CHAPTER 15: MAJOR FINDINGS AND PRELIMINARY IMPLICATIONS OF THE 2000 EVERGLADES CONSOLIDATED REPORT

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In complying with the requirements of Everglades Forever Act (Act) (Section 373.4592(4)(d)6, F.S.), this 2000 Everglades Consolidated Report (Report) summarizes all data and findings available for the Water Year from May 1, 1998, to April 30, 1999, from Everglades research and monitoring. The Report supports decision-making by the Florida Department of Environmental Protection (DEP) and the South Florida Water Management District (District) regarding the implementation of the Everglades Construction Project (ECP) and other aspects of resource management for the Everglades ecosystem. In addition, the Report fulfills a suite of other annual reporting requirements under one cover, including information needs of the Joint Legislative Committee on Everglades Oversight, the Non-Everglades Construction Project permit report, 404 permit reports to the U.S. Army Corps of Engineers (Corps) and reports on the performance of the Stormwater Treatment Areas (STAs). This consolidation of reports allows for consistency in content and quality, while providing District and other agencies with a single decision-support document that has been subject to peer review by a panel of experts and by other interested parties in a public review process.

The Act establishes both interim and long-term water quality goals to ultimately achieve restoration and protection of the Everglades Protection Area (EPA). While the Act does not specifically designate two distinct implementation phases, it recognizes that measures in addition to the ECP and Everglades Best Management Practices (BMP) Regulatory Program may or may not be required to achieve compliance with long-term water quality standards. Interim activities are those underway to reduce total phosphorus concentrations to approximately 50 parts per billion (ppb), and includes the ECP and Everglades BMP Regulatory Program (Rule 40E-63). The goal of long-term management is to combine point-source, basin-level and regional solutions in a system-wide approach to ensure that all waters discharged to the Everglades Protection Area meet water quality standards by December 31, 2006. For areas outside of the Everglades Construction Project, these activities are being conducted under the Everglades Stormwater Program (ESP).

Major findings derived from information provided in this 2000 Everglades Consolidated Report are summarized below. Immediately following each set of findings are *preliminary implications* for subsequent implementation decisions, including those affecting the Everglades Construction Project and the Everglades Stormwater Program. Most of these major findings are supported by information in more than one chapter of this Report. Chapter-specific findings are provided in the individual chapters.

MAJOR FINDINGS ON INTEGRATED APPROACHES TO ACHIEVING WATER QUALITY GOALS BY DECEMBER 2006

A. The long-term water quality goal of the Everglades restoration is compliance with all water quality standards by December 31, 2006. The long-term water quality goal of the Everglades restoration program is to ensure that all waters discharged to the Everglades Protection Area meet water quality goals by December 31, 2006 (**Chapters 1 and 11**). Concurrent with the implementation of interim steps, the District and other groups are evaluating information related to water quality (**Chapters 2–8**), ecosystem-wide planning (**Chapters 9, 10 and 11**) and regulatory programs (**Chapters 5 and 11**) to provide a sound foundation for long-term compliance strategies (Chapter 1).

B. Long-term solutions require the synthesis of many activities. A tremendous amount of research, data analyses, rule-making, planning and basin-specific evaluations must be completed and integrated in a relatively short time to enable the design, land acquisition, permitting and construction of long-term solutions required in the Everglades Forever Act by December 31, 2006. At least 18 activities, some in parallel, some in sequence, must be completed in a timely manner in order to determine, fund and implement the optimal combination of refined BMPs, STAs, advanced treatment technologies and/or additional regulatory programs by December 31, 2006 (**Chapters 1**, **11, 12 and 13**).

