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September 25, 2009

-VIA HAND DELIVERY -

Ms. Ann Cole
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Re: Docket No. 090007-EI

Dear Ms. Cole:

I am enclosing for filing in the above docket the original and fifteen (15) copies of the revised prefiled testimonies and exhibits of Florida Power & Light Company's witness R.R. LaBauve that were filed on August 3, 2009 (2009 Estimated/Actual True-up) and August 28, 2009 (2010 Projections). The revisions to Mr. LaBauve's prefiled testimonies and exhibits pertain only to correcting the numbering of exhibits and to their references in his testimonies. There are no substantive changes to either the prefiled testimonies or exhibits.

If there are any questions regarding this transmittal, please contact me at 561-304-5639.

Sincerely,

John T. Butler

Enclosures
cc: Counsel for Parties of Record (w/encl.)

BEFORE THE
FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 090007-EI
FLORIDA POWER & LIGHT COMPANY

AUGUST 3, 2009
(REVISED SEPTEMBER 25, 2009)

ENVIRONMENTAL COST RECOVERY

ESTIMATED/ACTUAL TRUE-UP
JANUARY 2009 THROUGH DECEMBER 2009

TESTIMONY & EXHIBITS OF:

R. R. LABAUVE

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

TESTIMONY OF RANDALL R. LABAUVE

DOCKET NO. 090007-EI

August 3, 2009

(REVISED SEPTEMBER 25, 2009)

Q. Please state your name and address.

A. My name is Randall R. LaBauve and my business address is 700 Universe Boulevard, Juno Beach, Florida 33408.

Q. By whom are you employed and in what capacity?

A. I am employed by Florida Power & Light Company (FPL) as Vice President of Environmental Services.

Q. Have you previously testified in predecessors to this docket?

A. Yes, I have.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to present for Commission review and approval FPL's plans for a new environmental compliance project, the Turkey Point Cooling Canal Monitoring Plan (the "CCM Plan").

Q. Have you prepared, or caused to be prepared under your direction, supervision, or control any exhibits in this proceeding?

A. Yes, I am sponsoring the following exhibits:

- RRL-5 – Florida Department of Environmental Protection (FDEP) Conditions of Certification (PA 03-45A2) Special Conditions IX and X.
- RRL-6 - DRAFT Turkey Point Plant Groundwater, Surface Water, and Ecological Monitoring Plan, dated July 16, 2009
- RRL-7 - CCM Plan Objectives and Strategies

Q, Please describe the cooling canal system at the Turkey Point Plant.

A. The cooling canal system is a 5,900-acre closed cycle system that is used by Turkey Point Units 1 through 4 for condenser and auxiliary equipment cooling and by Unit 5 to discharge cooling tower blowdown. This closed cycle system does not have a point source discharge directly into Biscayne Bay, and cooling water is constantly recycled through the plant. Some water is lost via evaporation and seepage. Make-up water principally consists of inflows from groundwater beneath the cooling canals and rainwater. As a result of the natural evaporation process, water in the cooling canal system is hypersaline, meaning that it has a high salt content. The cooling canal system is a permitted industrial wastewater facility.

Q. Please describe current monitoring efforts at the Turkey Point Plant.

A. In 1972, FPL and the South Florida Water Management District (SFWMD) (previously known as the Central and Southern Florida Flood Control) entered into an agreement that defined the current

monitoring efforts for the cooling canal system. Monitoring efforts originally utilized up to 87 monitoring wells. These wells monitored the water in the vicinity of Biscayne Bay and to the west of the cooling canal for temperature and conductivity. Monitoring efforts were scaled back over the years as data being produced and reviewed by regulatory agencies indicated that the operation of the cooling canal system was having no significant impact on the regional environment. The current version of the agreement is the Fourth Supplemental Agreement between FPL and the SFWMD, dated July 15, 1983. Currently, only four groundwater monitoring wells are required to be sampled at quarterly intervals for salinity, temperature and water level.

FPL also monitors surface water elevations along five transects that measure water levels in the westernmost feeder canal in the cooling canal system, the Interceptor Ditch (ID) and the L-31E Canal as part of the Interceptor Ditch Operations Plan within the Turkey Point Plant. These water levels provide input to the operation of the ID to restrict inland movement of cooling canal water.

In addition to these monitoring efforts required by the current agreement, other related but independent monitoring efforts are also ongoing. As part of radiological monitoring requirements for the Nuclear Regulatory Commission, the Florida Department of Health Services conducts quarterly to semi-annual monitoring of direct

radiation, air particulates, surface water, sediment, fish, crustaceans, groundwater and leafy vegetation. To date, no evidence has been found of any radiological levels of concern.

Q. Please describe the environmental law or regulation requiring the CCM Plan.

A. On January 18, 2008, FPL submitted an application for power plant site certification under the Florida Electrical Power Plant Siting Act ("PPSA"), section 403.501 et seq, Florida Statutes for the Turkey Point Uprate Project in Homestead, Florida. On October 29, 2008, the FDEP Siting Office issued the Conditions of Certification (PA 03-45A2). Conditions of Certification IX and X require FPL to develop a monitoring plan for the cooling canal system and the areas surrounding the cooling canal system. Conditions of Certification IX and X are included as Exhibit RRL-5.

Condition IX, "Biscayne Bay Surface Water Monitoring", which is imposed by the FDEP, requires FPL to submit a monitoring plan within 180 days following certification of Units 3 and 4, which will include:

- specific conductivity (salinity) and temperature monitoring within the surface waters of Biscayne Bay, including the Biscayne Bay Aquatic Preserve;
- a minimum of five monitoring stations located near shore in the vicinity of the Turkey Point Plant; and

- specific monitoring locations, sampling frequencies and methods and specific parameters to be monitored.

Condition X, "Surface Water, Ground Water, and Ecological Monitoring" sets the framework for new monitoring and, as may be needed, abatement or mitigation measures for approval of FPL's Turkey Point Units 3 and 4 Uprate Application. This condition is imposed by the SFWMD, Miami-Dade Department of Environmental Resources Management (DERM), and the FDEP and requires the establishment of relevant baseline conditions, determination of the extent and effect of the cooling canal system on the surface water, groundwater, and nearby ecological communities, and detection of changes that may occur as a result of the Uprate Project.

The Conditions of Certification require that the CCM Plan be incorporated into the Fifth Supplemental Agreement and include an assessment of potential impacts to the surface water and groundwater including wetlands, as needed, in the vicinity of the cooling canal system.

The CCM Plan will collect relevant data which will enable a reasonable assessment of the effects of the cooling canal system and the Uprate Project. The resources where the effects are of highest interest include:

- fresh groundwater to the west of the cooling canal system, where groundwater supplies are withdrawn;
- surface water in Biscayne Bay and littoral zone;
- surface water in adjacent freshwater canals;
- freshwater wetlands immediately to the west of the cooling canal system; and
- coastal wetlands (mangroves) immediately east of the cooling canal system.

Q. Please describe the newly required CCM Plan.

A. On February 18, 2009, pursuant to Conditions IX and X of the FDEP October 29, 2008 Final Order Approving Site Certification, FPL submitted its initial draft of the proposed CCM Plan associated with FPL's Turkey Point Uprate Project to SFWMD. This CCM Plan requires an assessment of baseline conditions to provide information on the vertical and horizontal extent of the hypersaline groundwater plume and the extent and effect of that plume on groundwater and surface water quality, if any. Comments, concerns and requests for revisions or action items have been received from the SFWMD as well as the FDEP, DERM and incorporated into the current draft of the proposed monitoring plan, dated July 16, 2009. The draft CCM Plan is included as Exhibit RRL-6.

The CCM Plan has not yet been finalized or agreed upon by FPL and the agencies and is therefore subject to change based on input from

the agencies. FPL expects the CCM Plan to be approved by mid September 2009.

The objective of FPL's CCM Plan is to implement the Conditions of Certification IX and X, which state that "the Revised Plan shall be designed to be in concurrence with other existing and ongoing monitoring efforts in the area and shall include but not necessarily be limited to surface water, groundwater and water quality monitoring, and ecological monitoring to:

- delineate the vertical and horizontal extent of the hypersaline plume that originates from the cooling canal system and to characterize the water quality including salinity and temperature impacts of this plume for the baseline condition;
- determine the extent and effect of the groundwater plume on surface water quality as a baseline condition; and
- detect changes in the quantity and quality of surface and groundwater over time due to the cooling canal system associated with the Uprate Project. The Revised Plan shall include installation and monitoring of an appropriate network of wells and surface water stations."

Q. Please describe the proposed activities associated with the CCM Plan.

A. The CCM Plan will provide information to determine the extent and effects of the hypersaline cooling canal system water on both surface

and groundwater and its potential impacts on Biscayne Bay and the multi-jurisdictional lands around the Turkey Point Plant. The CCM Plan includes monitoring of surface water, groundwater, and ecological conditions prior to implementation of Uprate modifications and after implementation of the Uprate Project. Prior to the start-up of the Uprate Project and following implementation of the Uprate Project, data will be collected using monitoring that addresses ground and surface water levels, salinity, temperature, tracer components, tidal influences, preferential groundwater flow paths, surface and ground water quality, rainfall, and associated ecological conditions.

Q. Please describe the strategy that FPL will implement to meet the objectives of the CCM Plan.

A. The CCM Plan has been designed to focus on the objectives as they relate to the cooling canal system and the Uprate Project and those resources that may be affected adjacent to the cooling canal system. Exhibit RRL-7 provides the objectives of the CCM Plan and the strategy FPL will implement to meet the objectives.

Q. Please describe the adaptive approach that will be used in the CCM Plan.

A. To effectively build on the information gained as the monitoring effort progresses, an adaptive approach will be utilized. The intent of the adaptive approach is to facilitate the addition or elimination of sampling so that the most relevant information is collected and analyzed. By remaining flexible, the objectives of the CCM Plan can

be more effectively met in a reasonable manner while being fully protective of the environmental resources.

Q. How will results of the CCM Plan be reported?

A. Comprehensive monitoring reports will be submitted for documentation of site conditions and activities. The reports will include a summary of the cooling canal system operations and operational changes that result in changes in physical or chemical characteristics of cooling water effluent or flow rates. A description of monitoring activities, station modifications and station operational summaries, and results of surface and groundwater data collection for the period will be included. The reports will also provide analyses of the key findings from the cooling canal system, including any additional characterization and testing, and the surrounding areas as related to the surface, groundwater, and ecological monitoring efforts. The reports will include a completeness evaluation of specific plan objectives and recommendations for adjustments (additions or deletions) to the monitoring program along with rationales. An updated monitoring schedule will be included in the report.

The reports will be submitted every six months during the pre Uprate period and initially during the post Uprate period. The frequency of report submittals may be allowed to decrease over time pending evaluation of the data and approval by the lead agency.

The semi-annual reports will typically include four to six months of new data that is assessed in conjunction with previous findings. The annual reports will typically have 10 to 12 months of new data.

To facilitate communication and keep the applicable agencies apprised of the monitoring efforts and any significant findings, quarterly meetings will be held. Issues of concern or suggested improvements in the monitoring effort commensurate with focused objectives of the Conditions of Certification should be discussed.

Q. When will FPL begin the CCM Plan?

A. The original date set for completion of negotiations was July 31, 2009, but because the parties were not able to come to an agreement, the completion date has been extended to October 16, 2009. The parties expect to have an approved plan by mid-September; therefore the earliest start date is the middle of September, 2009.

Q. Has FPL estimated the cost of the proposed CCM Plan?

A. Yes. O&M and Capital estimates for the total project are $7.2 million and $2.7 million, respectively.

Q. Has FPL estimated its 2009 ECRC recovery amount for the CCM Plan?

A. O&M and Capital estimates for 2009 are $200,000 and $800,000, respectively. These costs are associated with the purchase of probes, wiring calibrations, flow meters, solar panels and batteries, as well as creating transects for ecological monitoring and a bathymetric survey.

These activities may be modified per the approval of the final CCM Plan expected in September, 2009.

Q. Has FPL estimated its 2010 ECRC recovery amount for the CCM Plan?

A. O&M and Capital estimates for 2010 are $3,400,000 and $1,800,000 respectively. These costs are associated with project management, electronic data set-up and management, installation of well clusters, conducting ecological monitoring, instrument maintenance and preparing reports. As mentioned above, required activities may be modified per the approval of the final CCM Plan expected in September, 2009.

Q. How will FPL ensure that the costs incurred are prudent and reasonable?

A. FPL will use competitive bidding for this project. FPL maintains a strong market presence allowing it to leverage corporate-wide procurement activities to the specific benefit of individual project procurement activities. Maintaining a relationship with a range of service providers, when available, offers the opportunity to assess capabilities, respond to changing resource loads and remain knowledgeable of current market trends and cost of service.

Q. How is the current monitoring effort at FPL's Turkey Point Plant being recovered?

A. Costs associated with the current monitoring efforts at the Turkey Point Plant are being recovered through FPL's current base rates.

Costs associated with the current interceptor ditch operation and monitoring of the four remaining wells are approximately $50,000 per year. The current draft of the CCM Plan calls for the installation of several more monitoring wells and monitoring equipment at various locations in and around the Turkey Point Plant, as well as data collection and reporting. These activities will be incremental to FPL's current monitoring efforts.

Q. Is FPL recovering through any other mechanism the costs for the CCM Plan for which it is petitioning for ECRC recovery?

A. No. FPL is only requesting recovery of incremental activities associated the CCM Plan. The costs associated with the current monitoring efforts are not included in FPL's estimates for the CCM Plan.

Q. What are the next steps after the data is gathered and the reports are written?

A. If the FDEP, in consultation with SFWMD and DERM, determines that the pre- and post-Uprate monitoring data: (1) is insufficient to evaluate changes as a result of this project; (2) indicates harm or potential harm to the waters of the State including ecological resources; (3) exceeds State or County water quality standards; or (4) is inconsistent with the goals and objectives of the CERP Biscayne Bay Coastal Wetlands Project, then additional measures may be required to evaluate or to abate such impacts. The potential additional measures that might be required include but are not limited to:

- the development and application of a 3-dimensional coupled surface and groundwater model (density dependent) to further assess impacts of the Uprate Project on ground and surface waters; such model shall be calibrated and verified using the data collection during the monitoring period;
- mitigation measures to offset such impacts of the Uprate Project necessary to comply with State and local water quality standards, which may include methods and features to reduce and mitigate salinity increases in groundwater including the use of highly treated reuse water for recharge of the Biscayne aquifer or wetlands rehydration;
- operational changes in the cooling canal system to reduce any such impacts; and/or
- other measures to abate impacts as may be described in the revised plan.

Q. Does this conclude your testimony?

A. Yes.

and Light Company effective July 1, 1982, or as may be subsequently revised. (Attached as Exhibit B.)

6. Reservation of Legal Rights

The Department recognizes that the NRC has exclusive authority in certain areas related to the construction and operation of Turkey Point Units 3 and 4. *These conditions of certification do not limit, expand or supersede any federal* requirement or restriction under federal law, regulation, or regulatory approval or license. Compliance with the conditions herein does not constitute a waiver of the applicant's responsibility to comply with all applicable NRC requirements. Applicant's acceptance of these radiological conditions of certification does not, in and of itself, constitute a waiver by Applicant of any claim that any such radiological conditions are invalid under the doctrine of federal preemption or otherwise by law.

7. Annual Radiological Environmental Operating Report

Upon submittal to the NRC, a copy of the Annual Radiological Environmental Operating Report for Turkey Point Units 3 & 4 shall be provided to the Department's Siting Coordination Office.

VIII. INDUSTRIAL WASTE DISCHARGES

Any discharges during construction and operation of Units 3, 4 & 5 shall be in accordance with all applicable provisions of NPDES permit No. FL0001562-004-IW1N (attached as Appendix D) as well as any subsequent modifications, amendments and/or renewals.

IX. BISCAYNE BAY SURFACE WATER MONITORING

As proposed, the Turkey Point Units 3 and 4 uprate project may cause an increase in temperature and salinity in the cooling canal system. Field data is needed in order to determine impacts of the proposed changes in the Turkey Point cooling canal system on Biscayne Bay.

A. Within 180 days following certification of Units 3 & 4, FPL shall submit a Biscayne Bay Surface Water Monitoring Plan (Plan) pursuant to Chapter 62-302, F.A.C. to the DEP Southeast District Office for review and approval. The Plan shall include, at a minimum, the following components:

1. salinity and temperature monitoring within the surface waters of the Bay, including the Biscayne Bay Aquatic Preserve; (Specific parameters to be measured, including specific conductance and temperature, shall be sampled in accordance with Chapter 62-160, F.A.C.);

2. a minimum of five monitoring stations located near shore in the vicinity of the Turkey Point Plant; and

3. *specific monitoring locations, sampling frequencies and methods,* and specific parameters to be monitored.

B. This monitoring data shall be compared to data using compatible monitoring instrumentation already in place in Biscayne Bay.

C. FPL shall continue the monitoring of salinity and temperature in the cooling canals under its industrial waste water facility permit.

D. If the Department determines that the pre- and post-Uprate salinity and temperature monitoring data indicate potential adverse changes in the surface water in Biscayne Bay, then the Department may propose additional measures to evaluate or to abate such impacts to Biscayne Bay.

E. The Plan, including monitoring locations, shall be approved prior to implementation. *The Department shall indicate its approval or disapproval of the* submitted plan within 90 days of the originally submitted information. In the event that the Department requires additional information for the licensee to complete, and the Department to approve the Plan, the Department shall make a written request to the licensee for additional information no later than 30 days after receipt of the submitted information. Any changes to the approved Surface Water Monitoring Plan shall be approved by Coastal and Aquatic Managed Areas personnel in consultation with other FDEP personnel.

[62-160, 62-302, 62-302.700, 62-520.600, F.A.C.]

X. SURFACE WATER, GROUND WATER, ECOLOGICAL MONITORING

This is a consolidated condition agreed upon by three agencies, Department of Environmental Protection (DEP), Miami-Dade County Department of Environmental Resource Management (DERM) and the South Florida Water Management District (SFWMD). This consolidated condition sets forth the framework for new monitoring and, as may be needed, abatement or mitigation measures, for approval of FPL's Turkey Point Units 3 and 4 Uprate Application. Specific monitoring and potential modeling parameters will be identified and implemented pursuant to a monitoring plan as part of a supplemental agreement between FPL and the SFWMD as described below.

A. In addition to the monitoring framework set forth in this consolidated condition, within 180 days after Certification, FPL shall execute a SFWMD approved Fifth Supplemental Turkey Point Agreement ("Fifth Supplemental Agreement") to the original 1972 Agreement between FPL and the SFWMD pertaining to FPL's obligation to monitor for impacts of the Turkey Point cooling canal system on the water resources of the SFWMD in general and the facilities and operations of the SFWMD (the "Agreement"). Subject to the SFWMD's approval, FPL shall also amend the Agreement's Revised Operating Manual as referenced in paragraph C. "Monitoring Provisions" (the "Revised Plan") of the Fourth Supplemental Agreement, dated July 15,

1983. The Revised Plan shall be incorporated into the Fifth Supplemental Agreement and shall include assessment of potential impacts to surface water and ground water including wetlands, as needed, in the vicinity of the cooling canal system. The specific monitoring boundaries shall be determined as part of the Revised Plan.

