflow Coefficient - Intercept	-	0.18	0.2	0.63	0.29	0.24	
Bypass Depth	cm	0	0	0	0	0	
Maximum Inflow	hm3/day	0	0	0	0	0	
Maximum Outflow	hm3/day	0	0	0	0	0	
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	
Inflow Seepage Control Elev	cm	0	0	0	0	0	
Inflow Seepage Conc	ppb	20	20	20	20	20	
Outflow Seepage Rate	(cm/d) / cm	0.0059	0.0017	0	0	0	
Outflow Seepage Control Elev	cm	-46	-46	0	0	0	
Max Outflow Seepage Conc	ppb	20	20	20	20	20	
Seepage Recycle Fraction	-	0.5	0.5	0	0	0	
Seepage Discharge Fraction	-	0	0	0	0	0	
Initial Water Column Conc	ppb	30	30	30	30	30	
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	
Initial Water Column Depth	cm	50	50	50	50	50	
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*	*12*	
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*	*128.70*	
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*	*4*	
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*	*22*	
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*	*23.80*	
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*	*400*	
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*	*80*	

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.03	2.00	2.97	3.94	4.87		4.87
Run Date	-	12/05/02	12/05/02	12/05/02	12/05/02	12/05/02		12/05/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65		01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65		01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95		12/31/95
Output Duration	days	11322	11322	11322	11322	11322		11322
Cell Label		2	4	3	5a	5b		Total Outflow
Downstream Cell Label		4	Outflow	Outflow	5b	Outflow		-
Surface Area	km2	2.242	3.363	0.991	1.056	1.582		9.2
Mean Water Load	cm/d	3.5	2.1	0.9	3.9	2.6		1.4
Max Water Load	cm/d	87.7	59.8	22.8	97.7	67.3		34.9
Inflow Volume	hm3/yr	28.5	25.9	3.3	15.0	14.9		46.8
Inflow Load	kg/yr	2467.7	974.7	283.2	1294.5	568.3		4045.4
Inflow Conc	ppb	86.5	37.6	86.5	86.5	38.1		86.5
Treated Outflow Volume	hm3/yr	25.9	24.8	3.2	14.9	14.8		42.9
Treated Outflow Load	kg/yr	974.7	559.8	65.9	568.3	339.4		965.1
Treated FWM Outflow Conc	ppb	37.6	22.6	20.4	38.1	22.9		22.5
Total Outflow Volume	hm3/yr	25.9	24.8	3.2	14.9	14.8		42.9
Total Outflow Load	kg/yr	974.7	559.8	65.9	568.3	339.4		965.1
Total FWM Outflow Conc	ppb	37.6	22.6	20.4	38.1	22.9		22.5
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00		0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00		0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0		0.0
Bypass Load	%	0%	0%	0%	0%	0%		0%

6.1.3.2 Possible Future Modifications, STA-5

As discussed in Part 2 of this *Long-Term Plan*, the pre-2006 strategy for STA-5 is to convert Cell 2B from emergent macrophyte to submerged aquatic vegetation (SAV), coupled with certain structure modifications for improved control and the addition of additional seepage control capacity. If the SAV can be made to perform as intended (e.g., as SAV_C4), the projected treatment performance is capable of meeting the assigned objective of a long-term geometric mean concentration of 10 ppb. However, in the instance of STA-5, a number of uncertainties remain. The most significant of those uncertainties include:

- The extent to which the SAV community can be made to reliably replicate on a long-term basis the SAV_C4 level of performance;
- The influence of CERP projects (in particular the EAA Storage Reservoir Projects) on inflow volumes and TP concentrations to STA-5;
- The extent to which inflow patterns can be relied upon to maintain the SAV communities in STA-5 in a hydrated condition. This is of heightened concern at STA-5, as runoff from the C-139 Basin is more subject to seasonal variation than runoff from any other ECP basin;
- The extent to which source controls in the C-139 Basin can be implemented and capable of preventing increased total phosphorus concentrations and loads in basin runoff;
- Appropriate target outflow concentrations for STA-5, recognizing the distribution of outflows to receiving water bodies other than the EPA;
- Confirmation that the estimated performance of any of the vegetative communities remains applicable to the estimated inflow concentrations at STA-5, which exceed all calibration ranges in DMSTA.

In this section, possible future modifications and enhancements to STA-5 are considered. It is not recommended that any such additional modifications and enhancements be considered for implementation until such time as additional information resulting from the PDE component (see Part 5 of this Long-Term Plan) is available and demonstrates:

- The need for additional modifications or enhancements;
- The extent to which the additional modifications or enhancements can be reliably demonstrated to contribute to an ability to meet the phosphorus criterion.

A summary of the possible future alternatives for STA-6 is presented in Table 6.47.

Table 6.47 Possible Post-2006 Alternatives, STA-5

Alt. No.	Description	Long-Term Mean TP Concentration (ppb)		Ave. Annual Outflow	
		Flow-Weighted	Geometric	Volume (ac-ft/yr)	TP Load (kg/yr)
1	As recommended in Part 2; Cells 1B and 2B as SAV_C4; no additional actions post-2006.	19.6	10.4	125,500	3,032
2	As recommended in Part 2; Cells 1B and 2B as NEWS; no additional actions post-2006.	29.8	13.2	125,500	4,615
3	As recommended in Part 2; Cells 1B and 2B as NEWS; convert Cells 1A and 2A to NEWS post-2006	25.2	10.0	125,300	3,893
4	Add north-south levee in Cells 1A and 2A; locate at approx. 36% of cell area west of downstream end current cells; convert new cells 1AE & 1AW to NEWS; cells 1B and 2B as NEWS; No increase in overall treatment area	26.3	11.1	124,900	4,060
5	As for Alt. 4, but expand treatment area west to L-2 (new pump station needed); new upstream area as Emergent	25.0	11.4	124,100	3,826
6	As for Alt. 4, but increase size of treatment area 50% with third flow path	21.0	10.4	121,500	3,144

Tables 6.48 through 6.53 present additional detail on the estimated treatment performance of Alternatives 1-6, respectively, and consist of screen information taken directly from the DMSTA analyses. Unlike the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, it is not contemplated in this analysis that those inflows would vary markedly from that now existing following full implementation of CERP, should the EAA Storage Reservoirs projects be developed as modeled for the *Basin-Specific Feasibility Studies.*

Table 6.48 Estimated Treatment Performance, STA-5 Alternative 1

Input Variable	Units	Value
Design Case Name	-	Alt2
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: Cells 1A & 2A--Emergent & Cells 1B & 2B--SAV_C4

Filename: 5EX_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	-0.1%
Flow-Wtd Conc - With Bypass	ppb	19.6
Flow-Wtd Conc - Without Bypass	ppb	19.6
Geometric Mean Conc	ppb	10.4
95th Percentile Conc	ppb	24.9
Freq Cell Outflow > 10 ppb	%	62%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B		
Vegetation Type	------->	EMERG	SAV_C4	EMERG	SAV_C4		
Inflow Fraction	-	0.5	0	0.5	0		
Downstream Cell Number	-	2	0	4	0		
Surface Area	km2	3.379	4.937	3.379	4.937		
Mean Width of Flow Path	km	1.56	1.56	1.56	1.56		
Number of Tanks in Series	-	3	3	3	3		
Outflow Control Depth	cm	40	60	40	60		
Outflow Coefficient - Exponent	-	2.8	2.15	2.91	1.78		
Outflow Coefficient - Intercept	-	1.57	2.02	1.51	2.1		
Bypass Depth	cm	0	0	0	0		
Maximum Inflow	hm3/day	0	0	0	0		
Maximum Outflow	hm3/day	0	0	0	0		
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0		
Inflow Seepage Control Elev	cm	0	0	0	0		
Inflow Seepage Conc	ppb	20	20	20	20		
Outflow Seepage Rate	(cm/d) / cm	0.0015	0.0014	0.0015	0.0033		
Outflow Seepage Control Elev	cm	-46	-38	-46	-38		
Max Outflow Seepage Conc	ppb	20	20	20	20		
Seepage Recycle Fraction	-	0.5	0.5	0.5	0.5		
Seepage Discharge Fraction	-	0	0	0	0		
Initial Water Column Conc	ppb	30	30	30	30		
Initial P Storage Per Unit Area	mg/m2	500	500	500	500		
Initial Water Column Depth	cm	50	50	50	50		
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*4*	*4*	*4*		
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*		
K = Net Settling Rate at Steady State	m/yr	*16*	*80*	*15.66*	*80.10*		
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*		
C0 - Periphyton	ppb	*0*	*0*	*0*	*0*		
C1 - Periphyton	ppb	*0*	*0*	*0*	*0*		
K - Periphyton	1/yr	*0.00*	*0.00*	*0.00*	*0.00*		
Zx - Periphyton	cm	*0*	*0*	*0*	*0*		
Sm = Transition Storage Midpoint	mg/m2	*0*	*0*	*0*	*0*		
Sb = Transition Storage Bandwidth	mg/m2	*0*	*0*	*0*	*0*		

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	6.13	11.65	17.49	23.03			23.03
Run Date	-	05/28/02	05/28/02	05/28/02	05/28/02			05/28/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65			01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65			01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95			12/31/95
Output Duration	days	11322	11322	11322	11322			11322
Cell Label		1A	1B	2A	2B			Total Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow			-
Surface Area	km2	3.379	4.937	3.379	4.937			16.6
Mean Water Load	cm/d	6.6	4.4	6.6	4.4			2.7
Max Water Load	cm/d	60.0	40.5	60.0	40.4			24.4
Inflow Volume	hm3/yr	81.5	80.2	81.5	80.2			163.1
Inflow Load	kg/yr	14531.8	9296.2	14531.8	9241.2			29063.6
Inflow Conc	ppb	178.2	115.9	178.2	115.3			178.2
Treated Outflow Volume	hm3/yr	80.2	78.2	80.2	76.6			154.8
Treated Outflow Load	kg/yr	9296.2	1528.1	9241.2	1503.6			3031.8
Treated FWM Outflow Conc	ppb	115.9	19.5	115.3	19.6			19.6
Total Outflow Volume	hm3/yr	80.2	78.2	80.2	76.6			154.8
Total Outflow Load	kg/yr	9296.2	1528.1	9241.2	1503.6			3031.8
Total FWM Outflow Conc	ppb	115.9	19.5	115.3	19.6			19.6
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00			0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00			0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0			0.0
Bypass Load	%	0%	0%	0%	0%			0%

Table 6.49 Estimated Treatment Performance, STA-5 Alternative 2

Input Variable	Units	Value
Design Case Name	-	Fut Alt2
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: Cells 1A & 2A--Emergent & Cells 1B & 2B--NEWS

Filename: 5EX_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	-0.1%
Flow-Wtd Conc - With Bypass	ppb	29.8
Flow-Wtd Conc - Without Bypass	ppb	29.8
Geometric Mean Conc	ppb	13.2
95th Percentile Conc	ppb	41.9
Freq Cell Outflow > 10 ppb	%	60%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B		
Vegetation Type	------->	EMERG	NEWS	EMERG	NEWS		
Inflow Fraction	-	0.5	0	0.5	0		
Downstream Cell Number	-	2	0	4	0		
Surface Area	km2	3.379	4.937	3.379	4.937		
Mean Width of Flow Path	km	1.56	1.56	1.56	1.56		
Number of Tanks in Series	-	3	3	3	3		
Outflow Control Depth	cm	40	60	40	60		
Outflow Coefficient - Exponent	-	2.8	2.15	2.91	1.78		
Outflow Coefficient - Intercept	-	1.57	2.02	1.51	2.1		
Bypass Depth	cm	0	0	0	0		
Maximum Inflow	hm3/day	0	0	0	0		
Maximum Outflow	hm3/day	0	0	0	0		
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0		
Inflow Seepage Control Elev	cm	0	0	0	0		
Inflow Seepage Conc	ppb	20	20	20	20		
Outflow Seepage Rate	(cm/d) / cm	0.0015	0.0014	0.0015	0.0033		
Outflow Seepage Control Elev	cm	-46	-38	-46	-38		
Max Outflow Seepage Conc	ppb	20	20	20	20		
Seepage Recycle Fraction	-	0.5	0.5	0.5	0.5		
Seepage Discharge Fraction	-	0	0	0	0		
Initial Water Column Conc	ppb	30	30	30	30		
Initial P Storage Per Unit Area	mg/m2	500	500	500	500		
Initial Water Column Depth	cm	50	50	50	50		
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*4*	*12*		
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*		
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*15.66*	*128.70*		
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*		
C0 - Periphyton	ppb	*0*	*4*	*0*	*4*		
C1 - Periphyton	ppb	*0*	*22*	*0*	*22*		
K - Periphyton	1/yr	*0.00*	*23.80*	*0.00*	*23.80*		
Zx - Periphyton	cm	*0*	*0*	*0*	*0*		
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*0*	*400*		
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*0*	*80*		

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.00	1.97	2.90	3.87			3.87
Run Date	-	12/05/02	12/05/02	12/05/02	12/05/02			12/05/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65			01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65			01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95			12/31/95
Output Duration	days	11322	11322	11322	11322			11322
Cell Label		1A	1B	2A	2B			Total Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow			-
Surface Area	km2	3.379	4.937	3.379	4.937			16.6
Mean Water Load	cm/d	6.6	4.4	6.6	4.4			2.7
Max Water Load	cm/d	60.0	40.5	60.0	40.4			24.4
Inflow Volume	hm3/yr	81.5	80.2	81.5	80.2			163.1
Inflow Load	kg/yr	14531.8	9296.2	14531.8	9241.2			29063.6
Inflow Conc	ppb	178.2	115.9	178.2	115.3			178.2
Treated Outflow Volume	hm3/yr	80.2	78.2	80.2	76.6			154.8
Treated Outflow Load	kg/yr	9296.2	2321.2	9241.2	2293.5			4614.7
Treated FWM Outflow Conc	ppb	115.9	29.7	115.3	29.9			29.8
Total Outflow Volume	hm3/yr	80.2	78.2	80.2	76.6			154.8
Total Outflow Load	kg/yr	9296.2	2321.2	9241.2	2293.5			4614.7
Total FWM Outflow Conc	ppb	115.9	29.7	115.3	29.9			29.8
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00			0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00			0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0			0.0
Bypass Load	%	0%	0%	0%	0%			0%

Table 6.50 Estimated Treatment Performance, STA-5 Alternative 3

Input Variable	Units	Value
Design Case Name	-	Fut Alt3
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description: All cells as NEWS **Filename:** 5EX_Data.xls

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	-0.2%
Flow-Wtd Conc - With Bypass	ppb	25.2
Flow-Wtd Conc - Without Bypass	ppb	25.2
Geometric Mean Conc	ppb	10.0
95th Percentile Conc	ppb	35.6
Freq Cell Outflow > 10 ppb	%	42%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1A	1B	2A	2B		
Vegetation Type	------->	NEWS	NEWS	NEWS	NEWS		
Inflow Fraction	-	0.5	0	0.5	0		
Downstream Cell Number	-	2	0	4	0		
Surface Area	km2	3.379	4.937	3.379	4.937		
Mean Width of Flow Path	km	1.56	1.56	1.56	1.56		
Number of Tanks in Series	-	3	3	3	3		
Outflow Control Depth	cm	60	60	60	60		
Outflow Coefficient - Exponent	-	2.8	2.15	2.91	1.78		
Outflow Coefficient - Intercept	-	1.57	2.02	1.51	2.1		
Bypass Depth	cm	0	0	0	0		
Maximum Inflow	hm3/day	0	0	0	0		
Maximum Outflow	hm3/day	0	0	0	0		
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0		
Inflow Seepage Control Elev	cm	0	0	0	0		
Inflow Seepage Conc	ppb	20	20	20	20		
Outflow Seepage Rate	(cm/d) / cm	0.0015	0.0014	0.0015	0.0033		
Outflow Seepage Control Elev	cm	-46	-38	-46	-38		
Max Outflow Seepage Conc	ppb	20	20	20	20		
Seepage Recycle Fraction	-	0.5	0.5	0.5	0.5		
Seepage Discharge Fraction	-	0	0	0	0		
Initial Water Column Conc	ppb	30	30	30	30		
Initial P Storage Per Unit Area	mg/m2	500	500	500	500		
Initial Water Column Depth	cm	50	50	50	50		
C0 = WC Conc at 0 g/m2 P Storage	ppb	*12*	*12*	*12*	*12*		
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*		
K = Net Settling Rate at Steady State	m/yr	*129*	*129*	*128.70*	*128.70*		
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*		
C0 - Periphyton	ppb	*4*	*4*	*4*	*4*		
C1 - Periphyton	ppb	*22*	*22*	*22*	*22*		
K - Periphyton	1/yr	*23.80*	*23.80*	*23.80*	*23.80*		
Zx - Periphyton	cm	*0*	*0*	*0*	*0*		
Sm = Transition Storage Midpoint	mg/m2	*400*	*400*	*400*	*400*		
Sb = Transition Storage Bandwidth	mg/m2	*80*	*80*	*80*	*80*		

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.06	2.03	3.00	3.97			3.97
Run Date	-	12/05/02	12/05/02	12/05/02	12/05/02			12/05/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65			01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65			01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95			12/31/95
Output Duration	days	11322	11322	11322	11322			11322
Cell Label		1A	1B	2A	2B			Total Outflow
Downstream Cell Label		1B	Outflow	2B	Outflow			-
Surface Area	km2	3.379	4.937	3.379	4.937			16.6
Mean Water Load	cm/d	6.6	4.4	6.6	4.4			2.7
Max Water Load	cm/d	60.0	40.8	60.0	40.8			24.4
Inflow Volume	hm3/yr	81.5	80.0	81.5	80.0			163.1
Inflow Load	kg/yr	14531.8	3539.0	14531.8	3538.4			29063.6
Inflow Conc	ppb	178.2	44.2	178.2	44.2			178.2
Treated Outflow Volume	hm3/yr	80.0	78.1	80.0	76.5			154.5
Treated Outflow Load	kg/yr	3539.0	1957.0	3538.4	1936.1			3893.1
Treated FWM Outflow Conc	ppb	44.2	25.1	44.2	25.3			25.2
Total Outflow Volume	hm3/yr	80.0	78.1	80.0	76.5			154.5
Total Outflow Load	kg/yr	3539.0	1957.0	3538.4	1936.1			3893.1
Total FWM Outflow Conc	ppb	44.2	25.1	44.2	25.3			25.2
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00			0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00			0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0			0.0
Bypass Load	%	0%	0%	0%	0%			0%

Table 6.51 Estimated Treatment Performance, STA-5 Alternative 4

Case Description: Additional compartmentalization; locate new levee at east point exist upstream cells; New cells 1AE and 2AE as NEWS; upstream cells emergent, no increase in treatment area

Filename: 5EX_Data.xls

Input Variable	Units	Value
Design Case Name	-	Fut Alt4
Starting Date for Simulation	-	01/01/65
Ending Date for Simulation	-	12/31/95
Starting Date for Output	-	01/01/65
Steps Per Day	-	3
Number of Iterations	-	2
Output Averaging Interval	days	7
Reservoir H2O Residence Time	days	0
Max Inflow / Mean Inflow	-	0
Max Reservoir Storage	hm3	0
Reservoir P Decay Rate	1/yr/ppb	0
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Output Variable	Units	Value
Water Balance Error	%	0.0%
Mass Balance Error	%	-0.1%
Flow-Wtd Conc - With Bypass	ppb	26.3
Flow-Wtd Conc - Without Bypass	ppb	26.3
Geometric Mean Conc	ppb	11.1
95th Percentile Conc	ppb	38.7
Freq Cell Outflow > 10 ppb	%	49%
Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1AW	1AE	1B	2AW	2AE	2B
Vegetation Type	------->	EMERG	NEWS	NEWS	EMERG	NEWS	NEWS
Inflow Fraction	-	0.5	0	0	0.5	0	0
Downstream Cell Number	-	2	3	0	5	6	0
Surface Area	km2	2.165	1.214	4.937	2.165	1.214	4.937
Mean Width of Flow Path	km	1.56	1.56	1.56	1.56	1.56	1.56
Number of Tanks in Series	-	3	3	3	3	3	3
Outflow Control Depth	cm	40	60	60	40	60	60
Outflow Coefficient - Exponent	-	2.8	2.8	2.15	2.91	2.91	1.78
Outflow Coefficient - Intercept	-	1.57	1.57	2.02	1.51	1.51	2.1
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0015	0.003	0.0014	0.001	0.003	0.0033
Outflow Seepage Control Elev	cm	-46	-46	-38	-53	-46	-38
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.5	0.5	0.5	0.5	0.5	0.5
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*12*	*4*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*128.70*	*15.66*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*4*	*0*	*4*	*4*
C1 - Periphyton	ppb	*0*	*22*	*22*	*0*	*22*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*23.80*	*0.00*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*400*	*0*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*80*	*0*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.00	2.00	2.97	3.90	4.87	5.87	5.87
Run Date	-	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1AW	1AE	1B	2AW	2AE	2B	otal Outflow
Downstream Cell Label		1AE	1B	Outflow	2AE	2B	Outflow	-
Surface Area	km2	2.165	1.214	4.937	2.165	1.214	4.937	16.6
Mean Water Load	cm/d	10.3	18.2	4.4	10.3	18.2	4.4	2.7
Max Water Load	cm/d	93.6	167.1	40.7	93.6	167.2	40.7	24.4
Inflow Volume	hm3/yr	81.5	80.7	79.8	81.5	80.8	79.9	163.1
Inflow Load	kg/yr	14531.8	10878.6	4678.5	14531.8	10869.5	4681.3	29063.6
Inflow Conc	ppb	178.2	134.9	58.7	178.2	134.5	58.6	178.2
Treated Outflow Volume	hm3/yr	80.7	79.8	77.8	80.8	79.9	76.3	154.1
Treated Outflow Load	kg/yr	10878.6	4678.5	2039.9	10869.5	4681.3	2020.7	4060.5
Treated FWM Outflow Conc	ppb	134.9	58.7	26.2	134.5	58.6	26.5	26.3
Total Outflow Volume	hm3/yr	80.7	79.8	77.8	80.8	79.9	76.3	154.1
Total Outflow Load	kg/yr	10878.6	4678.5	2039.9	10869.5	4681.3	2020.7	4060.5
Total FWM Outflow Conc	ppb	134.9	58.7	26.2	134.5	58.6	26.5	26.3
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.52 Estimated Treatment Performance, STA-5 Alternative 5

Input Variable	**Units**	**Value**	**Case Description:**	**Filename:**	**5EX_Data.xls**
Design Case Name	-	Fut Alt5	As for Alt 4, but extent treatment area west to L-2		
Starting Date for Simulation	-	01/01/65	New pumping station required		
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			
Steps Per Day	-	3	**Output Variable**	**Units**	**Value**
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	-0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	25.0
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	25.0
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	11.4
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	37.1
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	52%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		**1**	**2**	**3**	**4**	**5**	**6**
Cell Label	-	1AW	1AE	1B	2AW	2AE	2B
Vegetation Type	------->	EMERG	NEWS	NEWS	EMERG	NEWS	NEWS
Inflow Fraction	-	0.5	0	0	0.5	0	0
Downstream Cell Number	-	2	3	0	5	6	0
Surface Area	km2	3.642	1.214	4.937	3.642	1.214	4.937
Mean Width of Flow Path	km	1.56	1.56	1.56	1.56	1.56	1.56
Number of Tanks in Series	-	3	3	3	3	3	3
Outflow Control Depth	cm	40	60	60	40	60	60
Outflow Coefficient - Exponent	-	2.8	2.8	2.15	2.91	2.91	1.78
Outflow Coefficient - Intercept	-	1.57	1.57	2.02	1.51	1.51	2.1
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0015	0.003	0.0014	0.001	0.003	0.0033
Outflow Seepage Control Elev	cm	-46	-46	-38	-53	-46	-38
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.5	0.5	0.5	0.5	0.5	0.5
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*12*	*4*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*128.70*	*15.66*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*4*	*0*	*4*	*4*
C1 - Periphyton	ppb	*0*	*22.80*	*22*	*0*	*22*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*23.80*	*0.00*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*400*	*0*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*80*	*0*	*80*	*80*

Output Variables	**Units**	**1**	**2**	**3**	**4**	**5**	**6**	**Overall**
Execution Time	seconds/yr	1.06	2.03	3.00	3.97	4.97	5.97	5.97
Run Date	-	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1AW	1AE	1B	2AW	2AE	2B	otal Outflow
Downstream Cell Label		1AE	1B	Outflow	2AE	2B	Outflow	-
Surface Area	km2	3.642	1.214	4.937	3.642	1.214	4.937	19.6
Mean Water Load	cm/d	6.1	18.1	4.4	6.1	18.1	4.4	2.3
Max Water Load	cm/d	55.6	163.7	39.5	55.6	163.7	39.5	20.7
Inflow Volume	hm3/yr	81.5	80.1	79.2	81.5	80.3	79.4	163.1
Inflow Load	kg/yr	14531.8	8996.7	4108.3	14531.8	8987.2	4111.0	29063.6
Inflow Conc	ppb	178.2	112.4	51.9	178.2	111.9	51.8	178.2
Treated Outflow Volume	hm3/yr	80.1	79.2	77.2	80.3	79.4	75.9	153.1
Treated Outflow Load	kg/yr	8996.7	4108.3	1921.4	8987.2	4111.0	1904.3	3825.7
Treated FWM Outflow Conc	ppb	112.4	51.9	24.9	111.9	51.8	25.1	25.0
Total Outflow Volume	hm3/yr	80.1	79.2	77.2	80.3	79.4	75.9	153.1
Total Outflow Load	kg/yr	8996.7	4108.3	1921.4	8987.2	4111.0	1904.3	3825.7
Total FWM Outflow Conc	ppb	112.4	51.9	24.9	111.9	51.8	25.1	25.0
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.53 Estimated Treatment Performance, STA-5 Alternative 6

Input Variable	Units	Value	Case Description:	Filename:	5EX_Data.xls
Design Case Name	-	Fut Alt6	As for Alt 4, but expand treatment area with third flow path		
Starting Date for Simulation	-	01/01/65	No new pumping station required		
Ending Date for Simulation	-	12/31/95			
Starting Date for Output	-	01/01/65			

Input Variable	Units	Value	Output Variable	Units	Value
Steps Per Day	-	3			
Number of Iterations	-	2	Water Balance Error	%	0.0%
Output Averaging Interval	days	7	Mass Balance Error	%	-0.1%
Reservoir H2O Residence Time	days	0	Flow-Wtd Conc - With Bypass	ppb	21.0
Max Inflow / Mean Inflow	-	0	Flow-Wtd Conc - Without Bypass	ppb	21.0
Max Reservoir Storage	hm3	0	Geometric Mean Conc	ppb	10.4
Reservoir P Decay Rate	1/yr/ppb	0	95th Percentile Conc	ppb	31.1
Rainfall P Conc	ppb	10	Freq Cell Outflow > 10 ppb	%	49%
Atmospheric P Load (Dry)	mg/m2-yr	20	Bypass Load	%	0.0%

Cell Number -->		1	2	3	4	5	6
Cell Label	-	1AW	1AE	1B	2AW	2AE	2B
Vegetation Type	------->	EMERG	NEWS	NEWS	EMERG	NEWS	NEWS
Inflow Fraction	-	0.333	0	0	0.333	0	0
Downstream Cell Number	-	2	3	0	5	6	0
Surface Area	km2	2.165	1.214	4.937	2.165	1.214	4.937
Mean Width of Flow Path	km	1.56	1.56	1.56	1.56	1.56	1.56
Number of Tanks in Series	-	3	3	3	3	3	3
Outflow Control Depth	cm	40	60	60	40	60	60
Outflow Coefficient - Exponent	-	2.8	2.8	2.15	2.91	2.91	1.78
Outflow Coefficient - Intercept	-	1.57	1.57	2.02	1.51	1.51	2.1
Bypass Depth	cm	0	0	0	0	0	0
Maximum Inflow	hm3/day	0	0	0	0	0	0
Maximum Outflow	hm3/day	0	0	0	0	0	0
Inflow Seepage Rate	(cm/d) / cm	0	0	0	0	0	0
Inflow Seepage Control Elev	cm	0	0	0	0	0	0
Inflow Seepage Conc	ppb	20	20	20	20	20	20
Outflow Seepage Rate	(cm/d) / cm	0.0015	0.003	0.0014	0.001	0.003	0.0033
Outflow Seepage Control Elev	cm	-46	-46	-38	-53	-46	-38
Max Outflow Seepage Conc	ppb	20	20	20	20	20	20
Seepage Recycle Fraction	-	0.5	0.5	0.5	0.5	0.5	0.5
Seepage Discharge Fraction	-	0	0	0	0	0	0
Initial Water Column Conc	ppb	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500
Initial Water Column Depth	cm	50	50	50	50	50	50
C0 = WC Conc at 0 g/m2 P Storage	ppb	*4*	*12*	*12*	*4*	*12*	*12*
C1 = WC Conc at 1 g/m2 P storage	ppb	*22*	*22*	*22*	*22*	*22*	*22*
K = Net Settling Rate at Steady State	m/yr	*16*	*129*	*128.70*	*15.66*	*128.70*	*128.70*
Zx = Depth Scale Factor	cm	*60*	*60*	*60*	*60*	*60*	*60*
C0 - Periphyton	ppb	*0*	*4*	*4*	*0*	*4*	*4*
C1 - Periphyton	ppb	*0*	*22*	*22*	*0*	*22*	*22*
K - Periphyton	1/yr	*0.00*	*23.80*	*23.80*	*0.00*	*23.80*	*23.80*
Zx - Periphyton	cm	*0*	*0*	*0*	*0*	*0*	*0*
Sm = Transition Storage Midpoint	mg/m2	*0*	*400*	*400*	*0*	*400*	*400*
Sb = Transition Storage Bandwidth	mg/m2	*0*	*80*	*80*	*0*	*80*	*80*

Output Variables	Units	1	2	3	4	5	6	Overall
Execution Time	seconds/yr	1.03	2.00	3.00	3.94	4.90	5.90	5.90
Run Date	-	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02	12/06/02
Starting Date for Simulation	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Starting Date for Output	-	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65	01/01/65
Ending Date	-	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95	12/31/95
Output Duration	days	11322	11322	11322	11322	11322	11322	11322
Cell Label		1AW	1AE	1B	2AW	2AE	2B	otal Outflow
Downstream Cell Label		1AE	1B	Outflow	2AE	2B	Outflow	-
Surface Area	km2	2.165	1.214	4.937	2.165	1.214	4.937	16.6
Mean Water Load	cm/d	6.9	12.1	2.9	6.9	12.1	2.9	1.8
Max Water Load	cm/d	62.3	110.7	26.8	62.3	110.7	26.8	24.4
Inflow Volume	hm3/yr	54.3	53.4	52.6	54.3	53.6	52.7	108.6
Inflow Load	kg/yr	9678.2	6465.1	2389.1	9678.2	6439.0	2383.1	19356.4
Inflow Conc	ppb	178.2	121.0	45.5	178.2	120.1	45.2	178.2
Treated Outflow Volume	hm3/yr	53.4	52.6	50.6	53.6	52.7	49.3	99.9
Treated Outflow Load	kg/yr	6465.1	2389.1	1056.1	6439.0	2383.1	1039.5	2095.7
Treated FWM Outflow Conc	ppb	121.0	45.5	20.9	120.1	45.2	21.1	21.0
Total Outflow Volume	hm3/yr	53.4	52.6	50.6	53.6	52.7	49.3	99.9
Total Outflow Load	kg/yr	6465.1	2389.1	1056.1	6439.0	2383.1	1039.5	2095.7
Total FWM Outflow Conc	ppb	121.0	45.5	20.9	120.1	45.2	21.1	21.0
Bypass Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Load	kg/yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bypass Conc	ppb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bypass Load	%	0%	0%	0%	0%	0%	0.0	0%

Table 6.53 presents data for the existing two flow paths only. The third flow path is not directly included, due to a limitation on the available number of cells in the DMSTA software. This limitation was accommodated in the analysis by limiting inflows to the existing two flow paths to two-thirds of the total inflows, on the assumption that the performance of the third flow path would closely parallel that shown in Table 6.53.