C. The Everglades Forever Act establishes interim steps to achieve long-term restoration goals. The Act requires implementation of any additional measures needed to achieve and maintain compliance with water quality standards by December 31, 2006. The Act also requires submittal of a plan by December 31, 2003, of proposed changes to the Everglades Construction Project designed to achieve long-term solutions (**Chapter 1**). The U.S. Army Corps of Engineers construction permit for the ECP requires submittal by January 1, 2001 of a final strategy for achieving compliance with State water quality standards by December 31, 2006. The same construction permit also requires that best efforts be made in implementing additional water quality measures for STA-2 within four years of first discharge. This date is more than three years before the deadline in the Act (**Chapter 1**). Basin-level feasibility studies have begun for all basins tributary to the Everglades Protection Area, and will evaluate alternative water quality treatments to achieve the long-term restoration goals (**Chapters 1 and 11**). Results from these efforts will be linked to the Restudy's Comprehensive Plan for the regional restoration of South Florida (**Chapter 10**) and the Lower East Coast Water Supply Plan (**Chapter 9**).

Preliminary Implication 1. Restoration time lines are aggressive and ambitious. Considering the number and complexities of research, regulatory and potential construction activities required to achieve the long-term water quality goals, the December 31, 2006 time frame established by the Everglades Forever Act is very ambitious. Delays in the timely completion of these activities, many of which are outside the control of the District, may result in unintended delays of the long-term water quality objectives of the Everglades, despite the best efforts of the District. The District may be required to make recommendations on long-term solutions based on incomplete science and engineering information, which carries associated environmental and economic risks.

Preliminary Implication 2. The Long Term Compliance Permit(s) must provide more detail on efforts needed to comply with water quality standards. The state permits for the Everglades program will be modified and in 2003, the District will submit detailed plans to achieve compliance with all water quality standards in the Everglades Protection Area by December 31, 2006.

D. Dedicated funding is being provided for restoration programs. The Everglades Trust Fund has been created to account for all funds associated with the Everglades Construction Project. *Ad valorem* and agricultural privilege taxes together raised over $38 million for the Everglades Construction Project; additional funds are being contributed by Alligator Alley toll revenues. The federal government is contributing more than $190 million to the STA-1 East project. The Act requires many unfunded activities in additional to the ECP totalling $78 million through 2014. These needs will be met through *ad valorem* taxes unless other sources are identified.

Preliminary Implication 3. No funding is available for long-term solutions. To date, no funding for design, acquisition, construction or operation of management actions beyond the interim goals of the Everglades Program has been identified. Funding must be identified by December 31, 2003, as part of the long-term compliance permit requirements (see **Chapters 1 and 13)**.

MAJOR FINDINGS ON WATER QUALITY IN THE EVERGLADES PROTECTION AREA

A. Reducing phosphorus remains a critical restoration goal. Phosphorus levels entering the Everglades Protection Area remain a critical concern (**Chapter 4**). Available peer-reviewed research indicates significant changes in native Everglades flora and fauna within Water Conservation Area 2A begin to occur at average water column phosphorus concentrations between 10 and 20 ppb (**Chapter 3**). A summary of data and findings being compiled by DEP in support of rule making on the phosphorus standard supports this overall finding. The Environmental Regulatory Commission is ultimately responsible for determining if these floral and faunal changes constitute an imbalance and how compliance with a standard should be determined.

B. Current efforts are reducing phosphorus. Practices, Stormwater Treatment Area 1-West and STA-6 and other accomplishments of the Everglades Construction Project have reduced phosphorus in waters entering the Everglades Protection Area from the Everglades Agricultural Area, although not to anticipated long-term levels (**Chapters 3**, **4**, **5** and **6**). The Everglades Stormwater Program (**Chapter 11**) is being administered by the District to achieve water quality compliance for basins outside of the Everglades Construction Project by December 31, 2006; phosphorus-related management will be an important objective of this program.

C. Nutrient concentrations and loads fluctuate in basins, but decline across the entire system. Inflows to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) indicate significant improvement trends in specific conductance and total phosphorus in the 1990s. However, no other significant trends in water quality concentrations were detected in WCA-2, WCA-3, or Everglades National Park. During Water Year 1999, which included significant dry periods, inflow loads were below average, with the exception of total nitrogen loads to the Refuge, which increased. Water quality data also clearly show, for both total phosphorus and total nitrogen concentrations and loads, that the Refuge and the Water Conservation Areas have been assimilating nutrients as water flows southward through the Everglades ecosystem (**Chapter 4**).