B. The Revised Plan shall be designed to be in concurrence with other existing and ongoing monitoring efforts in the area and shall include but not necessarily be limited to, surface water, groundwater and water quality monitoring, and ecological monitoring to:

1. delineate the vertical and horizontal extent of the hyper-saline plume that originates from the cooling canal system and to characterize the water quality including salinity and temperature impacts of this plume for the baseline condition;

2. determine the extent and effect of the groundwater plume on surface water quality as a baseline condition; and

3. detect changes in the quantity and quality of surface and ground water over time due to the cooling canal system associated with the Uprate project. The Revised Plan shall include installation and monitoring of an appropriate network of wells and surface water stations. The Revised Plan shall be approved by the SFWMD in consultation with the DEP Office of Coastal and Aquatic Managed Areas, the DEP Southeast District Office and DERM.

C. FPL shall transmit electronic copies of all data and reports required under the Fifth Supplemental Agreement and the Revised Plan in accordance with timeframes as approved in the Fifth Supplemental Agreement to:

SFWMD, Director, Water Supply (or alternative transmittal procedures to be described in the Fifth Supplemental Agreement);

Miami-Dade County, Director, DERM;

DEP, Director, Southeast District Office;

DEP Siting Coordination Office

DEP, Director, Biscayne Bay Aquatic Preserve Manager,

D. If the DEP in consultation with SFWMD and DERM determines that the pre- and post-Uprate monitoring data: is insufficient to evaluate changes as a result of this project; indicates harm or potential harm to the waters of the State including ecological resources; exceeds State or County water quality standards; or is inconsistent with the goals and objectives of the CERP Biscayne Bay Coastal Wetlands Project, then additional measures, including enhanced monitoring and/or modeling, shall be required to evaluate or to abate such impacts. Additional measures include but are not limited to:

1. the development and application of a 3-dimensional coupled surface and groundwater model (density dependent) to further assess impacts of the

Uprate Project on ground and surface waters; such model shall be calibrated and verified using the data collection during the monitoring period;

2. mitigation measures to offset such impacts of the Uprate Project necessary to comply with State and local water quality standards, which may include methods and features to reduce and mitigate salinity increases in groundwater including the use of highly treated reuse water for recharge of the Biscayne Aquifer or wetlands rehydration;

3. operational changes in the cooling canal system to reduce any such impacts; and/or

4. other measures to abate impacts as may be described in the Revised Plan.

[Sections 373.016, 373.223, F.S.; Rules 40E-4.011, 40E-4.301, 40E-4.302, F.A.C.; Sections 62-302 and 62-520, F.A.C.; Section 24-42, Code of Miami-Dade County, Miami-Dade County Comprehensive Development Master Plan (CDMP) Land Use Element, Conservation Element, Intergovernmental Coordination Element, Coastal Management Element.]

XI. COOLING CANAL SYSTEM

Permits and approvals that regulate the operation of the cooling canal system are incorporated herein and attached as Appendices. These permits and approvals shall be fully enforceable by both the permitting agency and as Conditions of Certification for Units 3 and 4. Any violation of such permits and approvals, where it is determined that Units 3 and 4 are the cause, shall also be a violation of these Conditions of Certification.

XII. WATER MANAGEMENT DISTRICT

A. General

1. If this Certification is transferred, pursuant to Condition IV.O., from the Licensee to another party, the Licensee from whom the Certification is transferred shall remain liable for corrective actions that may be required as a result of any violations that occurred prior to the transfer.

2. This Certification is based in part on the Licensee's submitted information to the SFWMD which reasonably demonstrates that harm to the site water resources will not be caused by the authorized activities. The plans, drawings and design specifications submitted by the Licensee shall be considered the minimum standards for compliance with conditions XI.

3. This project must be constructed, operated and maintained in compliance with and meet all non-procedural requirements set forth in Chapter 373, F.S., and Chapters 40E-2 (Consumptive Use), 40E-3 (Water Wells), and 40E-20 (General Water Use Permits), F.A.C.

TURKEY POINT PLANT GROUNDWATER, SURFACE WATER, AND ECOLOGICAL MONITORING PLAN

June 11, 2009

(as revised by the Agencies on July 16, 2009)

Prepared for:

Florida Power & Light Company

FPL

Prepared by:

ecology and environment, inc.
International Specialists in the Environment

Table of Contents

List of Tables

Table

List of Figures

Figure

Acronyms and Abbreviations

BBAP	Biscayne Bay Aquatic Preserve
BBCW	Biscayne Bay Coastal Wetlands
BBSW	Biscayne Bay Surface Water
BBGW	Biscayne Bay Groundwater
BBSWGW	Biscayne Bay Surface Water and Groundwater
BNP	Biscayne National Park
BOD	Biological Oxygen Demand
B^{+}	Boron ion
Br^{-}	Bromide ion
BSL	Below Sea Level
°C	Degrees Celsius
Ca^{2+}	Calcium ion
Cl^{-}	Chloride ion
CCS	Canal Cooling System
CDMP	Comprehensive Development Master Plan
CERP	Comprehensive Everglades Restoration Plan
cm	Centimeter
COD	Chemical Oxygen Demand
CRP	Continuous Resistivity Profiling
D	Deuterium
DBHYDRO	South Florida Water Management District Hydrologic and Environmental Database
DERM	Miami-Dade Department of Environmental Resource Management
DO	Dissolved Oxygen
DTS	Distributed Temperature Sensing
E & E	Ecology and Environment, Inc.
F^{-}	Fluoride ion
°F	Degrees Fahrenheit
F.A.C.	Florida Administrative Code

FDEP	Florida Department of Environmental Protection
FIU	Florida International University
FKAA	Florida Keys Aqueduct Authority
FPL	Florida Power and Light Company
ft	Feet
fpd	Feet Per Day
GSD	Ground Sampling Distance
HCO_3-	Bicarbonate ion
H_2O	Water
ID	Interceptor Ditch
IWWF	Industrial Wastewater Facility
K	Hydraulic Conductivities
K^+	Potassium ion
Kg	kilogram
Km	kilometer
LIDAR	Light Detection and Ranging
M	Meters
µm	Micrometer
Mg^{2+}	Magnesium Cations
mg/L	Milligrams Per Liter
MW	Megawatt
µS	MicroSiemens
Msl	Mean Sea Level
MLW	Mean Low Water
N	Nitrogen
Na	Sodium
NA	Not Applicable
NAD	North American Datum
NAVD	North American Vertical Datum
ND	Not Detectable
NPS	National Park Service
NGVD	National Geodetic Vertical Datum
NSF	National Science Foundation

NTU	Nephelometric Turbidity Units
O	Oxygen
ORP	Oxidation-Reduction Potential
P	Phosphorus
pH	Potential of Hydrogen
ppm	Parts Per Million
Ppt	Parts Per Thousand
PSS78	Practical Salinity Scale of 1978
psu	practical salinity units
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
SFWMD	South Florida Water Management District
$SO4^{2-}$	Sulfate Anion
Spp	Species (plural)
SRP	Soluble Reactive Phosphorus
SWIR	Short-Wave Infrared
T	Tritium
TBD	To Be Determined
TDS	Total Dissolved Solids
TIR	Thermal Infra-Red
TP	Total Phosphorus
TPCSW	Turkey Point Canal Surface Water
TPGW	Turkey Point Groundwater
USACE	United States Army Corps of Engineers
USGS	United States Geologic Survey
VNIR	Visible to Near Infra-Red
WRIR	Water Resources Investigations Report

Add Hydrogen, Nitrogen and Oxygen Isotopes, Add Alkalinity As $CaCo_3$, NRG, EPA, NOAA, DOI, DOH, FWS, RECOVER, GIS, ESRI, MDL, NH_4, NO_x, TKN, TOC, C, P, N, stable carbon isotope ($\delta^{13}C$), SiO_2, DOC, SAV, $\delta^{15}N$, GT

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Introduction

This Monitoring Plan (Plan) has been developed pursuant to Conditions of Certification (COC) IX and X of the Power Plant Site Certification for the Florida Power & Light (FPL) Turkey Point Plant Units 3 and 4 Nuclear Power Plant Unit Combined Cycle Plant # PA 03-45 (Uprate Certification). COC IX and X are attached hereto as Appendix A.

The Plan to be implemented by FPL pursuant to Conditions IX and X of the Units 3 and 4 Uprate Certification incorporates contributions from the Florida Department of Environmental Protection's Office of Coastal and Aquatic Management Areas and its Southeast District Office (collectively, FDEP), the South Florida Water Management District (SFWMD), Miami-Dade County's Department of Environmental Resources Management (DERM) (collectively, the Agencies), and Biscayne National Park.

The Monitoring Plan shall provide information to determine the vertical and horizontal effects and extent of the cooling canal system (CCS) water on both surface and groundwater and ecological conditions surrounding Turkey Point (see Figure 1-1). It includes monitoring of surface water, groundwater, and ecological conditions prior to implementation of Uprate modifications and after implementation of the Uprate. Prior to the start-up of the Uprate and following implementation of the Uprate, data shall be collected using monitoring for ground and surface water levels, specific conductance, temperature, CCS tracer suite constituents, tidal influences, preferential groundwater flow paths, surface and groundwater quality (including CCS constituents), rainfall, and ecological conditions.

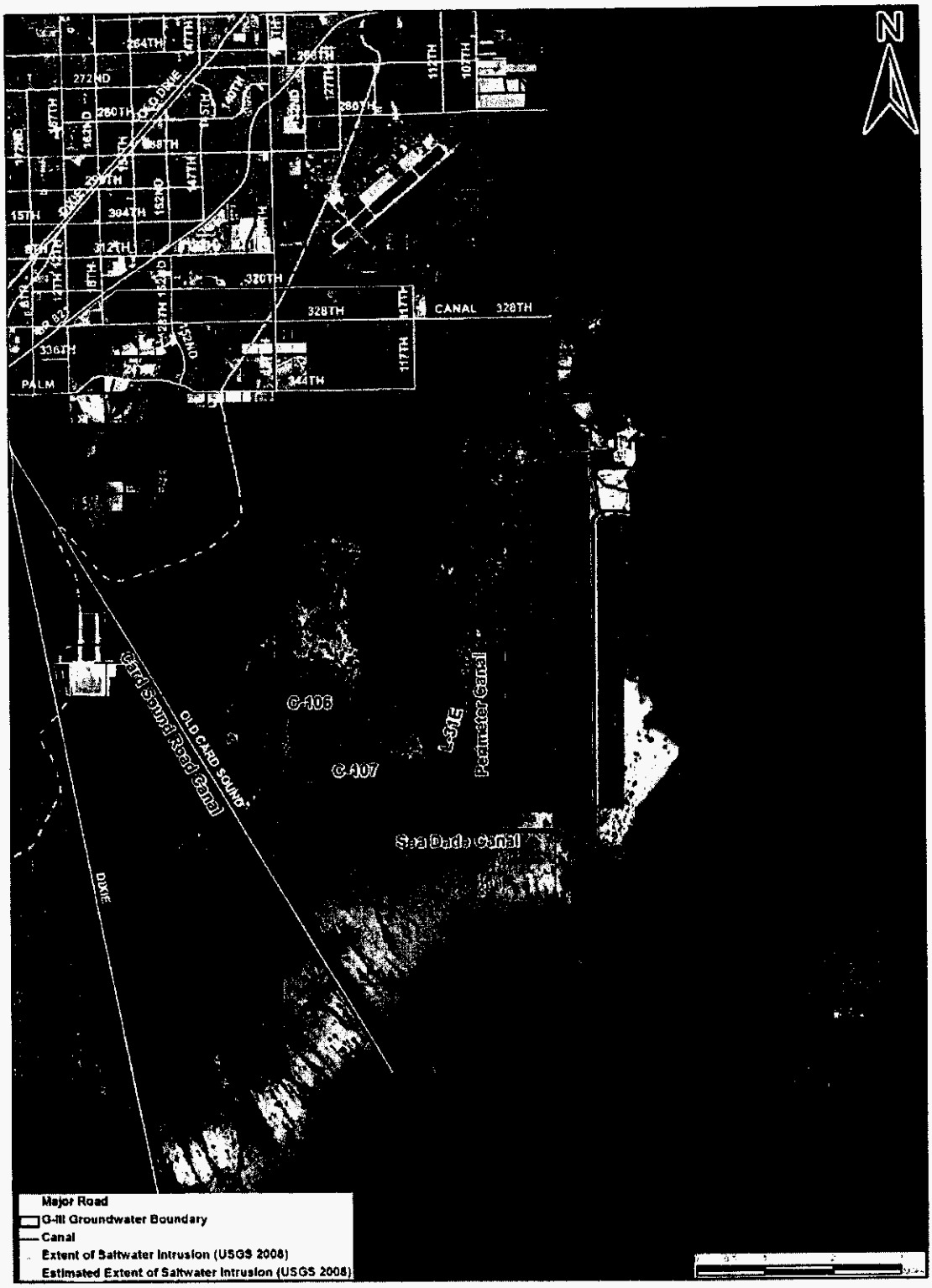

Figure 1-1. Turkey Point Surrounding Habitats. (add in legend G-III should read FPL G-III)

1.1 PLAN MODIFICATION PROCEDURES

The COC includes provisions for the additional measures beyond current Plan specifications as described above. If the SFWMD, in consultation with the FDEP and DERM, determines that the monitoring data:

- is insufficient to evaluate changes as a result of the project; or
- indicates harm or potential harm to the waters of the State including ecological resources; or
- exceed State or County water quality standards; or
- is inconsistent with the goals and objectives of the CERP Biscayne Bay Coastal Wetlands Project,
- then additional measures, including enhanced monitoring and/or modeling, shall be required to evaluate or to abate such impacts as described in COC X.D.(1-4) of the Uprate Certification.

1.1.1 Adaptive Monitoring of Groundwater and Surface Water

The development of this Plan was based on limited existing hydrologic or ecological information. While we expect that most information needs will be met by implementing this Plan, we also expect to learn from the new information collected. New findings may indicate a need to modify the Plan, leading to the collection of additional information (e.g., new parameters, locations, frequencies) and/or decrease in some sampling and analysis. Such an adaptive approach requires timely data analysis, reporting, and initial consensus building regarding Plan modifications.

1.1.2 Adaptive Approach for Ecological Monitoring

It is anticipated that a phased monitoring approach shall be implemented. Both the resistivity surveys and the porewater surveys are considered the first phase (Phase I) of delineating the extent of the CCS plume. These results will be assessed by the SFWMD is consultation with the other Agencies and may be used to refine the hydrologic monitoring design and identify potential areas of concern. Additional hydrologic information derived from surface water and groundwater monitoring during the first year of this program is also likely to provide such insights. This may lead to recommendations for additional sampling locations and/or parameters that may be incorporated into a second phase of the Monitoring Plan (Phase II) as a result of Phase I findings. The details of Phase II monitoring will be considered by all parties and ultimately specified by the Agencies.

The current Plan emphasizes the use of plant communities, as measured along transects, as ecological indicators. A minimum of two years of information

obtained during the pre-Uprate period shall be used to establish a pre-Uprate baseline. This information may also indicate areas (spatial or topical) of special concern, such that Plan modifications are warranted. In particular, transect monitoring within the zones containing stressed vegetation (i.e. atypical mangroves and stunted sawgrass) are considered initial sampling and subject to modification. Other modifications may include the addition of parameters, new locations, or relocation of existing sites. Additional types of monitoring for ecological impacts may need to be added later based on: 1) the data and lessons learned from the initial ecological monitoring described, as well as 2) other things learned based on other biological monitoring that FPL or the Agencies are doing.

1.1.3 Process and Criteria for Plan Modification

The Plan may be modified at any time either by the Agencies or at the recommendations of FPL with Agency approval. Criteria for Plan modification shall be based on the progress toward completion of the objectives of COC IX and X and conditions of the Fifth Supplemental Agreement. Examples of potential Plan modifications are presented below.

- the development and application of a 3-dimensional coupled surface and groundwater model (density dependent), calibrated and verified using the data collection during the monitoring period;
- addition/deletion of monitoring stations for plume delineation based on monitoring data submitted;
- addition of monitoring parameters for water quality or tracer(s) based on results of CCS water characterization or new information regarding potential constituents that may be of concern to water quality or ecological resources;
- modifications for calculation of the water budget;
- reduction of monitoring frequencies and/or parameters based on plume stabilization during the post-Uprate monitoring phase; or
- addition or modification of ecological monitoring stations, parameters or sampling locations based on resistivity surveys, porewater surveys, or other available information.

The process of this initial consensus building and decision making for Plan modifications includes: 1) regular technical discussions among the technical experts from partner Agencies and FPL, including a semi-annual meeting to discuss sampling results; 2) review and consideration by all Agencies and FPL of any written recommendation from any agency or FPL for a modification of the Plan; 3) decision making by the Agencies, consistent with COC XD and the revised 2009 Agreement between the SFWMD and FPL (the Fifth Supplemental Agreement). During the meetings, report findings, progress towards the Plan objectives, and Plan modifications being considered by the Agencies or FPL will

be discussed. Consideration of proposed Plan modifications may be initiated by the Agencies or FPL with prior written communication, either within report submittals or separately. Review comments will then be provided within 60 days of the report submittal, which will include detailed descriptions and implementation schedules of Plan modifications approved by the Agencies.

Monitoring and reporting under this Plan shall continue until the SFWMD provides written notice of termination.

2

Proposed Monitoring Plan

2.1 MONITORING DESIGN STRATEGY

The Plan consists of an integrated system of surface, groundwater, porewater, and ecologic sampling. New monitoring wells shall be installed and a hydrogeologic investigation and surface and groundwater monitoring shall be conducted. All stage recorders and groundwater wells (top of casings) shall be referenced to allow comparison of results across the landscape and at depths. Where available or possible, data collected by other entities will be used to further enhance the understanding of baseline conditions and determination of impacts. Ecological monitoring shall be initiated in areas of presumed stress, along transects, and for spatial characterization.

The approach for monitoring existing conditions at the Turkey Point Plant and adjacent environments is to determine the relationship of CCS water and: a) the underlying groundwater in all directions; b) the western freshwater wetlands, and nearby canals; c) adjacent saltwater wetlands; d) the eastern mangrove shoreline; e) the Biscayne Bay littoral zone; and f) within Biscayne Bay and Card Sound. The tracking of the CCS water movement is proposed through a combination of automated monitoring along with manual data collection of water constituents and tracers of CCS water (discussed in Section 2.2, pending).

The monitoring area shall include the CCS and surrounding areas, as shown in Figure 1-1. Portions of the Florida Keys National Marine Sanctuary, Biscayne Bay Aquatic Preserve (BBAP), BNP, and the Model Land Basin are also included. This description is not intended to limit the scope of the monitoring if it indicates that the plume or its effects extend beyond this area.