Again, it is the intent that, as a result of the PDE process discussed in Part 5 of this Long-Term Plan, the SAV community in STA-5 be made to reliably replicate the SAV_C4 level of performance. Should that not be possible, then additional steps would be needed to obtain the target performance. That target is for this analysis taken as achieving a long-term geometric mean TP concentration of 10 ppb, although, as discussed earlier, there is some uncertainty that objective is completely applicable to STA-5.

Review of the data summarized in Table 6.47 suggests that, should the SAV community in STA-5 perform as NEWS in lieu of as SAV_C4, simple conversion of the upstream cells to SAV could be projected to achieve the planning objective. However, it is far from certain that the entire STA could be satisfactorily maintained in a hydrated condition without some degree of upstream storage. In addition, the topography in the western cells slopes from west to east, with the result that it might not be possible to develop and maintain SAV in lieu of emergent vegetation in the westerly parts of the upstream cells. Finally, the TP concentrations in inflows to STA-5 well exceed the upper bounds of the DMSTA calibration data sets, leading to concern for the veracity of the projected treatment performance in the more upstream parts of the cells.

As indicated in Table 6.47, should the SAV community in Cells 1Band 2B behave as NEWS in lieu of SAV_C4 (Alt. 2), the projected long-term geometric mean TP concentration in discharges from STA-5 would be expected to increase from 10.4 to 13.2 ppb. All inflows to STA-5 considered for Alternatives 1 through 6 are consistent with those presented in Part 5 of the October 23, 2002, *Evaluation of Alternatives for the ECP Basins*, Burns & McDonnell. As concluded therein, those inflows can be substantially influenced by the design and operation of the EAA Storage Reservoirs CERP projects.

The inflow volumes and total phosphorus concentrations considered to this point in analysis of STA-5 were developed using the hydrologic results of the 2050wPROJ SFWMM simulation, which considered the EAA Storage Reservoirs to be designed and operated largely as contemplated in the analysis of Alternative D13R for the April 1999 *Central and Southern Florida Project, Comprehensive Review Study* prepared by the Jacksonville District, U.S. Army Corps of Engineers and the SFWMD (the *Restudy*).

Part 6 of the *Evaluation of Alternatives for the ECP Basins* explored at least one alternative to the design and operation of the EAA Storage Reservoirs projects that was considered to beneficially impact the overall water quality performance of STA-5. The Project Development Team (PDT) for the EAA Storage Reservoirs Phase 1 CERP project is currently developing and evaluating alternatives to the project formulation reflected in Alternative D13R. Should the EAA Storage Reservoir Projects be modified in a manner generally consistent with that presented in Part 6 of the *Evaluation of Alternatives for the ECP Basin*, the bulk of the above-listed concerns with implementation of Alternative 3 would be satisfactorily addressed. Data presented in Table 6.23 of that reference indicates that, in addition, should Alternative 3 as described herein for STA-5 be implemented with that modified EAA Storage Reservoir Project, the estimated long-term TP concentrations in outflows from STA-5 would be 18 ppb (flow-weighted) and 10 ppb (geometric mean – computed value less than 10, but 10 taken as the lowest sustainable concentration). However, the alternative reservoir project considered in that Part 6 varies markedly from that presently envisioned for the EAA Storage Reservoirs projects, to the extent that it would be imprudent to currently anticipate such a change in the CERP projects.

Selection of appropriate future steps that can be taken at STA-5 should the SAV community function more as NEWS than as SAV_C4 is, to a greater degree than for any other STA, highly dependent upon resolution of a wide array of uncertainties. Some of those uncertainties are to be addressed by the PDE component described in Part 5 of this Long-Term Plan. Others will of necessity remain unresolved until the CERP PDTs finally establish the specific nature of both Phase 1 and Phase 2 of the EAA Storage Reservoir Project.

For this projection of possible future steps and projected expenditures, it is anticipated that Alternative No. 6 as summarized in Table 6.47 might eventually be needed, assuming:

- The continued development of a source control program in the C-139 Basin as recommended in Part 5 contributes to a reduction in inflow loads and concentrations (or, at the very least, no increase);
- There would be no change to the estimated inflows to STA-5 as a result of CERP;
- The planning objective of a long-term geometric mean concentration of 10 ppb would be found to apply to STA-5;
- Uncertainties relative to an adequate capacity to maintain the STA in a hydrated condition and to the high inflow concentrations (exceeding DMSTA calibration range) would be satisfactorily addressed by the PDE component.

6.1.3.3 Summary of Possible Future Enhancements

The following is a summary listing of all presently identified possible future enhancements and modifications to STA-6. These modifications are consistent with Alternative 3 as summarized in Table 6.43.

- Conversion of Cells 2, 3 and 5A from emergent macrophyte vegetation to submerged aquatic vegetation (SAV).

The following is a summary listing of all presently identified possible future enhancements and modifications to STA-5. These modifications are consistent with Alternative 6 as summarized in Table 6.47.

- Construct new north-south levees in Cells 1A and 2A, creating new cells 1AW, 1AE, 2AW, and 2AE. The new levees would be located at approximately 36% of the existing cell areas west of the downstream ends of the current cells;
- Convert new Cells 1AE and 2AE from emergent macrophyte vegetation to SAV;
- Develop a third parallel flow path in STA-5, providing an increase in effective treatment area of approximately 2,055 acres. Additional discussion of this third flow path is presented below.

The simplest location for an expansion of STA-5 would be to develop the new flow path immediately adjacent to and either north or south of the existing treatment area. Expansion to the south would require use of lands acquired under the Talisman Land Exchange, and presently considered potentially available for use in the EAA Storage Reservoirs projects. Expansion to the north would require the acquisition of additional lands now in agricultural production. The third flow path would be expected to closely parallel in configuration and nature the existing flow paths, modified as discussed above. It is anticipated that a total land area of approximately 2,520 acres would be needed for this fourth flow path.

6.1.3.4 Opinion of Capital Cost

An opinion of the probable capital cost for implementation of the possible future Alternative 3 at STA-6 is presented in Table 6.54. That opinion of capital cost is stated in FY 2003 dollars.

Table 6.54 Opinion of Capital Cost, Future STA-6 Enhancements, Alt. 3

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Eradication of Existing Vegetation	1050	ac	$200	$210,000	Unit cost from 02/2002 STSOC for SAV/LR
Subtotal, Estimated Construction Costs					**$210,000**	**$210,000**
Planning, Engineering & Design		10	%		$21,000	**$21,000**
Program & Construction Management		10	%		$21,000	**$21,000**
Total Estimated Cost, Without Contingency					**$252,000**	**$252,000**
Contingency		30	%		$75,600	**$78,000**
TOTAL ESTIMATED CAPITAL COST					**$327,600**	**$330,000**

An opinion of the probable capital cost for implementation of the possible future Alternative 6 at STA-5 is presented in Table 6.55. That opinion of capital cost is stated in FY 2003 dollars.

Table 6.55 Opinion of Capital Cost, Future STA-5 Enhancements, Alt. 6

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Interior Levees in Cells 1A and 2A	2	Mi.	$390,000	$780,000	Cost for modification of existing STA
2	New Water Control Structures (Cells 1AW and 1AE outflow)	4	Ea.	$190,000	$760,000	Cost for modification of existing STA
3	Stilling Wells (Includes Electrical and Telemetry) for Item 2	4	Ea.	$9,000	$36,000	Cost for modification of existing STA
4	Establish New Flow & Water Quality Monitoring Sites for Item 2	2	Ea.	$10,000	$20,000	Cost for modification of existing STA
5	New Water Control Structure Electrical for Item 2 (Includes telemetry)	4	Ea.	$43,000	$172,000	Cost for modification of existing STA
6	Electrical Power Distribution for Item 2	2	Mi.	$80,000	$160,000	Cost for modification of existing STA
7	Eradication of Existing Vegetation, Cells 1AE and 2AE	600	Ac.	$200	$120,000	Cost for modification of existing STA
8	New Exterior Levee, 8' height	5	Mi.	$485,000	$2,425,000	Cost for Expansion
9	New Interior Levee, 7' height	2	Mi.	$390,000	$780,000	Cost for Expansion
10	New Water Control Structures	8	Ea.	$190,000	$1,520,000	Cost for Expansion
11	Stilling Wells (Includes Electrical and Telemetry) for Item 102	8	Ea.	$9,000	$72,000	Cost for Expansion
12	Establish New Flow & Water Quality Monitoring Sites for Item 10	6	Ea.	$10,000	$60,000	Cost for Expansion
13	New Water Control Structure Electrical for Item 10 (Includes telemetry)	8	Ea.	$43,000	$344,000	Cost for Expansion
14	Electrical Power Distribution for Item 10	4	Mi.	$80,000	$320,000	Cost for Expansion
15	Disking and Land Prep.	2055	Mi.	$60	$123,300	Cost for Expansion
16	New Seepage Return Pump Station	50	cfs	$9,500	$475,000	Cost for Expansion
Subtotal, Estimated Construction Costs					**$8,167,300**	**8,200,000**
Planning, Engineering & Design		10	%		$816,730	**820,000**
Program & Construction Management		10	%		$816,730	**820,000**
Total Estimated Cost, Without Contingency					**$9,800,760**	**9,840,000**
Contingency		30	%		$2,940,228	**2,900,000**
Land Acquisition		2250	Ac.	$2,800	**$6,300,000**	**8,190,000**
Land Acquisition Contingency		30	%		$1,890,000	
TOTAL ESTIMATED CAPITAL COST					**$20,930,988**	**$20,930,000**

6.1.3.5 Opinion of Incremental Operation and Maintenance Costs

An opinion of the probable incremental average annual operations and maintenance cost for implementation of the possible future Alternative 3 at STA-6 is presented in Table 6.56. That opinion of incremental cost is stated in FY 2003 dollars.

Table 6.56 Opinion of Incremental O&M Cost, Future STA-6 Enhancements, Alt. 3

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Incremental Cost forAnnual Vegetation Control	1050	ac	$30	$31,500	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$31,500**	
Contingency		30	%		$9,450	
TOTAL INCREMENTAL O&M COST					**$40,950**	**$40,000**

An opinion of the probable incremental average annual operations and maintenance cost for implementation of the possible future Alternative 6 at STA-5 is presented in Table 6.57. That opinion of incremental cost is stated in FY 2003 dollars.

Table 6.57 Opinion of Incremental O&M Cost, Future STA-5 Enhancements, Alt. 6

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Levees	2	Mi.	$3,300	$6,600	Modified existing STA
2	New Water Control Structures	4	Ea.	$8,000	$32,000	Modified existing STA
3	New Opns Monitoring Sites	2	Ea.	$40,000	$80,000	Modified existing STA
4	Incremental Cost forAnnual Vegetation Control	600	ac	$30	$18,000	Modified existing STA
5	New Levees	7	Mi.	$3,300	$23,100	Expansion area
6	New Water Control Structures	8	Ea.	$8,000	$64,000	Expansion area
7	New Opns Monitoring Sites	3	Ea.	$40,000.00	$120,000	Expansion area
8	Monitoring of Permit Compliance Sites, New	4	Ea.	$54,500	$218,000	Expansion area
9	Mech. Maintenance, Seepage Pumping Station, 2 units assumed	2	Ea.	$2,500	$5,000	Expansion area
10	Pump Station Building Maint.	1	Ea.	$12,000	$12,000	
11	Seepage Pump Station Power Consumption	18000	Ac. Ft.	$0.60	$10,800	
12	Vegetation Contol, New SAV Cells	1520	Ac..	$80		
13	Vegetation Control, New Emergent Cell	500	Ac..	$50	$25,000	Expansion area
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$614,500**	
Contingency		30	%		$184,350	
TOTAL INCREMENTAL O&M COST					**$798,850**	**$800,000**

6.1.3.6 Possible Implementation Schedule and Expenditures

The possible future enhancements and modifications to STA-6 and STA-5 discussed previously in this section should only be implemented once their need is conclusively demonstrated and adequate assurance exists that the phosphorus criterion can be obtained thereby. In particular, the potential expansion of STA-5 to create a third parallel flow path represents a substantial incremental expenditure. Accordingly, it is anticipated that the additional enhancements, if needed, would be implemented incrementally, based on the continually improving understanding of performance and need resulting from the PDE component described in Part 5 of this Long-Term Plan, and as additional certainty is gained relative to the nature of CERP projects directly impacting these two STAs. As a result, the following possible implementation schedule is highly conjectural in nature, as it is based on the principal assumption that the results of the PDE component will not increase treatment performance projections markedly beyond the more conservative present estimates.

By December 31, 2006, more definitive estimates of the projected treatment performance of the enhanced STA-5 and STA-6 should be in hand, as well as additional certainty as to the possible performance of source controls in the C-139 Basin. At that time, it should be possible to identify any additional steps that might be taken in STA-5 and STA-6, short of conversion of remaining emergent cells to SAV and expansion of STA-5. Should it be determined that the conversion is needed, and that remaining uncertainties relative to the ability to maintain the STAs in a hydrated condition can be satisfactorily addressed, modification of the existing STA-5 (e.g., partial implementation of Alternative 6) and implementation of Alternative 3 for STA-6 would be planned in Fiscal Year (FY) 2007, and implemented in FY 2008.

The final remaining step for STA-5 would be expansion of the treatment area through addition of a third flow path (e.g., the remaining elements of Alternative 6).

Substantial uncertainty remains as to the influence of CERP projects, in particular the EAA Storage Reservoirs projects, on inflow volumes and loads to STA-5. In addition, the enhancements to STA-5 recommended in Part 2 of this *Long-Term Plan* will have been in place an insufficient period of time at the end of 2006 to permit full understanding of their performance.

The location of the third flow path can be substantially influenced by the results of detailed planning for the EAA Storage Reservoir, Phase 2 project. That project is presently scheduled for completion in 2014; it is anticipated that the PIR for that project will have been completed on a schedule that will allow the Congress to consider authorization and appropriation for the project in WRDA 2010. The results of that planning process can be expected to directly impact both the projected capital cost and average annual operations and maintenance cost for the expansion, and may well directly influence projected inflow volumes and loads.

Detailed planning and design for the expansion, if needed, should be undertaken no earlier than FY 2011, following Congress' consideration of the EAA Storage Reservoir Phase 2 Project in WRDA 2010. The construction of the additional works necessary for that conversion could then take place no earlier than FY 2012 and 2013.

A summary of the estimated expenditures for the possible future additional enhancements to STA-5 and STA-6 through FY 2016 is presented in Table 6.58. That projection of possible expenditures is in FY 2003 dollars.

Table 6.58 Projected Expenditures, Possible Future Enhancement of STA-5 & STA-6

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	
2004							$0
2005							$0
2006							$0
2007	$221,000				$66,000		$287,000
2008		$221,000	$2,210,000		$732,000		$3,163,000
2009						$220,000	$220,000
2010						$220,000	$220,000
2011	$620,000			$8,190,000	$180,000	$220,000	$9,210,000
2012		$310,000	$3,100,000		$1,000,000	$220,000	$4,630,000
2013		$310,000	$3,100,000		$1,000,000	$220,000	$4,630,000
2014						$840,000	$840,000
2015						$840,000	$840,000
2016						$840,000	$840,000
Total	**$841,000**	**$841,000**	**$8,410,000**	**$8,190,000**	**$2,978,000**	**$3,620,000**	**$24,880,000**

6.1.4. Summary of Possible Expenditures for Post-2006 Projects

A summary opinion of the possible future expenditures for additional (post-2006) enhancements to the STAs of the Everglades Construction Project is presented in Tables 6.59 and 6.60. Those projections are in FY 2003 dollars, and exclude cost escalation. Table 6.59 presents a listing of possible expenditures by fiscal year and location. Table 6.60 presents a listing of possible expenditures by fiscal year and type of expenditure.

The total possible additional expenditures for the post-2006 projects, excluding escalation, is estimated at $87.64 million in FY 2003 dollars. By contrast, the total estimated expenditures for the pre-2006 projects recommended in Part 2 are $50.32 million (also in FY 2003 dollars). The potential high cost for the post-2006 projects underscores the importance of the Process Development and Engineering (PDE) component described in Part 5 of this Long-Term Plan. If fully successful, the future possible expenditures developed in this Part 6 and summarized in Tables 6.59 and 6.60 could be unnecessary.

Table 6.59 Possible Post-2006 Expenditures, ECP Basins, By Location

Fiscal Year	Projected Expenditure by Location STA-1E & STA-1W	STA-2 & STA-3/4	STA-5 & STA-6	Fiscal Year Total Expenditure
2004	$0	$0	$0	$0
2005	$0	$0	$0	$0
2006	$0	$0	$0	$0
2007	$36,000	$248,000	$287,000	$571,000
2008	$557,000	$2,668,000	$3,163,000	$6,388,000
2009	$652,000	$300,000	$220,000	$1,172,000
2010	$70,000	$300,000	$220,000	$590,000
2011	$70,000	$9,307,000	$9,210,000	$18,587,000
2012	$70,000	$12,238,500	$4,630,000	$16,938,500
2013	$6,677,000	$12,238,500	$4,630,000	$23,545,500
2014	$5,396,500	$1,170,000	$840,000	$7,406,500
2015	$5,396,500	$2,040,000	$840,000	$8,276,500
2016	$410,000	$2,910,000	$840,000	$4,160,000
Total	**$19,335,000**	**$43,420,000**	**$24,880,000**	**$87,635,000**
Note:	All estimated expenditures are in FY 2003 dollars			

Table 6.60 Possible Post-2006 Expenditures, ECP Basins, By Expenditure Type

Fiscal Year	Scheduled Expenditure by Type Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	Fiscal Year Total Expenditure
2004	$0	$0	$0	$0	$0	$0	$0
2005	$0	$0	$0	$0	$0	$0	$0
2006	$0	$0	$0	$0	$0	$0	$0
2007	$445,000	$0	$0	$0	$126,000	$0	$571,000
2008	$43,000	$445,000	$4,450,000	$0	$1,450,000	$0	$6,388,000
2009	$0	$43,000	$430,000	$0	$154,000	$545,000	$1,172,000
2010	$0	$0	$0	$0	$0	$590,000	$590,000
2011	$2,277,000	$0	$0	$15,540,000	$180,000	$590,000	$18,587,000
2012	$0	$1,118,500	$11,285,000	$0	$3,945,000	$590,000	$16,938,500
2013	$737,000	$1,118,500	$11,285,000	$5,800,000	$4,015,000	$590,000	$23,545,500
2014	$0	$368,500	$3,685,000	$0	$1,273,000	$2,080,000	$7,406,500
2015	$0	$368,500	$3,685,000	$0	$1,273,000	$2,950,000	$8,276,500
2016	$0	$0	$0	$0	$0	$4,160,000	$4,160,000
Total	**$3,502,000**	**$3,462,000**	**$34,820,000**	**$21,340,000**	**$12,416,000**	**$12,095,000**	**$87,635,000**
Note:	All estimated expenditures are in FY 2003 dollars and exclude cost escalation.						

6.2. Possible Future Projects, ESP Basins

This section identifies possible future projects in the ESP Basins which might eventually prove necessary should the pre-2006 strategies (Part 3 of this Long-Term Plan) acting together with the Process Development and Engineering (PDE) component prove insufficient to assure compliance with water quality standards, including the numeric phosphorus criterion established under Rule 62-302.540, F.A.C. These possible projects are structured upon the principal hypothetical assumption that the primary strategy recommended in Part 3 (full integration with CERP and reliance on presently structured and scheduled CERP projects) is not successful in meeting the phosphorus criterion. In essence, these possible future projects are identified as a means to quantify the impact of an inability to obtain satisfactory results from the primary strategies set forth in this Long-Term Plan. These projects are not recommended for immediate implementation as, in every instance, they would either replace or be duplicative of projects presently scheduled and structured for implementation by CERP.

6.2.1. Acme Improvement District, Basin B

In Acme Improvement District, Basin B, should it prove for any reason impracticable to rely upon the presently scheduled CERP project, it is probable that a separate project focused strictly on meeting water quality goals, including the numeric phosphorus criterion, would consist of Alternative 5 as presented in Part 3 (diversion to STA-1E). The estimated capital cost of that project (see Table 3.2) is $17.0 million (FY 2003 dollars). The estimated average annual incremental operations and maintenance cost for that project (see Table 3.3) is $250,000 (FY 2003 dollars).

It is assumed for this analysis that the implementation schedule and projected expenditures would be consistent with that discussed in Part 3 (completion prior to the end of 2006). While it is possible that implementation could be delayed pending resolution of the CERP project, no earlier completion could be anticipated. Total estimated expenditures for that project over the period FY 2004-2016 aggregate to $19.50 million in FY 2003 dollars (see Table 3.4).

6.2.2. North Springs Improvement District (NSID)

The October 23, 2002, *Basin-Specific Feasibility Studies, Everglades Stormwater Project Basins* by Brown & Caldwell evaluated three alternatives for the NSID. Only one of those three alternatives (Alternative 2) was developed upon the assumption of no reliance on the presently scheduled Hillsboro Site 1 CERP impoundment, and consisted of the development of a permanent off-site diversion. Estimated costs for that alternative are taken from Table 8-7 of the *Basin-Specific Feasibility Studies*. The estimated capital cost of Alternative 2 (in FY 2003 dollars) was $107.97 million. The estimated average annual operations and maintenance cost (in FY 2003 dollars) was $290,000.

In Table 8-6 of the *Basin-Specific Feasibility Studies*, Brown & Caldwell projected that completion of Alternative 2 would require 4 years from the date of a determination to proceed with that alternative. For this analysis, it is assumed that determination would be made prior to the end of FY 2004, resulting in project completion prior to the end of FY 2008. Given that implementation schedule, a projection of possible expenditures for Alternative 2 as it is outlined in the *Basin-Specific Feasibility Studies* is presented in Table 6.61.

Total projected expenditures over the period FY 2003-2016 would be $110.29 million (in FY 2003 dollars).

Table 6.61 Possible Expenditures, NSID without CERP

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	
2004							$0
2005				$73,310,000			$73,310,000
2006	$2,220,000				$666,000		$2,886,000
2007		$1,110,000	$11,110,000		$3,667,000		$15,887,000
2008		$1,110,000	$11,110,000		$3,667,000		$15,887,000
2009						$290,000	$290,000
2010						$290,000	$290,000
2011						$290,000	$290,000
2012						$290,000	$290,000
2013						$290,000	$290,000
2014						$290,000	$290,000
2015						$290,000	$290,000
2016						$290,000	$290,000
Total	**$2,220,000**	**$2,220,000**	**$22,220,000**	**$73,310,000**	**$8,000,000**	**$2,320,000**	**$110,290,000**

6.2.3. North New River Canal Basin (NNRC)

The October 23, 2002, *Basin-Specific Feasibility Studies, Everglades Stormwater Program Basins* by Brown & Caldwell evaluated a total of three alternatives for the NNRC Basin, each directed toward elimination of discharges to WCA-3A from Pumping Station G-123. Each alternative assumed that the long-term strategy (after 2018) to accomplish that objective would rely on completion of the WCA 2 and WCA 3 Diversion CERP Project (Component YY4). Alternative 1 considered the construction and operation of a chemical treatment facility to address G-123 discharges during the period 2006-2018. Alternative 2 considered an early (2006) discontinuation in use of G-123. Alternative 3 considered no action other than the possible implementation of source controls until the scheduled 2018 completion of the CERP project.

The primary concern with Alternative 2 was the extent to which an early discontinuation in use of G-123 might adversely impact flood protection in the NNRC basin. For this analysis, in which it is assumed that no reliance is placed on the CERP project, it is considered necessary to develop a fourth alternative that would permit the earliest possible discontinuation in use of G-123 while providing certain assurance of no reduction in flood protection afforded the basin.

That fourth alternative is assumed to consist of the construction and operation of a forward pumping station on the North New River Canal at the easterly end of the NNRC basin (at the Sewell Structure G-54). That station is assigned a capacity of 400 cfs (equal to the maximum capacity of pumping station G-123); it is assumed for this analysis that no enlargement of the North New River Canal upstream of G-54 would be necessary. That capacity is assumed to be developed with four 100 cfs pumps driven by electric motors (e.g., configured similar to G-123). An opinion of the capital cost for that possible alternative in the NNRC basin (expressed in FY 2003 dollars) is presented in Table 6.62.