Preliminary Implication 1. Further phosphorus reductions are needed. In accordance with the Everglades Forever Act and in conjunction with Best Management Practices, the Stormwater Treatment Areas (STAs) are being designed and constructed to achieve the interim target of 50 ppb; current evidence suggests that STAs will provide

outflow concentrations well below the interim target. STAs and advanced treatment technologies are also being evaluated for their potential application to inflows from other Everglades Protection Area tributaries, such as the Western Basins and the lower East Coast. DEP's numerical interpretation of the State's narrative standard for phosphorus will provide the basis for determining what management actions are needed to achieve long-term compliance.

D. Water quality in the EPA generally meets criteria, but some parameters present concerns. The majority of parameters sampled in the Everglades Protection Area meet state Class III surface water quality criteria and are of no concern at this time. However, for some parameters, water quality data exceeded state water quality criteria more than 5 percent of the time, including dissolved oxygen, specific conductance, total beryllium, pH, unionized ammonia, and iron. These parameters were classified as being of "concern."

Although no numeric water quality standard has yet been established for phosphorus, it was categorized as of "concern" or "potential concern" in all Everglades locations based upon comparisons with the Act's interim concentration goal of 50 ppb, and the Act's default criterion concentration of 10 ppb (**Chapter 4**). Data from the Everglades Nutrient Removal Project and the Stormwater Treatment Areas suggest that phosphorus concentrations can be substantially reduced through wetland treatment (**Chapter 6**). Concentrations equal to or lower than 10 ppb are characteristic of interior Everglades marsh locations.

The pesticide diazinon was classified as of "concern" because it twice exceeded its chronic toxicity limit. Other pesticides such as ametryn, atrazine, bromacil, diuron, endosulfan, endosulfan sulfate, hexazinone, metolachlor, 2,4-D, and simazine were classified as of "potential concern". For these chemicals, data indicated that the practical quantification limit had been exceeded, meaning that detections were found at reliably measurable levels while being less than those of the criteria or toxicity levels (**Chapter 4**).

Alkalinity, dissolved oxygen, specific conductance, pH, total cadmium, total copper, total iron, total lead, total zinc, turbidity and un-ionized ammonia were sampled at 10 structures outside of the EAA that discharge into the Everglades Protection Area. Of these parameters, dissolved oxygen, pH, total iron, turbidity and un-ionized ammonia had excursions of Class III criteria at one or more locations. Phosphorus exceeded the 50 ppb interim goal at six of the discharge structures and exceeded the 10 part per billion default criterion at the remaining four structures. Calculations of annual flow-weighted means for phosphorus at each discharge structure allow the structures to be compared from highest to lowest contributor (**Chapter 4**).

Preliminary Implication 2: Changes in water quality criteria, as well as restoration efforts, are needed. The water quality criteria for some of the parameters currently classified as of concern should be revised because they are inappropriate for the Everglades. Specifically, the dissolved oxygen standard should take into account the natural fluctuations found in Florida's warm-water marsh environments; the pH and alkalinity criteria should be revised for the soft waters in the Refuge interior marshes; and the iron criteria should be revised because it is lower than natural background levels in the Everglades. Other parameters such as pH, specific conductance, trace metals and some pesticides are still likely to periodically exceed criteria; efforts to restore the Everglades should address all these parameters.

Preliminary Implication 3. Establishing discharge limits is vital to Phase 2 decisions. The relationships between phosphorus discharges **into** the Everglades Protection Area and resulting phosphorus levels **within** the Everglades need to be defined. Knowledge of these relationships is important for devising compliance methodologies, which in turn, affect decisions regarding the optimal mix of long-term phosphorus reduction strate-

gies. Final plans for long-term compliance must be completed by December 31, 2003, and these relationships should be established as soon as possible to allow sufficient time for planning, design and construction.