Details related to CCS monitoring are described in Section 2.2.1; Development of a Water Budget in Section 2.2.2; Groundwater Monitoring (including well installation, locations and sampling) in Section 2.3; Surface Water Station Locations in Section 2.4; and Ecological Monitoring in Section 2.5. Monitoring related to the operation of the ID is provided in Appendix B.

In delineating the horizontal extent of the plume originating from the CCS, this monitoring Plan shall rely on a "tracer suite," to confirm that impacts observed are associated with the CCS. Table 2-1 summarizes parameters and indicates

abbreviations in the Monitoring Plan. Additional parameters not indicated herein may be added as requested by the Agencies without restrictions.

Although shown on maps in the subsequent sections, the exact monitoring locations may need to be adjusted based on access, environmental considerations (i.e., wetland and estuarine impacts), or other findings that warrant placement in an alternative location. Final locations of all sampling sites shall be approved by the SFWMD in consultation with other Agencies prior to placement.

Preliminary investigation into the thermal anomaly located in the NW side of the CCS shall be undertaken after the detailed bathymetric survey (Section 2.2.2 water budget) has taken place. This investigation includes detailed sampling and characterization and shall include surface water sampling for parameters required under the quarterly sampling. The approximate location of the thermal anomaly is from Longitude 80 21 4.79 West, Latitude 25 24 47.13 North, and Longitude 80 21 5.46 West, Latitude 25 24 11.04 North. The exact location should be measured during the bathymetric survey and should be compared to existing reports.

2.2 TRACER SUITE

Pending – Needs to be specified before plan approval

Table 2-1. Elements Proposed for Groundwater/Surface Water Characterization.

Field Parameters[c]	
Temperature (T)	pH
Specific Conductance (conductivity at 25°C) in µS/cm.	Oxidation-Reduction Potential (ORP)
Dissolved Oxygen (DO)	Salinity using the Practical Salinity Scale of 1978 (PSS78)
Percent Oxygen Saturation	
Laboratory Parameters	
CCS tracer suite[c]	
Pending – Needs to be specified before plan approval	
Major Ions[c]:	Nutrients:
Calcium (Ca^{2+})	Nitrogen species:
Sodium (Na^{+})	Ammonia (NH_3)[c] - calculated as NH_3
Magnesium (Mg^{2+})	Ammonium (NH_4^{+}) as N[c]
Potassium (K^{+})	Nitrite (NO_2^{-}) as N[3 c]
Strontium (Sr^{2+})	Nitrate+Nitrite (NO_X) as N[c]
Chloride (Cl^{-})	Total Kjeldahl Nitrogen (TKN)[c]
Bromide (Br^{-})	Total Nitrogen (TN)[c] - calculated
Sulfate (SO_4^{2-})	Phosphorus species:
Fluoride (F^{-})	Total Phosphorus (TP)[c]
Bicarbonate (HCO_3^{-})	Soluble Reactive Phosphorus (SRP)[c]
Boron (B^{+})	Silicate[a]
Alkalinity (ALKA) Alkalinity as $CaCO_3$	Biological Parameters:
Sulfides	Chlorophyll-*a*[a]
	Pheophytin[a]
Total Dissolved Solids (TDS)[c]	
	Other:
	Gross Alpha[a]
Trace Elements[b]:	
Arsenic	Mercury
Barium	Manganese
Beryllium	Molybdenum
Cadmium	Nickel
Chromium (Hexavalent Chromium)	Selenium
Copper	Thallium
Iron	Vanadium
Lead	Zinc

[a] Surface water only, [b] Groundwater only, [c] Both surface and groundwater.

2.2.1 CCS Water Monitoring

The purpose of sampling within the CCS is to characterize the water within it. A total of six stations are proposed along the interior boundary of the CCS and one in the central portion of the CCS (total = 7). These stations (labeled CCS-1 to CCS-7) are located both at the edge and the middle of the CCS system, as well as in the areas that are of the highest and lowest stage. These data shall provide a clear spatial and temporal understanding of the specific conductance and temperature variability within the CCS (Figure 2-1 and Table 2-2).

All stations in the perimeter canals shall have a conductivity, temperature, and depth (CTD) sensor placed approximately one-foot below the surface level, and one approximately one-foot above the bottom of the canal. Stations in shallow water (< 3 ft) shall use one water quality sensor The site in the center of the CCS (CCS-2) shall only have one sensor approximately one-foot above the bottom of the canal; a second sensor is not warranted due to this center canal's shallow depth (~ 3 feet). Sensors shall monitor for temperature, specific conductance (calculated from specific conductivity and temperature) and will help determine the vertical profiles in the CCS canals. Also at each station, water level shall be measured with a fixed senor that is referenced to NGVD 1929 and NAVD 1988 vertical datum.

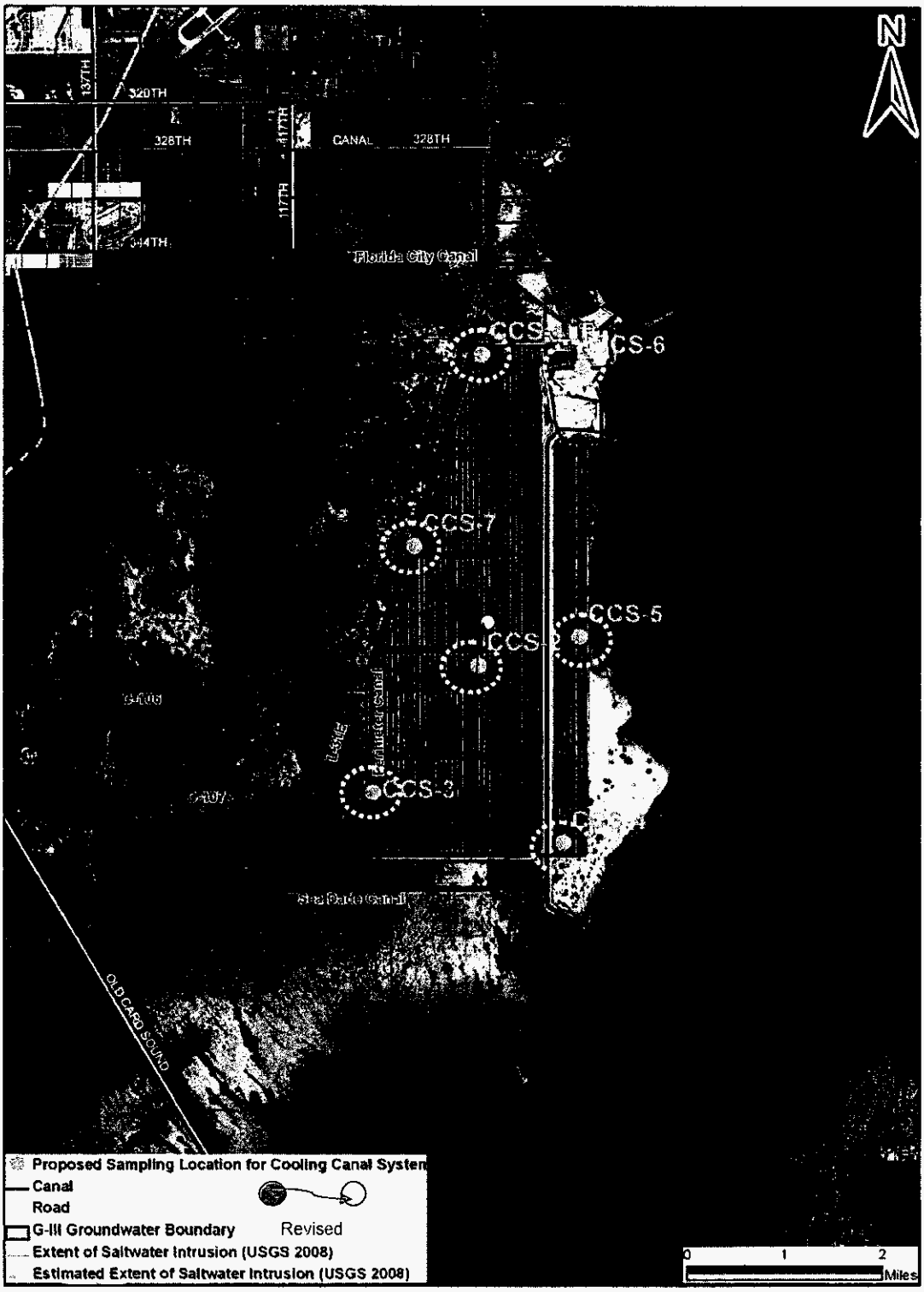

Figure 2-1. Proposed CCS Monitoring Stations. (E &E revise location CCS-2)

Manual water quality monitoring shall be conducted quarterly at the seven CCS stations. Samples shall be collected from each station at each sensor depth with analyses listed in Table 2-1.

Table 2-2. Rationale for the proposed CCS monitoring locations.

Location	Samples	Rationale
Cooling Canal System (CCS) stations: to characterize CCS water and monitor changes Monitoring of water from just below the surface within the CCS and at bottom unless otherwise noted.		
CCS	CCS-1	This site is located in the feeder canal and shall document the specific conductance and temperature of water leaving the plant, where greatest hydraulic stage is observed and shall serve as a station associated with operation of the ID.
	CCS-2	This site is in the middle of the CCS, co-located with TPGW-13, and documents the change in specific conductance and temperature as the water travels down the CCS. This shallow site shall only have one monitoring sensor.
	CCS-3	This site is located in Canal 32 near the southwest corner of the CCS, and will characterize water at this end of the CCS and shall serve as a station associated with operation of the ID.
	CCS-4	This site is located in the Collector Canal at the southeast corner of the CCS, and shall characterize water at this end of the CCS, by the scrub mangrove forest.
	CCS-5	This site is located in the deepest portion of Canal E6 and characterizes the water on its return trajectory back to the plant, nearest the location where DERM has observed atypical mangroves.
	CCS-6	This location in the East Canal measures water as it enters the plant, in the area of lowest hydraulic stage; this site will provide insight into the degree of exchange between CCS and surrounding subsurface hydrology.
	CCS-7	This station is located in Canal 32, halfway down the CCS on the west side and is primarily to serve as a station associated with operation of the ID.

2.2.2 Water Budget and Mass Balance Calculations

Water budget estimates for the CCS were previously computed but proved to be inconsistent in the final volumes (Golder 2008 report; Golder submittal for Uprate; E&E's 2009 letter to SFWMD). Thus, documentation of such volumes has not been accurately documented to date. This new initiative will facilitate improved bathymetric survey work and provide supportive calculations for the volumes of water storage of the CCS.

Developing a water budget for the CCS is essential in evaluating the exchange between the CCS and the regional groundwater, fresh surface waters and Biscayne Bay waters. A key component of the water budget is performing a bathymetric survey that provides the water volume of the CCS concurrently with

station measurements and plant operations, ID operations, surface water and groundwater gradients, rainfall, evaporation and tidal influences. Since the volume of water in the CCS is not static, the relationships with effects of the tides, regional groundwater and surface waters and plant operations must be established to develop the appropriate numerical equation. Once this is completed the volume of the CCS can be properly estimated. An uncertainty analysis of the known and unknown parameters shall be completed. Once the bathymetric survey is completed and the numerical relationship between the tides, regional ground and surface water levels, rainfall, evaporation, and plant operations have been established, the water budget analysis process can begin.

As previously discussed, a one–time bathymetric survey of the CCS and each segment of the ID shall be conducted using sonar equipment, and results shall be tied to an established horizontal and vertical datum's (NGVD 1929 and NAD 1988). The positioning (x, y, and z) is critical and requires the use of a high accuracy GPS navigation system (or RTK survey grade equipment). The accuracy of the system should be decimeter GPS locations with vertical control. The geophysical results shall be converted into rectified electronic data set with specific points and coordinates. From this bathymetric survey, a three-dimensional rectified surface shall be developed in AutoCAD (version 14 or higher) that shows the spatial changes in elevation (depth) within the CCS. The volumetric calculations shall be merged by all field water level data (as outlined under 2.4.2.1 Station Construction Task).

Three rainfall stations shall be set up in the CCS system. One station shall be in the north, one at the GW/SW station in the center at TPGW-13 and one station in the south. Rainfall stations shall not be placed nearby structures that may shadow rain or prevent accuracy in rainfall collection. Rainfall buckets shall collect at the same frequencies as the water level data. Data shall be transmitted to the FPL server daily.

Permanent flow stations shall be established within the CCS with the deployment of acoustic Doppler flow meters. Volumetric flow measurements shall be conducted at three strategic locations in the CCS perimeter canal to aid in the estimation of water inputs and losses during the dry and wet seasons. The "stream gauging" techniques shall be taken at each location concurrently over a period of one day.

These locations are near the plant discharge to the CCS: at the bridge constriction on southeast side of the CCS and near the plant intake. (E &E needs to add location on map). Parameters that need to be collected are summarized below:

- Rainfall averaged from three on-site locations
- Plant intake and outflow (doppler)
- Groundwater and surface water levels in and surrounding the CCS

- ID operations, flows, qualities, and rates for each segment
- Meteorological data (solar radiation, wind speed, wind direction, air temperature, relative humidity, or other components necessary to calculate evaporation) at the CCS level
- Other parameters necessary to complete an accurate water budget

Evaporative losses shall be calculated based on meteorological conditions obtained from a weather station collecting data at TPGW-13 station combined with water temperature collected from the CCS surface water stations. Inflows (timing, duration, and frequency) from the ID shall be monitored electronically and merged with the other water budget components.

A time series volumetric spreadsheet (or equivalent) shall be developed based on actual field data. The spreadsheet shall include all components of the water budget. If the water budget spreadsheet contains summarized variables, all backup up or supportive information shall be included in the deliverables. The water budget report shall break down into monthly averages (January through December) and data shall be summarized yearly and shall be prepared along with a budget of ions and or other tracers using the time frames associated with the collection of ionic water quality. For periods with no water quality collection, the average value shall be used to multiply by the flow calculations to yield an overall monthly flows and loads.

The water budget shall include a breakdown for each contribution. This includes but is not limited to:

- Losses/gains to surficial aquifer vertically
- Losses/gains to Biscayne Bay
- Losses/gains to CCS (rainfall, evaporation)
- Losses/gains to surficial aquifer horizontally
- Losses/gains to Biscayne Bay Surface Water
- Losses/gains to Biscayne Bay Groundwater

The updated water budget shall be well documented using the new information and all estimates and assumptions shall be clearly noted. This shall be calculated on a monthly frequency and summed at the end of each year.

2.3 GROUNDWATER MONITORING

The purpose of groundwater monitoring is described in COC IX and X of the Uprate (see Appendix A).

2.3.1 Groundwater Well Locations

Fish and Stewart (1991) showed that the base of the Biscayne aquifer was approximately 106 feet below sea level (bsl) at the G-3321 well location, adjacent to the northwestern portion of the CCS and the L-31E Canal (Figure 2-2). The base of the Biscayne aquifer at G-3321 is shown within a few feet of the contact between overlying limestone with relatively high hydraulic conductivity [> 1,000 feet per day (fpd)] and underlying sandstone with relatively low hydraulic conductivity (10 to 100 fpd) within the Tamiami Formation.

Based on input with the Agencies (SFWMD, FDEP, DERM), a series of groundwater monitoring stations shall be installed. A total of 14 well clusters are included. Figure 2-2 shows revised locations. These well clusters are spatially distributed to facilitate plume monitoring and are generally aligned along transects to aid in determining concentration gradients on a sub-regional scale. Figure 2-2 and Table 2-3 shows the proposed well locations. The exact installation locations may need to be adjusted based on site-specific conditions (access considerations, minimization of environmental impacts) or permitting constraints.

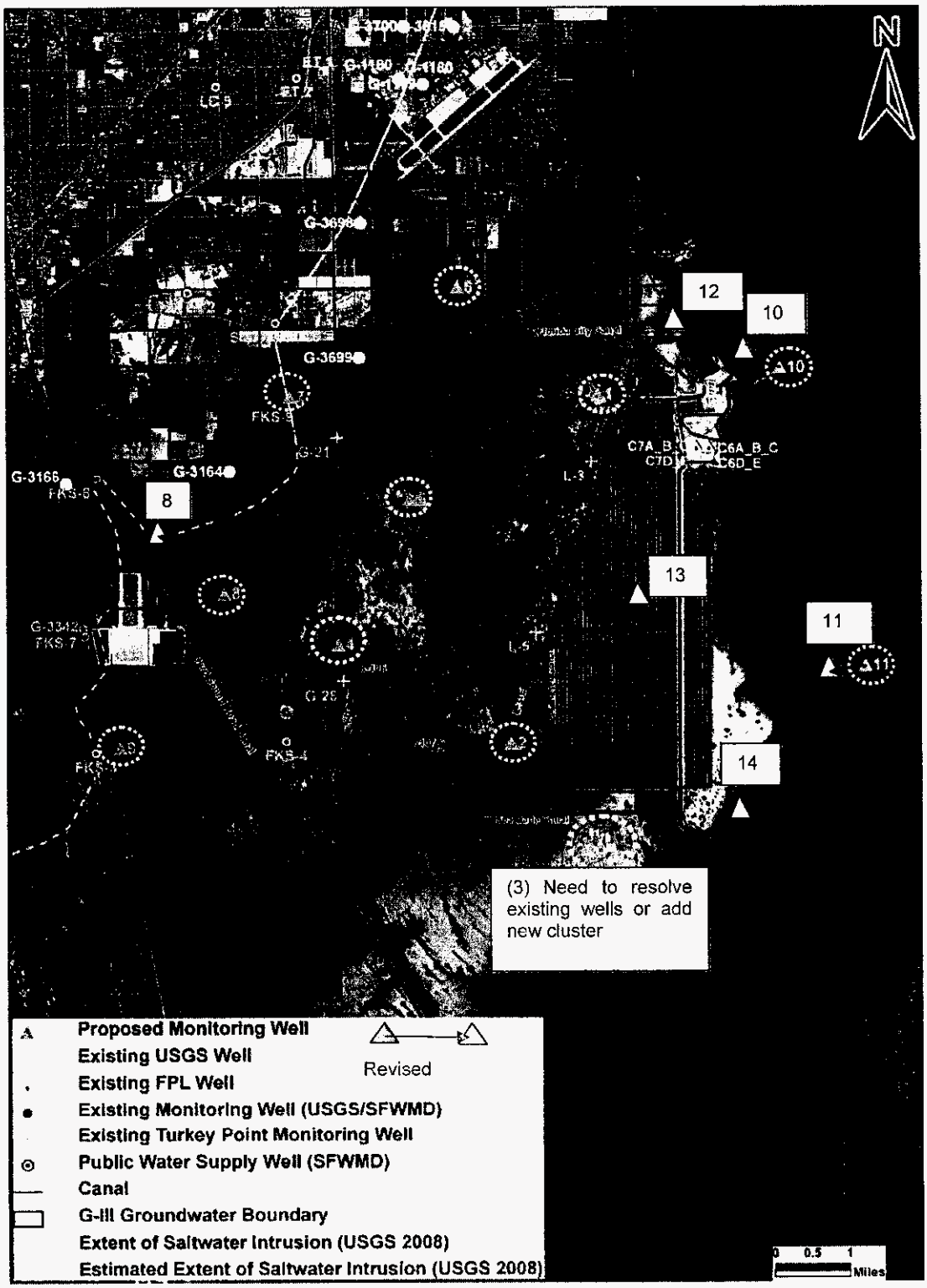

Figure 2-2. Proposed Groundwater Well Cluster Locations. (E & E revise map accordingly)

Table 2-3. Rationale for the proposed groundwater monitoring locations. All locations are approximate until field verification.