Table 6.62 Opinion of Capital Cost, NNRC Basin without CERP

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Forward Pumping Station at Structure G-54	400	cfs	$9,900	$3,960,000	Unit cost from Evaluation Methodology; assume 4 pumps at 100 cfs each
Subtotal, Estimated Construction Costs					**$3,960,000**	**$4,000,000**
Planning, Engineering & Design		10	%		$396,000	**$400,000**
Program & Construction Management		10	%		$396,000	**$400,000**
Total Estimated Cost, Without Contingency					**$4,752,000**	**$4,800,000**
Contingency		30	%		$1,425,600	**$1,400,000**
TOTAL ESTIMATED CAPITAL COST					**$6,177,600**	**$6,200,000**

Because a basic premise of this alternative is that existing Pumping Station G-123 would be replaced by this new station, which would operate no more frequently than the existing station, no incremental operation and maintenance costs are assigned. A projection of expenditures for this alternative, assuming a determination to proceed is made in FY 2004 and project completion is scheduled for FY 2006, is presented in Table 6.63.

Table 6.63 Possible Expenditures, NNRC without CERP

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	
2004							$0
2005	$400,000				$120,000		$520,000
2006		$400,000	$4,000,000	$0	$1,280,000		$5,680,000
Total	**$400,000**	**$400,000**	**$4,000,000**	**$0**	**$1,400,000**	**$0**	**$6,200,000**

6.2.4. C-11 West Basin

The October 23, 2002, *Basin-Specific Feasibility Studies, Everglades Stormwater Project Basins* by Brown & Caldwell evaluated three alternatives for the C-11 West Basin. Each alternative assumed that the long-term strategy to comply with water quality standards, including the numeric phosphorus criterion, would rely on completion of the Western C-11 Impoundment and Diversion Canal CERP Project (2006 completion) and the North Lake Belt Storage CERP Project (2036 completion).

Alternative 1 consisted of the construction and operation of a chemical treatment facility that would accommodate basin flows and loads not diverted from Pumping Station S-9 as a result of the CERP projects. Alternative 2 consisted of the construction and operation of a biological treatment facility that would also accommodate basin flows and loads not diverted from Pumping Station S-9 as a result of the CERP projects. Alternative 3 considered no actions other than source controls and reliance on the CERP projects, with a part of the basin flows and loads discharged without treatment at S-9.

No alternatives were developed that considered the CERP projects to not take place. In the instance of the C-11 West Basin, the initial CERP Project (Western C-11 Impoundment and Diversion Canal CERP Project) is authorized and planning is in progress. It is therefore assumed for this analysis that the basin flows and loads that must be addressed include those which would not, based on the preliminary simulations conducted, be accommodated in that project.

Given continuing concerns over the compatibility of chemical treatment plant effluent with the native communities in the Everglades and the technical efficacy of Alternative 1, this analysis assumes construction and operation of biological treatment facility (STA) similar in nature to Alternative 2.

Estimated costs for that alternative are taken from Table 4-10 of the *Basin-Specific Feasibility Studies*. The estimated capital cost of Alternative 2 (in FY 2003 dollars) was

$297.54 million. The estimated average annual operations and maintenance cost (in FY 2003 dollars) was $320,000.

In Table 4-9 of the *Basin-Specific Feasibility Studies*, Brown & Caldwell projected that physical completion of Alternative 2 would require 6.5 years from the date of a determination to proceed with that alternative, followed by a 3 year period for initial startup and process stabilization. For this analysis, it is assumed that determination would be made prior to the end of FY 2004, resulting in completion of the project's physical works prior to the end of FY 2010. Given that implementation schedule, a projection of possible expenditures for Alternative 2 as it is outlined in the *Basin-Specific Feasibility Studies* is presented in Table 6.64.

Total projected expenditures over the period FY 2004-2016 would be $299.46 million (in FY 2003 dollars).

Table 6.64 Possible Expenditures, C-11 West without Future (2036) CERP

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	
2004				$53,000,000			$53,000,000
2005				$100,000,000			$100,000,000
2006				$100,000,000			$100,000,000
2007	$1,430,000				$430,000		$1,860,000
2008	$1,430,000				$430,000		$1,860,000
2009		$1,430,000	$14,270,000		$4,710,000		$20,410,000
2010		$1,430,000	$14,270,000		$4,710,000		$20,410,000
2011						$320,000	$320,000
2012						$320,000	$320,000
2013						$320,000	$320,000
2014						$320,000	$320,000
2015						$320,000	$320,000
2016						$320,000	$320,000
Total	**$2,860,000**	**$2,860,000**	**$28,540,000**	**$253,000,000**	**$10,280,000**	**$1,920,000**	**$299,460,000**

6.2.5. L-28 Basin

In the L-28 Basin, should it prove for any reason impracticable to rely upon the presently scheduled CERP projects, it is probable that separate projects focused strictly on meeting water quality goals, including the numeric phosphorus criterion, would consist of Miccosukee and Seminole tribal STAs discussed in Part 3. The estimated capital cost of those projects (see Tables 3.5 and 3.8) is $33.58 million (FY 2003 dollars). The estimated average annual incremental operations and maintenance cost for those projects (see Tables 3.6 and 3.9) is $1,540,000 (FY 2003 dollars).

It is assumed for this analysis that the implementation schedule and projected expenditures would be consistent with that discussed in Part 3 (physical completion in 2008, with full operation after startup and stabilization in 2011). While it is possible that implementation could be delayed pending resolution of the CERP project, no earlier completion could be anticipated. Total estimated expenditures for that project over the period FY 2003-2016 aggregate to $46.48 million in FY 2003 dollars (see Tables 3.10 and 3.11).

6.2.6. Feeder Canal Basin

As discussed in Part 3, the pre-2006 strategy in the Feeder Canal Basin consists of reliance on a combination of source controls and completion of the Seminole Tribe's Water Conservation Plan (WCP) to obtain an overall flow-weighted mean TP concentration in discharges from the basin of 50 ppb. Subsequent reliance is placed on the Big Cypress/L-28 Interceptor Canal Modifications CERP project for diversion of discharges from the Feeder Canal Basin to the Gap Basin (in essence, diversion to the Big Cypress National Preserve for its rehydration). That CERP project is presently scheduled for completion in 2015; in Part 3 of this Long-Term Plan, it is recommended that CERP project be accelerated, with an earliest projected completion date of 2009.

The October 23, 2002, *Basin-Specific Feasibility Studies, Everglades Stormwater Project Basins* by Brown & Caldwell evaluated two alternatives for the Feeder Canal Basin. Alternative 1 consisted of a combination of source controls and the construction of a biological treatment system (STA). Alternative 2 considered source controls only. The overall performance of the source controls considered in both those alternatives was consistent with that recommended in Part 3 of this Long-Term Plan (e.g., overall flow-weighted mean TP concentration of 50 ppb in discharges from the Feeder Canal basin).

In this analysis, it is assumed that either of the following two conditions could possibly apply, leading to the need for the STA considered in Alternative 1 of the *Basin-Specific Feasibility Studies* for this basin.

- It might eventually be concluded that a flow-weighted mean TP concentration of 50 ppb in discharges to the Big Cypress National Preserve would not be permitable;
- The Big Cypress/L-28 Interceptor Canal Modifications CERP project could either be substantially delayed, or a determination made that it would not be feasible to await its completion prior to diverting Feeder Canal Basin discharges away from direct release to the EPA.

Estimated costs for that alternative are taken from Table 5-5 of the *Basin-Specific Feasibility Studies*. The estimated capital cost of Alternative 1 (in FY 2003 dollars) was $91.95 million. The estimated average annual operations and maintenance cost (in FY 2003 dollars) was $660,000.

In Table 5-4 of the *Basin-Specific Feasibility Studies*, Brown & Caldwell projected that physical completion of Alternative 1 would require 4.5 years from the date of a determination to proceed with that alternative, followed by a 3 year period for initial startup and process stabilization. For this analysis, it is assumed that determination could be made no earlier than FY 2006, resulting in completion of the project's physical works prior to the end of FY 2010. Given that implementation schedule, a projection of possible expenditures for Alternative 1 as it is outlined in the *Basin-Specific Feasibility Studies* is presented in Table 6.65.

Total projected expenditures over the period FY 2003-2016 would be $95.91 million (in FY 2003 dollars).

Table 6.65 Possible Expenditures, Feeder Canal Basin without CERP

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $)						Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Program & Const. Mgmt.	Construction	Land Acquisition	Project Contingency	Incremental O&M Cost	
2004							$0
2005							$0
2006							$0
2007				$4,340,000			$4,340,000
2008	$5,620,000				$1,690,000		$7,310,000
2009		$2,810,000	$28,080,000		$9,260,000		$40,150,000
2010		$2,810,000	$28,080,000		$9,260,000		$40,150,000
2011						$660,000	$660,000
2012						$660,000	$660,000
2013						$660,000	$660,000
2014						$660,000	$660,000
2015						$660,000	$660,000
2016						$660,000	$660,000
Total	**$5,620,000**	**$5,620,000**	**$56,160,000**	**$4,340,000**	**$20,210,000**	**$3,960,000**	**$95,910,000**

6.2.7. Summary of Possible Expenditures for Post-2006 Projects

A summary opinion of the possible future expenditures for compliance with water quality standards, including the numeric phosphorus criterion, in the ESP Basins should it be found generally impracticable or not permitted to place primary reliance on CERP is presented in Table 6.66. The projections in that table are in FY 2003 dollars, and exclude cost escalation; the table presents a listing of possible expenditures by fiscal year and location.

The total possible additional expenditures for the post-2006 projects, excluding cost escalation, is estimated at $577.84 million in FY 2003 dollars. The potential high cost for those projects underscores the importance of full integration with and reliance on CERP as discussed in Part 3 of this Long-Term Plan. If fully successful, the future possible expenditures developed in this Part 6 and summarized in Table 6.66 would be unnecessary.

Table 6.66 Possible Post-2006 Expenditures, ESP Basins, By Location

Fiscal Year	Projected Expenditure by Basin						Fiscal Year Total Expenditure
	Acme Basin B	NSID Basin	NNRC Basin	C-11 West Basin	L-28 Basin	Feeder Basin	
2004	$2,700,000	$0	$0	$53,000,000	$0	$0	$55,700,000
2005	$7,150,000	$73,310,000	$520,000	$100,000,000	$580,000	$0	$181,560,000
2006	$7,150,000	$2,886,000	$5,680,000	$100,000,000	$5,820,000	$0	$121,536,000
2007	$250,000	$15,887,000	$0	$1,860,000	$13,880,000	$4,340,000	$36,217,000
2008	$250,000	$15,887,000	$0	$1,860,000	$13,880,000	$7,310,000	$39,187,000
2009	$250,000	$290,000	$0	$20,410,000	$1,540,000	$40,150,000	$62,640,000
2010	$250,000	$290,000	$0	$20,410,000	$1,540,000	$40,150,000	$62,640,000
2011	$250,000	$290,000	$0	$320,000	$1,540,000	$660,000	$3,060,000
2012	$250,000	$290,000	$0	$320,000	$1,540,000	$660,000	$3,060,000
2013	$250,000	$290,000	$0	$320,000	$1,540,000	$660,000	$3,060,000
2014	$250,000	$290,000	$0	$320,000	$1,540,000	$660,000	$3,060,000
2015	$250,000	$290,000	$0	$320,000	$1,540,000	$660,000	$3,060,000
2016	$250,000	$290,000	$0	$320,000	$1,540,000	$660,000	$3,060,000
Total	**$19,500,000**	**$110,290,000**	**$6,200,000**	**$299,460,000**	**$46,480,000**	**$95,910,000**	**$577,840,000**
Note:	All estimated expenditures are in FY 2003 dollars, and exclude cost escalation.						

6.3. Recommended Post-2006 Strategy

The information presented in the above Sections 6.1 and 6.2 is illustrative of the potential economic impact of a failure to effectively implement the recommended strategies presented in Parts 2, 3 and 5 of this Long-Term Plan. Those costs aggregate to a total possible incremental expenditure of $673.75 million (in FY 2003 dollars). The strategies recommended in earlier parts of this 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 this Long-Term Plan.

This 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 this Long-Term Plan that additional steps, once identified and their need confirmed, be expeditiously implemented. Documentation of any additional measures (the **Post-2006 Projects**) will be to a level of detail not less than that presented herein for the Pre-2006 Projects.

6.3.1. Funding for Adaptive Implementation [Bc88]

To facilitate that adaptive implementation process and assure that additional steps are expeditiously implemented, it is recommended that a dedicated funding source be established. Its use would be limited to additional enhancements and modifications resulting from the PDE process that can be implemented within the existing footprints of the ECP STAs, or added to CERP projects as a locally preferred option to enhance their water quality performance. It is not intended that dedicated funding source be used for more substantive efforts similar to those discussed in Section 6.1 and 6.2 of this Part 6, which could include:

- In the ECP Basins, further expansion of the STAs post-2006 if needed to meet water quality standards, including the numeric phosphorus criterion, which could include:
  - Expansion of STA-2, either through addition of a fourth parallel flow path, or through development of a new STA potentially sited immediately north of the Hillsboro Canal and west of the Arthur R. Marshall Loxahatchee National Wildlife Refuge;
  - Expansion of STA-5, increasing its effective treatment area by as much as 50%;
  - Expansion of STA-1E to include lands in Section 24, Township 44 South, Range 40 East in Palm Beach County.
- In the ESP Basins, a variety of 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 outside the purview of CERP;
  - For the Feeder Canal Basin, development of an additional STA outside the purview of CERP.

Given the significant magnitude of possible expenditures for the items listed above, it is intended that the District submit a comprehensive report to the Governor and Legislature no later than December 31, 2008, on the status and progress of the Long-Term Plan recommended herein. That report, described more fully in Part 5, should include specific identification of which, if any, of the above (or other) more extensive measures are then considered necessary to achieve the planning objective and the goals of the EFA. **It is the intent of this Long-Term Plan to prevent the need for such more extensive measures**

if at all possible. It is recommended that a total of $36.0 million in funds be made available for the adaptive implementation process recommended herein, distributed as $9.0 million per year in each of Fiscal Years 2007 through 2010. Assuming average annual cost escalation of 3% per year from FY 2003 through FY 2016, that level of funding is equivalent to approximately $30,615,000 in FY 2003 dollars.

In addition, the overall projected expenditures for this Long-Term Plan include an allowance for Program Management [Bc90], computed as roughly 3% of the projected annual expenditures for the adaptive implementation of additional measures.

It is intended that science and engineering factors will drive the decision process for the adaptive implementation of additional measures, and that the implementation of those measures not be limited by the above funding projection, which is at this point simply an allowance. It is further intended that those measures be implemented without waiting for a response from the 2008 report to the Governor and Legislature.

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7. RECOVERY OF IMPACTED AREAS WITHIN THE EPA

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*, prepared for the South Florida Water Management District by Burns & McDonnell. 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 this 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

Regional hydrologic and hydraulic analyses prepared in connection with the Comprehensive Everglades Restoration Plan (CERP) were conducted on the parallel assumptions that:

- Compliance with the final phosphorus criterion would be achieved in the 1994 ECP and subsequent projects prior to release of discharges to the EPA;
- The various hydropattern restoration works listed above would be completed under the auspices of the Everglades Forever Act, outside the scope of CERP.

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.

This Part 7 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 7.1.

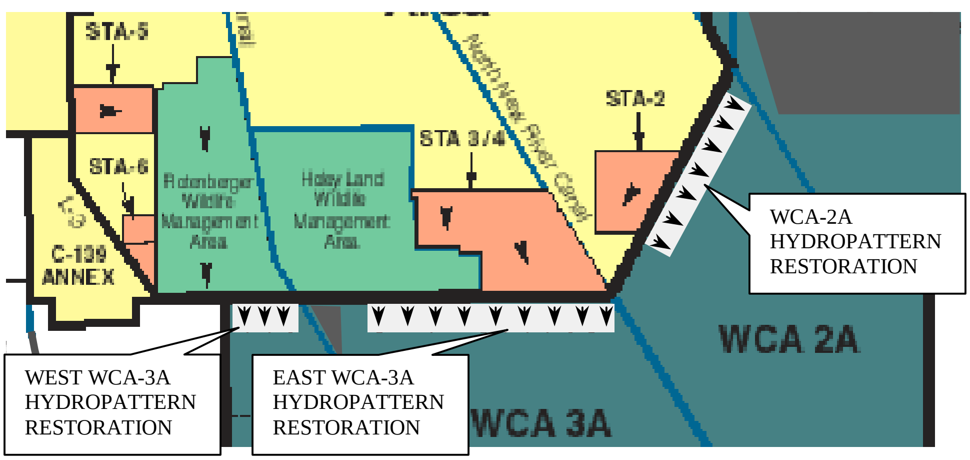


Figure 7.1 EFA Hydropattern Restoration Works

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, this Part 7 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;
- Proposed funding for implementing steps specifically directed to the accelerated recovery of impacted areas within the EPA;
- A summary of projected expenditures through Fiscal Year (FY) 2016.

7.1. Development of Planning and Analytical Tools [Bc87(1)-Bc87(4)]

Development of the following planning and analytical tools is included in this overall strategy for the Hydropattern Restoration.

- Development and calibration of a recovery model;
- Determination of the downstream influence of adding "clean" water to previously impacted areas;
- Development and evaluation of options for accelerating the recovery of previously impacted areas.

- Conduct of an alternatives analysis and plan formulation for completion of the Hydropattern Restoration works originally envisioned in the 1994 Everglades Forever Act.

7.1.1. Recovery Model Development and Calibration [Bc87(1)]

It is necessary to develop and calibrate a model capable of predicting the response of impacted areas in the EPA to improved water quality. The function of the model would be to predict the spatial extent and temporal distribution of recovery.

One possible approach to this need could be the continued development of process-based ecological models such as the SFWMD's Everglades Landscape Model (ELM). Because of the paucity of long-term observational data describing soil and habitat recovery eutrophication, simple empirical (statistical) modeling approaches may not be appropriate to predict recovery rates. The ELM is a regional scale ecological model designed to predict the landscape response to different water management scenarios in south Florida. The ELM simulates changes to the hydrology, soil and water nutrients, periphyton biomass and community type, and vegetation biomass and community type in the Everglades region. Other models may be appropriate as well.

It is anticipated that recovery model development and calibration will require expenditures at a current (FY 2003 dollars) level of $250,000 per year for a 4-year period encompassing Fiscal Years 2004-2007, inclusive.

7.1.2. Downstream Influences of Adding Clean Water to Previously Impacted Areas [Bc87(2)]

An additional item of research necessary to permit full development and calibration of the recovery model is determination of the response downstream of impacted areas following the addition of clean water (e.g., water meeting the phosphorus criterion established in Rule 62-302.540 F.A.C.). The objective is to assess the potential for the downstream transport of phosphorus released from the impacted areas (e.g., reflux from the peat) and its impact on flora and fauna in those downstream, previously unimpacted areas.

It is anticipated that this research will require expenditures at a current (FY 2003 dollars) level of $500,000 per year for a 3-year period encompassing Fiscal Years 2004-2006, inclusive.

7.1.3. Options for Accelerating Recovery [Bc87(3)]

In anticipation that the probable pace of natural recovery of previously impacted areas will result in an undesirably long recovery period, it is proposed to fund analysis and research on options for accelerating recovery. At the present time there are no specific management activities that have been demonstrated to accelerate recovery at a large scale. In addition, there are some concerns that active management in impacted areas may exacerbate phosphorus movement, particularly if not carefully investigated prior to implementation. However, there is evidence from short-term studies that options may exist for accelerating recovery. An example of such an option would be the use of prescribed burns in previously impacted areas. Other options might include the application of herbicides and/or harvesting in previously impacted areas.

Some initial work has been started with respect to the use of burns and herbicide. In addition, the Florida Fish and Wildlife Conservation Commission periodically burns parts of the remnant Everglades; it would be desirable to coordinate those efforts with this element.

A significant amount of information is available on a major wildfire that occurred in the northern portion of WCA-3A in the spring of 1999. In mid-1999, Environmental Permitting and Design, Inc., under subcontract to Burns & McDonnell, prepared a vegetation survey of an area extending south 3 miles from the L-5 Borrow Canal and west 8 miles from the intersection of the L-5 Borrow Canal with U.S. Highway 27. That survey is summarized in the June 2000 *Plan Formulation, Stormwater Treatment Area-3/4 and East WCA-3A Hydropattern Restoration* prepared for the South Florida Water Management District by Burns & McDonnell.

In addition, the Department of the Interior has expressed an interest in conducting research on the efficacy of prescribed burns on habitat restoration in the Loxahatchee National Wildlife Refuge.

It is anticipated that research will require expenditures at a current (FY 2003 dollars) level of $500,000 per year for a 3-year period encompassing Fiscal Years 2004-2006, inclusive.

7.1.4. Alternatives Analysis and Plan Formulation [Bc87(4)]

Following development of the planning and analytical tools discussed above, and upon definition of the specific nature and operation of CERP projects which could impact the design of the measures to accelerate the recovery of impacted areas, including the Hydropattern Restoration works, a full alternatives analysis and plan formulation will be conducted preparatory to design. The estimated cost of that alternatives analysis and plan formulation is approximately $400,000 in current (FY 2003) dollars. The alternatives analysis and plan formulation would be conducted during FY 2008, and the resulting recommendations and basis for design included in the December 31, 2008 report to the Governor and Legislature recommended in Part 5 of this Long-Term Plan.

7.1.5. Summary of Estimated Costs for Planning and Analytical Tools

A summary of the estimated costs for the recommended development of planning and analytical tools associated with the Hydropattern Restoration and accelerated recovery of previously impacted areas is presented in Table 7.1.

Table 7.1 Summary of Projected Expenditures, Development of Planning and Analysis Tools

Fiscal Year	Scheduled Expenditure by Activity (FY 2003 $)				Fiscal Year Total for Bc87(1) - Bc87(4) (FY 2003 $)
	Develop & Calibrate Recovery Model [Bc87(1)]	Research Influence of Adding Clean Water [Bc87(2)]	Research Options for Accelerated Recovery [Bc87(3)]	Alternatives Analysis & Plan Formulation [Bc87(4)]	
2004	$250,000	$500,000	$500,000		$1,250,000
2005	$250,000	$500,000	$500,000		$1,250,000
2006	$250,000	$500,000	$500,000		$1,250,000
2007	$250,000				$250,000
2008				$400,000	$400,000
Total	**$1,000,000**	**$1,500,000**	**$1,500,000**	**$400,000**	**$4,400,000**

7.2. Hydropattern Restoration Works [Bc87(5)]

As discussed above, substantial effort is required to finally develop full definition of the design and operation of the hydropattern restoration works originally authorized by the Everglades Forever Act. The following sections provide an initial conceptual description of the nature of those works as presently understood. Those conceptual descriptions are subject to modification following conclusion of the research, analyses, and plan formulation process described earlier in this Part 7. In addition, this section presents opinions of the probable cost for development, operation and maintenance of those works; a projection of the probable implementation schedule; and a summary of projected expenditures for those hydropattern restoration works.

7.2.1. Conceptual Design, WCA-2A Hydropattern Restoration

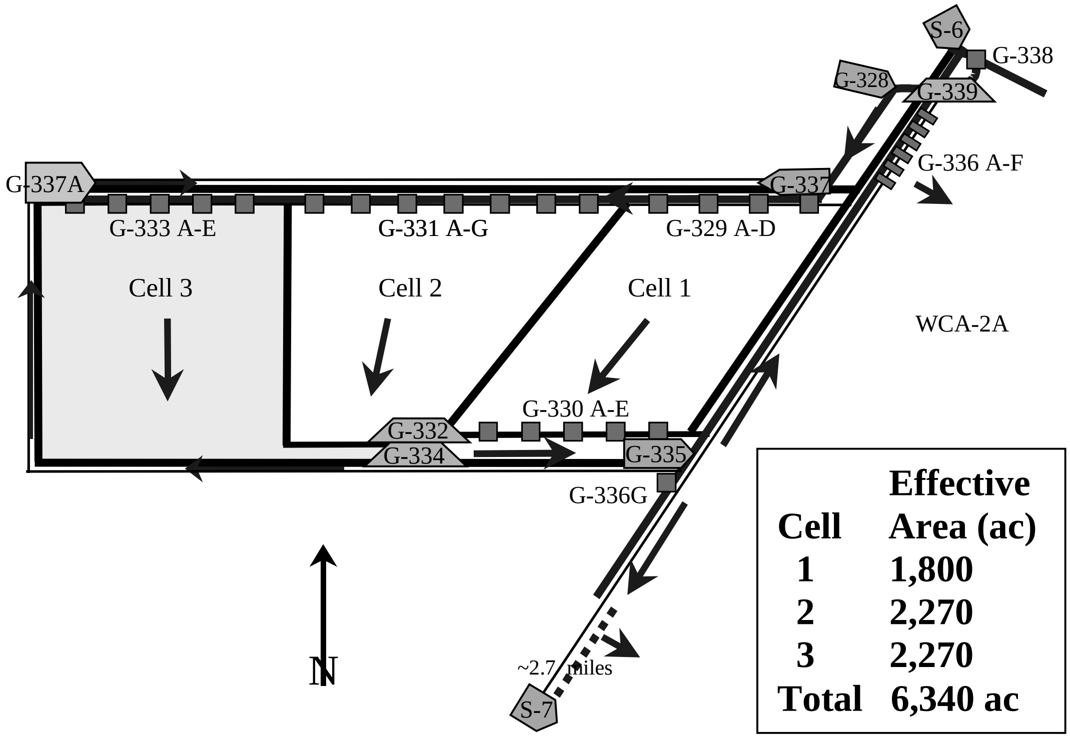
As originally contemplated in the February, 1994 *Conceptual Design, Everglades Protection Project*, discharges from STA-2 were to have been delivered via a sheet flow approximation to a length of the westerly perimeter of WCA-2A of approximately 40,000 feet, extending generally northeasterly from the STA-2 Outflow Pumping Station (G-335). Physical works anticipated at that time included:

- Relocation and enlargement of the West Levee L-6, to replace the original flood protection of East Levee L-6;
- Enlargement of the L-6 Borrow Canal;
- Modification of the East Levee L-6 to permit a distributed discharge to the westerly boundary of WCA-2A. That modification included:
  - A lowering of the top elevation of East Levee L-6;
  - Construction of a series of overflow flows to distribute STA-2 discharges to WCA-2A.
- A new canal and control structure connecting the enlarged L-6 Borrow Canal to the Hillsboro Canal in WCA-1 (WCA-1 water supply).

Each of the above components has been at least partially implemented. The following identifies changes made to the original *Conceptual Design* to this date.

- The WCA-1 water supply structure (G-338) is now situated immediately downstream of Pumping Station S-6, discharging from the STA-2 Supply Canal to the Hillsboro Canal in WCA-1;
- The overflow weirs originally intended for passing STA-2 discharges across the East Levee L-6 to WCA-2A have been replaced with ungated box culverts, each 10'x5'. The number of those structures, and their locations, has been modified from the original intent as discussed in the following paragraphs.

In its issuance of Clean Water Act Section 404 permit for the construction of STA-2, the Jacksonville District, U.S. Army Corps of Engineers permitted the discharge of waters from STA-2 to WCA-2A. Continuing concern over the potential impact of such discharges prior to their full compliance with water quality standards led to a modified plan developed and implemented with Corps approval. A schematic of STA-2 and the WCA-2A Hydropattern Restoration as it now exists is shown in Figure 7.2.



Cell	Effective Area (ac)
1	1,800
2	2,270
3	2,270
Total	6,340 ac

Figure 7.2 Existing STA-2 and WCA-2A Hydropattern Restoration

The originally intended discharge structures over a length of approximately 18,000 feet of the perimeter of WCA-2A extending north from G-335 (along a previously unimpacted area of WCA-2A) were excluded from the construction. In order to replace the “lost” hydraulic capacity, a part of the discharge from STA-2 is now directed south, through Structure G-336G, discharging to WCA-2A through a 3,400-ft. length of a fully degraded East Levee L-6 near S-7.

It is intended that, upon completion of the STA-2 modifications recommended in Part 2, STA-2 discharges will fully comply with water quality standards. This Long-Term Plan for completion of the WCA-2A Hydropattern Restoration consists of construction of additional culverts through the East Levee L-6 over that length (approximately 18,000 ft.) of the WCA-2A excluded from the original construction. It is anticipated that a total of 6 culverts (10’x5’ reinforced concrete boxes similar to G-336 (A-F)) will serve that purpose.