Preliminary Implication 4. Phosphorus compliance methodology will influence decisions on long-term strategies. The methods of measuring compliance with the numeric phosphorus criterion remain to be determined for various areas within the Everglades Protection Area. Until this compliance methodology is developed, the District will continue to use 10 ppb to guide development of phosphorus reduction strategies. If the final discharge limits are significantly different from 10 ppb, the optimal mix of management activities could change significantly.

Preliminary Implication 5: Basins other than the EAA that discharge into the Everglades Protection Area contribute to potential water quality problem. Each basin contributing stormwater to the Everglades Protection Area will be studied through the Everglades Stormwater Program (**Chapter 11**) to identify the parameters that are causing criteria excursions and their sources. Actions that can to be taken on properties within a basin contributing to criteria excursions can include: revising existing discharge permits; issuing discharge permits where they do not exist and implementing one or more appropriate stormwater Best Management Practices.

E. The Everglades has a continuing mercury problem. Methylmercury, a highly toxic form of organic mercury, is produced at high rates within the EPA when inorganic mercury is "methylated" by marsh bacteria. Methylmercury is absorbed by aquatic life at the bottom of the Everglades food web, and it concentrates in species higher up the food web. High methylmercury levels in largemouth bass atop the Everglades aquatic food web led to human health advisories and may threaten some Everglades wildlife – despite the fact that the current Class III water quality standard for total mercury (12 ng/L) is being met in the EPA (Chapter 7).

Preliminary Implication 6. Mercury standards should be revised. The designated use of the Everglades as a fishery may be impaired, and the current mercury standard should be revised downward to protect both humans and wildlife. Additional monitoring, modeling and toxicity studies of fish-eating wildlife and their predators are needed to further quantify mercury risks throughout the food web and to support the revision of water quality standards.

F. Atmospheric sources of mercury are significant. Currently, more than 95 percent of the new mercury supplied to the Everglades is coming from atmospheric deposition, but the contribution from local air pollution is still uncertain. High mercury levels in peat soil may also be feeding the methylation process (**Chapter 7**).

Preliminary Implication 7: Air programs may be needed and some sources may be non-abatable. Compliance with revised water quality standards for Everglades mercury must account for non-abatable mercury in Everglades peat soils and global air reservoirs. The District and DEP should continue support for national/international mercury reduction initiatives. Additional study is required to quantify the Everglades response to mercury reductions in local air sources.

G. Many factors influence Everglades mercury levels. Methylmercury is produced by naturally occurring bacteria, primarily in peat soils but also in thick mats of algae and associated organisms, called periphyton. Carbon, sulfur and dissolved oxygen cycles in the Everglades have direct influences on methylmercury production. Sulfur may have the most significant impact on methylmercury production. Phosphorus may have an indirect effect on methylmercury production, transport and bioaccumulation through its effects on the carbon and dissolved oxygen cycles. The decreases in phosphorus concentrations resulting from operation of Stormwater Treatment Areas (STAs) is

unlikely to increase wildlife exposures to methylmercury to toxic levels. Based upon Everglades Nutrient Removal Project data, the STAs are expected to remove 50-75 percent of the mercury in EAA runoff when permanently flooded. However, based upon STA-6 data, dryout and rewetting may encourage methylmercury production and concentration up the food web (**Chapter 7**).

Preliminary Implication 8: Stormwater Treatment Areas are beneficial, but factors influencing mercury levels warrant further research. Although no regulatory efforts are required at this time, investigation of the factors impacting methylmercury production should continue. The potential impacts of sulfur and iron enriched EAA runoff upon the mercury cycle should be evaluated. The role of phosphorus, though indirect, should not be ignored. The benefits of reducing phosphorus through STAs outweigh potential localized increases in mercury risks. However, operating STAs with higher flows and deeper water during high rainfall is likely to maximize total mercury and methylmercury removal efficiencies.