Location	Rationale
Groundwater Stations : to establish baseline conditions and delineate limits of CCS plume A cluster of three groundwater monitoring wells at each location to enable sampling from macroporous-permeable zones.	
TPGW-1	Monitor west/northwest of L-31E
TPGW-2	Monitor west of the south-central portion of the CCS.
TPGW-3	Monitor south of the CCS.
TPGW-4	Monitor westward of the CCS.
TPGW-5	Monitor westward of the CCS.
TPGW-6	Monitor northwest of the CCS.
TPGW-7	Monitor west of the CCS and northwest of TPGW-5. Nearest well cluster to Newton Wellfield.
TPGW-8	Monitor west of the CCS and northwest of TPGW-4.
TPGW-9	Reference Well
TPGW-12	Monitor north of the CCS.
TPGW-13	Site is located in the approximate center of the CCS to monitor below the source area of the hypersaline plume.
TPGW-10	Monitor offshore north of the entrance to the barge turning basin.
TPGW-11	Monitor offshore of the CCS in Biscayne Bay.
TPGW-14	Monitor offshore of the CCS in Biscayne Bay.

2.3.2 Groundwater Well Installation

Each well shall be completed with discrete screen intervals in the upper, middle, and lower portions of the Biscayne aquifer, and shall include the base of the plume. To accomplish this task, a pilot hole shall be advanced at each cluster site to delineate to the base of the Biscayne aquifer and characterize the aquifer characteristics and water quality. FPL shall conduct detailed geological sampling in the pilot hole of each cluster. Geological sampling of each pilot hole shall include continuous split spoon (SPT)/core sample collection from surface to total depth. Core samples shall be collected when SPT's are refused. Detailed geological samples shall be correlated to the downhole borehole videos in the final geological report.

Well development shall be conducted on all pilot holes prior to optical borehole imaging and all monitoring wells until field parameters stabilize in accordance with FDEP criteria.

Monitoring well screen intervals shall be site-specific and should represent macroporous and relatively high-permeability zones of the upper, middle, and lower Biscayne aquifer based on the combined results from digital optical imaging (oriented camera system), electromagnetic induction, caliper, flow, conductivity, temperature, gamma ray, full wave form sonic, and borehole logging of the deepest hole (Table 2-4).

In addition, the deepest well at each cluster shall be constructed for periodic (once every year) induction logging across the entire vertical extent of the well. This will enable the monitoring of conductivity changes within the surficial aquifer and potential migration of the plume even in zones that are not screened. Once installed, the network of wells shall be horizontally and vertically surveyed to second order accuracy and referenced to both NGVD 1929 and NAVD 1988 (Appendix C). Well construction requirements to facilitate an electromagnetic induction log are presented in Appendix D.

Table 2-4. Proposed borehole logging methods, descriptions of the properties measured, and types of data obtained.

Type of Log	Properties Measured	Purpose
Optical borehole imaging (OBI)	Imaging of borehole	Determines the 360-degree image of borehole and identify borehole condition and macroporous zones. Provide an oriented optical image of the borehole that compensates for tool spinning.
Induction	Formation and fluid conductivity	Provides data on specific conductance within fluid and formation around the borehole.
Caliper	Borehole diameter	Borehole diameter and determines presence of voids and cavities.
Flow	Flow rate	Identify zones of groundwater flow within borehole.
Temperature	Fluid temperature	Determine temperature variations across depth within borehole.
Gamma Ray	Rock sediment gamma radiation	Provide information on formation characteristics including rock types and changes in lithology.
Full Form Sonic	Lithology and porosity of formation	Provides information on presence and location of potential preferential flow paths.

A well construction spreadsheet supplied by the SFWMD shall be constructed and maintained. The spreadsheet shall include the following parameters: drilling method, geologic sampling method, drilling mud used, well installation date, latitude, longitude, state planar, muck (ground) elevation, ground surface elevation, measuring point at top of casing, depth from TOC, depth at top of screen, screen length, well construction material, screen slot size, gravel pack at screen interval, elevation at top of well screen, elevation at bottom of well screen, centralizers used, project manager, and the source of well information.

Data collected during well installation, including geological sampling (coring or SPT's), detailed lithologic logs, borehole geophysics, digital optical logs, initial induction logs, temperature and flowmeter logs, field water quality data, and well construction details shall be compiled and submitted to Agencies within 30 days of completion of each well. In addition, a summary of well drilling procedures, geophysical logging procedures and instrumentation used shall be provided. Based on wells installed from this monitoring effort and other subsurface geologic data, scaled geologic cross sections, including macroporosity zone and geophysical log overlays, shall be generated and included in the report. This includes information from the induction logs which reveal zones of saline water. In addition, a plan view map showing the location of significant features shall be included. The information generated from this report will enable a better understanding of the movement of groundwater in the area and will provide the basis for interpretation of tracer and water quality monitoring.

2.3.3 Wetland and Biscayne Bay Geophysical Survey

Broad-scale estimates of conductivity surface water and groundwater of wetlands and estuarine regions potentially influenced by the CCS are needed both to assess the spatial extent and magnitude of this influence (including the identification of potential groundwater upwelling zones) and provide information to improve the monitoring design within the adaptive protocols of this Plan. Electromagnetic resistivity surveys from helicopters and boats can provide such broad-scale salinity estimates for both surface water and groundwater (Fitterman and Desczcz-Pan 2001; Swarzenski et al. 2006). Airborne, helicopter-based resistivity surveys, including the wetland areas east of U.S. Highway 1 and Florida City and south of the Mowry Canal, including the CCS and coastal mangrove wetlands, shall be made to map estimated overland surface and groundwater salinity. One overland survey, with generally parallel aerial track lines separated by approximately 1 km or less, shall be made within one year of the acceptance of this Plan.

Either helicopter-based or boat-based electromagnetic resistivity surveys shall be made over Biscayne Bay (south of the latitude of the Mowry Canal) and over Card Sound. This choice should be made after further comparison of the technical capabilities of these two approaches and in consultation with the SFWMD. Two surveys (wet season and dry season) shall be made within one year of the acceptance of this Plan. If airborne surveys are made, tracks shall be separated by 1 km or less. If boat-based surveys are made, relatively fine-scale tracks (less than 1 km apart) shall be made within 3 km of the shoreline from Card Point to the Mowry Canal, but the remaining area of Biscayne Bay (south of this canal) and Card Sound shall be coarsely surveyed with at least 3 transects that cross these bays eastward to Key Largo, Old Rhodes Key, and Elliott Key. Concurrent surveys using ship-board distributed temperature sensing is recommended. All available specific conductance and salinity data from the surveyed terrestrial and estuarine areas should be utilized to provide best estimates of salinity based on resistivity values.

2.3.4 Groundwater Sampling

Each station shall comprise a combination of three monitoring wells at each site, designed to evaluate the extent of CCS influence and to determine hydraulic gradients (vertical and horizontal) with specific focus on macroporous hydrogeologic zones. Each monitoring well shall be instrumented and automatically monitored for groundwater levels, temperature and specific conductance. The sensors in the monitoring wells shall be placed near the midpoint of the screened section of each well. Salinities measured by sensors shall be calculated using the PSS78.

Quarterly monitoring at each groundwater cluster shall consist of field parameters, major ions, TDS and CCS tracer suite as listed in Table 2-1. Semi-annual monitoring at each groundwater cluster shall consist of all of the above plus nitrogen and phosphorus series. In addition, trace elements shall be monitored semi-annually for twelve months in the groundwater clusters (1, 2, 13 and 14) labeled in Figure 2-2. If trace element concentrations exceed primary and secondary drinking water standards in groundwater samples, monitoring for these parameters shall continue and may be expanded to other stations. All applicable samples shall be analyzed in accordance with Chapter 62-160 F.A.C. at an FDEP approved laboratory facility capable of analyzing samples with a wide salinity range (including hypersaline waters).

FPL shall continue to collect all quarterly-data manually (from two depths) from the existing wells L-3, L-5, G-21 and G-28 to compare the information with the new wells, which are more strategically screened. Since there are over 30 years of data from these existing wells, a comparison of the information against nearby wells shall give insight into the accuracy of the historical data. Previously, these wells were monitored quarterly with field instruments. While temperature, specific conductance, and water level shall continue to be monitored with field instruments, samples shall be collected and sent to a laboratory for analysis of the same parameters that shall be the subject of monitoring in the new wells.

To further supplement the groundwater data being collected by FPL, information collected by the others, including but not limited to USGS and the FKAA, may be used upon the Agencies pre-approval. The Agencies will review each proposed well's applicability to the Monitoring Plan based on geologic data and construction details submitted. Currently, the USGS collects chloride data on a semi-annual or quarterly basis and conducts induction logs once a year from a network of coastal wells throughout Miami-Dade County. In some cases there are only a few years of data, and in other cases, over 30 years. Some of these wells are located in the project area and are screened near the base of the Biscayne aquifer.

Figure 2-3 (needs to be revised with updated well cluster locations) provides a summary of the wells that are may be used to supplement the monitoring effort, the associated well depth, and screen interval. Based on input from the USGS, the well construction information on their wells is reliable and all elevations are referenced to NGVD. Further input is needed from FKAA on their wells.

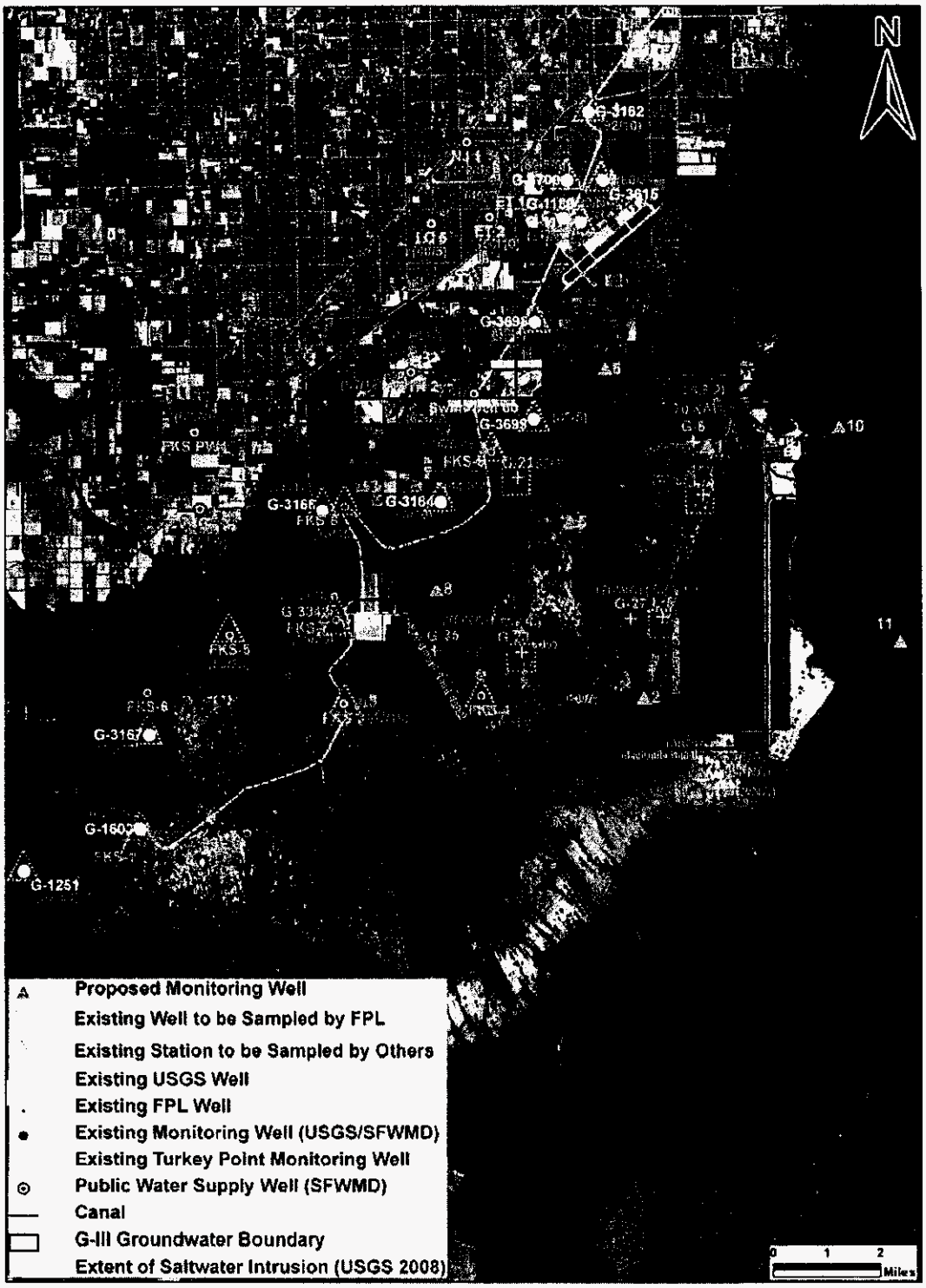

Figure 2-3. Existing Wells Proposed to Supplement Groundwater Monitoring Showing Well Depth / Screen Length.

2.4 SURFACE WATER MONITORING

The purpose of surface water monitoring is described in COC IX and X of the Uprate Certification (see Appendix A). This section focuses on the proposed surface water monitoring in Biscayne Bay and the nearby fresh water and tidal canals, including the L-31E Canal, tidal canal downstream of the S-20 Structure, the Card Sound Canal. Monitoring surface water in the Model Land Basin freshwater wetlands and nearshore mangroves shall be addressed in the Ecological Monitoring section of this Plan.

2.4.1 Surface Water Locations

A total of five surface water stations are proposed in Biscayne Bay, extending offshore along the length of the CCS. BBSW-4 shall be co-located with TPGW-14 while BBSW-3 shall be located with groundwater cluster TPGW-11 (Figure 2-4). Table 2-5 shows the locations of these surface water stations and the rationale for these locations respectively. The exact installation locations may need to be adjusted based on site-specific conditions (access considerations, minimization of environmental impacts) or permitting constraints. The surface water stations shall be located as close to shore as possible, but it is recognized that the water is quite shallow immediately east for much of the CCS.

As shown in Figure 2-4 and Table 2-5, freshwater and surface water stations are proposed at three nontidal surface water locations in the L-31E Canal: one tidal location on the S-20 Discharge Canal, and one tidal location at the Card Sound Canal. A sixth location in the Card Sound Road Canal, away from the influences of the CCS, shall be monitored manually with the quarterly sampling events (Add to figure). This is a reference station and may indicate the Card Sound Road Canal's influence on regional saltwater intrusion and the possible impact on the area between Card Sound Road and the CCS.

The L-31E Canal is the closest freshwater water body to the CCS. The L-31E Canal stations shall serve a dual purpose of providing information for the assessment of CCS influences, as well as supporting the monitoring of water levels for ID operation.

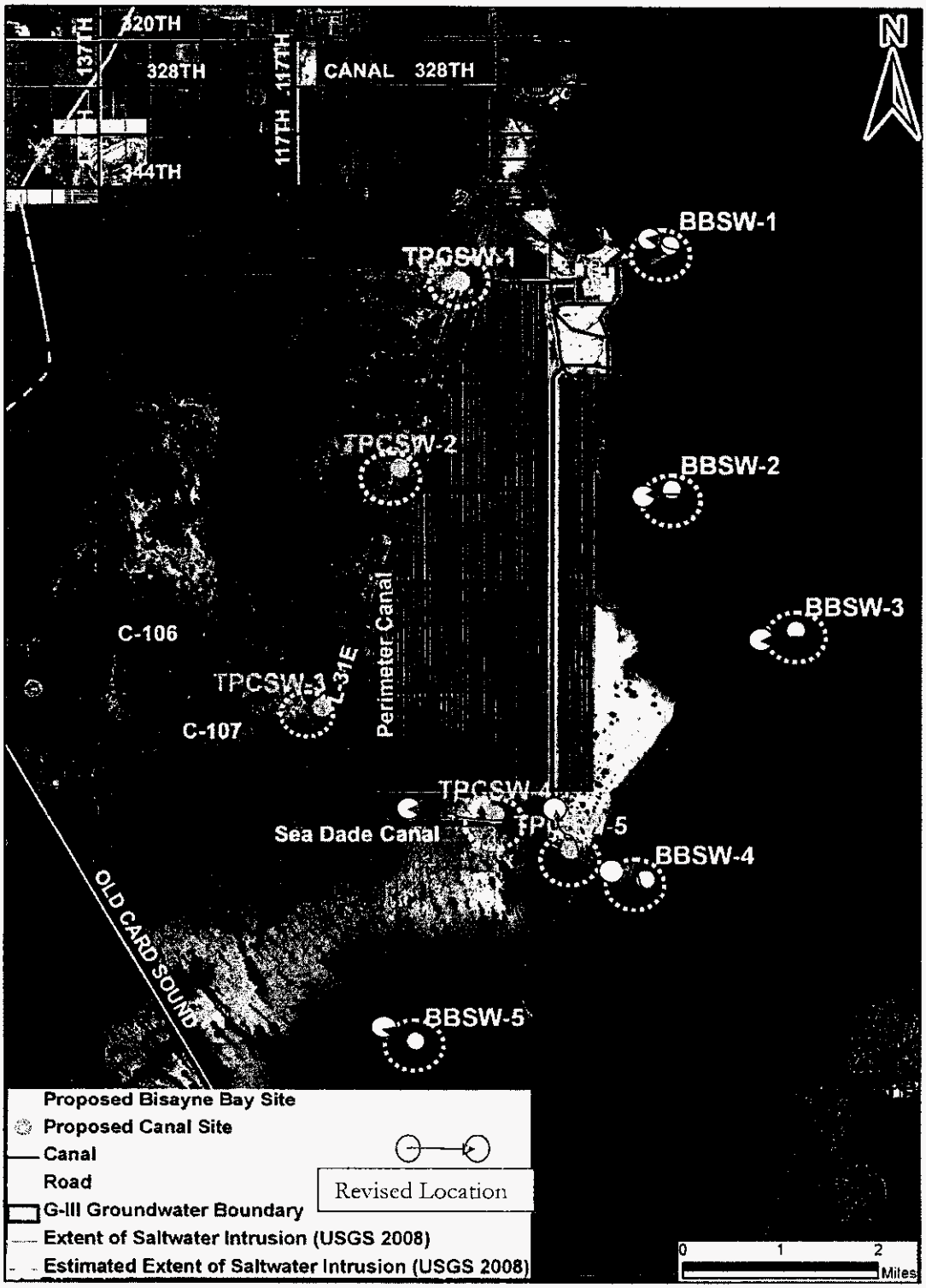

Figure 2-4. Proposed Surface Water Monitoring Sites (need to revise locations).