7.2.2. Conceptual Design, East WCA-3A Hydropattern Restoration

As originally contemplated in the February, 1994 *Conceptual Design, Everglades Protection Project*, discharges from STA-3/4 would be divided between Pumping Station S-7 (nominal capacity of 2,490 cfs) and a sheet flow discharge to WCA-3A along the L-5 levee and canal system. The sheet flow releases to WCA-3A would vary in amount, up to a maximum of 4,170 cfs, distributed across approximately a 46,600-ft. length of L-5 extending west from U.S. Highway 27 (confluence of the L-5 Borrow Canal with the North New River Canal). Physical works anticipated at that time included:

- Full degradation of approximately 46,200 feet of both the North and South L-5 Levee;
- Enlargement of the L-5 Borrow Canal for increased conveyance, extending from the North New River Canal west approximately 32,300 feet;
- Construction of a new gated spillway in the North New River Canal immediately upstream of its confluence with the L-5 and L-6 Borrow Canals.

Of the above components, only the gated spillway (Structure G-371) remains in the current plan for Phase 1 of the Everglades Construction Project. The following is a summary listing of the various considerations which have combined to directly impact the nature of the East WCA-3A Hydropattern Restoration Works.

- As a result of legislative direction in the Everglades Forever Act, the basic footprint of STA-3/4 was modified to exclude the “Toe of the Boot” addition to the Holey Land Wildlife Management Area, reducing the STA-3/4 frontage along East WCA-3A from 46,200 feet to approximately 30,500 feet;
- In its issuance of Clean Water Act Section 404 permit for the construction of STA-3/4, the Jacksonville District, U.S. Army Corps of Engineers prohibited the discharge

of waters from STA-3/4 to previously unimpacted areas within WCA-3A prior to those discharges conforming with final water quality standards;

- Hydrologic modeling conducted for the April, 1999 *Final Integrated Feasibility Report and Programmatic Environmental Impact Statement* (the *Restudy*) indicated that the originally intended volume of discharges from STA-3/4 to WCA-3A would result in excessive depths and hydropattern in Northeastern WCA-3A;

- Hydrologic modeling for ALTD13R of the *Restudy* (the base plan subsequently adopted for CERP) limited the direct discharge from STA-3/4 to WCA-3A to a peak rate of 1,500 cfs, with the magnitude and timing of those releases controlled in response to a rainfall-driven formula controlled by conditions in a specific indicator region of Northeastern WCA-3A. The average annual volume discharged to Northeast WCA-3A in that analysis was reported as 237,000 acre-feet per year (see Table B.3-5 in Appendix B of the *Restudy*, for Transect No. 6);

- The modeling for ALTD13R also directed the bulk of the discharges from STA-3/4 west along the L-5 Borrow Canal to the present location of Pumping Station S-8 (at the confluence of the Miami Canal with the L-5 Borrow Canal), at a maximum daily rate of 2,800 cfs;

- Additional topographic surveys obtained in connection with the design of STA-3/4 indicated that existing grades in Northeastern WCA-3A are generally above those in STA-3/4, with the result that sheet flow discharges to WCA-3A by gravity from STA-3/4 could be problematic.

A total of six alternatives for the control and distribution of discharges from STA-3/4 were considered in the September 1999 *Alternatives Analysis, Stormwater Treatment Area-3/4 and East WCA-3A Hydropattern Restoration*, prepared for SFWMD by Burns & McDonnell. The selected alternative was that most consistent with the modeling for ALTD13R of the *Restudy*. No capability for sheet flow discharge was included in that alternative, due to the restriction against discharges to unimpacted areas in WCA-3A in advance of full conformance to final water quality standards. The selected alternative was subsequently refined in the June, 2000 *Plan Formulation, Stormwater Treatment Area-3/4 and East WCA-3A Hydropattern Restoration*, prepared for SFWMD by Burns &

McDonnell, and is now under construction, with full completion scheduled for October, 2003.

As it is now being constructed, the outflow distribution and control works for STA-3/4 include:

- Enlargement of the L-5 Borrow Canal west of the southwesterly corner of STA-3/4, with a nominal design capacity of 2,950 cfs;
- Construction of an earthen plug between the West L-5 Borrow Canal Enlargement and the existing L-5 Borrow Canal;
- Construction of a new Discharge Canal along the south line of STA-3/4, paralleling the L-5 Borrow Canal over a length of approximately 26,500 feet. An open connection will exist between the L-5 Borrow Canal and the Discharge Canal at the easterly end of the Discharge Canal;
- Enlargement of the L-5 Borrow Canal west from its confluence with the North New River a distance of approximately 3,200 feet, with a nominal design capacity of 3,495 cfs. That capacity is distributed as a maximum of 2,490 cfs to existing Pumping Station S-7, and a maximum of 1,005 cfs to existing Structure S-150;
- Three roadway bridges, two over the new Discharge Canal, and one over the enlarged West L-5 Borrow Canal immediately east of Pumping Station S-8;
- Gated spillway Structure G-371, which has been designed and is scheduled for construction following completion and placement into service of STA-3/4.

A schematic diagram of the STA-3/4 outflow distribution and control works as they are presently designed and being constructed is presented in Figure 7.3.

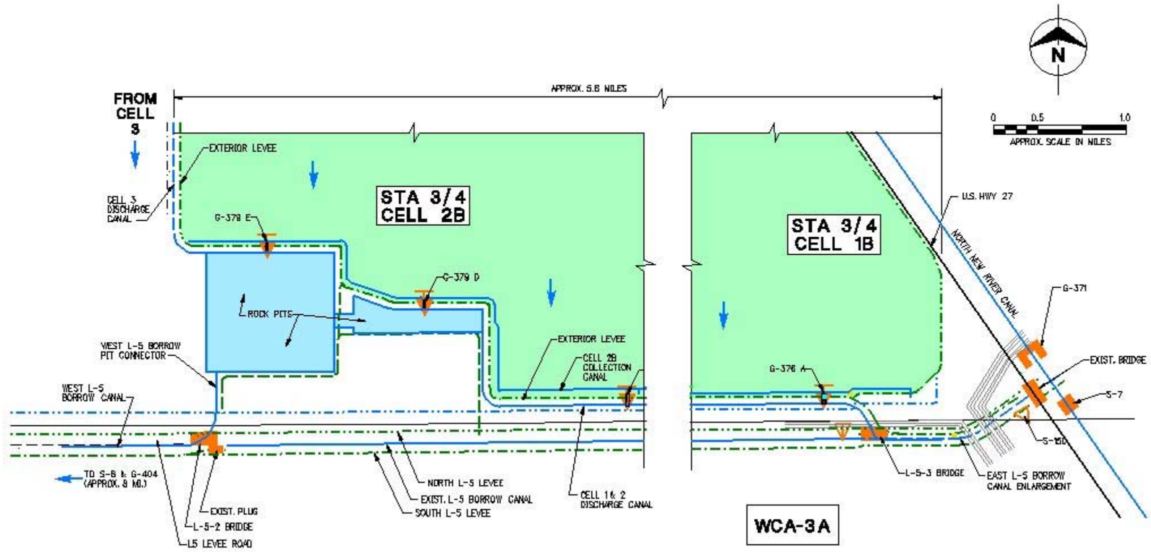


Figure 7.3 STA-3/4 Outflow Distribution and Control

The West L-5 Borrow Canal Enlargement, including the new roadway bridge immediately east of Pumping Station S-8, was completed in early 2003. The remainder of the outflow distribution and control works (with the exception of Structure G-371) are under construction and scheduled for completion in March 2004. The construction of Structure G-371 is expected to commence upon the full operation of STA-3/4.

Prior to the enlargement, the capacity of the West L-5 Borrow Canal was between 800 and 900 cfs. Although it would have been necessary to enlarge the West L-5 Borrow Canal to carry the 2,800 cfs contemplated in the ALTD13R hydrologic analysis, no estimate of cost for the enlargement can be found in Appendix C of the *Restudy*.

The following conceptual design of the East WCA-3A Hydropattern Restoration project is developed upon the primary assumption of a future capacity to deliver up to 1,500 cfs via sheet flow approximation to WCA-3A along its shared boundary with STA-3/4.

Again, the nature of this Long-Term Plan is subject to adjustment following completion of the recommended alternatives analysis and plan formulation.

A preliminary hydraulic analysis of the Northeastern WCA-3A was conducted during design of STA-3/4, and is documented in Part 6 of the June, 2000 *Plan Formulation*. That analysis was prepared upon the assumption of an inflow rate to the area of 1,500 cfs. The area modeled extended south approximately 14,400 feet from the L-5 levee system, and was approximately 41,500 feet in width. That modeling effort was never finalized, as the recommended plan for initial construction of STA-3/4 did not include the sheet flow discharge to WCA-3A. However, the modeling conducted suggested a water surface elevation along the South L-5 Levee of 12.4 ft. NGVD (assuming the 1,500 cfs inflow uniformly distributed along a six-mile length of that line). Upon the assumption that the specific nature of facilities effecting discharge through South Levee L-5 would consist of culverts followed by a spreader canal paralleling L-5, an assigned tailwater elevation at those structures of 12.6 ft. NGVD is considered in this Long-Term Plan (e.g., allowance of 0.2 ft. for head loss along the spreader canal and mounding at the structure outlets).

The design water surface elevation in the STA-3/4 discharge canal system (which includes the STA-3/4 Discharge Canal, the rock pits to which it connects, and the enlarged East and West L-5 Borrow Canals) varies both by location and with the rate of discharge from STA-3/4. Those elevations are directly influenced by both the rate of discharge from STA-3/4, and by the combined operations of existing pumping stations S-7 and S-8 (which function as outflow pumping stations for STA-3/4). The design maximum tailwater (Discharge Canal) elevations at the Cell 1B outflow control structures (G-376) is 12.3 ft. NGVD. The design maximum tailwater (Discharge Canal) elevations at the Cell 2B outflow control structures (G-379) is 12.6 ft. NGVD. Those maximum tailwater elevations should be realized only as the total discharge from STA-3/4 approaches 5,840 cfs in order to prevent excessive depth-duration in the treatment cells. For a discharge from STA-3/4 of 1,500 cfs, assuming the entire STA in operation and balanced flow distribution in the parallel flow paths, the maximum desirable tailwater elevations at the G-379 structures would be 11.6 ft. NGVD. The maximum desirable tailwater elevation at the G-376 structures would also be 11.6 ft. NGVD.

Existing ground surface elevations along the South Levee L-5 in the modeled inlet zone vary from 10.2 to 11.3 ft. NGVD, averaging approximately 10.9 ft. NGVD, 0.3 ft. above the static water surface elevation in Cell 1B, and roughly equal to the static water surface elevation in Cell 2B. Upon conversion of Cells 1B and 2B to submerged aquatic vegetation (SAV) as recommended in Part 2, those static water surface elevations will increase to 11.3 and 11.6 ft. NGVD, respectively.

Given the above, it presently appears that it will be necessary to pump STA-3/4 outflows up to an elevation adequate to assure delivery of the intended rate of discharge to East WCA-3A. For this Long-Term Plan, that pumping station is assigned a capacity of 1,500 cfs. The pumping station will draw from the existing rock pits near the southwestern corner of STA-3/4, and will discharge to the L-5 Borrow Canal. That discharge will require the construction of a new discharge canal across the FPL transmission line right-of-way, and a new bridge at the canal's crossing of North Levee L-5. That bridge is assumed to be similar in design to Bridge L-5-2.

The existing profile grade of North Levee L-5 (which serves as the primary access route to the Holey Land Wildlife Management Area and Pumping Station S-8) is at approximate elevation 15.0 ft. NGVD throughout much of its length adjacent to the existing (unimproved) L-5 Borrow Canal. The maximum design stage in the L-5 Borrow Canal should therefore be no higher than elevation 13.0 ft. NGVD (2.0 feet below the roadway surface); that elevation is taken as the approximate design headwater elevation for any culverts through the South L-5 Levee.

Given a headwater elevation of 13.0 ft. NGVD and a tailwater elevation of 12.6 ft. NGVD, it is anticipated that the hydraulic equivalent of seven 10'x5' reinforced concrete box culverts would be required to pass the anticipated rate of 1,500 cfs. It would be necessary that those culverts be equipped with gates so that, in the event of extreme high stages in WCA-3A, the gates may be closed to preserve the flood protection function of the South Levee L-5. As these gates would be normally open, and closed only infrequently in the event of extreme hydrologic events, it would not be considered necessary to fully automate those structures. Electrical supply for normal gate operation could be obtained from an existing power distribution line along the north side of North Levee L-5. Backup supply in the event of power failure could consist of the use of a portable generator.

Distribution of the culvert discharges along the length of the inlet zone adjacent to South Levee L-5 can be expected to require the construction of a spreader canal paralleling L-5. That spreader canal would be expected to provide a waterway area of roughly 100 square feet below elevation 11.0 ft. NGVD.

Through the reach of interest, the existing L-5 Borrow Canal affords an average waterway area of approximately 375 square feet below elevation 11.0 ft. NGVD (approximate bank elevation), and 470 square feet below elevation 13.0 ft. NGVD. In order to limit maximum flow velocities to a non-scouring value of approximately 2 feet per second, it will be necessary to partially enlarge the existing L-5 Borrow Canal. A schematic of the above conceptual design of the East WCA-3A Hydropattern Restoration is shown in Figure 7.4.

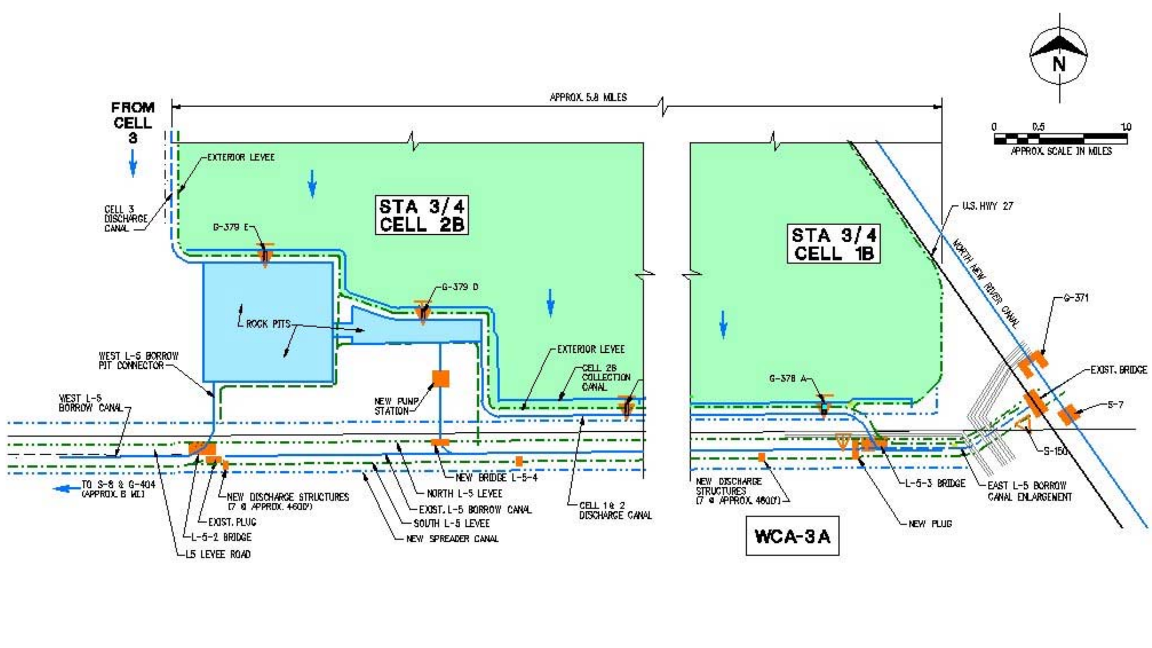


Figure 7.4 Conceptual Design, East WCA-3A Hydropattern Restoration

Again, this Long-Term Plan is subject to confirmation or modification as a result of the recommended alternatives analysis and plan formulation.

7.2.3. West WCA-3A Hydropattern Restoration

Substantial modification has been made to the basic design of STA-5, STA-6, the Rotenberger Tract Restoration, and other components of the ECP potentially impacting the West WCA-3A Hydropattern Restoration subsequent to publication of the February 1994 *Conceptual Design*. The reader is referred to the following documents for a more complete discussion of the current design of the Western Basins elements of the ECP:

- September, 1997; *Final Design Report, Stormwater Treatment Area No. 5 (STA-5), STA-5 Discharge Canal, and STA-5 Outlet Canal*; prepared for SFWMD by Burns & McDonnell.
- March, 1997; (Pre-Final) *Detailed Design Report, Stormwater Treatment Area No. 6 (STA-6)*; prepared for SFWMD by Burns & McDonnell.

The one remaining element of the West WCA-3A Hydropattern Restoration Project is the degradation (removal to existing grade) of South Levee L-4 generally between the Miami Canal and the L-3 Canal Extension. As was discussed above for the WCA-2A and East WCA-3A Hydropattern Restoration projects, completion of this element of the project has been delayed as a result of restrictions imposed by the Clean Water Act Section 404 permit issued for the related projects. The 404 permit allowed a 100-ft. gap to be cut in the south L-4 Levee and a connector canal dug between the L-4 borrow canal and the L-3 Canal Extension.

Following completion of the enhancements to STA-3/4, STA-5 and STA-6 recommended in Part 2, it is intended that the discharges from those treatment areas will fully comply with the phosphorus criterion, allowing completion of the West WCA-3A Hydropattern Restoration as originally intended.

7.2.4. Opinion of Probable Cost [Bc87(5)]

Opinions of the probable capital cost for the WCA-2A, East WCA-3A, and West WCA-3A Hydropattern Restoration projects outlined above are presented in Tables 7.2, 7.3 and 7.4, respectively. Those estimated costs are reported in FY 2003 dollars. Again, the specific nature and design of each of those projects is subject to adjustment as a result of the recommended alternatives analysis and plan formulation.

Table 7.2 Opinion of Capital Cost, WCA-2A Hydropattern Restoration

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Additional G-336 Structures (ungated 10'x5' RCB's)	6	Ea.	$90,000	$540,000	
Subtotal, Estimated Construction Costs					**$540,000**	**$540,000**
Planning, Engineering & Design		10 %			$54,000	**$50,000**
Construction Management		7 %			$37,800	**$40,000**
Total Estimated Cost, Without Contingency					**$631,800**	**$630,000**
Contingency		30 %			$189,540	**$190,000**
TOTAL ESTIMATED CAPITAL COST					**$821,340**	**$820,000**

Table 7.3 Opinion of Capital Cost, East WCA-3A Hydropattern Restoration

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	New Pumping Station	1500	cfs	$7,500	$11,250,000	Unit cost from Evaluation Methodology
2	New Water Control Structures in Cell 1 (10'x5', Gated)	7	Ea.	$190,000	$1,330,000	Unit cost from June 2001 Estimate for STA-3/4, Esc.
3	Spreader Canal Excavation in WCA-3A	125000	Cu. Yd.	$2.50	$312,500	Unit cost from Evaluation Methodology, Shallow Excavation, No Blasting
4	Clearing in WCA-3A for Spreader Canal, Heavy Brush	75	Ac.	$1,500	$112,500	Unit cost from Evaluation Methodology
5	New Bridge on North L-5, 226'x27'	6100	Sq. Ft.	$100	$610,000	
6	Power Drops to New Water Control Structures	7	Ea.	$10,000	$70,000	
7	Pumping Station Discharge Canal Excavation, Deep Excavation with Blasting	20000	Cu. Yd.	$4.50	$90,000	Unit cost from Evaluation Methodology
8	L-5 Canal Enlargement, Deep Excavation with Blasting	40000	Ea.	$4.50	$180,000	Unit cost from Evaluation Methodology
Subtotal, Estimated Construction Costs					**$13,955,000**	**$14,000,000**
Planning, Engineering & Design		10 %			$1,395,500	**$1,400,000**
Construction Management		7 %			$976,850	**$980,000**
Total Estimated Cost, Without Contingency					**$16,327,350**	**$16,380,000**
Contingency		30 %			$4,898,205	**$4,900,000**
TOTAL ESTIMATED CAPITAL COST					**$21,225,555**	**$21,280,000**

Table 7.4 Opinion of Capital Cost, West WCA-3A Hydropattern Restoration

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Clearing in WCA-3A, Heavy Brush	36	Ac.	$1,500	$54,000	Unit cost from Evaluation Methodology
2	Excavation (Degrade South Levee L-4)	130,000	Cu. Yd.	$2.50	$325,000	Unit cost from Evaluation Methodology
3	Haul and Place on North Levee L-4	130000	Cu. Yd.	$4.00	$520,000	
Subtotal, Estimated Construction Costs					**$899,000**	**$900,000**
Planning, Engineering & Design		10 %			$89,900	**$90,000**
Construction Management		7 %			$62,930	**$60,000**
Total Estimated Cost, Without Contingency					**$1,051,830**	**$1,050,000**
Contingency		30 %			$315,549	**$320,000**
TOTAL ESTIMATED CAPITAL COST					**$1,367,379**	**$1,370,000**

It is anticipated that little or no incremental operation and maintenance costs would be incurred as a result of the completion of the WCA-2A and West WCA-3A Hydropattern Restoration. An opinion of the incremental annual operation and maintenance cost for the East WCA-3A Hydropattern Restoration is presented in Table 7.5, and is reported in FY 2003 dollars. It should be noted that no costs for fuel consumption in the new pumping station are included, as virtually all discharges from STA-3/4 must be pumped in any event.

Table 7.5 Opinion of Incremental O&M Cost, East WCA-3A Hydropattern Restoration

Item No.	Description	Estimated Quantity	Unit	Estimated Unit Cost	Estimated Total Cost	Remarks
1	Building Maintenance	1	Ea.	$12,000	$12,000	Unit cost from Evaluation Methodology
2	New Water Control Structures	7	Ea.	$12,000	$84,000	Unit cost from Evaluation Methodology
3	Mech. Maintenance, Pumping Station, 2 units assumed	2	Ea.	$45,000	$90,000	Unit cost from Evaluation Methodology
4	Power Consumption, Pumping Station, Cell 5A	65	cfs	$300	$19,500	
5	Engine Operator	1	Ea.	$100,000	$100,000	
Subtotal, Estimated Incremental Operation & Maintenance Costs					**$305,500**	
Contingency		30 %			$91,650	
TOTAL INCREMENTAL O&M COST					**$397,150**	**$400,000**

7.2.5. Implementation Schedule

The proposed implementation schedule for development of the Hydropattern Restoration works described in this Part 7 is structured to recognize:

- The need for development and calibration of planning and analysis tools prior to establishing a final plan of improvement, which will require the conduct of a full alternatives analysis and plan formulation;
- The need for in-service demonstration of the capability of the enhanced treatment areas to meet water quality standards prior to effecting discharge to previously unimpacted areas in the EPA;
- The intended schedule and timing of the report to the Governor and Legislature (December 31, 2008), the issuance and review and acceptance of which is needed prior to commencing construction on the hydropattern restoration works.

As discussed in an earlier section of this Part 7, development and calibration of the planning and analysis tools is proposed to completed during Fiscal Years 2004-2007; the alternatives analysis and plan formulation is scheduled for Fiscal Year 2008 (ending September 30, 2008). At that point in time, the following are also scheduled to have occurred, which would allow the full and proper development of the report to the Governor and Legislature scheduled for December 31, 2008:

- The Process Development and Engineering (PDE) efforts recommended in Part 5 will have progressed to a point allowing full definition of any additional STA enhancements that might be necessary to adequately assure compliance with final water quality standards;
- The STA enhancements recommended in Part 2 for the ECP basins will have been complete and operational for approximately 2 years, providing in-service demonstration of their effectiveness and confirmation of the need for any additional enhancements recommended by the PDE process.

Detailed engineering and design of the final recommended plan would occur in the second half of Fiscal Year (FY) 2009 and the first half of FY 2010. Actual construction of the recommended improvements would occur in Fiscal Years 2011 and 2012 (e.g., overall completion by October 1, 2012).

7.2.6. Summary of Projected Expenditures, Hydropattern Restoration Works [Bc87(5)]

A summary of the projected expenditures for development and subsequent operation and maintenance of the hydropattern restoration works conceptually defined in this Part 7 is presented in Table 7.6. All projected expenditures are reported in FY 2003 dollars.

Table 7.6 Summary of Projected Expenditures for Hydropattern Restoration [Bc87(5), Bf]

Fiscal Year	Scheduled Expenditure by Type (FY 2003 $) [Bc87(5)]				Fiscal Year Total (Bc87(5)]	Incremental O&M Cost [Bf]	Fiscal Year Total (FY 2003 $)
	Planning, Eng. & Design	Construction Management	Construction	Project Contingency			
2009	$770,000			$230,000	$1,000,000		$1,000,000
2010	$770,000			$230,000	$1,000,000		$1,000,000
2011		$540,000	$7,720,000	$2,475,000	$10,735,000		$10,735,000
2012		$540,000	$7,720,000	$2,475,000	$10,735,000		$10,735,000
2013					$0	$400,000	$400,000
2014					$0	$400,000	$400,000
2015					$0	$400,000	$400,000
2016					$0	$400,000	$400,000
Total	**$1,540,000**	**$1,080,000**	**$15,440,000**	**$5,410,000**	**$23,470,000**	**$1,600,000**	**$25,070,000**

7.3. Implement Steps to Accelerate Recovery of Impacted Areas [Bc87(6)]

Following approval and authorization of the plan submitted to the Governor and Legislature in December 2008, it is contemplated that the most promising techniques to accelerate recovery of the impacted areas, in addition to the Hydropattern Restoration projects described above, would commence in FY 2010. For planning purposes, it is recommended to include funding for this activity in the amount of $2 million per year for five years (in escalated dollars). For an assumed average annual cost escalation of 3% per year, those expenditures are equivalent to a total funding amount of $7.67 million in FY 2003 dollars.

7.4. Summary Opinion of Cost and Expenditures [Bc87, Bc90, Bf]

A summary of the projected expenditures through FY 2016 for steps devoted to the accelerated recovery of impacted areas within the EPA is presented in Table 7.7. Those projected expenditures are all stated in FY 2003 dollars. Expenditures for development and calibration of the necessary planning and analysis tools are considered firm; expenditures after FY 2008 are considered to be the best available estimate, and are subject to adjustment as a result of the alternatives analysis and plan formulation process. As all such efforts would by definition be on lands presently held by the District or otherwise in the public domain, no land acquisition costs are included.

Table 7.7 Projected Expenditures, Recovery of Previously Impacted Areas

Fiscal Year	Scheduled Expenditure by Function (FY 2003 $)						Fiscal Year Total Expenditure (FY 2003 $)
	Alternatives Analysis & Planning* [Bc87(1)-(4)]	Hydropattern Restoration [Bc87(5)	Steps to Accelerate Recovery [Bc87(6)]	Subtotal, all Bc87	Program Management [Bc90}	Incremental Operation & Maintenance [Bf]	
2004	$1,250,000			$1,250,000	$38,000		$1,288,000
2005	$1,250,000			$1,250,000	$38,000		$1,288,000
2006	$1,250,000			$1,250,000	$38,000		$1,288,000
2007	$250,000			$250,000	$8,000		$258,000
2008	$400,000			$400,000	$12,000		$412,000
2009		$1,000,000		$1,000,000	$30,000		$1,030,000
2010		$1,000,000	$1,626,183	$2,626,183	$79,000		$2,705,183
2011		$10,735,000	$1,578,818	$12,313,818	$369,000		$12,682,818
2012		$10,735,000	$1,532,833	$12,267,833	$368,000		$12,635,833
2013			$1,488,188	$1,488,188	$45,000	$400,000	$1,933,188
2014			$1,444,843	$1,444,843	$43,000	$400,000	$1,887,843
2015				$0	$0	$400,000	$400,000
2016				$0	$0	$400,000	$400,000
Total	**$4,400,000**	**$23,470,000**	**$7,670,865**	**$35,540,865**	**$1,068,000**	**$1,600,000**	**$38,208,865**

* See Table 7.1

7.4.1. Program Management {Bc90]

The projected expenditures in Table 7.7 include Program Management costs computed at approximately 3% of the projected capital and other project expenditures (excluding O&M) in each fiscal year.

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8. OPERATION, MAINTENANCE AND MONITORING

Previous sections of this Long-Term Plan address the nature and probable costs and funding needs for additional steps recommended to be taken to meet the phosphorus criterion established in Rule 62-302.540 F.A.C. Part 2 identifies proposed modifications and enhancements to the various stormwater treatment areas (STAs) previously constructed or now being completed under the 1994 Everglades Construction Project. That Part 2 includes opinions of the probable incremental operation and maintenance costs associated with those STAs, the general location and identification of which are shown in Figure 8.1.