Preliminary Implication 9: Advanced treatment technologies should continue to be screened for mercury generation. Monitoring of advanced treatment technologies, especially periphyton-based systems, should ensure that these systems do not result in net methylmercury export or excessive accumulation in the food web.

MAJOR FINDINGS ON THE ECOLOGICAL NEEDS OF THE EVERGLADES PROTECTION AREA

A. Phosphorus has major impacts on Everglades flora and fauna. Excess phosphorus in runoff, altered hydrology and reduction in the original size of Everglades marshes have adversely affected the ecology of the Everglades Protection Area (**Chapters 2 and 3**). The nutrient phosphorus is a major determinant of the ecological structure and function of the system (**Chapter 3**). Recent information provides additional evidence on consequences of phosphorus enrichment for a wide range of biological communities, including periphyton (attached algae), macroinvertebrates (insects, crustaceans) and macrophytes (larger aquatic plants). Changes in plant and animal communities, including those caused by phosphorus, can also have major consequences for ecosystem functions and values (**Chapters 2 and 3**).

B. Phosphorus research provides a foundation for rule-making. State, federal and other research activities are providing the information needed to establish a numeric criterion for phosphorus in the Everglades Protection Area (**Chapter 3**). Phosphorus threshold studies in Water Conservation Area 2A indicate that shifts in algal species begin to occur at about 10 ppb and other ecological changes are evident between 10 and 20 ppb. Preliminary research results from the Refuge suggest that ecological changes associated with phosphorus enrichment are similar to those documented in WCA-2A. Cattails can outcompete other natural vegetation over time under enriched phosphorus conditions, and recent research has given specific information on the ecological reasons why this replacement occurs (**Chapters 2 and 3**).

Extensive information from WCA-2A is being summarized by DEP to support rule-making on a phosphorus criterion and standard for this well-studied segment of the remnant Everglades. Sufficient data to establish a numeric interpretation of the phosphorus criterion for Water Conservation Areas 1 and 2A, and Everglades National Park should be available by Act deadlines. Data collection in WCA-3A and in Taylor Slough has begun to augment information available on these segments of the remnant Everglades. **Chapter 1** summarizes the sequence of steps needed to achieve compliance with water quality standards by 2006, includ-

ing the numeric interpretation of the phosphorus criterion.

C. Improvements continue in models used to predict impacts of phosphorus discharges and water quantity on the Everglades. Landscape modeling has improved information available on the long-term effects of hydroperiod and water depth on tree islands, and is providing an integrative view of changes associated with nutrient and water inputs from various water management alternatives, such as those of the Restudy. Population level models are being constructed to support impact assessments and management alternatives for key species in the EPA.

D. Exotic plant invasions threaten restoration. The Act recognized the challenge of exotic species invasions for ecosystem restoration, and required the District and other agencies to coordinate and report their control efforts. The Florida Exotic Pest Plant Council has identified melaleuca, Old-World climbing fern, Australian pine and Brazilian pepper, and several aquatic species as species posing a significant threat to the Everglades (**Chapter 14**). Likewise, the South Florida Ecosystem Restoration Task Force identified invasive species as one of the most serious threats to the restoration of South Florida. Little specific information is available on the ecological consequences of invasions by some exotic plants in the Everglades. Therefore, the true potential for exotics to interfere with Everglades restoration is not known and aggressive control programs can be difficult to justify for some species.

Old World climbing fern presents a new and significant threat to the Everglades. Much progress has been made in controlling melaleuca on public lands; now, attention must be focussed on this new species with tremendous potential for invasion, expansion and alteration of vegetation communities.

Preliminary Implication 1. Research on biological control and ecological effects of exotic plants is needed. Cooperative efforts with other organizations should be continued to develop sustainable, biological controls for exotic plants invading South Florida.

Preliminary Implication 2. Controlling the Old World climbing fern must be a restoration priority. Tools and strategies for the regional control of the Old World climbing fern are needed greatly.