Table 2-5. Rationale for the proposed surface water monitoring locations.

Location	Sample	Rationale
Biscayne Bay	BBSW-1	This site is in the cut and just offshore the Barge Turning Basin, northeast of the CCS.
	BBSW-2	Located offshore from the scrub mangrove where DERM has observed atypical mangroves to monitor for seepage from the CCS.
	BBSW-3	This site is located near the Arsenicker Keys, just offshore the mangrove forest and co-located with TPGW-11.
	BBSW-4	This site monitors the offshore portion of the CCS south of the Arsenicker Keys and near the mouth of the Card Sound Canal/historical CCS outlet, and co-located with TPGW-14. This site is located in close proximity to a Department of Health radiological monitoring site.
	BBSW-5	This site is located south of the CCS and mitigation bank.
L-31E Canal	TPCSW-1	This site is located northwest of the CCS along ID Transect A to monitor for seepage from the CCS and to aid in the operation of the ID.
	TPCSW -2	This site is located along the middle segment of the CCS and along ID Transect C to monitor for seepage from the CCS and to aid in the operation of the ID.
	TPCSW -3	This site is located by the S-20 structure, at the intersection of the L-31E and C-107 Canals to monitor for seepage from the CCS. It is also part of the ID operations located along Transect E.
S-20 Discharge Canal	TPCSW 4	Sampling station located at the S-20 Discharge Canal. This site shall monitor the extent to which the tidal portions of the drainage canal downstream of the S-20 Structure is affected by the surface waters of the CCS as well as the potential influence of Biscayne Bay on the canal around the CCS.
Card Sound Canal	TPCSW -5	Located in Card Sound Canal, just below the CCS, where manatees have been increasingly observed as reported by DERM.

2.4.2 Surface Water Data Collection

The proposed surface water stations in Biscayne Bay shall measure conditions just above the sediment surface. All stations shall be automated with one set of temperature and conductivity sensors installed horizontally approximately one foot above the sediment surface (Appendix D). All proposed sampling stations in Table 2-5 shall be automated and instrumented similarly to the CCS stations. This will allow for the determination of water level, temperature, and specific conductance at each site.

Data from each surface water station discussed above shall be collected at 15-minute intervals from the top of each hour and remotely uploaded to a database. This monitoring strategy shall allow a continuous assessment of specific conductance and temperature changes in Biscayne Bay and canals in the areas surrounding the Turkey Point Plant. The stage sensors shall be tied to an

established datum (NGVD 1929 and NAVD 1988). All sensors shall be inspected and cleaned as needed.

In addition to the proposed automated monitoring, quarterly monitoring at each surface water station shall consist of field parameters, major ions, and TDS and CCS tracer suite, as listed in Table 2-1. Semi-annual monitoring at each surface water station shall consist of all of the above parameters, and nutrients and biological parameters. Gross Alpha shall be monitored semi-annually for 12 months in all stations located within the cooling system. All applicable samples shall be analyzed in accordance with Chapter 62-160 F.A.C. at an FDEP-approved laboratory facility capable of analyzing samples with a wide specific conductance range (including hypersaline waters).

In addition to the data currently collected, where possible, additional data from other entities (Figure 2-6) such as BNP, NRC, USACE, EPA, NOAA, DOI, NPS, DOH, USGS, FWS, DERM and other local governments, and SFWMD will be added to the information collected from this effort to form a more comprehensive understanding of this area. BNP monitors salinity at 34 sites in the area at the same 15-minute sampling frequency (Bellmund et al. 2007), and the sites around the CCS (BISC08B, BISC12B, and BISC13S) will be used to complement the monitoring efforts. Information available from the sampling network in BNP, Audubon Society's nearby sites, and the SFWMD Water Quality sampling network will be reviewed for relevance and applicability in the inclusion of data reporting. Other data that will support this monitoring effort include the SFWMD operations of the S-20 structure, since that affects the water quality at TPCSW-4.

2.4.2.1 Station Construction Tasks/Testing

To maximize implementation of the Plan, it is important to install the surface water stations and groundwater wells in specific steps that are required to initialize other subsequent steps of the Plan. A key component of the water budget (Section 2.2.2) is performing a bathymetric survey that provides the water volume of the CCS concurrently with station measurements and plant operations, ID operations, surface water and groundwater gradients, rainfall, evaporation and tidal influences. Since it will take several days and several tidal cycles to collect the bathymetric survey data, it is important to relate the data collected from the survey back to the elevation of the surficial water tables, surface water elevations, and the elevation of the CCS. To complete this task, it is necessary to complete the well/surface water clusters in the list presented below before conducting the bathymetric survey.

All Biscayne Bay Groundwater/surface water locations:

- CCS Groundwater/surface water location in the center (TPGW-13) of the CCS
- CCS Surface water level and WQ locations
- ID and L-31E Surface water level and WQ locations
- GW Stations at the North (TPGW-12)
- GW Stations at the South (STATION NEEDS TO BE ADDED)
- GW Stations at the TPGW-3
- GW Stations at the TPGW-2

Items listed above are all related to the bathymetric survey. Once the tasks above are completed, the bathymetric survey shall be conducted as described under the Water Budget section (Section 2.2.2).

2.5 ECOLOGICAL MONITORING

2.5.1 Overview and Strategy

The purpose of ecological monitoring is described in COC IX and X of the Uprate (see Appendix A). Ecological monitoring is necessary to establish the current, pre-Uprate status of major ecological conditions and biotic components, the extent to which CCS operations impact conditions and components, and the extent to which Uprate implementation further impacts and changes these conditions and components. Ecological conditions of primary (but not exclusive) interest, related to CCS operations and ecological responses, are salinity, a tracer set of CCS water, and nutrients. Biotic components of primary interest are marsh vegetation (freshwater graminoid and woody), mangrove, submerged aquatic vegetation (SAV), and benthic fauna in and adjacent to Biscayne Bay.

The strategy employed for this Plan is as follows:

- Spatially characterize ecological conditions via broad reconnaissance surveys within one year of Plan approval. These surveys include resistivity surveys of freshwater marsh, Biscayne Bay, and Card Sound (see Section 2.3.3), along with sampling of specific conductance and a CCS tracer suite within the upper 50 cm of soils, sediments, or other bottom-types;
- Within one month of Plan approval, begin identifying areas of potential CCS impact. This will be accomplished by synthesizing existing data relating to the distribution and density of vegetation

using observations and cursory analysis of historical aerial photography;

- Initiate assessment of these impacted areas immediately after they have been spatially identified;
- Establish transects and plots in freshwater marshes, including sampling of specific conductance and a CCS tracer suite, and nutrients in soils and sediments;
- Initiate Biscayne Bay benthic SAV and faunal assessment; and
- Document broad-scale vegetation patterns via pre- and post-Uprate aerial photographic surveys.

2.5.2 Design

The ecological monitoring is based on a BACI (Before-After-Control-Impact) approach. Three zones (freshwater marshes, saline/coastal wetlands, and Biscayne Bay and Card Sound) shall be assessed continuously pre- and post-Uprate. Results shall be compared with changes over this time in reference areas that are ecologically similar, with exposure to similar environmental factors other than CCS operations. The "Triangle Area," between Card Sound Road and US Highway 1 of the Model Lands, is proposed to be the reference area (Figure 2-5). At a minimum, two years of pre-Uprate monitoring shall be performed. Additionally, some measurements shall be taken within the CCS.

Within each zone, a slightly different sampling design is recommended. A transect design is to be used within the northern, eastern, western, and southern marshes (Figure 2-5). Areas that have been identified as containing stressed or atypical vegetation patterns shall be included in the transects and subject to additional evaluation. These stressed areas include the following locations:

1) an atypical mangrove area, east of the CCS (25.41°N, 80.32°W)
2) short fringe mangroves, south of the Sea Dade Canal (25.34°N, 80.33°W)
3) stunted sawgrass site, west of CCS (25.43°N, 80.35°W)
4) pond area in saltwater mangrove area east of CCS (25.3799°N, 80.3268°W)
5) nearshore benthic features within Card Sound (25.4072°N, 80.3273°W)

A transect approach shall also be used in the mangrove wetlands east of the CCS, but because of the small area involved and structure of existing or remnant creeks, these transects may be modified over time to spatially conform with landscape features and areas of potential impact. Within Biscayne Bay and Card Sound, a combination of nearshore-offshore transects and nearshore areal sampling shall be used. For any of these zones, additional study sites shall be added at locations where specific CCS influence is subsequently identified or

concerns are noted (e.g., sites of CCS derived groundwater upwelling) and/or other concerns are noted.

2.5.3 Initial Ecological Condition Characterization

Assessment of biotic responses to CCS operations requires information on the spatial distribution of environmental conditions that affect biota and are potentially influenced by CCS water. A condition of primary interest is specific conductance (especially soil and sediment specific conductance for vascular plants), but other conditions (such as temperature and nutrients) are important ecological factors. Measurement of a CCS tracer suite is essential to establish the extent of CCS connectivity in a given adjacent zone. Initial information on salinity distribution will be derived from two sources: 1) electromagnetic resistivity surveys (Section 2.3.3) of wetlands, the CCS, Biscayne Bay and Card Sound; and 2) porewater surveys of these areas, including the freshwater and saline wetlands adjacent to the CCS and Biscayne Bay and Card Sound. Porewater shall be analyzed for conductivity within the root zone (about 30 cm deep, but limited to the top 50 cm), along with the CCS tracer suite analysis at a subset of locations. Results from these surveys shall identify zones of CCS water connectivity with surface sediments and soils via seepage and groundwater pathways, providing information on potential ecological influence of the CCS, as well as a basis to improve the monitoring design within the adaptive protocols of this Plan.

The resistivity surveys, described in Section 2.3.3, shall encompass the wetland areas adjacent to the CCS, the CCS, and Biscayne Bay and Card Sound. Results from these surveys will be used to locate potential upwelling zones containing CCS water. A minimum of one survey over land and two seasonal surveys over Biscayne Bay and Card Sound (one wet season and one dry season) shall be completed within the first year of the Plan implementation.

A broad-scale survey of porewater temperature, conductivity, and the CCS tracer suite shall be made in adjacent wetlands and in Biscayne Bay and Card Sound during the first dry season after acceptance of this Monitoring Plan. Specific conductivity and temperature profiles (at 10 cm intervals to 50 cm or bedrock) shall be measured in situ (using field meter and probes) at more than 100 points in the wetland and more than 100 points in Biscayne Bay and Card Sound. The boundaries of the surveyed areas shall be as far west as Tallahassee Road and Card Sound Road south of the L-31E, wetlands, and Biscayne Bay as far north as the Florida City Canal, south to Card Point, and east as far and as 3 km offshore from the Biscayne Bay and Card Sound shoreline. Sample sites shall be approximately even in distribution, but some samples may be taken in areas of special interest (such as apparently stressed areas, tree islands, remnant creeks, or sites where groundwater inputs are suspected). If such areas are found to be distinct from adjacent marsh areas, the transect design (described in the

Freshwater Wetland section below) shall be modified to include these areas. Water level (within wetlands) or water depth (within the Bay) shall also be measured and locations of all sampling shall be tracked and identified by GPS. Following analysis of the survey results, and after consultation with the SFWMD, CCS tracer suite measurements shall be made from porewater in the upper 30 cm of cores collected at a subset of sites that, based on specific conductance results, indicate the strongest CCS influence (with at least 30 samples in each wetland zone and 30 samples in Biscayne Bay and Card Sound). In Biscayne Bay and Card Sound, sampling shall be done during a neap tide period, January through March. A second sampling set may be called for, which may include additional parameters pending the results of this initial porewater survey and the resistivity survey sets.

2.5.4 Vegetation Mapping by Aerial Imaging

The distribution, density, and composition of plant communities shall be mapped pre- and post-Uprate from aerial photography and photo-interpretation. The spatial domain of this effort will be as described above for airborne resistivity flights over wetlands (including both freshwater and saline wetlands to the coastline). All methods for photography and interpretation, including ground-truthing, shall be conducted as described in RECOVER's vegetation mapping of the Everglades. However, in addition to identification of dominant species (plant community classification), the proportion of cover shall be estimated within as a set of 5 categories (with 20% cover increments). Specifications of RECOVER methods are described in two SFWMD Statement of Work documents, which will be provided to all interested parties. Pre-Uprate analysis shall be performed on photographs taken for RECOVER in April 2009, which will be provided by SFWMD to FPL or FPL contractors. Post-Uprate analysis shall be conducted on FPL photos taken two to three years after the initiation of Uprate operations. All FPL vegetation mapping work will be closely coordinated with the SFWMD staff that oversee the RECOVER vegetation mapping, with SFWMD review of FPL procedures, such that any duplication of effort and costs are minimized and data quality is maximized. All data derived from both the RECOVER and FPL efforts will be shared between the organizations. Data shall be reported in an ESRI geo-database and GIS format.

2.5.5 Wetland Transect Locations

Ecological assessment of the wetlands will focus primarily on patterns of plant community status and environmental conditions relevant to this community, along transects emanating from the CCS. The approximate locations are shown in Figure 2-5. Three east-west transects (approximately 6 km long) shall be established through the freshwater wetlands (shown in yellow in Figure 2-5) from the CCS into the Model Land Basin at least as far west as Tallahassee Road. Preliminary locations for these three western transects include an area of special

concern, adjacent to the CCS western boundary, where observations of sparse and stressed vegetation have been made, as well as western areas that are not obviously influenced by the CCS. Three shorter transects shall run from the northern and southern CCS boundary through freshwater wetlands (in yellow) and saline wetlands (in pink) to the Biscayne Bay and Card Sound coastline. Two of these transects traverse wetlands south of the CCS, with one from the southeast corner and one from the southwest corner of the CCS to Card Sound. A single transect traverses wetlands from the northern CCS boundary to (approximately) the mouth of the Florida City Canal. Three additional short transects shall run from the eastern CCS boundary to the coastline in the saline mangrove wetlands (shown in pink in Figure 2-5) with an orientation dictated by the shape of this narrow coastal area and the location of previously identified atypical mangroves growth and mangrove mortality.

A reference transect (in turquoise in Figure 2-5), approximately 9 km long through freshwater and saline wetlands shall also be established in the "Triangle Area." The final location of these transects and the sample sites selected along them shall be subject to the consent of the SFWMD, in consultation with other Agencies.

2.5.6 Freshwater Wetland Transect Assessments

Sampling along all transects shall be at 3 spatial levels (20 m plots, 5 m and 1 m subplots; Figure 2-6). The exact locations of these plots along the transect shall be jointly determined with the Agencies after an initial dry season assessment along each transect, with measurements every 500 m of field porewater specific conductance and temperature depth profiles to 50 cm depth, along with the CCS tracer suite, as described in the Initial Ecological Condition Characterization section. Additionally, dissolved boron in the upper 30 cm of porewater shall be sampled and analyzed. If no differences in specific conductance are observed along a transect, the plots shall be established at equal distances along the length of the transect (Figure 2-6).

Along each western transect, five 20 m x 20 m major plots shall be set up. Eight sub-plots shall be set up per major plot along each transect. This includes four 5 m x 5 m (pink boxes) and 1 m x 1 m (yellow boxes) subplots that shall be randomly established (Figure 2-6). From each major (20m x 20m) plot, species composition and abundance, woody species cover, herbaceous species cover, and canopy height shall be measured. Percent vegetative cover shall be determined from the aerial imagery, while the other parameters shall be determined from ground assessment. Photographs for each plot shall be digitized, and classification of community types defined for each plot.

During the ground assessment, one 5 m x 5 m subplot shall be randomly established within each quadrant of the larger plot (Figure 2-6). Species diversity

and characteristics of woody plant species within each subplot (e.g., height, diameter at breast height) shall be measured. Within the same quadrant, a 1 m x 1 m subplot shall also be randomly established in the marsh to determine the marsh species diversity and density. All sawgrass (*C. jamaicence)* culms and spikerush (*Eleocharis* spp.) stems shall be counted within each subplot. The number of leaves in ten *C. jamaicense* culms shall be counted and measured; similarly, the height of ten *Eleocharis* spp. stems shall be measured. Estimates of plant productivity shall be made in woody vegetation (5x5m) plots from changes in morphology (e.g., diameter at breast height) and leaf litter production. Plant productivity of dominant graminoid species (in 1x1m plots) shall be estimated by leaf biomass turnover measurements. The proposed methodology is consistent with methods used in Everglades National Park by the National Science Foundation (NSF)-funded Long-Term Ecological Research program based out of Florida International University.

Plot (20 m x 20 m) measurements shall be conducted once a year, while the 5 m subplot measurements shall be conducted twice a year, at the end of the wet and dry seasons. Leaf litter production measurements shall be made quarterly. The 1 m subplots shall be measured at three month intervals.

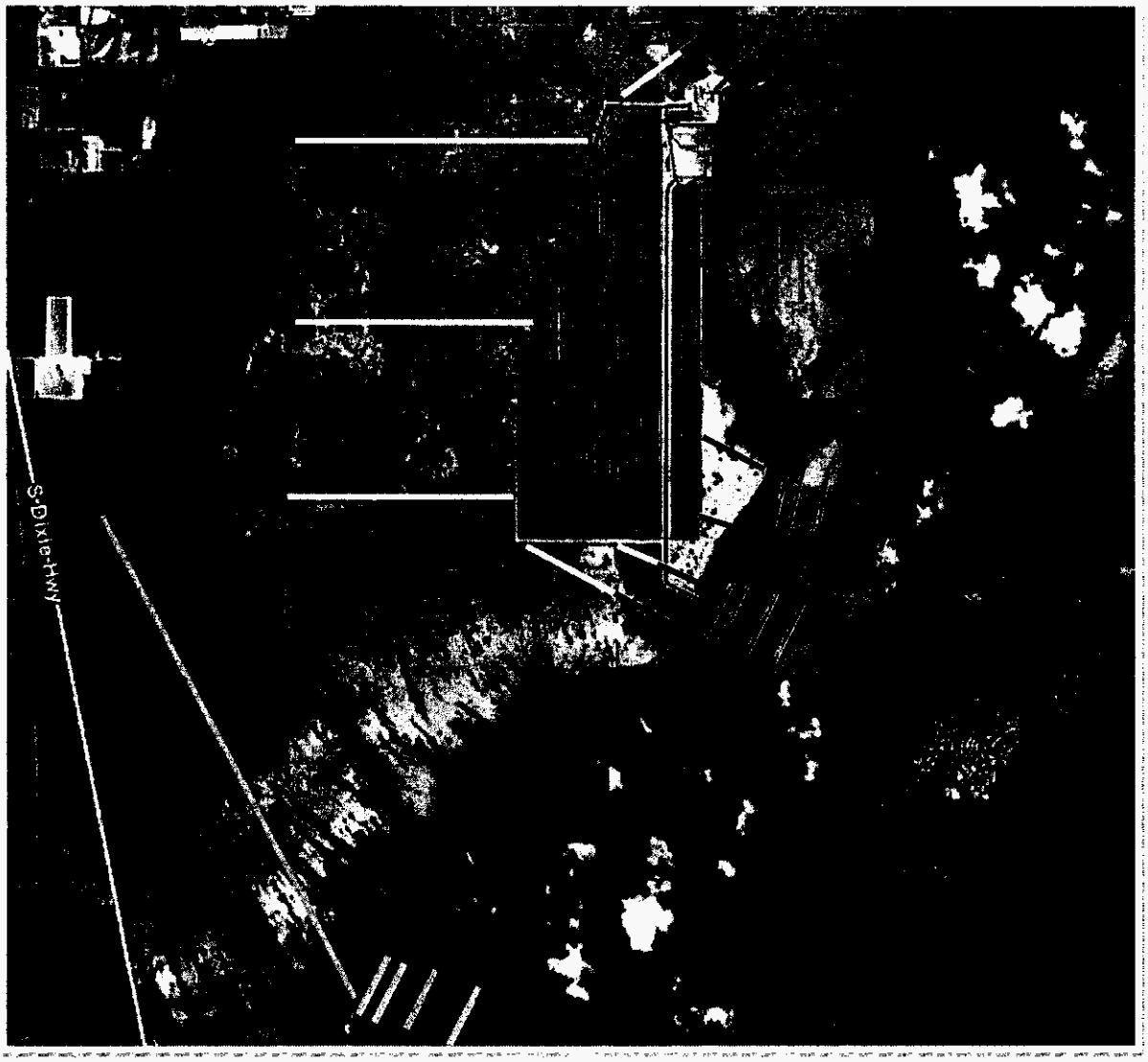

Figure 2-5. Ecological monitoring transects adjacent to the CCS (including freshwater wetlands in yellow and saline wetlands in pink, Biscayne Bay and Card Sound benthic in black) and associated reference transects (in turquoise). Location of the interface of freshwater and saline wetlands shown here is conceptual.