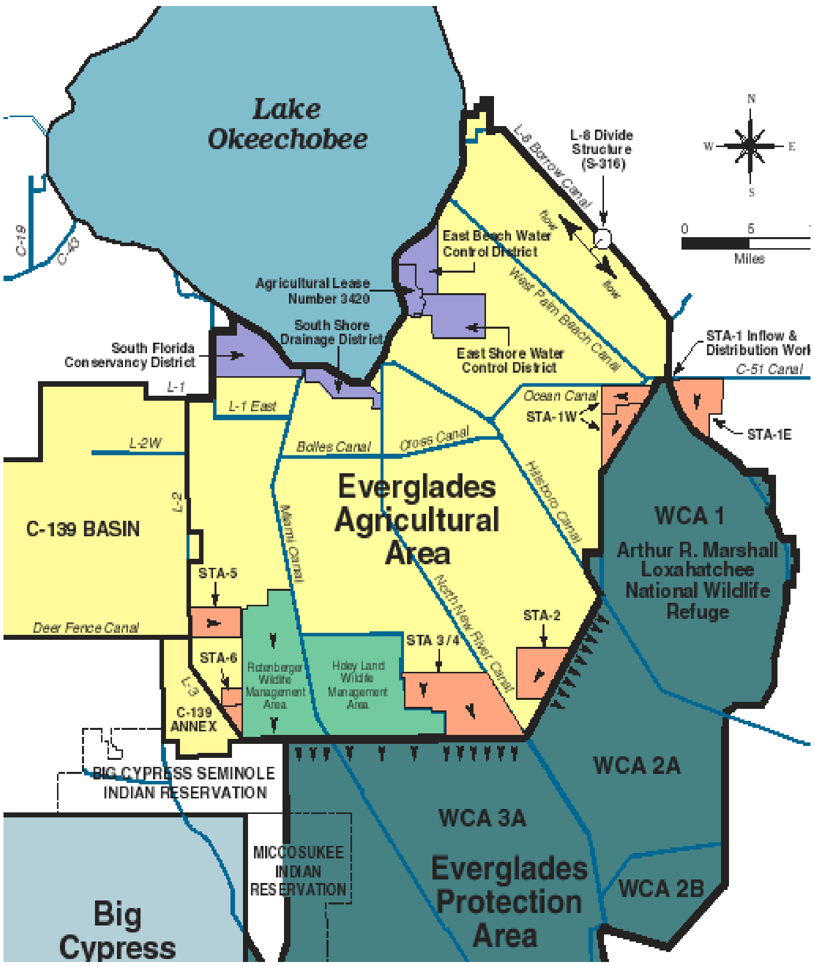

Figure 8.1 ECP Stormwater Treatment Areas

This Part 8 summarizes opinions of the probable cost for operation, maintenance and monitoring of those STAs as they presently exist (or will exist upon completion as presently designed), as well as the anticipated increased costs for operation, maintenance and monitoring associated with the enhancements and modifications recommended in Part 2 of this Long-Term Plan. In addition, this Part 8 summarizes estimates of the average annual cost for operation and maintenance of certain other "non-STA" works constructed under the 1994 ECP, together with the incremental operation and maintenance costs for the hydropattern restoration works described in Part 7 of this Long-Term Plan. These opinions of cost and estimated expenditures are included in this Long-Term Plan as they represent a significant continuing demand on the overall funding for the water quality improvement strategies established in the Everglades Forever Act.

Operation, maintenance and monitoring requirements for which opinions of cost are prepared include:

- Dedicated labor and personnel costs, including:
    - Site management
    - Data management and analysis
    - Pumping Stations
- Mechanical Maintenance of:
    - Pumping Equipment
    - Water Control Structures
- Building Maintenance (Pumping Stations)
- Levee Maintenance (Mowing)
- Primary Canal Maintenance (Removal of Floating Vegetation, Control of Emergents on Banks)
- Maintenance of Vegetated Areas
- Energy Costs, including:
    - Diesel Fuel Consumption in Primary Pumping Stations
    - Electricity Usage in Minor Pumping Stations (Primarily Seepage Return)
- Flow and Water Quality Monitoring, both for:
    - Documentation of Permit Compliance
    - Monitoring and Control of Treatment Area Operation

Those opinions of cost are developed in the following general groupings:

- STA Operations and Maintenance Costs (SFWMD budget activity code Bf) for both:
  - The six STAs of the ECP as they are presently designed and/or constructed;
  - Incremental operations and maintenance associated with the modifications and enhancements recommended in Part 2.
- Non-STA Operations and Maintenance Costs (SFWMD budget activity code Bf) for both:
  - Works designed and constructed under the original ECP;
  - Incremental operations and maintenance associated with the hydropattern restoration works as they are conceptually described in Part 7 of this Long-Term Plan.
- Flow and water quality monitoring costs for both:
  - Documentation of permit compliance (SFWMD budget activity code Bf80);
  - Monitoring and control of treatment area operation (SFWMD budget activity code Bc05), including hydrologic and hydraulic analyses necessary for discharge ratings and measurements at structures, as well as data processing.
- Additional dedicated labor and associated expenses for:
  - STA Site Management (SFWMD budget activity code Bf81);
  - Water Resource Management staff for hydraulic modeling, operations plan refinement and coordination, and similar activities (SFWMD budget activity code Bc90);
  - Program Management (SFWMD budget activity code Bc90).

8.1. STA Operation and Maintenance [Bf]

Estimates of the cost for operation and maintenance (O&M) of the six STAs of the Everglades Construction Project were developed by the District's Operations and Maintenance Department, and are summarized in Table 8.1. That tabulation of estimated costs is presented in FY 2003 dollars. The estimated O&M costs for STA-1W include costs associated with operation and maintenance of the STA-1 Inflow and Distribution Works. The estimated O&M costs for STA-1E include costs for operation and maintenance of the C-51 West End Flood Protection Project.

Table 8.1 Estimated STA Operation and Maintenance Costs, Current Design [Bf]

Fiscal Year	Estimated Expenditure by Location (FY 2003 $) [Bf]						Fiscal Year Total (FY 2003 $)
	STA-1E	STA-1W	STA-2	STA-3/4	STA-5	STA-6	
2004	$1,600,000	$3,000,000	$1,050,000	$2,400,000	$350,000	$70,000	$8,470,000
2005	$2,350,000	$2,500,000	$1,600,000	$2,400,000	$350,000	$70,000	$9,270,000
2006	$2,250,000	$2,500,000	$1,600,000	$2,400,000	$350,000	$380,000	$9,480,000
2007	$2,250,000	$1,550,000	$1,600,000	$2,400,000	$350,000	$380,000	$8,530,000
2008	$2,250,000	$1,550,000	$1,600,000	$2,400,000	$350,000	$380,000	$8,530,000
2009	$2,250,000	$1,550,000	$1,600,000	$2,400,000	$350,000	$380,000	$8,530,000
2010	$2,250,000	$1,550,000	$1,600,000	$2,000,000	$350,000	$380,000	$8,130,000
2011	$2,250,000	$1,550,000	$1,600,000	$2,000,000	$350,000	$380,000	$8,130,000
2012	$2,250,000	$1,550,000	$1,600,000	$2,000,000	$350,000	$380,000	$8,130,000
2013	$2,250,000	$1,550,000	$1,600,000	$2,000,000	$350,000	$380,000	$8,130,000
2014	$2,250,000	$1,550,000	$1,600,000	$2,000,000	$350,000	$380,000	$8,130,000
2015	$2,250,000	$1,550,000	$1,600,000	$2,000,000	$350,000	$380,000	$8,130,000
2016	$2,250,000	$1,550,000	$1,600,000	$2,000,000	$350,000	$380,000	$8,130,000
Total	**$28,700,000**	**$23,500,000**	**$20,250,000**	**$28,400,000**	**$4,550,000**	**$4,320,000**	**$109,720,000**

The above estimates of O&M cost are for the STAs as they are presently designed or are being constructed, and exclude those incremental O&M costs associated with the enhancements and modifications recommended in Part 2 of this Long-Term Plan. Those incremental costs are summarized in Table 2.20, and are gathered with the costs estimated in the above Table 8.1 to incorporate all estimated O&M costs for the STAs if modified and enhanced as recommended in Part 2. Those total estimated O&M costs for the modified and enhanced STAs are summarized in Table 8.2.

Table 8.2 Estimated Total O&M Costs for Enhanced STAs [Bf]

Fiscal Year	Estimated Expenditure for STA O&M (FY2003 $)		Fiscal Year Total (FY 2003 $)
	1994 ECP	Long-Term Plan Enhancements	
2004	$8,470,000	$0	$8,470,000
2005	$9,270,000	$249,000	$9,519,000
2006	$9,480,000	$836,000	$10,316,000
2007	$8,530,000	$1,457,000	$9,987,000
2008	$8,530,000	$1,457,000	$9,987,000
2009	$8,530,000	$1,457,000	$9,987,000
2010	$8,130,000	$1,457,000	$9,587,000
2011	$8,130,000	$1,457,000	$9,587,000
2012	$8,130,000	$1,457,000	$9,587,000
2013	$8,130,000	$1,457,000	$9,587,000
2014	$8,130,000	$1,457,000	$9,587,000
2015	$8,130,000	$1,457,000	$9,587,000
2016	$8,130,000	$1,457,000	$9,587,000
Total	**$109,720,000**	**$15,655,000**	**$125,375,000**
See	**Table 8.1**	**Table 2.20**	

8.2. Non-STA Operations and Maintenance

The 1994 Everglades Construction Project includes the construction or modification of physical works not directly related to the stormwater treatment areas. Those works include, but are not necessarily limited to, the following:

- New pumping stations (G-404 and G-409) on the L-4 Borrow Canal. G-404 is intended to lift STA-5 and STA-3/4 discharges from the Miami Canal to the L-4 Borrow Canal for redistribution. G-409 is a water supply pumping station drawing from the L-4 Borrow Canal and discharging to the Seminole Tribe's Big Cypress Reservation.
- New pumping station G-410 and associated works for the Rotenberger Tract restoration immediately downstream of STA-5 (Rotenberger Tract Restoration).
- Those parts of the WCA-2A Hydropattern Restoration which have been previously constructed.
- Canal enlargements and control structure (G-341) associated with the S-5A Basin Diversion.

Table 8.3 summarizes the estimated annual expenditures for the "non-STA" elements of the 1994 Everglades Construction Project, based on estimates prepared by District staff. That tabulation excludes estimated incremental costs for operations and maintenance of the additional hydropattern restoration works discussed in Part 7 of this Long-Term Plan. All projected expenditures are stated in FY 2003 dollars.

Table 8.3 Projected Expenditures for non-STA O&M, Current ECP Design [Bf]

Fiscal Year	Estimated Expenditure by Location (FY 2003 $) [Bf]				Fiscal Year Total (FY 2003 $)
	West WCA-3A Hydopattern	WCA-2A Hydopattern	Rotenberger Tract	S-5A Basin Diversion	
2004	$221,000	$22,000	$112,000	$46,000	$401,000
2005	$221,000	$22,000	$112,000	$46,000	$401,000
2006	$221,000	$22,000	$112,000	$46,000	$401,000
2007	$221,000	$22,000	$112,000	$46,000	$401,000
2008	$221,000	$22,000	$112,000	$46,000	$401,000
2009	$221,000	$22,000	$112,000	$46,000	$401,000
2010	$221,000	$22,000	$112,000	$46,000	$401,000
2011	$221,000	$22,000	$112,000	$46,000	$401,000
2012	$221,000	$22,000	$112,000	$46,000	$401,000
2013	$221,000	$22,000	$112,000	$46,000	$401,000
2014	$221,000	$22,000	$112,000	$46,000	$401,000
2015	$221,000	$22,000	$112,000	$46,000	$401,000
2016	$221,000	$22,000	$112,000	$46,000	$401,000
Total	**$2,873,000**	**$286,000**	**$1,456,000**	**$598,000**	**$5,213,000**

The above estimates of O&M cost are for the non-STA components of the ECP as they are presently designed or are being constructed, and exclude those incremental O&M costs associated with the enhancements and modifications recommended in Part 7 of this Long-Term Plan. Those incremental costs are summarized in Table 7.7, and are gathered with the costs estimated in the above Table 8.3 to incorporate all estimated O&M costs for the non-STA elements of the ECP, including the hydropattern restoration works discussed in Part 7. Those total estimated O&M costs are summarized in Table 8.4.

Table 8.4 Projected Total Expenditures for non-STA O&M, with Enhancements [Bf]

Fiscal Year	Estimated Expenditure for non-STA O&M (FY2003 $)		Fiscal Year Total
	1994 ECP	Long-Term Plan Enhancements	(FY 2003 $)
2004	$401,000	$0	$401,000
2005	$401,000	$0	$401,000
2006	$401,000	$0	$401,000
2007	$401,000	$0	$401,000
2008	$401,000	$0	$401,000
2009	$401,000	$0	$401,000
2010	$401,000	$0	$401,000
2011	$401,000	$0	$401,000
2012	$401,000	$0	$401,000
2013	$401,000	$400,000	$801,000
2014	$401,000	$400,000	$801,000
2015	$401,000	$400,000	$801,000
2016	$401,000	$400,000	$801,000
Total	**$5,213,000**	**$1,600,000**	**$6,813,000**
See	**Table 8.3**	**Table 7.7**	

8.3. Monitoring for Documentation of Permit Compliance [Bf80]

A detailed listing of the various structures at which flow and water quality monitoring for documentation of permit compliance will be conducted is presented in Table 8.5. That tabulation identifies not only existing permit compliance monitoring stations, but also the expected additions to those stations as the remaining elements of the ECP and the STA enhancements recommended in this Long-Term Plan come on line.

Table 8.5 Permit Compliance Monitoring Stations [Bf80]

Location	FY04 description	Number of stations	FY05 description	Number of stations	FY06 description	Number of stations	Beyond FY06 description	Number of stations
STA-1E (not including any groundwater monitoring)	New: Start-up monitoring to begin 1/04 and routine monitoring to begin 7/04: S-319, S-361, S-362	3	New: G-311	1	New: None	0	New: New Acme Basin B Inflow station	1
STA-1E (not including any groundwater monitoring)	**Existing**: None	0	Existing: S-319, S-361, S-362	3	Existing: G-311, S-319, S-361, S-362	4	Existing: G-311, S-319, S-361, S-362	4
STA-1W	New: None	0	New: None	0	New: None	0	New: None	0
STA-1W	**Existing**: G-300, G-301, G-302, G-251, G-310, S-5A	6	**Existing**: G-300, G-301, G-302, G-251, G-310, S-5A	6	**Existing**: G-300, G-301, G-302, G-251, G-310, S-5A	6	**Existing**: G-300, G-301, G-302, G-251, G-310, S-5A	6
STA-2	New: None	0	New: None	0	New: None		New: None	
STA-2	**Existing**: G-335, G-328, G-329B, G-331D, G-333C, G-330A, G-332, G-334, S-6	9	**Existing**: G-335, G-328, G-329B, G-331D, G-333C, G-330A, G-332, G-334, S-6	9	**Existing**: G-335, G-328, G-329B, G-331D, G-333C, G-330A, G-332, G-334, S-6	9	**Existing**: G-335, G-328, G-329B, G-331D, G-333C, G-330A, G-332, G-334, S-6	9
STA-3/4	New: Start-up monitoring to begin 10/1/03 and flow-through monitoring to begin 5/1/04: G-370, G-372, G-376 B&E, G-379B&D	6	New: Start-up monitoring to begin 10/1/04 and flow-through monitoring to begin 5/1/05: G-381B&E	2	New: G-371 and G-373 (starting Jan. 2006)	2	New: None	0
STA-3/4	Existing: None	0	Existing: G-370, G-372, G-376 B&E,G-379 B&D	6	Existing: G-370, G-372, G-376 B&E, G-379B&D, G-381B&E	8	Existing: G-370, G-371, G-372, G-373, G-376 B&E, G-379B&D, G-381B&E	10
STA-5	New: None	0	New: None	0	New: None	0	New: None	0
STA-5	Existing: G-342 (4 stations), G-344 (4 stations), G-406, G-410	10	Existing: G-342 (4 stations), G-344 (4 stations), G-406, G-410	10	Existing: G-342 (4 stations), G-344 (4 stations), G-406, G-410	10	Existing: G-342 (4 stations), G-344 (4 stations), G-406, G-410	10
STA-6	New: None	0	New: None	0	New: None	0	New: G-352B, G-407, G-401 (new Pump station)	3
STA-6	Existing: G-600, G-393B, G-354C	3	Existing: G-600, G-393B, G-354C	3	Existing: G-600, G-393B, G-354C	3	Existing: G-600, G-393B, G-354C	3
Total Bf80		37		40		42		46

A summary of projected expenditures (in FY 2003 dollars) over the period FY 2004 through 2016 for permit compliance monitoring is presented in Table 8.6, and is based on estimates prepared by District staff. Those estimates include not only the recurring annual costs for each station, but also costs associated with the initial establishment of the eighteen new compliance documentation structures presently anticipated.

Table 8.6 Summary of Projected Expenditures, Permit Compliance Monitoring [Bf80]

Fiscal Year	Fiscal Year Total (FY 2003 $)
2004	$3,560,000
2005	$3,300,000
2006	$3,100,000
2007	$3,100,000
2008	$3,100,000
2009	$3,100,000
2010	$3,100,000
2011	$3,100,000
2012	$3,100,000
2013	$3,100,000
2014	$3,100,000
2015	$3,100,000
2016	$3,100,000
Total	**$40,960,000**

8.4. Monitoring and Control of Treatment Area Operation [Bc05]

A detailed listing of the various structures at which flow and water quality monitoring for improved analysis and control of treatment area operation will be conducted is presented in Table 8.7. That tabulation identifies not only existing operational control monitoring stations, but also the expected additions to those stations as the remaining elements of the ECP and the STA enhancements recommended in this Long-Term Plan come on line. Costs associated with the initial establishment of those additional flow and water quality monitoring stations are included in Part 5 of this Long-Term Plan.

Table 8.7 Operations Monitoring Stations [Bc05]

Location	FY04 description	Number of stations	FY05 description	Number of stations	FY06 description	Number of stations	Beyond FY06 description	Number of stations
STA-1E (not including any groundwater monitoring)	**New**: None	0	**New**: S-363B, S-364B, S-365A&B, S-366B&D, S-367B&D, S-368B&D, S-369A&D, S-370B, S-371B, S-372B&D, S-373B, S-374B, S-375	19	**New**: None	0	**New**: None	0
STA-1E (not including any groundwater monitoring)	**Existing**: None	0	**Existing**: none	0	**Existing**: S-363B, S-364B, S-365A&B, S-366B&D, S-367B&D, S-368B&D, S-369A&D, S-370B, S-371B, S-372B&D, S-373B, S-374B, S-375	19	**Existing**: S-363B, S-364B, S-365A&B, S-366B&D, S-367B&D, S-368B&D, S-369A&D, S-370B, S-371B, S-372B&D, S-373B, S-374B, S-375	19
STA-1W	**New:** G-258 (gate sensor only), G-259	2	**New**: Two new stations in Cell 2A	2	**New**: Two new stations in Cell 1A	2	**New**: None	0
STA-1W	**Existing**: G-303, G-305G&N, G-306C&G, G-255, G-254B&D, G-253C&G, G-256, G-308, G-309, G-327A, ENR305, ENR306, G-250S	17	**Existing**: G-303, G-305G&N, G-306C&G, G-255, G-254B&D, G-253C&G, G-256, G-308, G-309, G-327A, ENR305, ENR306, G-258, G-259, G-250S	19	**Existing**: G-303, G-305G&N, G-306C&G, G-255, G-254B&D, G-253C&G, G-256, G-308, G-309, G-327A, ENR305, ENR306, G-258, G-259, G-250S, 2 new stations in cell 2A	21	**Existing**: G-303, G-305G&N, G-306C&G, G-255, G-254B&D, G-253C&G, G-256, G-308, G-309, G-327A, ENR305, ENR306, G-258, G-259, G-250S, 2 new stations in cell 2A, 2 new stations in Cell 1A	23
STA-2	**New**: None	0	**New**: None	0	**New**: one new station in Cells 1 and 2	2	**New**: one new station in Cell 3	1
STA-2	**Existing**: G-337, G-337A	2	**Existing**: G-337, G-337A	2	**Existing**: G-337, G-337A, one new station in Cell 3	3	**Existing**: G-337, G-337A, one new station in Cell 3, one new station in Cell 2	4
STA-3/4	**New start 5/1/04:** G-374B&E, G-375B&E, G-377B&D, G-378B&D, G-370 seep, G-372 seep, G-383	11	**New start 5/1/05**: G-380B&E, 2 new stations in Cell 3 mid-levee	4	**New**: None	0	**New**: None	0
STA-3/4	**Existing**: None	0	**Existing:** G-374B&E, G-375B&E, G-377B&D, G-378B&D, G-370 seep, G-372 seep, G-383	11	**Existing:** G-374B&E, G-375B&E, G-377B&D, G-378B&D, G-370 seep, G-372 seep, G-383, two new stations in Cell 3, G-370 seep, G-372 seep	15	**Existing:** G-374B&E, G-375B&E, G-377B&D, G-378B&D, G-370 seep, G-372 seep, G-383, two new stations in Cell 3, G-370 seep, G-372 seep	15
STA-5	**New**: None	0	**New**: None	0	**New**: None	0	**New**: None	0
STA-5	**Existing**: G-343 (B,C,F,G), G-349A, G-350A	6	**Existing**: G-343 (B,C,F,G), G-349A, G-350A	6	**Existing**: G-343 (B,C,F,G), G-349A, G-350A	6	**Existing**: G-343 (B,C,F,G), G-349A, G-350A	6
STA-6	**New**: None	0	**New**: None	0	**New**: None	0	**New**: G-353B, G-603, G-396B, G-351B	4
STA-6	**Existing**: G-602, G-603	2	**Existing**: G-602, G-603	2	**Existing**: G-602, G-603	2	**Existing**: discontinue	0
Total Bc05		**40**		**65**		**70**		**72**

A summary of projected expenditures (in FY 2003 dollars) over the period FY 2004 through 2016 for operations monitoring is presented in Table 8.8. The projected expenditure in FY 2004 reflects an anticipated operation of five months for the eleven new stations at STA-3/4. The projected expenditure in FY 2005 reflects an anticipated operation of five months for the additional four new stations at STA-3/4. Those expenditures are based on an estimated average annual cost of $40,000 for each station (in FY 2003 dollars), which amount includes an estimated average of $6,500 for diving support, vegetation management support, and equipment support.

In addition, the costs summarized in Table 8.8 include an estimated expenditure of $500,000 per year (in FY 2003 dollars) for additional hydrology and hydraulics work necessary to support the expanded operations monitoring program (primarily for data processing, flow measurements and structure discharge ratings).

Table 8.8 Summary of Projected Expenditures, Operations Monitoring [Bc05]

Fiscal Year	Estimated Expenditure by Location (FY 2003 $) [Bc05]							Fiscal Year Total (FY 2003 $)
	STA-1E	STA-1W	STA-2	STA-3/4	STA-5	STA-6	Add'l. H&H Work	
2004	$317,000	$760,000	$80,000	$183,000	$240,000	$80,000	$500,000	$2,160,000
2005	$760,000	$840,000	$80,000	$507,000	$240,000	$80,000	$500,000	$3,007,000
2006	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2007	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2008	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2009	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2010	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2011	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2012	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2013	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2014	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2015	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
2016	$760,000	$920,000	$200,000	$600,000	$240,000	$80,000	$500,000	$3,300,000
Total	**$9,437,000**	**$11,720,000**	**$2,360,000**	**$7,290,000**	**$3,120,000**	**$1,040,000**	**$6,500,000**	**$41,467,000**

8.5. Additional Dedicated Labor and Associated Expenses

It is recommended that the District, in implementation of this Long-Term Plan, include additional dedicated labor and associated expenses for the following activities related to the operation, maintenance and monitoring of the stormwater treatment area:

- STA Site Management (SFWMD budget activity code Bf81);

- Water Resource Management staff for hydraulic modeling, operations plan refinement and coordination, and similar activities (SFWMD budget activity code Bc90);
- Program Management (SFWMD budget activity code Bc90).

8.5.1. STA Site Management [Bf81]

It is recommended that one Full Time Equivalent (FTE) staff position be established for site management at each STA. The estimated average annual cost for that position (including associated expenses) is $85,000 in FY 2003 dollars. At present, four STAs are in full operation (STA-1W, STA-2, STA-5 and STA-6, Section 1). It is recommended that, in FY 2004, a total of three positions be established (one for STA-1W, one for STA-2, and one for STA-5 and STA-6, Section 1 combined), yielding a projected expenditure (in FY 2003 dollars) of $255,000 for those four areas.

Two additional STAs (STA-1E and STA-3/4) are expected to come on line during FY 2004. STA-1E is presently projected to enter full operation as early as May 2004, with the result that one additional position should be added for at least a five-month period in FY 2004. STA-3/4 is presently projected to enter full operation as early as April 2004, with the result that another position should be added for at least a six-month period in FY 2004. As a result, the total estimated expenditure for site management in FY 2004 is approximately $353,000.

In FY 2005 and 2006, a total of five site management positions should be filled for the entire year, leading to a projected expenditure (in FY 2003 dollars) of $425,000.

Upon completion of STA-6, Section 2, it is recommended that the sixth and final position be added, leading to a total estimated expenditure in FY 2007 and beyond of $510,000 per year (again in FY 2003 dollars).

8.5.2. Program Management [Bc90]

A total of two FTEs are recommended for operations plan refinement, hydraulic and water quality modeling of the STAs, operational support, and program coordination, at an average annual cost (in FY 2003 dollars) of $250,000, applicable to the entire period FY 2004 through 2016. In addition, it is recommended that the overall budget for implementation of this Long-Term Plan include an allowance of 3% of the estimated annual costs (excluding operation and maintenance) for the activities recommended in this Part 8 (e.g., 3% of the estimated annual cost for monitoring and additional dedicated staff).

8.6. Summary of Projected Expenditures

A summary of the projected expenditures for operation, maintenance and monitoring of the Everglades Construction Project, modified and enhanced as recommended in this Long-Term Plan, is presented in Table 8.9. Those projected expenditures are reported in FY 2003 dollars.

Table 8.9 Summary of Projected Expenditures for Operation, Maintenance and Monitoring [Bc05, Bc90, Bf, Bf80, Bf81]

Fiscal Year	Projected Expenditure in FY 2003 $					Fiscal Year Total (FY 2003 $)
	Operation & Maintenance [Bf]	Permit Monitoring [Bf80]	Operations Monitoring [Bc05]	Site Management [Bf81]	Program Management (Bc90]	
2004	$8,871,000	$3,560,000	$2,160,000	$353,000	$440,000	$15,384,000
2005	$9,920,000	$3,300,000	$3,007,000	$425,000	$459,000	$17,111,000
2006	$10,717,000	$3,100,000	$3,300,000	$425,000	$462,000	$18,004,000
2007	$10,388,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,763,000
2008	$10,388,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,763,000
2009	$10,388,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,763,000
2010	$9,988,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,363,000
2011	$9,988,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,363,000
2012	$9,988,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,363,000
2013	$10,388,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,763,000
2014	$10,388,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,763,000
2015	$10,388,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,763,000
2016	$10,388,000	$3,100,000	$3,300,000	$510,000	$465,000	$17,763,000
Total	**$132,188,000**	**$40,960,000**	**$41,467,000**	**$6,303,000**	**$6,011,000**	**$226,929,000**
See Also	**Table 8.2 plus Table 8.4**	**Table 8.6**	**Table 8.6**	**Text section 8.5.1**	**Text section 8.5.2**	

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9. SUMMARY SCHEDULE AND PROJECTED PLAN EXPENDITURES

This Part 9 summarizes all projected expenditures under this Long-Term Plan for the period encompassing Fiscal Years (FY) 2004-2016. In addition, a detailed schedule for implementation of the various projects and processes recommended in this Long-Term Plan is being developed for the District's subsequent management and control of the effort.