MAJOR FINDINGS ON THE HYDROLOGICAL NEEDS OF THE EVERGLADES PROTECTION AREA

A. Improving Everglades hydrology via increased water volumes and revised distribution of inflows remains a critical restoration goal. The hydrology of the Everglades Protection Area has been altered fundamentally in quantity, timing, depth and duration (**Chapter 2**). Performance measures for system hydrology have been established in the Central and Southern Florida Project Comprehensive Review Study (Restudy) using the Natural Systems Model (**Chapters 2** and **10**). The alternative presently recommended by the Restudy shows a 19 percent increase in the volume of water directed to the Everglades compared to the 1979 to 1988 base period.

B. Long-term discharges from the Everglades Construction Project will help to reestablish natural hydropatterns in the Everglades. The Everglades Construction Project has been designed to restore more natural quantity, timing, depth and duration for water in the Everglades Protection Area (**Chapters 1, 2 and 10**).

Preliminary Implication 1. The hydropattern goals for the Everglades may need revision. In

concert with the Restudy, long-term aspects of Everglades Construction Project should be designed to achieve the hydrologic performance targets of the Everglades Protection Area. Accordingly, the target of 28 percent increase in flows to the Everglades mentioned in the Act may need to be refined in accordance with adaptive management practice supported by best available scientific information.

C. Implementation of the Comprehensive Plan is essential for regional restoration. The Comprehensive Plan developed through the Restudy provides the means to capture 1.7 billion gallons of water per day for storage, treatment and delivery to components of the ecosystem. Through 60 project components, the Plan will increase dynamic storage capacity and water supply, while providing water to improve the quantity, quality, timing and distribution of inflows to the Everglades Protection Area.

D. Research helps to refine hydrological targets for restoration. Detailed investigation into early Everglades hydrology is providing evidence on the importance of flowing water in maintaining habitat diversity in Everglades marshes. The effects of hydroperiod on the health of tree islands and the linkage between the success of endangered species and water depths have both been examined through landscape modeling. Experiments have provided direct evidence on the role of water depth in the ecology of wading birds and the competitive abilities of cattail and sawgrass populations (**Chapter 2**).

MAJOR FINDINGS ON EVERGLADES AGRICULTURAL AREA BEST MANAGEMENT PRACTICES

A. Best Management Practices are continuing to reduce phosphorus loads. Implementation of Best Management Practices (BMP) within the Everglades Agricultural Area has resulted in phosphorus load reductions that have surpassed the load reduction targets in the Act. The cumulative load of phosphorus attributable to and discharged from the Everglades Agricultural Area over the last four years since BMPs have been required to be fully implemented was **54 percent** lower than the load that would have occurred without BMPs (based on calculations considering hydrologic variability) (**Chapter 5**). This reduction does **not** equate to a 54 percent decline in total loading of phosphorus passing southward through the area; it includes only the loading attributable to activities within the EAA (**Chapters 4 and 5**).

B. BMPs may be able to produce further phosphorus reductions. Through continuing research, monitoring and refinement of Best Management Practices, further sustainable reductions in phosphorus load and concentration from the Everglades Agricultural Area are probable (**Chapter 5**). Information gained from the Best Management Practices Program in the Everglades Agricultural Area is being considered for application to other tributaries that discharge into the Everglades Protection Area (**Chapters 1** and **11**).

***Preliminary Implication 1*. BMPs may be an important part of the long-term water quality solutions for the Everglades.** Refined BMPs may play a more important role in the final mix of STAs, advanced treatment technologies and BMPs used to achieve compliance with water quality standards than was apparent when the Act was developed in 1994. If proven cost-effective, additional BMPs could be implemented to reduce the overall costs and scale of long-term water quality solutions.