Twice a year (once at the end of the wet and dry seasons), ten leaves/stems of each of the dominant species shall be randomly selected and collected from each plot along each transect for morphological and physiological characterization. Leaf characteristics (i.e., leaf length, width, and thickness, water content) shall be measured prior to the leaves being dried and analyzed for C, N, and P contents, as well for ($\delta^{13}C$). Changes in these plant characteristics over time and among plants within and between transects shall be analyzed for trends and differences.

Water levels, surface water (when present) temperature and specific conductance, soil temperature, and porewater specific conductance and the CCS tracer suite shall be measured at each major plot every 3 months. Porewater nutrients (TP, SRP, NH_4, NO_X, TKN) shall be measured in all subplots twice per year. Bulk soil nutrients (TP, TN, TOC) and bulk density shall be measured in these subplots annually. In major plots with apparently stressed vegetation, sulfide and boron shall also be measured in porewater samples during the first two sampling times to assess these potential stressors. Additionally, specific conductance and temperature shall be measured in L-31E Canal and ID surface waters along the line of these transects.

As described in the Initial Ecological Condition Characterization (Section 2.5.3), the specific conductance and ecological condition of tree islands along potentially remnant streams and other sites of special interest shall be assessed in a preliminary survey. If results from this survey indicate the need for additional information, then additional transects or plots near the three established transects may be added. Sampling shall be consistent with that occurring along transects, but the SFWMD will coordinate Agency review prior to initiation.

Plot site selection, plot design, and sampling along the three shorter freshwater marsh transects north and south of the CCS shall be as described above for the western transects. However, only two major plots shall be established along each of these transects. Plot site selection, plot design, and sampling along the reference freshwater marsh transect within the "Triangle Area" shall be as described above for the western transects, with a total of 5 plots.

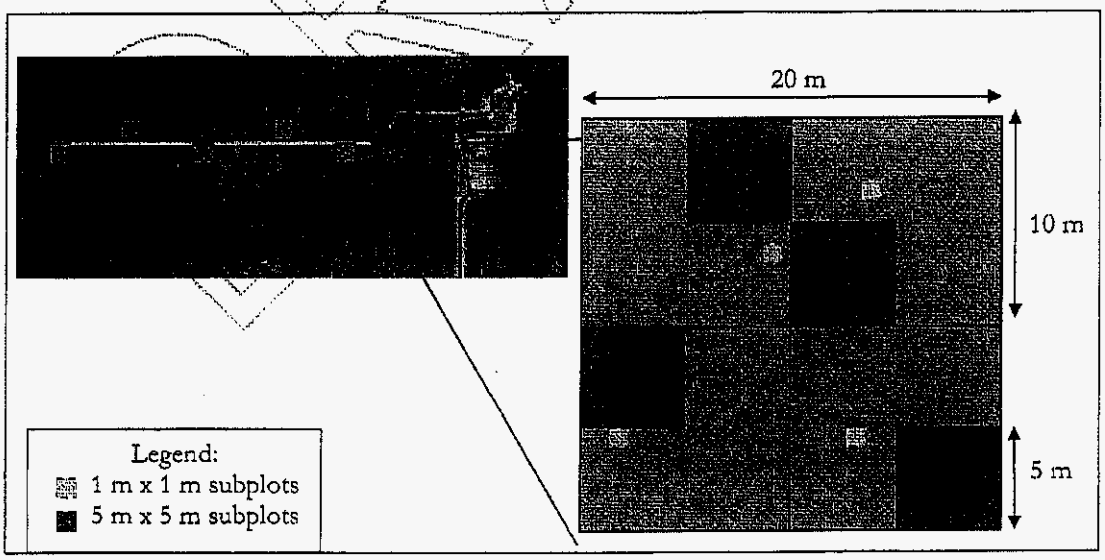

Figure 2-6. Example of a proposed sampling design for ecological monitoring along the transects.

2.5.7 Saline Wetland Transect Assessment

Assessment along the six transects containing saline wetlands (shown in pink in Figure 2-5) shall focus on plant community composition, morphology, productivity, and environmental conditions, similar to that described for the freshwater wetlands. The sampling design shall also be similar, with the establishment of 2 major (20m x 20 m) plots per transect, each with 4 to 8 subplots (pending the presence of herbaceous vegetation). The specific location of these plots shall be determined with the consent of the SFWMD after an initial site survey with porewater salinity, temperature, and the CCS tracer suite measurements as described above. However, along the three short eastern transects, initial site survey points shall be spaced approximately 100 to 200 m apart. The following shall be measured as previously described for freshwater wetlands: plant community composition, cover, canopy height, leaf litter production, and leaf biomass turnover; stage, surface water temperature, and conductivity; and soil temperature, porewater specific conductance, the CCS tracer suite, and nutrients. Additionally, dissolved sulfides shall be measured in saline wetland porewater. Twice a year (at the end of the wet and dry seasons), ten leaves/stems from each of the dominant species shall be randomly selected and collected from each plot along the transect. Leaf characteristics (i.e., leaf length, width, and thickness, water content) shall be measured prior to the leaves being dried and analyzed for C, N, and P contents, as well for $\delta^{13}C$. Changes in these plant characteristics over time and among plants within and among transects shall be analyzed for trends and differences.

The saline coastal portion of the reference transect within the Triangle Area (Figure 2-5) shall also include, at a minimum, 3 major plots and subplots and sampling of these subplots as described for the saline wetlands.

2.5.8 CCS Ecological Measurements

At the time when the transect surveys are conducted, CCS sampling to characterize nutrient concentrations in the sediments of CCS canals shall also be conducted to better understand ecological relationships in adjacent areas. Sampling shall be done along three transects extending from the three western marsh transects (yellow in Figure 2-5) to the three saline marsh transects east of the CCS (pink in Figure 2-5). Measurements shall include nutrients in porewater and bulk sediment. Along each of these transects, five sites shall be selected, including the eastern- and western-most canals. Sediment cores shall be collected two times per year with porewater analysis twice per year, and bulk sediment analysis once per year (as in wetland and Biscayne Bay sampling). Sample depths shall include surface (0-10 cm) and subsurface (40-50 cm) samples. Major dissolved macronutrients (TP, SRP, TKN, NO_X, NH_4, SiO_4, DOC), and micronutrients (Fe and trace metals) in porewater and total nutrients (TP, TN, TOC) and select elements (a subset of those listed in Table 2-1, established in

consultation with the SFWMD after Plan adoption) in the sediments shall be measured.

2.5.9 Biscayne Bay and Card Sound

Ecological monitoring of Biscayne Bay and Card Sound shall focus on documenting benthic biota (submerged aquatic vegetation (SAV), benthic and epibenthic fauna), specific conductance to which these biota are exposed, and a CCS tracer suite to distinguish the extent of CCS connectivity to these conditions. Specific conductance and the CCS tracer suite initially shall be broadly surveyed as described above (see Section 2.5.3). Benthic surveys, and fish and invertebrate sampling, as specified in the Plan shall utilize results from existing monitoring programs within Biscayne Bay to the extent possible. Sample methodology for work in the Plan is consistent with other programs within Biscayne Bay and Card Sound, but is performed in locations near Turkey Point not sampled by the other programs. Data from these programs shall be used for assessment of reference area conditions.

Benthic surveys shall be made using a transect design to discern potential CCS effects as a function of distance from shore. A set of twelve fixed transects (black lines in Figure 2-5), each 2 km long, shall be sampled randomly (along each transect) twice per year. The transects shall be arrayed such that each set includes 4 transects approximately parallel to shore that are 0.5 km, 1.0 km, 2.0 km, and 4.0 km offshore. The array shall include 4 sets of these transects that project from the proposed saline wetland transects: one northern zone (offshore of the power plant), one central zone (offshore of the central CCS), one southern zone (offshore of the Sea Dade Canal - southeast CCS corner), and one reference set in northern Barnes Sound (starting north of Middle Key; in turquoise in Figure 2-5). Sampling shall be done to estimate the species composition, abundance and cover of benthic vegetation (submerged aquatic vegetation, SAV, including macroalgae) and large sessile fauna (e.g., corals and sponges), using the Braun–Blanquet methodology currently used in Florida Bay and Biscayne Bay by RECOVER and other groups (Fourqurean et al. 2001). For each transect and sampling event, 10 points shall be randomly selected, with measurements in 4 quadrats (0.25 m^2 each) per sample point. Sampling times shall be done twice per year, once during the months of March-May and once during the months of August-October.

SAV closer than 0.5 km shall be monitored using video analysis, as in Lirman et al. (2008) along the shoreline from the Florida City Canal to Card Point, plus along the shoreline of northern Barnes Sound from the Card Sound Bridge to Middle Key as a reference area. Surveys should coincide with the timing of the Braun-Blanquet surveys (2 times per year).

Nearshore benthic fauna (small fish and invertebrates, such as pink shrimp) are currently monitored by RECOVER elsewhere in Biscayne Bay and Card Sound (Figure 2-7), but not off the CCS north of Mangrove Point. This Monitoring Plan component shall fill this gap between Mangrove Point and Turkey Point, using the same methods (with 30 throw trap samples per sampling event, twice during the year in the wet season and dry season).

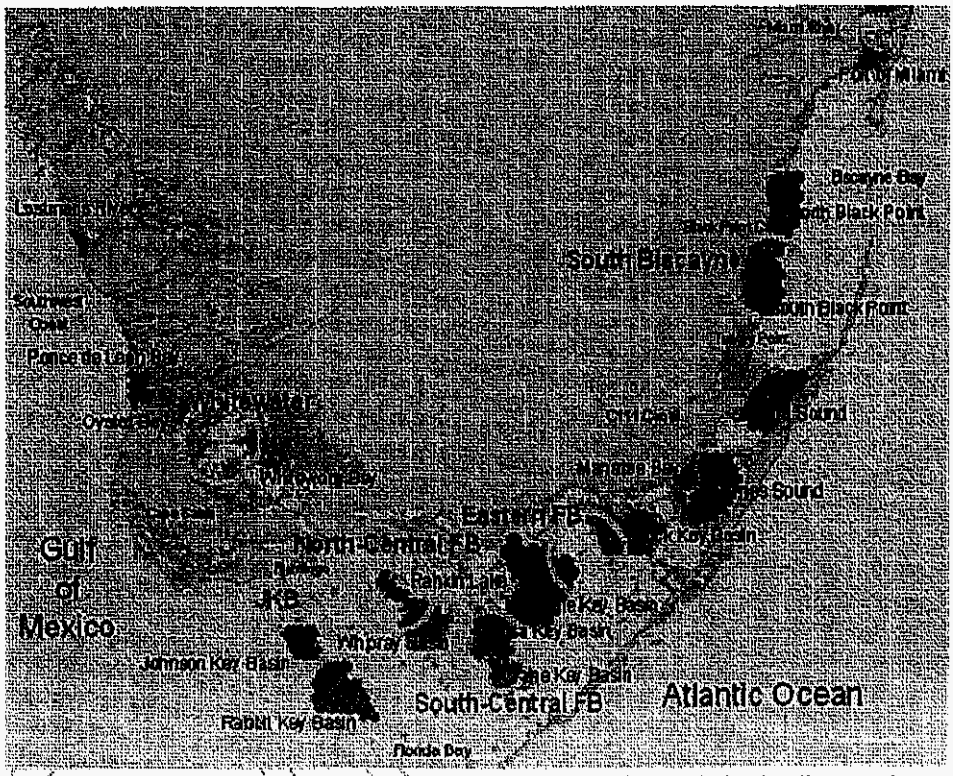

Figure 2-7. Fish and Invertebrate Assessment Network sample basins (in green), funded by RECOVER. (See, http://www.sfrestore.org/scg/scg_meetings/2008_meetings/092508/Pink%20Shrimp%20ASSESSMENT%202008.pdf).

Supporting information, needed to interpret ecological findings, shall be collected along transects and at fish and invertebrate sampling sites. Surface water specific conductance and temperature shall be measured at each site during each sampling event. For each benthic survey transect, light extinction shall be measured at two points per transect. Porewater specific conductance and temperature shall also be measured at each sampling point along these transects, with the CCS tracer suite measured at a subset of points (at least three per transect). Sampling depth shall reflect exposure within the seagrass root zone (upper 30 cm). Nutrients in porewater (as measured in the CCS and wetlands) shall be measured twice per year and bulk sediments shall be measured once per

year at 3 sites per transect (as described in the Wetland sections). Seagrass leaf nutrients from the dominant species (likely turtle grass) along each transect shall also be analyzed once per year for total nutrient content (C, N, P per dry weight), as well as $\delta^{13}C$ and $\delta^{15}N$ ratios.

Table 2-6. Ecologic Monitoring: Transect Sampling.

Zone	Location(s) and number	Surface Water (SW) & Porewater (PW) Parameters	Biotic Parameters	Soil/ Sediment Parameters	Frequency	Description
Fresh Water Wetland	3 east-west transects, 3 (roughly) north-south transects, 1 reference transect (Figure 2-5). All with 3 spatial levels (20 m plots, 5 m and 1 m subplots; Figure 2-6)	SW: stage; temperature, and conductivity, PW: temperature, conductivity, tracer set, nutrients, boron	Plant community composition, cover, canopy height, productivity, leaf characteristics, C, N, P contents, $\delta^{13}C$	Nutrients (TOC,N,P), bulk density	Annual, bi-annual and once every three months depending on plot level (see text)	Additional parameters may be added
CCS	Along each of three transect lines within the CCS. Minimum of 5 sites per transect.	PW: temperature, conductivity, nutrients		Nutrients (C,N,P), bulk density, TOC trace elements	Once or twice per year consistent with timing of wetland transect samplings	Additional parameters may be added
Saline/ Coastal Wetland	Six transects plus reference transect (Figure 2-5), 3 spatial levels (20 m plots, 5 m and 1 m subplots; Figure 2-6)	SW: stage, temperature, conductivity PW: temperature, conductivity, CCS tracer suite, nutrients, and dissolved sulfide	Plant community composition, cover, canopy height, photosynthesis, leaf characteristics , C, N, P contents, $\delta^{13}C$	Nutrients (TOC,N,P), bulk density,	Annual, bi-annual and once every three months depending on plot level (see text	Additional parameters may be added
Biscayne Bay and Card Sound	For SAV and sessile benthic fauna, 4 sets of 4 transects (each 2 km long). Ten random sample points per transect. For nearshore 500 m zone, video SAV survey. For mobile epibenthic fauna, area between Mangrove and Turkey points, 30 stratified random points.	SW: temperature, conductivity, light extinction PW: temperature, conductivity, CCS tracer suite, nutrients	Benthic (SAV, coral, sponge) community composition and cover, salinity, temperature, seagrass leaf nutrients (C,N,P), $\delta^{13}C$, and $\delta^{15}N$, fish and invertebrate species composition and abundance	Nutrients (C,N,P), bulk density, TOC	Two times per year for biota and waters, one time per year for sediments.	Additional parameters may be added

Table 2-7. Ecologic Monitoring: Initial Characterization and Survey Sampling.