9.1. Summary of Projected Plan Expenditures

Projected expenditures for each process and project included in this Long-Term Plan were developed in each of Parts 2 through 8 of this document. Those expenditures were all estimated in FY 2003 dollars, and are summarized in Table 9.1 on the following page. That tabulation also provides cross-references to the source locations in this document for the listed expenditures.

Table 9.2, also on the following page, projects those expenditures in future (escalated) dollar values; an average annual cost escalation of 3% per year for the entire period FY 2004-2016 has been considered in this analysis. Escalation factors were applied annually on January 1, using January 1, 2003 as the base (e.g., all projected expenditures in calendar year 2004, which includes three quarters of fiscal year 2004 and one quarter of fiscal year 2005, were escalated at 3%).

Table 9.1 Summary of Long-Term Plan Expenditures (in FY 2003 Dollars)

Fiscal Year	Total Estimated Expenditure in FY 2003 Dollars																
	Pre-2006 Projects		Process Development and Engineering (PDE)						Accelerate Recovery of Impacted Areas (Includes Hydropattern) [Bc87]	Operations Monitoring [Bc05]	Operation & Maintenance [Bf]	Compliance Monitoring [Bf80]	STA Site Management [Bf81]	Adaptive Implementation [Bc88]	Program Management [Bc90]	Fiscal Year Total Expenditure
	ECP Basins [Bc10-Bc60]	ESP Basins [Bc71-75]	Basin Source Controls [Bc81]	Enhanced Control & Monitoring [Bc82]	Analytical & Forecasting Tools [Bc83]	SAV Optimization [Bc84]	Add'l. Structural & Operational Measures [Bc25]	Improved Inflow Forecasts [Bc86]								
2004	$5,280,000	$488,937	$327,500	$2,925,500	$2,907,750	$400,000	$1,198,082	$400,000	$1,250,000	$2,160,000	$8,871,000	$3,560,000	$353,000	$0	$896,000	$31,017,769
2005	$13,522,000	$711,772	$300,000	$4,360,500	$3,358,500	$100,000	$65,534	$525,000	$1,250,000	$3,007,000	$9,920,000	$3,300,000	$425,000	$0	$1,185,000	$42,030,306
2006	$10,973,000	$615,082	$300,000	$3,360,000	$2,025,000	$100,000	$0	$0	$1,250,000	$3,300,000	$10,717,000	$3,100,000	$425,000	$0	$1,021,000	$37,186,082
2007	$0	$0	$150,000	$3,442,500	$1,000,000	$400,000	$0	$225,000	$250,000	$3,300,000	$10,388,000	$3,100,000	$510,000	$7,996,380	$1,763,000	$32,524,880
2008	$0	$0	$150,000	$3,340,000	$1,000,000	$200,000	$0	$0	$400,000	$3,300,000	$10,388,000	$3,100,000	$510,000	$7,763,480	$851,000	$31,002,480
2009	$0	$0	$150,000	$3,246,000	$300,000	$0	$0	$225,000	$1,000,000	$3,300,000	$10,388,000	$3,100,000	$510,000	$7,537,360	$839,000	$30,595,360
2010	$0	$0	$100,000	$385,000	$300,000	$0	$0	$75,000	$2,626,183	$3,300,000	$9,988,000	$3,100,000	$510,000	$7,317,820	$790,000	$28,492,003
2011	$0	$0	$100,000	$385,000	$0	$0	$0	$150,000	$12,313,818	$3,300,000	$9,988,000	$3,100,000	$510,000	$0	$853,000	$30,699,818
2012	$0	$0	$100,000	$385,000	$0	$0	$0	$0	$12,267,833	$3,300,000	$9,988,000	$3,100,000	$510,000	$0	$848,000	$30,498,833
2013	$0	$0	$100,000	$385,000	$0	$0	$0	$150,000	$1,488,188	$3,300,000	$10,388,000	$3,100,000	$510,000	$0	$529,000	$19,950,188
2014	$0	$0	$100,000	$385,000	$0	$0	$0	$0	$1,444,843	$3,300,000	$10,388,000	$3,100,000	$510,000	$0	$523,000	$19,750,843
2015	$0	$0	$0	$385,000	$0	$0	$0	$150,000	$0	$3,300,000	$10,388,000	$3,100,000	$510,000	$0	$481,000	$18,314,000
2016	$0	$0	$0	$385,000	$0	$0	$0	$0	$0	$3,300,000	$10,388,000	$3,100,000	$510,000	$0	$477,000	$18,160,000
Total	$29,775,000	$1,815,791	$1,877,500	$23,369,500	$10,891,250	$1,200,000	$1,263,616	$1,900,000	$35,540,865	$41,467,000	$132,188,000	$40,960,000	$6,303,000	$30,615,040	$11,056,000	$370,222,562
Refer To	Table 2.21 (less [Bc90]	Table 3.12 (less [Bc90]	Table 5.8	Table 5.8	Table 5.8	Table 5.8	Table 5.8	Table 5.8	Table 7.7	Table 8.8	Table 8.2 plus Table 8.4	Table 8.8	Table 8.8	Text Section 6.3.1	Tables 2.21, 3.12, 5.8, 7.7, 8.8; Text section 6.3.1	

Table 9.2 Projected Long-Term Plan Expenditures Through FY 2016 (Escalated)

Fiscal Year	Total Estimated Expenditure (Includes cost escalation at 3%/year)																	
	Pre-2006 Projects		Process Development and Engineering (PDE)						Accelerate Recovery of Impacted Areas (Includes Hydropattern)	Operations Monitoring	Operation & Maintenance	Compliance Monitoring	STA Site Management	Adaptive Implementation	Program Management	Fiscal Year Total Expenditure
	ECP Basins	ESP Basins	Basin Source Controls	Enhanced Control & Monitoring	Analytical & Forecasting Tools	SAV Optimization	Add'l. Structural & Operational Measures	Improved Inflow Forecasts								
	[Bc10-Bc60]	[Bc71-75]	[Bc81]	[Bc82]	[Bc83]	[Bc84]	[Bc25]	[Bc86]	[Bc87]	[Bc05]	[Bf]	[Bf80]	[Bf81]	[Bc88]	[Bc90]	
2004	$5,048,509	$500,428	$335,830	$2,993,700	$3,395,990	$411,635	$1,212,154	$485,660	$1,283,196	$2,208,476	$9,071,660	$3,639,896	$360,922	$0	$916,109	$31,864,167
2005	$15,043,546	$749,556	$315,927	$4,590,774	$3,097,051	$105,308	$67,500	$473,888	$1,316,609	$3,166,631	$10,446,616	$3,475,184	$447,562	$0	$1,247,907	$44,544,060
2006	$11,426,306	$666,669	$324,394	$3,643,062	$2,192,950	$108,060	$0	$0	$1,351,025	$3,579,742	$11,623,817	$3,362,788	$461,027	$0	$1,107,550	$39,847,391
2007	$0	$0	$167,222	$3,844,532	$1,115,311	$448,955	$0	$251,396	$278,524	$3,673,007	$11,604,935	$3,450,402	$567,644	$9,000,000	$1,969,823	$36,371,751
2008	$0	$0	$173,110	$3,845,661	$1,154,888	$230,593	$0	$0	$460,307	$3,812,086	$11,955,951	$3,581,051	$589,140	$9,000,000	$979,304	$35,782,091
2009	$0	$0	$177,846	$3,847,461	$355,577	$0	$0	$266,684	$1,198,627	$3,911,351	$12,312,459	$3,674,299	$604,481	$9,000,000	$994,431	$36,343,216
2010	$0	$0	$122,139	$470,013	$366,245	$0	$0	$91,562	$3,207,044	$4,028,691	$12,193,506	$3,784,528	$622,616	$9,000,000	$964,443	$34,850,787
2011	$0	$0	$125,803	$484,113	$0	$0	$0	$188,616	$15,524,528	$4,149,552	$12,559,311	$3,898,064	$641,294	$0	$1,072,596	$38,643,878
2012	$0	$0	$129,092	$496,768	$0	$0	$0	$0	$15,878,062	$4,258,022	$12,935,191	$3,999,962	$658,055	$0	$1,098,391	$39,453,543
2013	$0	$0	$133,465	$513,596	$0	$0	$0	$200,103	$2,000,000	$4,402,260	$13,857,270	$4,135,456	$680,349	$0	$705,694	$26,628,193
2014	$0	$0	$137,468	$529,004	$0	$0	$0	$0	$2,000,000	$4,534,328	$14,272,989	$4,259,520	$700,760	$0	$718,622	$27,152,690
2015	$0	$0	$0	$544,874	$0	$0	$0	$212,289	$0	$4,670,357	$14,701,178	$4,387,305	$721,782	$0	$680,739	$25,918,525
2016	$0	$0	$0	$563,386	$0	$0	$0	$0	$0	$4,829,036	$15,147,115	$4,536,368	$746,305	$0	$695,351	$26,517,561
Total	$31,518,362	$1,916,654	$2,142,295	$26,366,943	$11,678,012	$1,304,551	$1,279,654	$2,170,198	$44,497,922	$51,223,538	$162,681,998	$50,184,824	$7,801,940	$36,000,000	$13,150,961	$443,917,852

9.2. Schedule

The intended schedule for implementation of the various processes and projects included in this Long-Term Plan is defined in Parts 1 through 8 of this document. The intended duration and completion date for each process and project is defined in those preceding sections. A more detailed implementation schedule has been prepared to assist the District in the long-term management of this Plan. That schedule has been prepared in Primavera P3e; electronic files of that schedule have been separately furnished to the District. Summary output from the schedule is included as Appendix C to this Long-Term Plan.

* * * * *

Appendix A

Summary of Changes from March 17, 2003 Conceptual Plan

Table of Contents

1. GENERAL

This Long-Term Plan updates and modifies the March 17, 2003 *Everglades Protection Area Tributary Basins, Conceptual Plan for Achieving Long-Term Water Quality Goals*, Burns & McDonnell, to reflect the Legislature's guidance as expressed in the 2003 amended Everglades Forever Act (F.S. 373.4592). In addition, this Long-Term Plan has been updated to respond to comments received from stakeholders, and to, in certain instances, refine the originally projected schedules, budgets, and scope of certain of the recommended elements of the *Conceptual Plan*.

This Appendix A summarizes all significant changes made to the *Conceptual Plan* in the preparation of the September 18, 2003 Review Draft of this Long-Term Plan. Minor editorial adjustments, corrections, and changes not impacting the basic content of the Plan are not discussed herein. The purpose of this Appendix A is to facilitate the review of this Long-Term Plan, as compared to the March, 2003 *Conceptual Plan,* by the District's staff and Governing Board, the Florida Legislature, the Florida Department of Environmental Protections, and other stakeholders.

Unless otherwise noted, all changes are referenced to the page and/or section number of the March 17, 2003 *Conceptual Plan*.

1.1. Summary of Changes Generally Applied to Entire Document

The following are items that were changed or modified universally throughout the document. They are included here to avoid unnecessary duplication in this identification of modifications to the *Conceptual Plan*.

1. The planning goal and objective of the Plan has been modified to reflect the Legislature's guidance as presented in the Everglades Forever Act as modified in 2003; the planning goal and objective as presented herein is to achieve the phosphorus criterion in the Everglades Protection Area.

2. All references to the phosphorus criterion have been updated to reflect that the rule (Rule 62-302.540 F.A.C.) has now been adopted by the Department of Environmental Protection Environmental Regulation Commission.
3. The document has been modified to incorporate direct cross-reference to the District's programmatic controls. The description and title of all specific projects and efforts now carry the District's budget activity code to facilitate long-term planning and control of budget and schedule. In addition, a new Part 9 has been added to the document, which summarizes the development and content of a Primavera P3e schedule for the Long-Term Plan; that schedule will be subsequently employed by the District to track progress and expenditures under the Long-Term Plan.
4. In general, since the District's FY 2003 is now completed, the projected expenditure and funding needs presented in this document exclude FY 2003 expenditures. Where such expenditures and efforts have taken place in FY 2003 and are considered significant, they are identified in the text of this document.
5. All projected expenditures and funding needs defined in Parts 2 through 8 of this document are now expressed in FY 2003 dollars. Escalated expenditures have been developed and are presented in (new) Part 9, using an average annual rate of cost escalation of 3% for the period FY 2004 through FY 2016.
6. In all opinions of capital cost, the original allowance of 10% of the estimated construction cost for Program and Construction Management has been modified to 7% of the estimated construction cost for Construction Management. A separate identification of Program Management Costs in an amount equal to 3% of the Plan costs (excluding estimated costs for Operations, Maintenance and Monitoring as developed in Part 8).

2. CHANGES TO SYNOPSIS

1. In the fourth line of the first paragraph, deleted the phrase "1994".
2. At the end of the fourth sentence in the first paragraph, added the phrase "including compliance with the phosphorus criterion established in Rule 62-302.540, F.A.C.".
3. In the eleventh line of the first paragraph, replaced the phrase "those standards and goals" with the phrase "compliance with the phosphorus criterion".
4. In the third item in the bulleted list, replaced "Program" with "Plan".

5. Replaced the paragraph following the bulleted list in total.
6. Deleted the second sentence in the next-to-last paragraph, and adjusted the wording of the first sentence.
7. In the ninth line of the next-to-last paragraph, added the phrase "defined in the EFA" immediately before "as may be needed".

3. CHANGES TO EXECUTIVE SUMMARY

1. On p. ES-1, replaced the first paragraph.
2. Modified references to the EFA to reflect that the Act was amended in 2003.
3. In last line of the second paragraph on p. ES-1, replaced the phrase "water quality standards" with a specific reference to the phosphorus criterion.
4. At the bottom of p. ES-1, replaced the excerpt from the 1994 EFA with the parallel language from the 2003 amendment to the EFA.
5. On p. ES-2, in advance of the paragraph beginning with "A summary listing…", added a new paragraph referring to the permit application and the March 17, 2003 Conceptual Plan, followed by an additional excerpt from the EFA as amended in 2003.
6. On p. ES-4, in the first numbered conclusion near the top of the page, replaced the second sentence, modifying the projected costs for possible strategies defined in Part 6 to reflect their estimated value in FY 2003 dollars, and indicating those costs are in addition to the projected expenditures recommended in the Plan.
7. On p. ES-4, deleted the second sentence in the next-to-last paragraph. Following that paragraph, added a reference to and an excerpt from the EFA as amended in 2003.
8. Modified the last paragraph on p. ES-4 to reflect that the phosphorus criterion has now been adopted by rule.
9. In the third paragraph on p. ES-5, deleted the opening phrase "In the absence of more specific planning guidance,".
10. On pp. ES-5 and ES-6, deleted the six paragraphs beginning with the phrase "On March 12, 2003".
11. On p. ES-6, replaced the second paragraph from the bottom of the page.
12. On p. ES-7, added specific reference to the phosphorus criterion in both the highlighted text box and the paragraph preceding the text box.
13. On p. ES-7, modified the text of the first item in the bulleted list at the bottom of the page.

14. In the final paragraph on p. ES-8, added reference to the inclusion of and priority placed on source controls in the ESP basins.
15. On p. ES-12, in the bulleted list of PDE components:
    - In the first item, deleted the phrase "where practicable";
    - In the fourth bullet, added parenthetical reference to optimization of SAV;
    - In the fifth bullet, added specific reference to the possible implementation of PSTA.
16. Modified the first sentence in the last paragraph on p. ES-12; total funding for PDE increased from $31.2 million to $42 million in FY 2003 dollars.
17. On p. ES-13, modified the last sentence of the first paragraph.
18. On p. ES-13, immediately following the first paragraph, added three new paragraphs referencing the proposed process for revisions to the Long-Term Plan, including an excerpt from the EFA as amended in 2003.
19. On p. ES-13, relocated the final paragraph (concerning funding for the adaptive implementation of future projects) to a new position in the first paragraph at the top of p. ES-14. Modified that paragraph to reflect that the decision process for that Adaptive Implementation is to be driven by science and engineering.
20. On p. ES-14, deleted the first sentence in the central paragraph.
21. In the next-to-last paragraph on p. ES-15, deleted the phrase "the earliest practicable achievement of" and added specific reference to the phosphorus criterion.
22. In the final paragraph on p. ES-15, revised the phrase "$750 million" to "$670 million in FY 2003 dollars", and noted those to be additional expenditures.
23. On p. ES-16, replaced Table ES.4.
24. On p. ES-17, deleted the second full paragraph.

4. CHANGES TO PART 1, INTRODUCTION

1. Modified references to the EFA to reflect that the Act was amended in 2003.
2. After the first paragraph on p. 1-1, added specific guidance from the EFA, including excerpts of selected sections of the Act.
3. At the bottom of p. 1-1, replaced the EFA excerpt relative to Long-Term Compliance Permits with excerpt from the Act as amended in 2003.

4. On pp. 1.6 through 1-8, deleted the final six paragraphs of Section 1.1.4 “Planning Objective” and added one new paragraph (now shown at the bottom of p. 1-7 of this Long-Term Plan).
5. On p. 1-8, in the first paragraph of Section 1.2 “Formulation of Conceptual Plan”, clarified the role of technical representatives of the United States Department of the Interior in the development of the *Conceptual Plan*. Inserted a new paragraph in advance of the identification of the three primary components of the Long-Term Plan (now shown as the third paragraph of Section 1.2 on p. 1-8 of this document).
6. On p. 1-9, inserted a new paragraph and bullet listing at the end of Section 1.2 “Formulation of Conceptual Plan”, referencing certain goals shared by the Long-Term Plan and CERP (now shown on p. 1-10 of this document).
7. On p. 1-10, after the first paragraph of Section 1.3 “Pre-2006 Projects”, added a new paragraph discussing BMPs in the Broward County basins to reflect Broward County’s request for increased emphasis on source controls
8. On p. 1-13, relocated the final paragraph of Section 1.4 “Process Development and Engineering (PDE)” (concerning funding for the adaptive implementation of future projects) to the end of Section 1.5 “Post-2006 Strategy). Modified that paragraph to reflect that the decision process for that Adaptive Implementation is to be driven by science and engineering, and not limited or controlled by the currently projected funding allowance. That paragraph is now shown as the final paragraph under Section 1.5 on p. 1-15 of this document.
9. On p. 1-14, in the first bullet of the listing possible measures for inclusion in the adaptive implementation strategy, added specific reference to PSTA.
10. Replaced old Section 1.9 “Funding” with new Section 1.9 ”Implementation Schedule and Funding Needs”. Added reference to the new Part 9. Added Table 1.2 (listing of SFWMD budget activity codes).
11. Added new Section 1.10 “Future Revisions to the Plan”. The text for this Section was furnished by the District following consultation with the Department of Environmental Protection, and as such is considered to represent the common recommendation of those two agencies for the process under which future revisions to the Plan would be developed, considered, and approved.
12. Added new Section 1.11 “List of Acronyms”.

5. CHANGES TO PART 2, PRE-2006 STRATEGIES, ECP BASINS

1. On p. 2-1, first paragraph, eighteenth line, revised the reference to the "planning objective" to specifically reference the phosphorus criterion (Rule 62-302.540, F.A.C.).
2. On p. 2-6, modified the paragraph immediately following Figure 2.3 (reference to Acme Improvement District analysis in Part 3).
3. On p. 2-16, section 2.2.4 "Implementation Schedule"; modified to include all planning, engineering and design in FY 2004. That modification was reflected in Table 2.7 as well.
4. On p. 2-20, added new paragraph immediately in advance of Figure 2.9, describing adjustments made to the subdivision of existing flow paths, generally increasing the extent of lands to be converted to SAV. Those adjustments were reflected in the listing of cell areas in Figure 2.9 and in Tables 2.8 and 2.9 as well.
5. On p. 2-23, section 2.3.4 "Implementation Schedule": modified the implementation schedule for enhancements to STA-2 to reflect all planning, engineering and design to be completed in FY 2004; construction of enhancements in Cells 1 and 2 to be completed in FY 2005; construction of enhancements in Cell 3 to be completed in FY 2006. Added brief discussion of anticipated off-site borrow source for levee construction, with borrow excavation and stockpiling in FY 2004. Parallel adjustments were made in Table 2.10.
6. On p. 2-25, section 2.4 "STA-3/4", modified currently anticipated construction completion date from October, 2003 to March, 2004. A similar change was made on p. 2-27 in the first paragraph following Figure 2.11.
7. On p. 2-30, in the first paragraph immediately following Table 2.11, included reference to an FY 2003 expenditure of $270,000 for planning, engineering and design; that amount was removed from the projected expenditures in Table 2.13. A similar notation was made in a new paragraph immediately following Table 2.13 on p. 2-33.
8. On p. 2-32, section 2.4.4 "Implementation Schedule"; modified the text of this section to reflect the proposed enhancement of STA-3/4 under a contract separate from the current contract for construction of the STA Works. Construction of enhancements now scheduled for the latter part of FY 2004 and FY 2005. Made parallel adjustments to projected expenditures in Table 2.13.
9. On p.2-48, section 2.6.4 "Implementation Schedule", added recommendation that the construction of STA-6, Section 2 and the STA-6 enhancements be completed as soon as

practicable to reduce overloading conditions at STA-5 and associated bypassed through G-406 to WCA-3A

10. On p. 2-49, section 2.7 “Summary Opinion of Expenditures” was reorganized to separate expenditures by District budget activity codes. In addition, a Program Management cost equal to approximately 3% of the projected capital expenditure in each fiscal year was added. All estimated costs for “Program and Construction Management” in the various capital cost estimates were reduced from 10% to 7% for “Construction Management” only.

6. CHANGES TO PART 3, PRE-2006 STRATEGIES, ESP BASINS

1. On p. 3-1, first paragraph, fourth line, revised the reference to the “planning objective” to specifically reference the phosphorus criterion (Rule 62-302.540, F.A.C.).
2. On p. 3-1, second paragraph, eliminated all but the last sentence.
3. On p. 3-3, after the third paragraph, added reference to and excerpt from the Everglades Forever Act as amended.
4. On p. 3-17, after the bullet listing of recommended improvements and strategies, added a new paragraph discussing BMPs in the Broward County basins to reflect Broward County’s request for increased emphasis on source controls.
5. On p. 3-17, added new paragraph to Section 3.2.2 defining the nature of assistance to be provided to local communities in the NSID, and referring to Tables 8.12 and 8.13 for projected expenditure amounts and schedule.
6. On p. 3-18, Section 3.3 “North New River Canal Basin (NNRC)”, replaced the third and fourth paragraphs with two new paragraphs (now immediately following Figure 3.5).
7. On p. 3-20, after the bullet listing of recommended improvements and strategies, added a new paragraph discussing BMPs in the Broward County basins to reflect Broward County’s request for increased emphasis on source controls.
8. On p. 3-22, in the second paragraph, corrected the projected completion date for the C-11 West Basin Critical Project (corrected date is the end of 2004).
9. On p. 3-23, after the bullet listing of recommended improvements and strategies, added a new paragraph discussing BMPs in the Broward County basins to reflect Broward County’s request for increased emphasis on source controls.
10. On p. 3-24, modified the bullet listing of projected expenditures, added a new paragraph referencing Tables 8.12 and 8.13 for projected funding amounts and schedule. In the second

bullet, added reference to the proposed evaluation of modifications to the C-11 West Impoundment for water quality improvement.

11. On p. 3-28, revised the final paragraph of Section 3.5 "L-28 Basin" to reflect that the planning process for the manner in which additional STA-3/4 discharges are to be conveyed to the new location of Pump Station S-140 is not yet complete.
12. On p. 3-44, in the first paragraph, added reference to the implementation of BMPs required under the landowners' agreement.
13. On p. 3-46, in the final paragraph of Section 3.6.1, revised the reference to "meeting final water quality standards" to specifically reference the phosphorus criterion (Rule 62-302.540, F.A.C.).
14. On p. 3-49, at the end of Section 3.6.3, added a new paragraph discussing the on-going BMP grant program in the West Feeder Canal subbasin and a bullet listing of the projects selected for grant funding in FY 2003.
15. On p. 3-52, replaced Tables 8.12 and 8.13 with new summary tables 8.12 and 8.13.

7. CHANGES TO PART 4, PROJECTED TREATMENT PERFORMANCE

1. On p. 4-1, first paragraph, first sentence, deleted the phrase "at the earliest practicable date"; added reference to the 2003 amendment of the Everglades Forever Act. Also in the first paragraph, added specific reference to achieving compliance with the phosphorus criterion in Rule 62-302.540 F.A.C.
2. On p. 4-1, deleted the second full paragraph and the following excerpt from the 1994 EFA, replaced with one new paragraph identifying compliance with the phosphorus criterion as the objective of the Long-Term Plan.
3. On pp. 4-2 and 4-3, deleted the six paragraphs beginning with the phrase "On March 12, 2003,".
4. On p. 4-3, in the first bullet at the bottom of the page, deleted the phrase ", where practicable,".
5. On p. 4-4, in the third item in the bulleted listing on this page, added parenthetical reference to optimization of SAV.

6. On p. 4-4, in the fourth item in the bulleted listing on this page, replaced the wording following "improvement measures" to make specific reference to the possible implementation of PSTA.
7. On p. 4-4, added a new item at the bottom of the bulleted listing.
8. On p. 4-4, in the seventh line of the first full paragraph following the bulleted listing, replaced the phrase "effect at the earliest practicable date" with the phrase "expeditiously implement".
9. On p. 4-5, inserted a reference to and an excerpt from the EFA as amended in 2003 immediately preceding the first full paragraph.
10. On p. 4-11, at the end of the first paragraph, added reference to the 2003 amendment of the EFA, and replaced the excerpt following that paragraph with an excerpt from the EFA as amended.

8. CHANGES TO PART 5, PROCESS DEVELOPMENT AND ENGINEERING (PDE)

1. On p. 5-4, first paragraph, modified to reflect that the decision making process for the adaptive implementation effort will be driven by science and engineering factors, not the budget allowance reflected in the projections of expenditures.
2. On p. 5-4, Section 5.1, first paragraph: added introductory sentence recognizing the implementation of source controls as being the highest priority in the ESP basins.
3. On p. 5-4, section 5.1, added fourth bullet to list.
4. On p. 5-5, last paragraph; deleted FY 2003 expenditure of $50,000, increased expenditure in FY 2004 from $50,000 to $77,500.
5. On p. 5-7, modified discussion of BMPs in the Broward County basins to reflect Broward County's request for increased emphasis on source controls.
6. On p. 5-10, section 5.2.2 "Additional Flow and Water Quality Stations": modified count and schedule for the addition of operations monitoring stations to reflect refinements requested by District; added Table 5.1. Increased the unit cost for new flow and water quality stations from $10,000 to $20,500 for gated structures and $51,500 for pump stations. Projected expenditures increased from $500,000 to $1,007,500.
7. On p. 5-10, section 5.2.3 "Review and Correction of Flow Measurement Anomalies", added sentence to end of section defining highest priority to be placed on inflow and outflow control structures.

8. On p. 5-11, section 5.2.4 “Analysis and Interpretation”, deleted the last sentence in the last item of the bullet listing.
9. On p. 5-12, deleted the first paragraph. In the final paragraph of section 5.2.4, increased the funding amount in FY 2004 from $1,600,000 to $1,915,000, and increased the funding amount in FY 2005 and thereafter from $2,400,000 to amounts varying by fiscal year, with a long-term maximum of $3,140,000 through FY 2008 (all amounts in FY 2003 dollars). Increases reflect relocation of two FTE’s from Part 8 “Operation, Maintenance and Monitoring” at a total average annual cost of $250,000. Remaining increases due to refined estimates prepared by District staff. Added listing of component elements of the annual cost. Overall, adds $5,617,000 to the expenditures originally projected for the PDE effort in the March 17, 2003 Conceptual Plan; that total includes $3.25 million in cost (for two FTE’s) originally included in Part 8. Actual increase in total Plan cost of $2,367,000.
10. On p.5-15, section 5.3.1 “Continued Development and Refinement of DMSTA”, reduced projected expenditure in FY 2004 from $300,000 to $242,500 (FY 2003 dollars); increased funding in FY 2005 and 2006 from $300,000 to $325,000. No change in funding beyond FY 2006.
11. On p. 5-16, section 5.3.2 “Water Quality Impacts of Reservoirs”, reduced project expenditure in FY 2004 from $500,000 to $340,000; increased projected expenditures in FY 2005 and 2006 from $500,000 to $575,000 per year.
12. On p. 5-16, section 5.3.3: The title of this section has been changed from “Tracking of Related Projects” to “PSTA Investigations”. The content of this section has been substantially modified to include:
    a. A continuation through FY 2006 of the operation and monitoring of certain District-sponsored research projects now in progress (total estimated cost of $975,000 in FY 2003 dollars added to the cost projections presented in the March 17, 2003 *Conceptual Plan*).
    b. The construction, operation and monitoring of a PSTA demonstration project in STA-3/4 (total estimated cost of $6.13 million in FY 2003 dollars added to the cost projections presented in the March 17, 2003 *Conceptual Plan*).
    c. Reference to an additional large-scale PSTA demonstration project in STA-1E now in the early planning stages by the Jacksonville District, USACE.
13. Added new section 5.3.4 “Summary of Funding Needs…” and Table 5.5.