MAJOR FINDINGS ON THE PERFORMANCE OF STORMWATER TREATMENT AREAS

A. The Everglades Nutrient Removal Project and STA-6 have been highly effective at removing phosphorus. The Everglades Nutrient Removal Project, now part of STA-1West, is exceeding its performance objectives in terms of phosphorus concentration and load reduction. During the first five years of operation, the Project outflow concentrations have averaged 22 ppb and load reductions have exceeded 82 percent (**Chapters 4 and 6**). Also, during the first 18 months of operation, the outflow of STA-6 averaged about 20 ppb, well below the interim phosphorus goal of 50 ppb (**Chapter 6**). These reductions in phosphorus loading have occurred during the early stages of Stormwater Treatment Area operation. STA performance will be closely monitored to determine if these trends continue on a long-term basis.

Preliminary Implication 1. Operating STA performance supports Everglades Construction Project assumptions. Evidence to date supports the basic assumptions and design parameters used in planning the STAs, and they are expected to achieve the interim goals of the Act.

MAJOR FINDINGS ON ADVANCED TREATMENT TECHNOLOGY RESEARCH

A. Advanced treatment technology research demonstrates mixed results. Nine advanced treatment technologies are being investigated for possible use in combination with STAs and BMPs to reduce stormwater phosphorus concentrations to comply with state water quality standards. Candidate technologies include chemical and wetland treatment systems. The research projects on advanced treatment technologies will be completed by June 2001, at a cost of approximately 10 million dollars (**Chapter 8**). Initial findings on the Submerged Aquatic Vegetation/Limerock technology are promising and suggest that large-scale deployment may provide a viable approach for improving STA performance. Technologies combining chemical and biological approaches are yielding mixed results to date. For example, preliminary results on Low Intensity Chemical Dosing indicate that this technology may be of limited value in improving STA performance and scale-up may be unnecessary.

B. Advanced treatment technologies may have local and regional applications. Some of the advanced treatment technologies that are being examined for use in conjunction with Stormwater Treatment Areas may have potential for treatment of pollutants at the source, as well as other regional applications through the Everglades Stormwater Program (**Chapter 11**).

Preliminary Implication 1. Completion of advanced treatment technology research is needed for long-term water quality decisions. The ultimate long-term solution will be a combination of STAs augmented by enhanced Best Management Practices, advanced treatment technologies as needed and/or additional regulatory programs to achieve and maintain compliance with long-term water quality standards. Completion of advanced treatment technology research is in the critical path for determining and implementing long-term solutions by December 31, 2006 (**Chapters 1** and **11**).

Preliminary Implication 2. Advanced treatment technologies may not be available for incorporation into STA-3/4. The final results from advanced treatment technology, BMP and STA

research will likely not be available until the end of 2001. No funding for advanced treatment technologies has been appropriated. Since STA-3/4 must be completed by Oct. 1, 2003, final design began in January 1999, and construction is scheduled to begin in 2001, it appears unlikely that advanced technologies will be included in the initial construction of STA-3/4.

C. Initial estimates of advanced treatment technology costs may have been underestimated. The preliminary cost estimates for advanced treatment technologies from a 1996 report appear to be unrealistically low. Current research with chemical treatment and microfiltration of local agricultural and urban stormwater suggests that actual costs may be substantially higher than initial estimates. Revised costs for all of the advanced treatment technologies under investigation will be available upon completion of each of the advanced treatment technology demonstration projects (**Chapter 8**).

MAJOR FINDINGS ON THE LOWER EAST COAST WATER SUPPLY PLAN

A. The interim LEC Water Supply Plan identifies critical projects. The Interim LEC Plan (March, 1997 draft) identifies a program of improvements that can proceed in a short time frame and without federal cost-sharing. Most noteworthy for the Everglades Protection Area are the establishment of minimum flows and levels (MFL), development of an MFL Recovery and Prevention Plan, and design of rainfall-driven operation schedules for the Water Conservation Areas (**Chapter 9**).