Zone	Type	Location(s) and number	Parameter(s)	Frequency	Description
Fresh Water and Saline Wetland	Resistivity Survey	At least as far west as Tallahassee Rd. and Card Sound Road south of the L-31E, at least as far north as the Florida City Canal, south to Card Sound	--	1	
	Porewater Survey	Spatially distributed within freshwater wetlands; minimum of 100 conductivity samples and 50 CCS tracer suite samples	Temperature, conductivity and CCS tracer suite, water level	1-2 times; initiate after Plan authorization	Additional parameters may be added after the first sampling event.
CCS	Resistivity Survey	Entire area of CCS	--	1	
Biscayne Bay	Resistivity Survey	Biscayne Bay south of Florida City Canal and Card Sound	--		
	Porewater Survey	Spatially distributed within 3 km of shore; minimum of 100 conductivity samples and 50 CCS tracer suite samples	Temperature, conductivity and CCS tracer suite	1-2 times; initiate after Plan authorization	Additional parameters may be added after the first sampling event.
All	Aerial Imaging	Entire area of interest	--	Pre- and post-Uprate per Plan specifications	

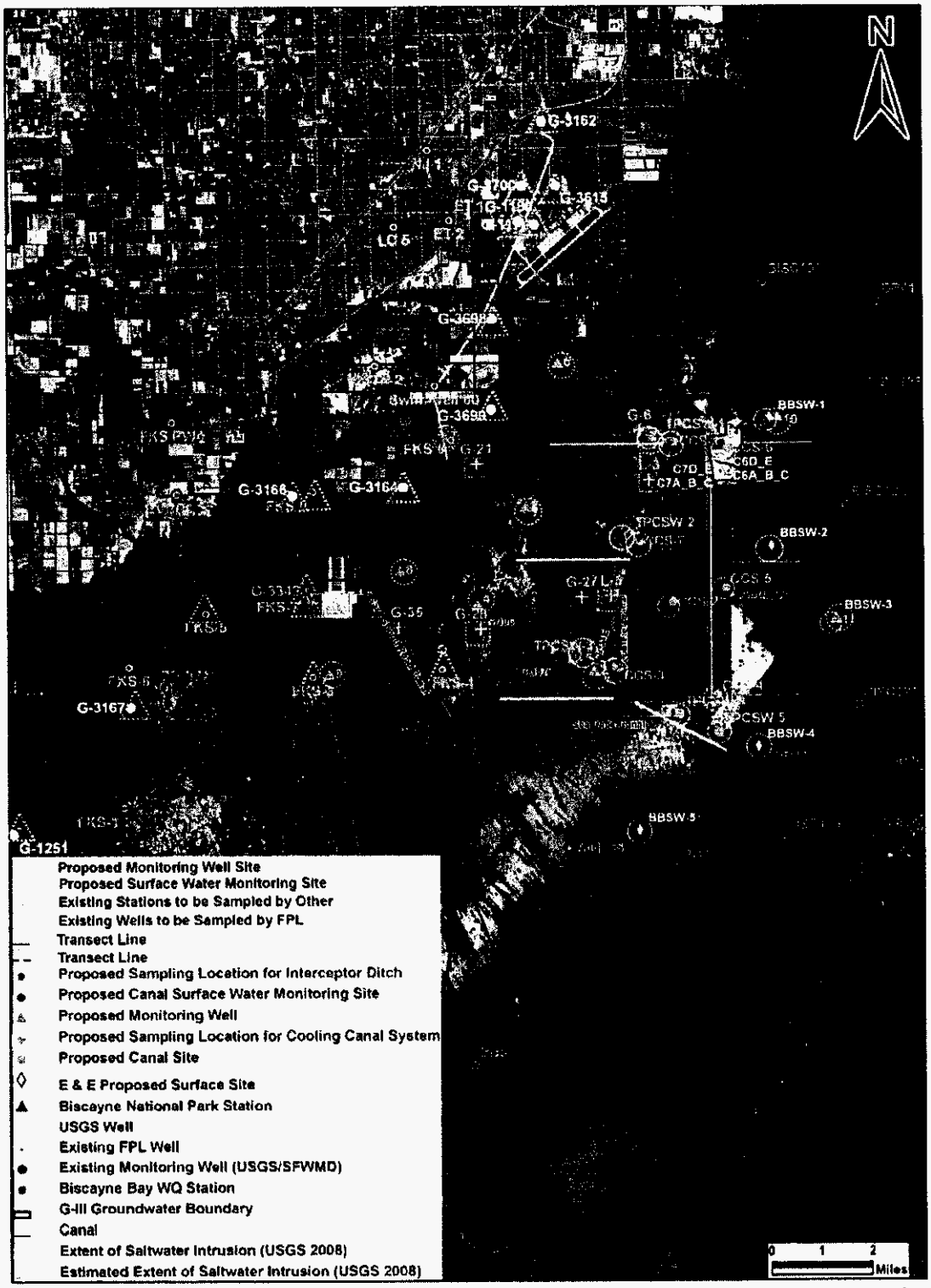

Figure 2-8. Existing and Proposed Monitoring Locations. (E & E need to update maps and locations)

3

Field Notifications Data Collection and Reporting

3.3 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PLAN

Pursuant to Chapter 62-160 F.A.C., a QA/QC Plan shall be prepared and submitted for the Agencies approval within 45 days of this Plan's approval. The QA/QC Plan shall lay out the overall framework to ensure defensible monitoring results and quality reporting. The Plan shall outline procedures used in the field to install wells, manually collect samples, and conduct laboratory analysis. All data collected shall meet SFWMD and FDEP QA/QC requirements. More detailed information related to calibration and maintenance of probes and other automated instrumentation shall be provided. A major part of the QA/QC Plan shall describe data management procedures to ensure the data is properly recorded and reported.

Detection limits for each parameter in the Plan shall be listed in the QA/QC Plan for Agency approval.

Field measurements for salinity shall be made in accordance with the Standard Method 2520B using the Practical Salinity Scale of 1978 (PSS78) (APHA 1998). Since the PSS78 is accurate to a salinity range of 2 to 42, it will be necessary to use chloride and TDS data from laboratory measurements to validate salinity values exceeding 42. The QA/QC plan should include a methodology for performing these validations.

3.3.1 Field Event Notifications

The lead Agency personnel or their designated contractor shall be notified of all field events no later than five days prior to initiation of field events including but not limited to site surveys, well installation, and surface and groundwater sampling. During long-term events, such as well installation, the lead Agency shall be notified for subtasks, such as development and geophysical logging. Agency personnel shall have access onsite to observe field activities and provide

copies of field generated data upon request. If field events are delayed, notification should be provided as soon as practical and include the revised field event schedule.

3.3.2 Modification Requests/Notifications

Minor modifications to the Plan, such as movement/adjustment of monitoring stations or locations over short distances due logistical constraints or to optimize monitoring, may be initiated by FPL or the Agencies in writing during Plan implementation. Modification requests by FPL shall be submitted within two months of implementation and must be approved by the Agencies prior to implementation.

3.3.3 Meetings

To facilitate communication and keep the Agencies apprised of the monitoring efforts and any significant findings, semi-annual meetings shall be held. Issues of concern or suggested improvements in the monitoring effort commensurate with focused objectives of the Conditions of Certification should be discussed.

3.1 DATA COLLECTION AND REPORTING

Detailed information shall be provided to enable the Agencies to understand potential physical, chemical, and possibly ecological impacts of water movement and/or interchanges between the CCS, surface water and groundwater. Data shall be submitted on a secure Web site and in the form of hard and electronic report copies. In accordance with the Conditions of Certification and unless stated otherwise in the Fifth Supplemental Agreement, electronic copies of all data and reports generated directly from this Monitoring Plan shall be provided to the SFWMD Director of Water Supply, Miami-Dade County Director of DERM, FDEP Director of the Southeast District Office, FDEP Siting Coordination Office Director, and Biscayne Bay Aquatic Preserve Manager.

Table 3-1 provides a summary of data collection efforts and frequency of collection.

Table 3-1. Sampling Frequency.

Sample Type	Automated Parameters	Electronic Frequency	Manual Parameters	Manual Frequency
CCS Water	Salinity[1], Conductivity, Temperature, Water Level	15 minutes	Salinity, Conductivity, Temperature, tracer suite and water quality parameters	Quarterly
Groundwater Monitoring Wells	Salinity[1], Conductivity, Temperature, Water Level	15 minutes	Salinity, Conductivity, Temperature, tracer suite and water quality parameters	Quarterly
Biscayne Bay Littoral Zone Surface Water	Salinity[1], Conductivity, Temperature, Water Level	15 minutes	Salinity, Conductivity, Temperature, tracer suite and water quality parameters	Quarterly
Canal Surface Water	Salinity[1], Conductivity, Temperature, Water Level	15 minutes	Salinity, Conductivity, Temperature, tracer suite and water quality parameters	Quarterly
Interceptor Ditch Control (Interceptor Ditch, L-31E, and CCS)	Salinity[1], Conductivity, Temperature, Water Level	15 minutes	Salinity, Conductivity, Temperature, tracer suite and water quality parameters	Quarterly
Ecological Monitoring	See Tables 2-6 and 2-7.			

[1] Salinity values calculated using the PSS78.

3.1 DATA COLLECTION

3.1.1 Automated Sample Collection

Proposed stations identified in Figures 2-1, 2-2, and 2-5 of this document shall be electronically monitored by FPL. All automated time-series specific conductivity, temperature, and water level data as discussed in Section 2 and provided in Table 3-2 shall be compiled from the remote locations through the use of telemetry. Each station shall have a stand-alone solar power supply, onsite data loggers (with storage capacity), and the appropriate sensors needed to monitor the parameters described in Table 3-2. Each data logger shall initially be programmed to collect the required data at 15-minute intervals (unless otherwise noted) starting at the top of the hour based on time at the atomic clock and maintained in Eastern Standard Time. The data loggers shall also not account for Daylight Savings Time, to retain consistency with SFWMD data collection efforts. Calibration of sensors shall be a function of the manufacturer's specifications. All sensors and equipment shall be maintained per the manufacturer's specifications.

Table 3-2. Proposed automated time-series data collection from surface and groundwater stations.

Parameter	Units
Temperature	Degrees (Celsius)
Level	Feet (1929 NGVD and in 1988 NAVD)
Specific Conductance	$\mu S\ cm^{-1}$
Salinity	psu

3.1.2 Manual Sample Collection

Data from efforts such as borehole logging, well and stage recorder surveying, manual water quality sampling, and biological monitoring, shall be recorded in field notebooks prior to transcription to an electronic database. As outlined in Section 2 and per Table 3-1, water quality samples shall be collected from groundwater wells, surface waters, and the CCS, as part of regular monitoring on a quarterly basis.

3.2 DATA REPORTING

3.2.1 Web Database

The data base shall be maintained and archived by FPL. This server shall be backed up and archived weekly to minimize the risk of data loss. The Agencies shall be given passwords to access the data 24 hours a day/7 days a week. A web master's contact information shall be clearly posted on the web page. The Web-based applications shall provide the following:

- Geologic and hydrogeologic data acquired during this investigation
- Well construction data and spreadsheets
- Downhole geophysical logs
- Geophysical surveys
- Water budget and load calculation
- Bathymetric survey
- Equipment calibration logs and maintained records
- Manual sampling COC's, field data sheets, laboratory analytical reports
- Summarized data shall include but is not limited to:
- Groundwater and surface water hydrographs
- Spreadsheet summaries and graphical representations of current and historical manual sample results
- Automated reports such as but is not limited to water level, temperature, specific conductivity and ID pump operations, meteorological monitoring
- Log of any plant operations change, system shut downs or deviations that might affect parameters in this investigation
- All results generated as a result of ecological monitoring, Sections 2.3.2 and 2.5, Geophysical Surveys
- Semi-annual and annual reports in PDF formats
- All other reports that pertain to this Monitoring Plan
- Aerial imaging results

If determined that additional information must be added or modified to enhance the Web site, FPL shall do this within 30 days.

3.2.2 Automated Data Reporting

The data generated from continuous electronic monitoring of meteorological, surface and groundwater stations and ID stage and pump operations shall be accessible real-time to the lead Agency; however, the raw data shall not become official until FPL has had a chance to conduct a Quality Assurance/Quality Control (QA/QC) review. This shall be done within 30 days of the date of collection. FPL shall provide electronic accessibility of the results to the SFWMD, FDEP, and DERM. All data shall be stored in a database maintained by FPL; this server shall be backed up and archived weekly to minimize the risk of data loss. The data shall be tabulated in downloadable Excel® or similar format, and where appropriate, graphically presented to allow monitoring of operations by FPL staff, quick review of time-series data variations, and sensor performance.

3.2.3 Manual Data Reporting

Data collected from manual sampling and monitoring shall be stored in a database maintained by FPL; this server shall be backed up and archived weekly to minimize the risk of data loss. Electronic copies of analytical data shall be provided simultaneously to FPL and the lead Agency; however, the data shall not become official until it has undergone a QA/QC review by FPL. A summary of QA/QC analytical results shall be posted on a secure Web site. While the length of time between collecting the data and posting it will vary depending on what is collected, FPL shall post the data within three months of collection or at minimum provide a status as to when the data shall be posted. The manual data shall be compiled with automated data into reports as outlined below. Data files shall be made electronically available to the Agencies.

Surveyor's Report

FPL shall obtain a licensed Florida surveyor to conduct detailed surveys at each location where monitoring is being done. The data collected from this effort shall be compiled and documented in a report that documents all data and techniques. The order of surveying shall be documented (1st, 2nd, or 3rd order).

Data collected from the survey of the groundwater well, surface water, and porewater sites should be documented. The data includes (Appendix C), but is not limited to: Latitude, Longitude, 1983 State Planar Coordinates North American Datum (NAD), Florida East zone, 1927 State Planar Coordinates NAD, Florida East zone, Natural Ground Surface Elevation: Elevation in 1988 North American Vertical Datum (NAVD); Elevation in 1929 National Geodetic Vertical Datum (NGVD); Elevation of bottom of surface water location; Elevation in 1988 NAVD; Elevation in 1929 NGVD; Monitor Well Top-of-Casing Elevation: Elevation in 1988 NAVD; Elevation in 1929 NGVD;

Elevation of any nearby standing surface water at the time of surveying. Electronic copy of field notes, electronic copy of all computation sheets, CORPSMET 95 files, site photographs, surveyor's report, benchmark sheets shall also be included.

3.2.3 Geology and Hydrogeology Report

Geologic and hydrogeologic data as outlined in this Monitoring Plan shall be collected to better understand the movement of water within the Biscayne aquifer, in the immediate vicinity of the CCS. This is relevant because subsurface conditions may influence the extent and rate of CCS water migration.

This report shall provide information on the lithology and hydrostratigraphy of the subsurface rocks and sediments of that area. Subsurface data collected from groundwater monitoring sites installed in the current and previous investigations (Unit 6 & 7 borings and APT's [near the footprint of new plant and radial collection borings and APT], will be placed in a hydrostratigraphic context that can be integrated into the developing karst hydrostratigraphic framework being developed by the USGS for Miami-Dade County [e.g., Cunningham et al. 2004; 2006a; 2006b; 2008]).

Agency personnel shall be allowed onsite to observe field activities and provided copies of field generated data upon request. The SFWMD will pre-approve well screen intervals prior to well construction.

Data collected during well installation (Section 2.3.1), including detailed lithologic logs, borehole geophysics, digital optical logs, initial induction logs, temperature and flowmeter logs, field water quality data, and well construction details shall be compiled and submitted to Agencies within 30 days of completion of each well. In addition, a summary of well drilling procedures, geophysical logging procedures, and instrumentation used shall be provided. Based on wells installed from this monitoring effort and other subsurface geologic data, scaled geologic cross sections, including macroporosity zone and geophysical log overlays, shall be generated and included in the report. This includes information from the induction logs, which reveal zones of saline water. Also a plan view map showing the location of significant features shall be included. The information generated from this report will enable a better understanding of the movement of groundwater in the area and will provide the basis for interpretation of tracer and water quality monitoring.

At the request of the SFWMD geophysical logs shall be provided electronically in a *.pdf and an *.las format.

Biscayne Bay Geophysical Survey Report

This electromagnetic resistivity survey is envisioned to aid in the vertical and horizontal delineation of the CCS water beneath Biscayne Bay. The geophysical survey cannot be fully implemented or at least results interpreted until the wells in Biscayne Bay are installed. Results from resistivity surveys shall be reported within six months of completion of a survey. Reports shall include a detailed description of methodology, maps showing survey track lines, and figures showing depth profiles of resistivity and any associated measurements along the track line. Best estimates of salinity or conductivity, derived from resistivity and all available salinity or conductivity data, shall be made with tabular documentation of data and calculations used for this estimate (in .xls or .xlsx format).

3.2.5 Water Budget Analysis Report

To estimate the rate at which water is transported or dispersed from the CCS, a water budget analysis shall be performed (Section 2.2.2). The results of the bathymetric survey, CCS characterization, water budget, and salt and ionic loads shall be included in the Water Budget Analysis Report. This report shall be generated following the collection of a year of groundwater, surface water and CCS water data and shall be prepared yearly. Following collection of data during the pre- and post-Uprate period, the salt and ionic loads shall be reassessed to see if there are any significant changes from the pre-Uprate period.

The water budget shall include a breakdown for each of the contributions. This includes, but is not limited to:

- Estimated losses/gains to surficial aquifer vertically
- Estimated losses/gains to Biscayne Bay
- Estimated losses/gains to CCS (rainfall, evaporation)
- Estimated losses/gains to surficial aquifer horizontally
- Estimated losses/gains to Biscayne Bay Surface Water
- Estimated losses/gains to Biscayne Bay Groundwater

3.2.6 Initial Ecological Condition Characterization Report

Initial information on salinity distribution shall be derived from porewater surveys of the freshwater and saline wetlands adjacent to the CCS and Biscayne Bay and Card Sound. Results from these surveys shall be detailed in a Report within one year of Plan approval. The Report shall provide a detailed description of all sampling and analysis methods, all data (including field and laboratory measurements, with QA/QC results, such as instrument blanks and calibrations), the GPS coordinates of all sites sampled, and a map showing site locations.

Climatic data from the previous month as recorded by onsite or nearby instrumentation (rain data, air temperature etc.) shall also be indicated in the Report. Results, including any calculations generated from the data, shall be provided in a spreadsheet (.xls or .xlsx format). Field observations shall also be recorded. The Report shall identify areas of CCS water connectivity with surface sediments and soils as indicated by the CCS tracer suite, and indicate potential ecological influence of the CCS.

3.2.7 Semi-Annual and Annual Comprehensive Monitoring Reports

Semi-annual and annual reports shall be provided to the Agencies during the pre-Uprate and post-Uprate monitoring periods. Comprehensive semi-annual monitoring reports shall be submitted for documentation of site conditions, data generated as part of Plan implementation including but not limited to, groundwater monitoring, surface water monitoring, CCS monitoring, and ecological monitoring as described in the Plan. The ecological component shall be a subsection of the Report and shall provide all data generated in the report period as indicated in the Ecological Monitoring (Section 2.5), including all field and laboratory measurements made, (with QA/QC results, such as instrument blanks and calibrations), the GPS coordinates of all sites sampled, and a map showing site sampling locations. The data and any calculations generated from the data shall be provided in electronic format (.xls or .xlsx format).

The report(s) should be submitted within 60 days of the completion of each monitoring season (wet and dry) and include quarterly and semi-annual monitoring results of the previous periods. The report(s) shall include a brief summary of the CCS operations and operational changes that result in changes in physical or chemical characteristics of cooling water effluent or flow rates. A description of monitoring activities, station modifications and station operational summaries, graphic summaries of electronic monitoring data with electronic data archives, spreadsheet summaries of physical parameters, sample results, sampling field forms and laboratory results, L-31E salinity profile reports, and monitoring well induction logging reports, and ID monitoring logs shall be included.

Results of the tracer study and integration with the water budget shall be provided to support estimates of 1) spatial extent of the plume and rate and direction of plume migration; 2) a comparison of tracer suite concentrations and other select chemical parameters within the cooling canal system to data from external surface and groundwater stations with an estimated percent contribution from waters originating from the CCS; and 3) a revised water budget that estimates the quantity of water and salt load that the CCS produced. The Report should include recommendations for installation of additional monitoring points or other Plan modifications if needed to complete the monitoring objectives.

The report(s) shall include a completeness evaluation of specific Plan objectives and recommendations for adjustments (additions or deletions) in the monitoring program along with rationales. An updated monitoring schedule shall be included in the report.

3.2.8 Comprehensive Pre-Uprate Report

A comprehensive pre-Uprate report shall be submitted for documentation of background conditions pre- and post-operation of the Uprate project. The report shall include summaries of data presentations included in semi-annual reports with trends analysis including incorporation of seasonal or other variations over the pre-Uprate monitoring period. The Report shall include a completeness evaluation of specific Plan objectives; recommendations for additional investigation if appropriate to meet the objectives, and recommendation for modification of ID operations if appropriate to meet the objectives of the revised Agreement.