14. On p. 5-17, changed the title of section 5.4 from “Replication of ENRP Cell 4 Performance” to “Optimizing SAV Performance”; similar change made throughout the text of this section.
15. On p. 5-19, in the first paragraph of section 5.4.3 “Hydrologic and Hydraulic Assessment”, modified the implementation schedule to move the second tracer study from FY 2006 to FY 2007.
16. On p. 5-20, changed the title of Section 5.5.1 from “Limerock Berms and Associated Studies” to “Evaluation of Full-Scale STA Enhancements”.
17. Added new section 5.4.6 “Summary of Funding Needs…” and Table 5.6.
18. On p. 5-22, in the last paragraph of section 5.5.1 “Limerock Berms and Associated Studies”, modified expenditures to match the Cost Share Agreement between the District and Florida DEP. Total expenditure modified from $1,901,486 to $1,862,268. Expenditure of $560,744 in FY 2003 excluded from FY 2004-2016 projections.
19. On p. 5-23, in section 5.6 “Improved Reliability of Inflow Forecasts”, inserted new section heading 5.6.1 “Update Baseline Data Sets” after the first full paragraph and renumbered subsequent sections in 5.6. Revised the scheduled date for completion of the first update to the Baseline Data from December 31, 2004 to December 31, 2003.
20. On p. 5-24, modified the second paragraph.
21. On p. 5-25, in the first full paragraph, modified the schedule for data acquisition and subsequent analysis in the C-11 West basin to reflect the currently anticipated completion date of the divide structure included in the Critical Project.
22. Added new section 5.6.6 “Summary of Funding Needs…” and Table 5.7.
23. On p. 5-27, in section 5.8 “Summary of Funding Needs”, added Program Management costs in an amount equal to 3% of the projected annual expenditure for the PDE effort in each fiscal year. This addition adds $1.15 million (in FY 2003 dollars) to the total estimated expenditures for the PDE effort as presented in the March 17, 2003 *Conceptual Plan*.
24. Overall, total projected expenditures for the PDE component (in FY 2003 dollars) increased from $28.05 million as reported in the *Conceptual Plan* to $40.17 million. Principal components of that $12.12 million increase include:
    - $0.61 million increase in the estimated cost for establishing new flow and water quality stations necessary to support the additional operations monitoring;
    - $5.62 million increase in the estimated cost for “Analysis and Interpretation” {Bc82(4)]; that increase includes $3.25 million in costs originally gathered in Part 8;
    - $6.13 million for the addition of a PSTA demonstration project in STA-3/4.

9. CHANGES TO PART 6, POST-2006 STRATEGIES

1. At the following locations, references to meeting the "long-term water quality objectives" or "standards" have been revised to reference the phosphorus criterion established in Rule 62-302.540 F.A.C. as the planning objective for the Long-Term Plan:
   - P. 6-3, first full paragraph following the bullet listing;
   - p. 6-5, second bullet from the top of the page;
   - p. 6-11, last bullet at the end of the page;
   - p. 6-23, third line from the bottom of the page;
   - p. 6-25, first full paragraph of Section 6.1.1.6;
   - p. 6-28, second item in the bulleted listing at the bottom of the page;
   - p. 6-59, second item in the bullet listing in the middle of the page;
   - p. 6-78, first full paragraph of Section 6.1.3.6;
   - p. 6-82, second sentence in the first full paragraph.
2. Modified all expenditure projections to report those projections in FY 2003 dollars only.
3. On p. 6-93, add a subsection heading 6.3.1 "Funding for Adaptive Implementation [Bc88]" immediately following the bullet listing. At the bottom of the page, added text to the effect that science and engineering factors are intended to drive the decision process for adaptive implementation of additional measures.

10. CHANGES TO PART 7, RECOVERY OF IMPACTED AREAS WITHIN THE EPA

1. Part 7 has been partially rearranged and reformatted. Previous Sections 7.3 "Opinion of Probable Cost" and 7.5 "Implementation Schedule" have been relocated and are now subsections of Section 7.2, which has been retitled from "Conceptual Design of Hydropattern Restoration Works" to "Hydropattern Restoration Works". Previous sections 7.4 and 7.6 have been renumbered as 7.3 and 7.4, respectively.
2. On p. 7-2, in the first bullet, revised "Final water quality standards" to read "Compliance with the final phosphorus criterion".

3. On p. 7-3, in the second bullet listing, added a new fourth bullet referencing the proposed funding for implementing steps to accelerate recovery of impacted areas in the EPA.
4. On p. 7-3, added a bullet listing of the planning and analytical tools to Section 7.1 “Development of Planning and Analytical Tools”.
5. On p. 7-4, in the first sentence, first paragraph of section 7.1.2, changed the reference to final water quality standards to specifically reference the phosphorus criterion.
6. On p. 7-13, modified the first paragraph following Figure 7.3 to update the current status of construction of the STA-3/4 outflow control and distribution works.
7. Added a new subsection 7.2.6 summarizing projected costs associated with the hydropattern restoration works. Includes new cost summary Table 7.6.
8. On p. 7-21, reformatted Table 7.6 (now Table 7.7) and added subsection 7.4.1: added Program Management costs in an amount equal to approximately 3% of the projected annual expenditure for all items other than incremental operation and maintenance; a concurrent change was made in all capital cost estimates, reducing the 10% allowance for “Program and Construction Management” to 7% for “Construction Management”.

11. CHANGES TO PART 8, OPERATION, MAINTENANCE AND MONITORING

1. Part 8 has been completely rearranged and reformatted to separate development and discussion of the various operation, maintenance and monitoring activities by the SFWMD budget activity codes.
2. The unit cost estimates originally applied for projection of STA operation and maintenance costs have been replaced with summary estimates based on detailed projections prepared by District staff. Original tables 8.1 through 8.9 have been deleted, and subsequent tables renumbered accordingly.
3. The unit cost estimates originally applied for projection of monitoring costs associated with permit compliance have been replaced with summary estimates based on detailed projections prepared by District staff. Those projections include the estimated costs for establishment of the new flow and water quality monitoring stations necessary for permit compliance documentation.

4. The unit cost estimates originally applied for projection of non-STA operation and maintenance costs have been replaced with summary estimates based on detailed projections prepared by District staff.
5. On p. 8-22, Table 8.9:
   - Of the 14 FTEs originally shown under item 1.a "Site Management", six are now specifically included as site managers (see new text section 8.5.1); two are included for H&H analyses associated with operations monitoring (see new text section 8.4 – in addition, the total FTE expense for this item was increased from $250,000 to $500,000); two are included for operations plan refinement and coordination (see new text section 8.5.2); and the function and costs for two have been relocated to Part 5, "Process Development and Engineering" under District budget activity code Bc82(4). The last two FTE's originally identified in Table 8.9 under item 1.a are now included in the summary estimates of STA O&M costs in new Table 8.2;
   - The flow and water quality monitoring costs are now summarized in new Tables 8.6 and 8.8.
6. New Tables 8.5 and 8.7 have been added to clarify identification of the structures at which flow and water quality monitoring is to be conducted, as well as to provide additional definition of when new monitoring stations are expected to come on line. The total number of permit compliance stations upon completion of all recommended STA enhancements has been corrected from 51 to 46; the total number of operations monitoring stations has corrected from 74 to 72.
7. An allowance for Program Management in an amount equal to approximately 3% of the projected annual expenditure for monitoring and additional dedicated labor has been added to the budget projections.
8. Expenditures and projected costs in Fiscal Year 2003 have been removed from all cost projections.
9. The estimated unit cost for STA site management FTEs has been reduced from $125,000 per year to $85,000 per year.

Appendix B

Summary of Changes from September 18, 2003 Review Draft

Table of Contents

1. GENERAL

This revision to the Long-Term Plan updates and modifies the September 18, 2003 Review Draft to respond to comments received from stakeholders, and to, in certain instances, refine the originally projected schedules of certain of the recommended elements of the Plan.

This Appendix B summarizes all changes made to the September 18, 2003 Review Draft in the preparation of the October 27, 2003 revision to this Long-Term Plan. The purpose of this Appendix B is to facilitate the review of this Long-Term Plan, as compared to the September, 2003 Review Draft, by the District's staff and Governing Board, the Florida Legislature, the Florida Department of Environmental Protections, and other stakeholders, in preparation for the presentation of this Long-Term Plan to the District's Governing Board for approval.

Unless otherwise noted, all changes are referenced to the page and/or section number of the September 18, 2003 Review Draft of this *Long-Term Plan*.

2. CHANGES TO SYNOPSIS

1. The following paragraph was added after the second full paragraph of the Synopsis: "Following operation of the Pre-2006 projects, the long-term geometric mean TP concentrations in discharges from the Everglades Construction Project, equal to approximately 88% of the water entering the Everglades, are predicted to range from 10-14 ppb. The only basins that are predicted to have discharge concentrations above that range after December 31, 2006 are those basins that have future CERP projects. These include the North Springs Improvement District, C-11 West, L-28 and Feeder Canal basins. Those basins' discharges account for approximately 12% of the total surface flows to the Everglades after completion of the Pre-2006 Projects and CERP projects scheduled for completion prior to December 2006."
2. In the second line of the third full paragraph of the Synopsis, the phrase "$446 million" was changed to read "$444 million".
3. The Synopsis was reformatted (font size and line spacing were increased).

3. CHANGES TO EXECUTIVE SUMMARY

1. On p. ES-1, the Everglades lawsuit case reference was changed to “88-1886-CIV-MORENO”.
2. On p. ES-10, in Table ES-3, the labels for the first and second rows were changed from (2004 2006” and “2007 2007” to “2004 12/30/06” and “12/31/06 12/31/07” respectively.
3. On p. ES-10, the following paragraph was added following the EFA excerpt ending in “*more intensive management of the STAs*”: “Following operation of the Pre-2006 projects, the long-term geometric mean TP concentrations in discharges from the Everglades Construction Project , equal to approximately 88% of the water entering the Everglades, are predicted to range from 10-14 ppb. The only basins that are predicted to have discharge concentrations above that range after December 31, 2006 are those basins that have future CERP projects. These include the North Springs Improvement District, C-11 West, L-28 and Feeder Canal basins. Those basins’ discharges account for approximately 12% of the total surface flows to the Everglades after completion of the Pre-2006 Projects and CERP projects scheduled for completion prior to December 2006.”
4. On p. ES-10, in the first line of the last paragraph, the word “potential” was replaced with the phrase “range of estimated performance in the ECP Basins”.
5. On p. ES-13, the following sentence was added prior to the last sentence of the last full paragraph: “This 2008 timing is anticipated to coincide with the renewal of the Long-Term permits required under Section 10 of the EFA.”
6. On p. ES-15, the last sentence of the first item in the bulleted list was replaced with the following: “The estimated cost for operation, maintenance and monitoring of the STAs (developed in Part 8 of this Long-Term Plan) over the period FY 2014 through 2016 is $215 million (expressed in FY 2003 dollars), which includes an estimated cost of $82 million for flow and water quality monitoring.” The dollar values shown in the September 2003 version were erroneously reported in escalated dollars.
7. On p. ES-17, Table ES.4 was replaced. See remaining discussion in this Appendix B for specific identification of changes impacting projected expenditures. A footnote was added to Table ES-17 to emphasize that the projections shown are in escalated dollars. Tabular values were changed to report in $1,000s in Table ES.4.

4. CHANGES TO PART 1, INTRODUCTION

1. On p. 1-18, added a new sentence to the first paragraph at the top of the page, indicating that Table 1.2 also includes reference to that Part or section of the Long-Term Plan in which individual projects or processes are described in detail.
2. On p. 1-19, Table 1.2 has been modified as follows:
   - A new budget activity code has been added (Bc83(4), PSTA Demonstration Project in STA-3/4).
   - A new column has been added to identify in which the Part or section of the Long-Term Plan the project or process is described.
3. On p. 1-24, in the second sentence of the first paragraph of Section 1.10.7 “Public Involvement”, the phrase “public involvement shall be followed” has been changed to read “public involvement are proposed”.
4. On p. 1-24, in item no. 3 of the list under Section 1.10.7 “Public Involvement”, the phrase “coincide with Legislative review” has been changed to read “coincide with potential Legislative review”.
5. The following items have been added to Section 1.11 “List of Acronyms”:
   - BCNP – Big Cypress National Preserve
   - CEU – Continuing Education Unit
   - PL – Public Law
   - NRCS – Natural Resource Conservation Service

5. CHANGES TO PART 2, PRE-2006 STRATEGIES, ECP BASINS

1. On p. 2-26, in the first sentence of Section 2.4 “STA-3/4”, changed the phrase “completion is presently scheduled for March 2004” to read “completion of the entire treatment works is presently scheduled for May 2004, yet it should be noted that efforts are underway to initiate flow-through operations of the 4,500-acre Cell 3 by March 2004.”
2. On p. 2-28, in the first paragraph following Figure 2.11, deleted "(March, 2004)."
3. On p. 2-33, in the first paragraph of Section 2.4.4 “Implementation Schedule”, deleted reference to completion date. Also changed the last sentence of this paragraph to read “The following items of construction are scheduled to be completed by December, 2006”.

4. On p. 2-33, in the last item of the bulleted list, changed the phrase "Cell 3B and Cell 2B" to read "Cells 1B, 2B and 3B".
5. On p. 2-33, in the last paragraph:
   - Changed the first sentence to read "It is recommended that the herbicide treatment of Cells 1B and 2B be scheduled for FY 2004, and that the herbicide treatment of Cell 3B be scheduled for FY 2006."
   - Deleted the third sentence, beginning with "In addition, it is…".
6. On p. 2-34, modified Table 2.13 to reflect the impact of the above changes. Construction expenditures in FY 2004 are now limited to the herbicide treatment of Cells 1B and 2B. Delayed start of construction for remaining elements from FY 2004 to FY 2005, impacting projected construction expenditures in FY 2005 and 2006. Made associated adjustments to annual expenditures for construction management and project contingency. Add $249,000 of incremental O&M expense in FY 2005 to reflect earlier conversion of Cells 1B and 2B. Reduced incremental O&M expense in FY 2006 from $374,000 to $249,000 (should have been $208,000 in September, 2003 Review Draft, as Cell 1B was not then scheduled for conversion until FY 2006).
7. On p. 2-50, modified Tables 2.20 and 2.21 as required by above-described changes to Table 2.13. Overall, results in no change in projected capital expenditures (Table 2.21), although annual amounts were adjusted. The total projected expenditure for incremental operation and maintenance through FY 2016 increased from $15,531,000 (should properly have been $15,365,000) to $15,655,000.

6. CHANGES TO PART 3, PRE-2006 STRATEGIES, ESP BASINS

1. The following changes to Section 3.5 "L-28 Basin" were made in response to comments received from the Seminole Tribe:
   a. The first full paragraph on p. 3-28 was revised to read as follows: "There are two Central and South Florida Restoration Critical Projects planned for the L-28 Basin, the Miccosukee Water Management Plan (WMP) and a Comprehensive Everglades Restoration Plan (CERP) project planned to expand and relocate the S-140 pump station. In addition, the Big Cypress-Seminole Indian Reservation Water Conservation Plan (WCP) is to be implemented under the National Resource Conservation Service (NRCS) PL 83-566 Small Watershed Project Program."

b. The second full paragraph on p. 3-28 was deleted in its entirety.

c. The first full sentence at the top of p. 3-29 was revised to read as follows: "These WRA's are not included in either Phase I or Phase II of the Critical Restoration Project, and are not currently scheduled or funded for construction."

d. On p. 3-29, in the third line of the second full paragraph on this page, the phrase "northwest corner of WCA-3A" was replaced with the phrase "western area of WCA-3A".

e. On p. 3-29, the following sentence was added at the end of the first paragraph in Section 3.5.1 "Alternatives Considered in the Basin-Specific Feasibility Studies": "Those alternatives consisted of hypothetical projects developed and evaluated for comparison purposes only."

f. In the last paragraph on p. 3-30, the phrase "CERP Projects and Critical Projects" was revised to read "CERP Projects and non-CERP Projects".

g. On p. 3-31, the second item in the bulleted list was replaced with the following: "The Seminole Tribe has just executed a scope of work with the NRCS for the development of a project that will route, detain and treat runoff from the Big Cypress Seminole Indian Reservation prior to its discharges to (1) Big Cypress National Preserve (BCNP), (2) BCNP and Miccosukee Tribe of Indians lands, and (3) the L-28 Borrow Canal, through WRAs 5, 6, and 7, respectively. This project, proposed for implementation under the NRCS PL 83-566 Small Watershed Project Program, has not yet been authorized or funded. This project is being designed to accommodate flows and loads only from reservation lands."

h. On p. 3-32, the first two lines at the top of the page were revised to read as follows: "CERP and NRCS planning processes. In the L-28 Basin, the two tribes are expected to fulfill the role of local sponsor to the federal initiatives."

i. On p. 3-32, the second full paragraph under Section 3.5.3 "Review and Disaggregation of Baseline Data" was revised to read as follows: "During development of final water quality improvement strategies in the L-28 Basin, it will be necessary to further refine estimated runoff volumes and loads to be treated in (1) the Miccosukee Tribe's STA; and (2) the Seminole Tribe's STA, discussed herein as a potential addition to, or addition within, the Seminole Tribe's proposed WRAs 5, 6 and 7, which are scheduled to be implemented under NRCS PL 83-566 Small Watershed Project Program, due to the following:"

j. On p. 3-39, in the first sentence following Table 3.7, the phrase "the Seminole Tribal STA" was changed to read "a possible Seminole Tribal STA".

k. On p. 3-39, the following paragraph was added in advance of the paragraph beginning "For reasons subsequently discussed…": "It should here be noted that Alternative 5 as generally described above represents the current conceptual design for the Seminole Tribe's projects scheduled to be implemented under the NRCS PL 83-566 Small Watershed Project Program."

l. The final paragraph on p. 3-39 was changed to read as follows: "An opinion of the probable capital cost for a possible Seminole Tribal STA (stated in FY 2003 dollars), if structured as described above for Alternative 3, is presented in Table 3.8. The Seminole Tribe's presently intended project (e.g., Alternative 5 as described above) has not yet been authorized or funded under the NRCS PL 83-566 Small Watershed Project Program, thus no concrete financial or design details are available at this time. The Seminole Tribe is moving forward with the study of the features represented in Alternative 5 to implement its project in this basin. As such, the information presented in Table 3.8 is different from those under consideration by the Seminole Tribe."

m. On p. 3-40, the paragraph immediately preceding Table 3.9 was changed to read as follows: "An opinion of the probable average annual cost for operation and maintenance of a possible Seminole Tribal STA (stated in FY 2003 dollars), structured as described above for Alternative 3, is presented in Table 3.9. The Seminole Tribe's presently intended project (e.g., Alternative 5 as described above) has not yet been authorized or funded under the NRCS PL 83-566 Small Watershed Project Program, thus no concrete financial or design details are available at this time. The Seminole Tribe is moving forward with the study of the features represented in Alternative 5 to implement its project in this basin. As such, the information presented in Table 3.9 is different from those under consideration by the Seminole Tribe."

n. On p. 3-41, the second sentence of the second paragraph was replaced with the following: "The Seminole Tribe's WRAs 5, 6 and 7, scheduled to be implemented under the NRCS PL 83-566 Small Watershed Project Program, have not yet been authorized or funded. Thus no tentative completion date is available for this project at this time."

o. The second item in the bulleted list on p. 3-41 was revised to read as follows: “Seek federal authorization for the Seminole Tribal STA as a component of the Seminole Tribe’s WRAs 5, 6 and 7, which are scheduled to be implemented pursuant to the NRCS PL 83-566 Small Watershed Project Program;”

p. On p. 3-43, in the first sentence of the paragraph at the bottom of the page, the phrase “CERP planning process” was changed to read “CERP and NRCS planning processes”. In the second sentence, the phrase “(PDT) in its development” was changed to read “(PDT) and the NRCS in their development”.

2. On p. 3-18, in the last sentence of the second full paragraph: changed the phrase “Table 8.12” to read “Table 3.12”; deleted the phrase “and Table 8.13 (escalated dollars)”.
3. On p. 3-26, in the first sentence at the top of the page: changed “purposed” to “purposes”; changed the phrase “Table 8.12” to read “Table 3.12”; deleted the phrase “and Table 8.13 (escalated dollars)”.
4. In the text box on p. 3-31, the first sentence was deleted and replaced with the following: “The District initiated coordination with the tribes, the USACE and the federal interest in the Big Cypress National Preserve in June, 2003. Additional coordination is still necessary to integrate the various projects in the basin.”
5. The following changes to Section 3.6 “Feeder Canal Basin [Bc74]” were made in response to comments received from the Seminole Tribe:

a. In the second sentence of the second full paragraph on p. 3-45, the phrase “scheduled for completion in January, 2003” was changed to read “substantially completed in July, 2003”. The third sentence of that same paragraph was changed to read as follows: “Phase II of the WCP, scheduled for completion by late 2006, involves improvements designed to improve water quality, restore wetland hydrology, increase water storage capacity and enhance flood protection within the reservation.”

b. On p. 3-45, in the last line of the second full paragraph, the phrase “completion in 2005” was changed to read “completion in late 2006”.

c. At the end of the first paragraph on p. 3-46, the phrase “1,231 acres” was changed to read “1,291 acres”.

d. In the third line of the second paragraph on p. 3-46, the word “sloughs” was changed to read “forested wetland systems”.

e. In the fourth line of the third paragraph on p. 3-46, the phrase “West Feeder Canal and” was deleted; in the fifth line of that same paragraph, the phrase “south of the

Big Cypress Reservation" was added immediately following "Big Cypress National Preserve".

f. On p. 3-46, the following sentence was added at the end of the first paragraph in Section 3.6.1 "Alternatives Considered in the Basin-Specific Feasibility Studies": "Those alternatives consisted of hypothetical projects developed and evaluated for comparison purposes only."

g. The following paragraph was added at the bottom of p. 3-47: "No information was provided in the *Basin Specific Feasibility Studies* to identify a proposed location for the STA, which could only be considered as a hypothetical alternative to the CERP Critical Project described earlier. No further investigation of this alternative is presently underway or planned."

h. The second sentence of the first paragraph on p. 3-49 was replaced with the following: "The primary basis for this assumption is recognition that the surface water quality standard for the Big Cypress Seminole Indian Reservation is a narrative criterion which states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. The USACE permit for the Seminole Tribe WCP does not *require* that discharges from the project meet a long-term flow weighted mean TP concentration of 50 ppb. The WCP, which is designed to accommodate flows and loads from reservation lands only, has a project *goal* to achieve discharges of 50 ppb. Only those direct discharges to the EPA from the Feeder Canal Basin will be required to comply with the 10 ppb phosphorus criterion adopted by the Environmental Regulation Commission on July 8, 2003."

i. In the first sentence of the second full paragraph on p. 3-51, the phrase "and the C-139 Basin" was deleted. The last sentence of that same paragraph was changed to read as follows: "The following project in the Feeder Canal Basin was selected for grant funding in FY 2003:"

j. On p. 3-51, the last two projects in the bulleted list (the J-7 Ranch and Howell Farms) were deleted. These projects are in the C-139 Basin.

k. In four places on pp. 3-52 and 3-53, the phrase "Component (CCC)" was added immediately following the phrase "Big Cypress/L-28 Interceptor Modifications CERP Project".

6. In the text box on p. 3-48, the first sentence was deleted and replaced with the following: "The District initiated coordination with the Seminole Tribe, the USACE and the federal interest in the Big Cypress National Preserve in June 2003. Additional coordination is still necessary to integrate the various projects in the basin."
7. In the last paragraph on p. 3-53, the phrase "Table 8.12" was corrected to read "Table 3.12"; the phrase "and Table 8.13 (escalated expenditures)" was deleted.
8. On p. 3-54, the following sentence was added at the end of the paragraph preceding Table 3.12: "Those expenditures include an allowance for Program Management [Bc90] computed as 3% of the projected expenditures in the individual basins."
9. On p. 3-54, the following corrections and changes were made to Table 8.12:
   a. The column entitled "Total Fiscal Year Expenditure" was corrected to include projected expenditures for Acme Basin B, which had not been carried forward to that column in the September 18, 2003 Review Draft.
   b. The column entitled "L-28 Basin" was deleted.
   c. A new column entitled "Program Management [Bc90]" was added, with projected annual expenditures equal to roughly 3% of the projected expenditures in each of the ESP basins. Those expenditures were also carried forward to the column entitled "Total Fiscal Year Expenditure".
10. Table 3.13 and the paragraph immediately preceding that table were deleted; escalated projected expenditures are addressed in Part 9.

7. CHANGES TO PART 4, PROJECTED TREATMENT PERFORMANCE

1. On p. 4-8, in Table 4.3, the labels for the first and second rows were changed from (2004 2006" and "2007 2007" to "2004 12/30/06" and "12/31/06 12/31/07" respectively.

8. CHANGES TO PART 5, PROCESS DEVELOPMENT AND ENGINEERING (PDE)

1. On p. 5-3, added a new paragraph immediately prior to the paragraph beginning "It is the intent…" This new paragraph was copied from p. 1-12, and is included here to further

emphasize the District's intent to annually evaluate progress under the Long-Term Plan and recommend additional steps for implementation.

2. On p. 5-3, in the first sentence of the paragraph beginning "It is the intent…", changed the phrase "to evaluate pre-2006 steps" to read "to fully evaluate the actual performance of pre-2006 steps".
3. On p. 5-4, in the last item in the bulleted list at the top of the page, inserted the phrase ", including STA expansion as described in Part 6," following the phrase "Identification of post-2006 measures".
4. On p. 5-5, immediately prior to section 5.1.1 "EAA Basins [Bc81(1)], added three new paragraphs to Section 5.1 "Source Controls (BMPs) [Bc81]. These new paragraphs more fully describe current and ongoing efforts to assist urban interests in the identification, development and implementation of urban BMPs.
5. On p. 5-18, added Budget Activity Code Bc83(4) to title of Section 5.3.3.
6. On p. 5-19, added the appropriate Budget Activity Codes in two locations (introductory phrases of the second and fourth paragraphs).
7. Added Budget Activity Code Bc83(4) to the titles of Table 5.3 and Table 5.4.
8. On p. 5-23, added the appropriate Budget Activity Codes in one location (introductory phrase of the second paragraph).
9. On p. 5-25, reorganized Table 5.5 to reflect the addition of a separate Budget Activity Code (BC83(4)) for the PSTA Demonstration Project in STA-3/4.

9. CHANGES TO PART 6, POST-2006 STRATEGIES

1. On p. 6-94, the following paragraph was added immediately preceding the last paragraph on the page: "In addition, the overall projected expenditures for this Long-Term Plan include an allowance for Program Management [Bc90], computed as roughly 3% of the projected annual expenditures for the adaptive implementation of additional measures."

10. CHANGES TO PART 7, RECOVERY OF IMPACTED AREAS WITHIN THE EPA

1. On p. 7-22, in Table 7.7, corrected projected expenditure for Hydropattern Restoration [Bc87(5)] in FY 2013 from $400,000 to $0 (see Table 7.6 for source, original Table 7.7 was

in error). As a direct result of that correction, the projected expenditure for Program Management [Bc90] in FY 2013 was reduced from $57,000 to $45,000; the projected total expenditure in FY 2013 was reduced from $2,345,188 to $1,930,188; and the total projected expenditure through FY 2013 was reduced from $38,620,865 to $38,208,865.

2. On p. 7-22, in the last sentence, changed the phrase "projected capital expenditure" to read "projected capital and other project expenditures (excluding O&M)".