B. The final LEC Water Supply Plan will be influenced by the Restudy. The LEC Plan is deemed an *interim* plan and will be coordinated with the C&SF Restudy's recommended program (**Chapter 10**) as approved at the State and federal level. A final LEC 2020 Plan will be completed by April 2000 (**Chapter 9**).

Preliminary Implication 1. The LEC Water Supply Plan could impact long-term decisions. Information available at this time supports continuation of the current design of the Everglades Construction Project. District staff will continue to synchronize the LEC Water Supply Plan with long-term implementation and the C&SF Restudy, as appropriate.

MAJOR FINDINGS ON THE CENTRAL AND SOUTHERN FLORIDA PROJECT COMPREHENSIVE REVIEW STUDY (RESTUDY)

A. The Restudy is a significantly larger project than the Everglades Construction Project, designed for resource management at the regional scale. The Restudy is an interagency effort with a significantly larger geographic scale than the Everglades Construction Project. The Restudy also uses a different planning time frame (2050) than the Everglades Construction Project (2006) (**Chapters 1 and 10**).

B. Continued implementation of the Restudy depends upon the federal government authorization. The recommended alternative (D-13R), plus critical projects, water quality treatment facilities and other project elements comprise the Comprehensive Plan. This Plan is being reviewed by the U.S. Congress and is expected to be acted upon in a Water Resources Development Act of 2000 (**Chapter 10**). Implementation of the Com-

prehensive Plan is estimated to cost $7.8 billion with a 50:50 cost share with the federal government.

Preliminary Implication 1. Restudy implementation should remain synchronized with the LEC Water Supply Plan, Everglades Construction Project and other keystone projects. Information available at this time supports continuation of the current design of the ECP. Restudy staff will continue to synchronize the Restudy with the LEC Water Supply Plan, Everglades Construction Project and the Everglades Stormwater Program. Water quality planning as part of the Comprehensive Plan will build upon water quality plans developed under the Everglades Forever Act, slated for completion by December 31, 2003. The building of storage reservoirs, water preserve areas, underground storage wells, treatment wetlands and other structures planned in the Restudy augment the programs initiated under the Everglades Forever Act.

MAJOR FINDINGS ON THE EVERGLADES STORMWATER PROGRAM

A. The Everglades Stormwater Program identified strategies for complying with water quality standards. In April 1998 DEP issued a permit (called the Non-ECP permit) to the District authorizing continued operation of the structures that a) were within the District's control, b) discharged waters into, within or from the Everglades Protection Area, and c) were not included in the Everglades Construction Project. This Non-ECP Permit, being administered by the District's Everglades Stormwater Program, requires the District to adhere to schedules and strategies for achieving and maintaining water quality standards to the maximum extent practicable (**Chapter 11**).

B. The Non-ECP permit also authorizes substantial monitoring and a Regulatory Action Strategy. The District's Everglades Stormwater Program includes a comprehensive monitoring program that will measure the progress of the programs contained in the permit towards achieving water quality standards.

This strategy will apply to all basins discharging into the Everglades Protection Area that are not addressed by the Everglades Construction Project. The Regulatory Action Strategy consists of a 10-step approach to: a) determine areas of water quality concerns within each contributing drainage basin; b) identify potential sources of those concerns; and c) propose corrective actions where needed. (**Chapter 11**). The Stormwater Program also includes water quality monitoring and reporting, water quality improvement plans and financial assessments for eight tributary basins.

Preliminary Implication 1. The success of the Everglades Stormwater Program is linked to ongoing research efforts. The District's ongoing research programs, including advanced treatment technology and BMP research, may assist the ESP efforts to achieve and maintain compliance with water quality standards beginning December 31, 2006.

Preliminary Implication 2. The Everglades Stormwater Program should be synchronized with the C&SF Restudy, Water Preserve Areas and Miami-Dade County Lake Belt Plan to help ensure efficiency. The structures and basins in the ESP should be part of the Restudy implementation, as well as projects associated with the LEC 2020 Plan. Close coordination between ESP activities and these programs will be essential to maintain a focus on regional restoration.