11. CHANGES TO PART 8, OPERATION, MAINTENANCE AND MONITORING

1. On p. 8-4, updated Table 8.2 to reflect changed incremental O&M expenditures in STA-3/4 (see discussion of changes to Part 2 "Pre-2006 Strategies, ECP Basins").
2. On p. 8-12, corrected table number of the "Summary of Projected Expenditures" from Table 8.16 to Table 8.9; updated table to reflect changed incremental O&M expenditures in STA-3/4 (see discussion of changes to Part 2 "Pre-2006 Strategies, ECP Basins").

12. CHANGES TO PART 9, SUMMARY SCHEDULE AND PROJECTED EXPENDITURES

1. On p. 9-1, the following sentence was added at the end of the final paragraph: "Escalation factors were applied annually on January 1, using January 1, 2003 as the base (e.g., all projected expenditures in calendar year 2004, which includes three quarters of fiscal year 2004 and one quarter of fiscal year 2005, were escalated at 3%)."
2. On p. 9-2, Table 9.1 was updated to reflect all changes noted earlier in this Appendix B. The net effect of those modifications was to increase the total expected expenditures through FY 2016 (in FY 2003 dollars) by approximately $778,000.
3. On p. 9-2, Table 9.2 was updated to reflect escalated dollars developed using the scheduled start and end dates reflected in the P-3 schedule, with escalation computed as described in item 1 above. In essence, the data date for escalation was shifted back 3 months from that assumed in earlier versions; the net effect of all changes was to reduce the total (escalated) expenditures by approximately $2,078,000.

4. On p. 9-3, in the last line of the first paragraph, the phrase “Appendix B” was changed to read “Appendix C”.
5. The last paragraph on p. 9-3 was deleted in its entirety.

13. CHANGES TO APPENDICES

1. No changes were made to Appendix A.
2. This Appendix B was added.
3. Appendix C, consisting of Primavera schedule output, was added.

* * * * *

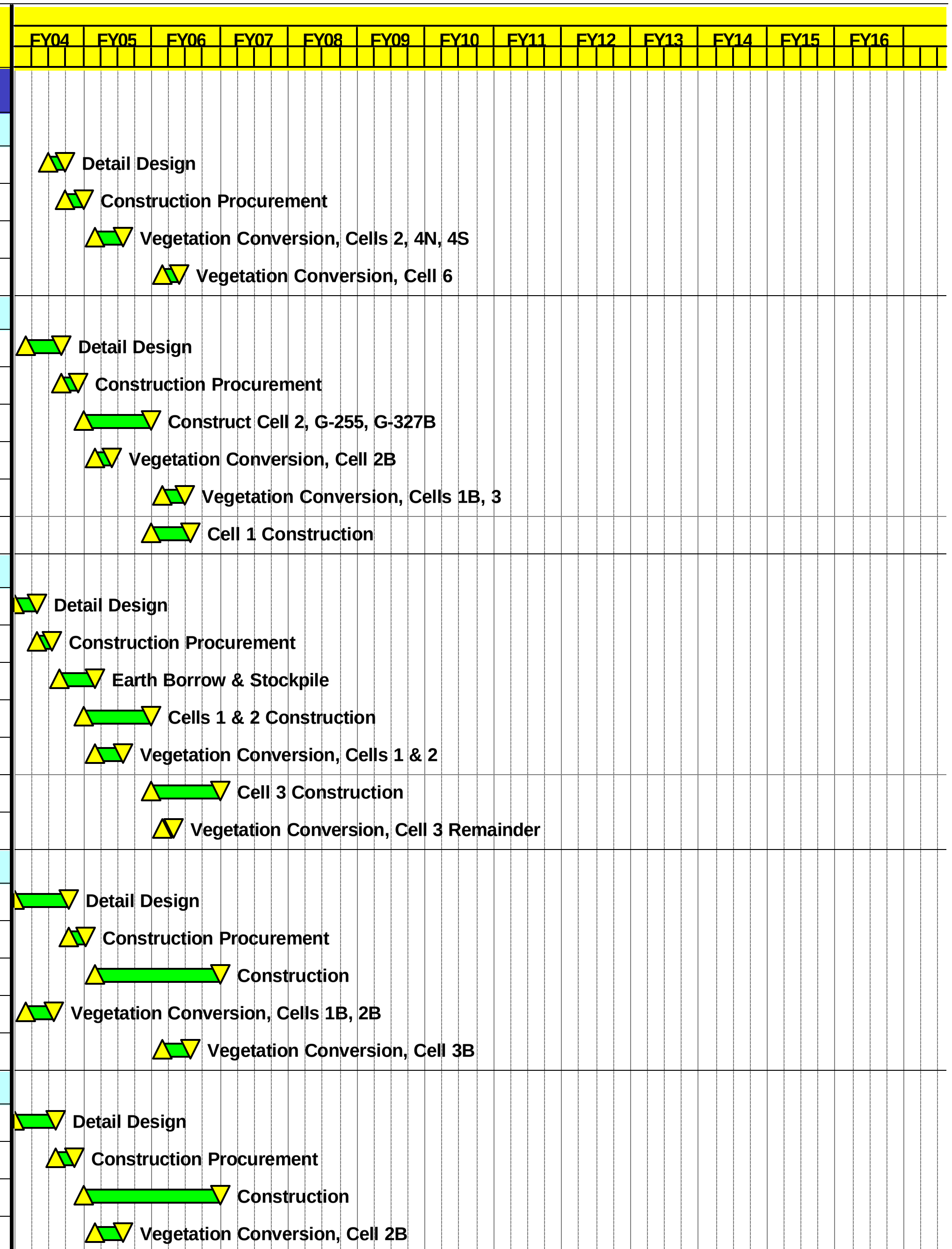
Appendix C

Implementation Schedule

The overall schedule for completion of the various projects and processes recommended in this Long-Term Plan is as developed in Parts 2, 3, 5 and 7. Parts 2 and 3 define the intended schedule for completion of the Pre-2006 projects in the ECP and ESP basins, respectively. Part 5 defines the intended schedule for completion of the various elements of the Process Development and Engineering component of this Long-Term Plan. Part 7 defines the intended schedule for activities directed to accelerating the recovery of previously impacted areas in the EPA, including completion of the hydropattern restoration works mandated under the Everglades Forever Act.

A Primavera file documenting the overall schedule for implementation of this Long-Term Plan has been developed and furnished to the District to assist the District in the continuing management of activities included in this Long-Term Plan. The following pages graphically summarize the contents of that schedule.

Activity ID	Activity Description	Early Start	Early Finish
Pre-2006 Projects			
BC10 - STA-1E Enhancements			
BC10-0500	Detail Design	01APR04*	30JUN04
BC10-0600	Construction Procurement	01JUL04*	08OCT04
BC10-0800	Vegetation Conversion, Cells 2, 4N, 4S	01DEC04*	29APR05
BC10-0810	Vegetation Conversion, Cell 6	01DEC05*	28FEB06
BC20 - STA-1W Enhancements			
BC20-0500	Detail Design	01DEC03*	04JUN04
BC20-0600	Construction Procurement	09JUN04*	08SEP04
BC20-0800	Construct Cell 2, G-255, G-327B	01OCT04*	30SEP05
BC20-0810	Vegetation Conversion, Cell 2B	01DEC04*	28FEB05
BC20-0820	Vegetation Conversion, Cells 1B, 3	01DEC05*	31MAR06
BC20-0830	Cell 1 Construction	03OCT05*	28APR06
BC30 - STA-2 Enhancements			
BC30-0500	Detail Design	01OCT03*	29JAN04
BC30-0600	Construction Procurement	30JAN04*	14APR04
BC30-0800	Earth Borrow & Stockpile	01JUN04*	30NOV04
BC30-0810	Cells 1 & 2 Construction	01OCT04*	30SEP05
BC30-0820	Vegetation Conversion, Cells 1 & 2	01DEC04*	29APR05
BC30-0830	Cell 3 Construction	03OCT05*	29SEP06
BC30-0840	Vegetation Conversion, Cell 3 Remainder	01DEC05*	31JAN06
BC40 - STA-3/4 Enhancements			
BC40-0500	Detail Design	01OCT03*	13JUL04
BC40-0600	Construction Procurement	14JUL04*	13OCT04
BC40-0800	Construction	01DEC04*	29SEP06
BC40-0810	Vegetation Conversion, Cells 1B, 2B	01DEC03*	30APR04
BC40-0820	Vegetation Conversion, Cell 3B	01DEC05*	28APR06
BC50 - STA-5 Enhancements			
BC50-0500	Detail Design	01OCT03*	11MAY04
BC50-0600	Construction Procurement	12MAY04*	11AUG04
BC50-0800	Construction	01OCT04*	29SEP06
BC50-0810	Vegetation Conversion, Cell 2B	01DEC04*	29APR05



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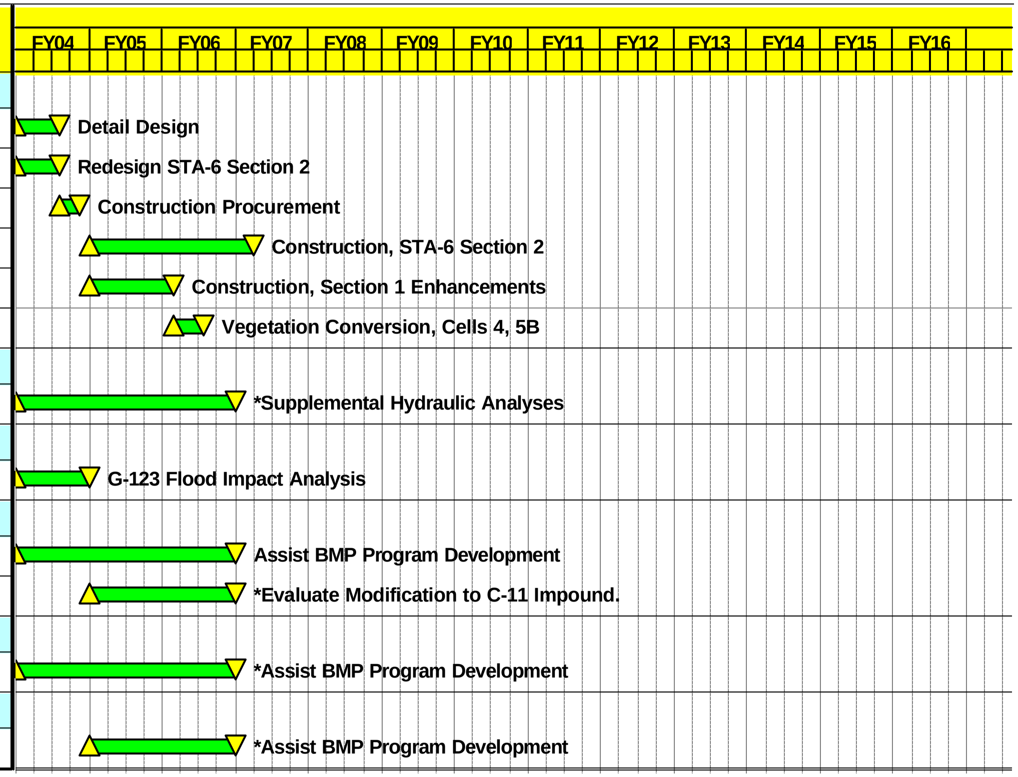
Activity ID	Activity Description	Early Start	Early Finish
BC60 - STA-6 Enhancements			
BC60-0500	Detail Design	01OCT03*	11MAY04
BC60-0510	Redesign STA-6 Section 2	01OCT03*	11MAY04
BC60-0600	Construction Procurement	12MAY04*	11AUG04
BC60-0800	Construction, STA-6 Section 2	01OCT04*	29DEC06
BC60-0820	Construction, Section 1 Enhancements	01OCT04*	30NOV05
BC60-0830	Vegetation Conversion, Cells 4, 5B	01DEC05*	28APR06
BC71 - NSID			
BC71-1200	*Supplemental Hydraulic Analyses	01OCT03	29SEP06
BC72 - NNRC Basin			
BC72-1200	G-123 Flood Impact Analysis	01OCT03*	30SEP04
BC73 - C-11 West Basin			
BC73-1200	Assist BMP Program Development	01OCT03*	29SEP06
BC73-1210	*Evaluate Modification to C-11 Impound.	01OCT04	29SEP06
BC74 - Feeder Canal Basin			
BC74-1200	*Assist BMP Program Development	01OCT03	29SEP06
BC75 - Acme Basin B			
BC75-1200	*Assist BMP Program Development	01OCT04	29SEP06



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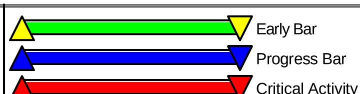

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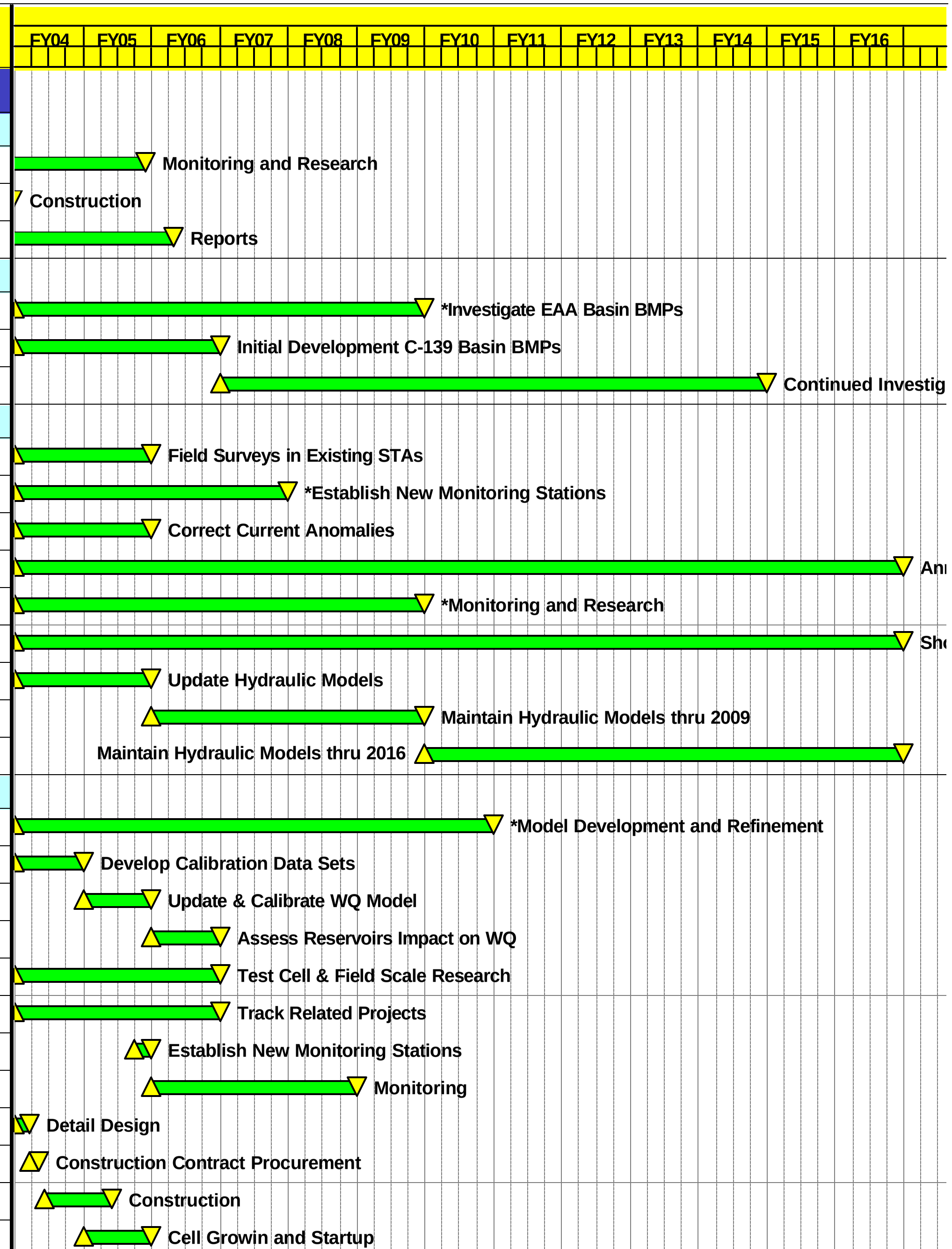
Activity ID	Activity Description	Early Start	Early Finish
Process Development & Engineering			
BC25 - Evaluation of Full Scale STA Enhancements			
BC25-0300	Monitoring and Research	03MAR03*	31AUG05
BC25-0800	Construction	03MAR03*	29AUG03
BC25-0900	Reports	03MAR03*	31JAN06
BC81 - Source Controls (BMP's)			
BC81-1300	*Investigate EAA Basin BMPs	01OCT03	30SEP09
BC81-2300	Initial Development C-139 Basin BMPs	01OCT03*	29SEP06
BC81-2310	Continued Investigations	02OCT06*	30SEP14
BC82 - Enhanced Control & Monitoring			
BC82-1300	Field Surveys in Existing STAs	01OCT03*	30SEP05
BC82-2800	*Establish New Monitoring Stations	01OCT03	28SEP07
BC82-3300	Correct Current Anomalies	01OCT03*	30SEP05
BC82-3310	Annual Maintenance	01OCT03*	30SEP16
BC82-4300	*Monitoring and Research	01OCT03	30SEP09
BC82-4900	Short-Term Water Quality Analyses	01OCT03*	30SEP16
BC82-5200	Update Hydraulic Models	01OCT03*	30SEP05
BC82-5210	Maintain Hydraulic Models thru 2009	03OCT05*	30SEP09
BC82-5220	Maintain Hydraulic Models thru 2016	01OCT09*	30SEP16
BC83 - Improved Analytical & Forecasting Tools			
BC83-1300	*Model Development and Refinement	01OCT03	30SEP10
BC83-2300	Develop Calibration Data Sets	01OCT03*	30SEP04
BC83-2310	Update & Calibrate WQ Model	01OCT04*	30SEP05
BC83-2900	Assess Reservoirs Impact on WQ	03OCT05*	29SEP06
BC83-3300	Test Cell & Field Scale Research	01OCT03*	29SEP06
BC83-3900	Track Related Projects	01OCT03*	29SEP06
BC83-4300	Establish New Monitoring Stations	01JUL05*	30SEP05
BC83-4310	Monitoring	03OCT05*	30SEP08
BC83-4500	Detail Design	01OCT03*	15DEC03
BC83-4600	Construction Contract Procurement	16DEC03*	11FEB04
BC83-4800	Construction	10MAR04*	01MAR05
BC83-4810	Cell Growin and Startup	01OCT04*	30SEP05



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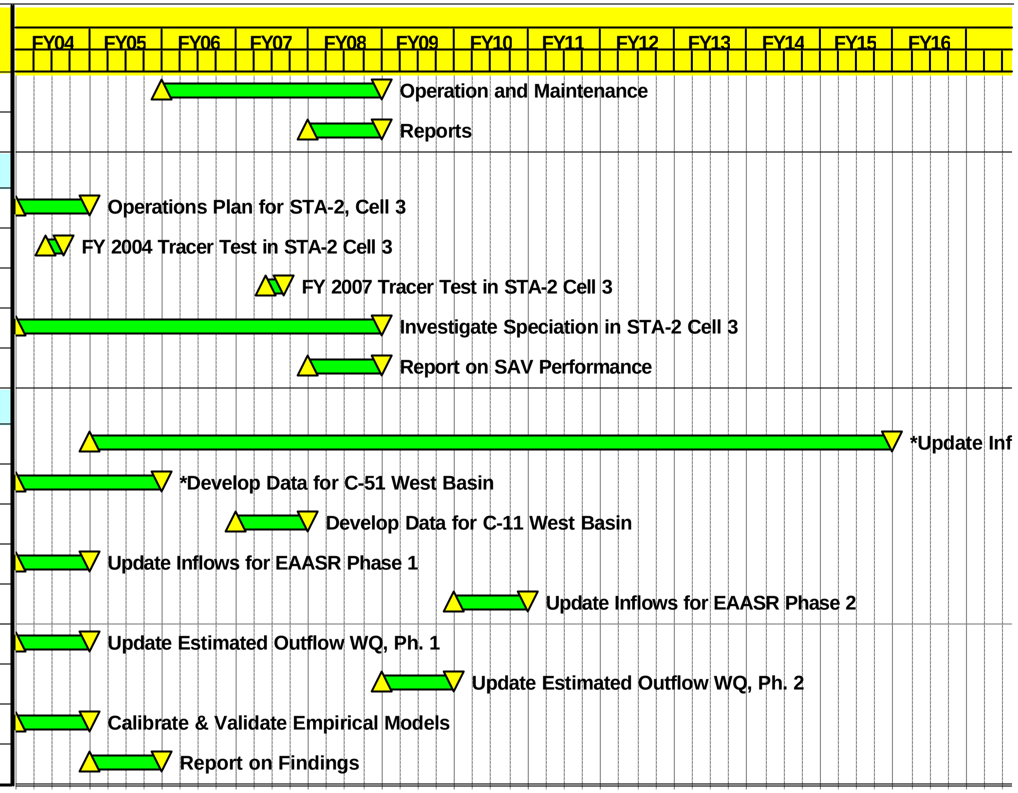
Activity ID	Activity Description	Early Start	Early Finish
BC83-4820	Operation and Maintenance	03OCT05*	30SEP08
BC83-4900	Reports	01OCT07*	30SEP08
BC84 - Operational Strategy			
BC84-1200	Operations Plan for STA-2, Cell 3	01OCT03*	01OCT04
BC84-3300	FY 2004 Tracer Test in STA-2 Cell 3	01MAR04*	28MAY04
BC84-3310	FY 2007 Tracer Test in STA-2 Cell 3	01MAR07*	30MAY07
BC84-4300	Investigate Speciation in STA-2 Cell 3	01OCT03*	30SEP08
BC84-5900	Report on SAV Performance	01OCT07*	30SEP08
BC86 - Improved Reliability of Inflow Forecasts			
BC86-1200	*Update Inflow Projections	01OCT04	30SEP15
BC86-2200	*Develop Data for C-51 West Basin	01OCT03	30SEP05
BC86-2210	Develop Data for C-11 West Basin	02OCT06*	28SEP07
BC86-3200	Update Inflows for EAASR Phase 1	01OCT03*	30SEP04
BC86-3210	Update Inflows for EAASR Phase 2	01OCT09*	30SEP10
BC86-4200	Update Estimated Outflow WQ, Ph. 1	01OCT03*	30SEP04
BC86-4210	Update Estimated Outflow WQ, Ph. 2	01OCT08*	30SEP09
BC86-5200	Calibrate & Validate Empirical Models	01OCT03*	30SEP04
BC86-5900	Report on Findings	01OCT04*	30SEP05



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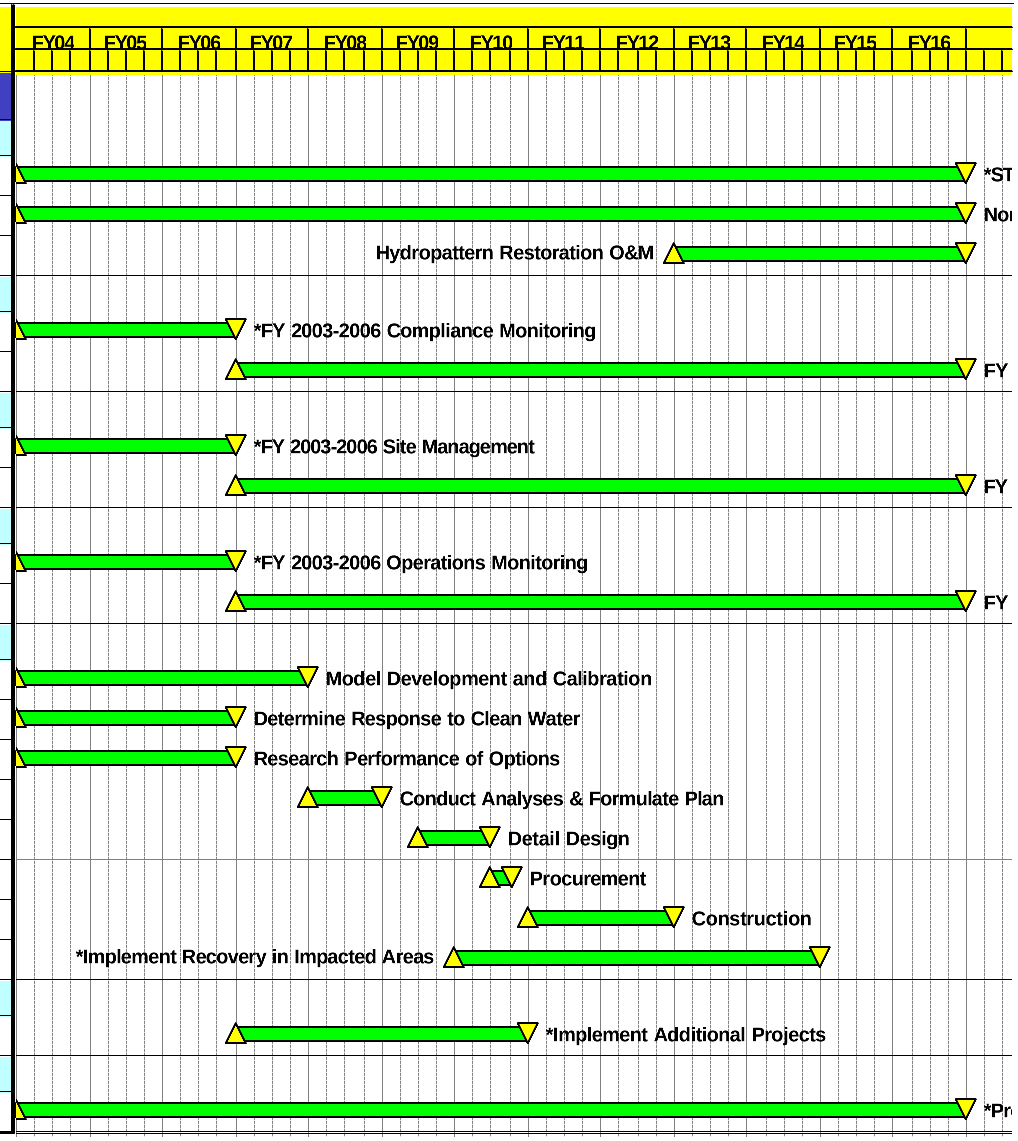
Activity ID	Activity Description	Early Start	Early Finish
Programmatic Activities & Accelerated Recovery			
BF01 - ECP O&M			
BF01-1800	*STA Operation & Maintenance	01OCT03	30SEP16
BF01-1810	Non-STA Operation & Maintenance	01OCT03*	30SEP16
BF01-1820	Hydropattern Restoration O&M	01OCT12*	30SEP16
BF80 - ECP Compliance Monitoring			
BF80-1300	*FY 2003-2006 Compliance Monitoring	01OCT03	29SEP06
BF80-1310	FY 2007-2016 Compliance Monitoring	02OCT06*	30SEP16
BF81 - STA Site Management			
BF81-1800	*FY 2003-2006 Site Management	01OCT03	29SEP06
BF81-1810	FY 2007-2016 Site Management	02OCT06*	30SEP16
BC05 - ECP Operations Monitoring			
BC05-1300	*FY 2003-2006 Operations Monitoring	01OCT03*	29SEP06
BC05-1310	FY 2007-2016 Operations Monitoring	02OCT06*	30SEP16
BC87 - Accelerate Recovery of Impacted Areas			
BC87-1200	Model Development and Calibration	01OCT03*	28SEP07
BC87-2300	Determine Response to Clean Water	01OCT03*	29SEP06
BC87-3300	Research Performance of Options	01OCT03*	29SEP06
BC87-4200	Conduct Analyses & Formulate Plan	01OCT07*	30SEP08
BC87-5500	Detail Design	01APR09*	31MAR10
BC87-5600	Procurement	01APR10*	15JUL10
BC87-5800	Construction	01OCT10*	28SEP12
BC87-6800	*Implement Recovery in Impacted Areas	01OCT09	30SEP14
BC88 - Adaptive Implementation			
BC88-1800	*Implement Additional Projects	02OCT06	30SEP10
BC90 - Program Management			
BC90-1800	*Program Management	01OCT03	30SEP16



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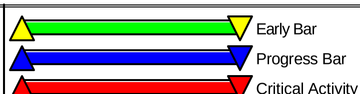

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