3.2.9 Comprehensive Post-Uprate Report

A comprehensive Post-Uprate Report shall be submitted after the fourth year of post-Uprate monitoring. The report shall include summaries of data presentations included in post-Uprate semi-annual reports with trends analysis including incorporation of seasonal or other variations over the pre-Uprate monitoring period. The Report shall include a completeness evaluation of specific Plan objectives, recommendations for additional investigation if appropriate to meet the objectives, and recommendation for modification of ID operations if appropriate to meet the objectives of the revised Agreement. The Report shall include conclusions regarding change during the post-Uprate monitoring period. If the certification objectives of plume delineation is completed by the end of the four year period following the Uprate, and with Agency approval, tasks for plume delineation, including monitoring for tracers, may be discontinued.

4
Schedule

Table 4-1 shows an overall monitoring schedule. This schedule shall be updated semiannually and agreed jointly between FPL and the lead Agency with input from the other Agencies.

In addition, permits for installing monitoring wells and instrumentation in Biscayne National Park must be obtained and entities to conduct the work selected. It is envisioned that it will take at least six months to drill all wells, purchase instrumentation, set up the monitoring network and get it fully operational.

The Uprate project is expected by FPL to come online in the spring of 2012. There shall be a minimum of two years of data collection prior to the Uprate Project coming online (pre-Uprate monitoring). Pre-Uprate monitoring shall continue until the Uprate is operational. During this time, both automated and manual data collection shall be conducted.

Table 4-1. Initial and overall monitoring schedule. (E & E needs to be updated based on this revision)

Year	2009						2010												2011												2012												2013												2014												2015											
Quarter	3			4			1			2			3			4			1			2			3			4			1			2			3			4			1			2			3			4			1			2			3			4			1			2			3			4		
Month	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Monitoring Network Set Up																																																																															
Characterize CCS Water																																																																																
Prepare QA/QC Plan																																																																																
Order and Install Instrumentation																																																																																
Install Wells																																																																																
Install Surface Water Stations																																																																																
Calibrate Instruments																																																																																
Obtain Park Permits for Monitoring Stations																																																																																
Set up Ecological Stations																																																																																
Conduct Electromagnetic Survey in Biscayne Bay																																																																																
Synoptic Sampling																																																																																
Conduct Automated Monitoring																																																																																
Conduct Manual Monitoring																																																																																
Conduct Ecological Monitoring																																																																																
Agency Briefing Meetings								X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X	
Submit Monitoring Reports									X						X						X						X						X						X						X						X						X						X						X						X			
Submit Geology and Hydrogeology Report														X																																																																
Submit Electromagnetic Survey Report														X																																																																
Submit Water Budget																										X																																																					
Review Data and Assess Need for Modifications to Plan											X						X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X			X	

Note: Schedule is to be updated every six months to reflect adaptive changes.

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Appendix A

FLORIDA DEP'S CONDITIONS OF CERTIFICATION IX AND X RELATED TO THE FPL TURKEY POINT POWER PLANT UPRATE

IX. Biscayne Bay Surface Water Monitoring

As proposed, the Turkey Point Units 3 and 4 uprate project may cause an increase in temperature and salinity in the cooling canal system. Field data is needed to determine impacts of the proposed changes in the Turkey Point cooling canal system on Biscayne Bay.

A. Within 180 days following certification of Units 3 & 4, FPL shall submit a Biscayne Bay Surface Water Monitoring Plan (Plan) pursuant to Chapter 62-302, F.A.C. to the DEP Southeast District Office for review and approval. The Plan shall include, at a minimum, the following components:

1. salinity and temperature monitoring within the surface waters of the Bay, including the Biscayne Bay Aquatic Preserve; (Specific parameters to be measured, including specific conductance and temperature, shall be sampled in accordance with Chapter 62-160, F.A.C.);
2. a minimum of five monitoring stations located near shore in the vicinity of the Turkey Point Plant; and 3. specific monitoring locations, sampling frequencies and methods, and specific parameters to be monitored.
3. specific monitoring locations, sampling frequencies and methods, and specific parameters to be monitored.

B. This monitoring data shall be compared to data using compatible monitoring instrumentation already in place in Biscayne Bay.

C. FPL shall continue the monitoring of salinity and temperature in the cooling canals under its industrial waste water facility permit.

D. If the Department determines that the pre- and post-Uprate salinity and temperature monitoring data indicate potential adverse changes in the surface water in Biscayne Bay, then the Department may propose additional measures to evaluate or to abate such impacts to Biscayne Bay.

E. The Plan, including monitoring locations, shall be approved prior to implementation. The Department shall indicate its approval or disapproval of the submitted Plan within 90 days of the originally submitted information. In

the event that the Department requires additional information for the licensee to complete, and the Department to approve the Plan, the Department shall make a written request to the licensee for additional information no later than 30 days after receipt of the submitted information. Any changes to the approved Surface Water Monitoring Plan shall be approved by Coastal and Aquatic Managed Area personnel in consultation with other FDEP personnel. [62-160, 62-302, 62-302.700, 62-520.600, F.A.C.]

X. Surface Water, Groundwater, Ecological Monitoring

This is a consolidated condition agreed upon by three Agencies, Department of Environmental Protection (DEP), Miami-Dade County Department of Environmental Resource Management (DERM) and the South Florida Water Management District (SFWMD). This consolidated condition sets forth the framework for new monitoring and, as may be needed, abatement or mitigation measures, for approval of FPL's Turkey Point Units 3 and 4 Uprate Application. Specific monitoring and potential modeling parameters will be identified and implemented pursuant to a monitoring plan as part of a supplemental agreement between FPL and the SFWMD as described below.

A. In addition to the monitoring framework set forth in this consolidated condition, within 180 days after Certification, FPL shall execute a SFWMD approved Fifth Supplemental Turkey Point Agreement ("Fifth Supplemental Agreement") to the original 1972 Agreement between FPL and the SFWMD pertaining to FPL's obligation to monitor for impacts of the Turkey Point cooling canal system on the water resources of the SFWMD in general and the facilities and operations of the SFWMD (the "Agreement"). Subject to the SFWMD's approval, FPL shall also amend the Agreement's Revised Operating Manual as referenced in paragraph C. "Monitoring Provisions" (the "Revised Plan") of the Fourth Supplemental Agreement, dated July 15, 1983. The Revised Plan shall be incorporated into the Fifth Supplemental Agreement and shall include assessment of potential impacts to surface water and groundwater including wetlands, as needed, in the vicinity of the cooling canal system. The specific monitoring boundaries shall be determined as part of the Revised Plan.

B. The Revised Plan shall be designed to be in concurrence with other existing and ongoing monitoring efforts in the area and shall include but not necessarily be limited to, surface water, groundwater and water quality monitoring, and ecological monitoring to:

1. delineate the vertical and horizontal extent of the hyper-saline plume that originates from the cooling canal system and to characterize the water quality including salinity and temperature impacts of this plume for the baseline condition;

2. determine the extent and effect of the groundwater plume on surface water quality as a baseline condition; and

3. detect changes in the quantity and quality of surface and groundwater over time due to the cooling canal system associated with the Uprate project. The Revised Plan shall include installation and monitoring of an appropriate network of wells and surface water stations. The Revised Plan shall be approved by the SFWMD in consultation with the DEP Office of Coastal and Aquatic Managed Areas, the DEP Southeast District Office and DERM.

C. FPL shall transmit electronic copies of all data and reports required under the Fifth Supplemental Agreement and the Revised Plan in accordance with timeframes as approved in the Fifth Supplemental Agreement to:

SFWMD, Director, Water Supply (or alternative transmittal procedures to be described in the Fifth Supplemental Agreement);
Miami-Dade County, Director, DERM; DEP, Director, Southeast District Office;
DEP Siting Coordination Office;
DEP, Director, Biscayne Bay Aquatic Preserve Manager.

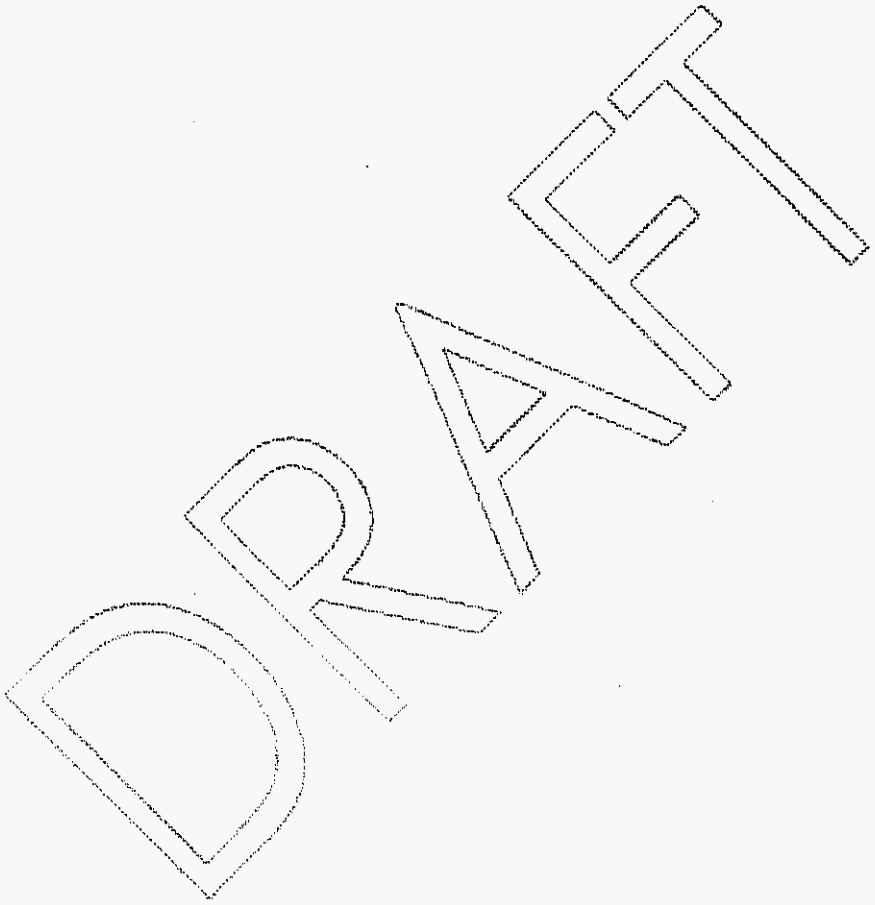
D. If the DEP in consultation with SFWMD and DERM determines that the pre- and post-Uprate monitoring data: is insufficient to evaluate changes as a result of this project; indicates harm or potential harm to the waters of the State including ecological resources; exceeds State or County water quality standards; or is inconsistent with the goals and objectives of the CERP Biscayne Bay Coastal Wetlands Project, then additional measures, including enhanced monitoring and/or modeling, shall be required to evaluate or to abate such impacts. Additional measures include but are not limited to:

1. the development and application of a 3-dimensional coupled surface and groundwater model (density dependent) to further assess impacts of the Uprate Project on ground and surface waters; such model shall be calibrated and verified using the data collection during the monitoring period;

2. mitigation measures to offset such impacts of the Uprate Project necessary to comply with State and local water quality standards, which may include methods and features to reduce and mitigate salinity increases in groundwater including the use of highly treated reuse water for recharge of the Biscayne aquifer or wetlands rehydration;

3. operational changes in the cooling canal system to reduce any such impacts; and/or 4. other measures to abate impacts as may be described in the Revised Plan.

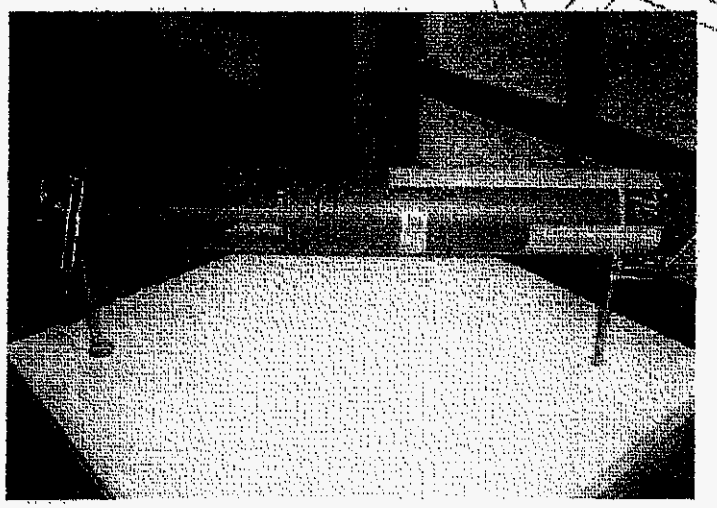
[Sections 373.016, 373.223, F.S.; Rules 40E-4.011, 40E-4.301, 40E-4.302, F.A.C.; Sections 62-302 and 62-520, F.A.C.; Section 24-42, Code of Miami-Dade County, Miami-Dade County Comprehensive Development Master Plan (CDMP) Land Use Element, Conservation Element, Intergovernmental Coordination Element, Coastal Management Element.]



Appendix B

NEAR SHORE SONDE DEPLOYMENT METHODS

The near shore sites, or mangrove sites, have sondes deployed to measure salinity using differing methods. This is due to the extremely shallow water at these locations, as well as the composition of the bottom substrate. Normally the sondes are deployed in a vertical position attached to a mooring pin, which has been cemented in place by drilling a hole in the bay floor. However at the mangrove sites there is insufficient water for vertical deployments, so the instruments are deployed horizontally~ and the bottom is composed mainly of mud which is unsuitable for drilling. Therefore, the instruments are deployed affixed to cement paving slabs, which have been drilled in 2 places at opposing corners and fitted with stainless steel eyebolts, that settle into the mud with the eyes of the eyebolts well above the bottom, and in the water column. The sonde is then locked to one of the eyebolts and fastened securely to both using nylon tie-wraps. This maintains a constant horizontal position, which will remain beneath the water surface even at low tide. This positioning also provides ample space for an additional sonde to be mounted simultaneously for concurrent sampling and overlapping data at deployment and retrieval times to ensure quality control. Per instruction by YSI personnel, the instruments are oriented in a way such that the sensor's hole is not facing directly down which could cause air bubbles to accumulate and skew the salinity data.



Appendix C

SURVEY PARAMETERS COLLECTED DURING GROUNDWATER WELL INSTALLATION

Data collected from the survey of the groundwater well, surface water and porewater sites. The data includes, but is not limited to:

- Latitude
- Longitude
- 1983 State Planar Coordinates North American Datum (NAD), Florida East zone
- 1927 State Planar Coordinates NAD, Florida East zone
- Natural Ground Surface Elevation
- Elevation in 1988 North American Vertical Datum (NAVD)
- Elevation in 1929 National Geodetic Vertical Datum (NGVD)
- Elevation of bottom of surface water location
- Elevation in 1988 NAVD
- Elevation in 1929 NGVD
- Monitor Well Top-of-Casing Elevation
- Elevation in 1988 NAVD
- Elevation in 1929 NGVD
- Elevation of any nearby standing surface water at the time of surveying (15 feet radius from site)

Appendix D

SPECIAL REQUIREMENTS FOR AN ELECTRO-MAGNETIC INDUCTION WELL (USGS)

In general the well should meet normal State or Federal Regulations for monitoring wells. USGS publication WRIR-96-4233 (http://water.usgs.gov/owq/pubs/wri/wri964233/) provides general guidelines for the installation of monitoring wells used to evaluate water quality. In addition to these general guidelines there are some special requirements needed if the well is going to be logged using an electromagnetic induction probe:

Casing material PVC: metal casing will interfere with the log.

Well Screen PVC: metal screens will interfere with the log. Slotted screen generally works but opening size is important. Sand from the aquifer can fill the well if the holes are too big.

Well diameter generally 2" to 6": USGS is currently logging wells 2" to 6" in diameter. For shallow wells, 2" usually works fine. For deep wells (>150 feet), the USGS suggests 3" or 4" well diameters to make sure the probe does not get stuck. The probe is most sensitive to differences in conductivity within an 8" to 40" donut-shaped radius around the well. 2 inch wells are generally fine but in very deep wells or long screened wells, the USGS has had difficulty getting the probe down the hole because of bends or distortions in the well casing so going with a 3 or 4" diameter well might provide better success in deep wells.

Depth extending to the base of the Biscayne aquifer is generally best because this allows us to evaluate changes throughout the zone of interest. Salinity is usually but not always highest at the base of the aquifer so this is generally a good depth to set the open interval. But the driller needs to be careful not over shoot the bottom of the aquifer.

If the monitoring well is to be used for detecting "up-coning" directly beneath a wellfield there are alternate strategies. If nothing but fresh water is found as drilling, it would be good to finish the well at the base of the aquifer. Future upconing would most likely begin at or near the base of the aquifer.

If salt water is found when drilling one can: (1) Stop drilling and screen the well at this depth so that one can monitor the chloride level at this depth or (2) Keep drilling to the base of the aquifer and complete the well at this depth to evaluate the full thickness of encroachment and maximum salinity. This would allow one to determine if seawater is encroaching preferentially through just one zone or

throughout the depth of aquifer. Either way induction logging can help detect future up coning. With option 2 one would learn more about what is happening in the aquifer, but with option 1 one is able to obtain a precise chloride value in mg/l.

Open Interval 5 to 10 feet. The idea of a short screen length is to be able to sample a discrete interval and avoid the effects of flow within the borehole.

Chloride Sampling: It is generally good to collect water chloride samples during drilling to determine if encroached seawater is present.

Annular Seal Neat Cement is best. Bentonite may interfere with the log, but some sort of seal just above the filter pack is necessary to prevent the cement from infiltrating the filter packer. Very fine sand might work, or bentonite might be required.

Hole Less than 8 inches: One would want to avoid disturbing aquifer materials beyond the radius that the probe is insensitive to, which is 8 inches. It would also be good to try to clear up the hole prior to well installation. If there is a lot of mud or muddy water in the hole the first few logs might detect this. Do not use salty or electrically conductive drilling fluid.

Manhole cover metal is OK at the very top of well but no metal should be used down the hole or on the casing.

Well centralizers ONLY OK if non metallic, even the screws used for well centralizers have caused us problems.

Finish Flush Mounted, this is usually best because the logging requires setting a tripod over the well.

Well nests Avoid Metal in adjacent wells -- If wells are very close together and one has a metal object in it, this can affect the log in the other well.

Other Logs

Additional logs are a plus, and digital borehole images, gamma, flow logs, lithologic logs, well completion diagrams, caliper, and magnetic susceptibility could be invaluable when one sees changes occurring above the base of the aquifer and wonder why. These logs also help one ensure that one has set the open interval at the correct depth. In the past, wells have been put in too deep or too shallow. These wells do not provide the quality of data desired.

A geologist should oversee well drilling and well completion. The geologist should collect samples and create a lithologic log and make sure that careful well

depth and material depth measurements are collected. The geologist should provide these logs to be used in conjunction with the induction logs.

Joints Threaded flush joint casing with seals. This prevents leakage from zones above the screened interval. This leakage could dilute samples and this could cause one to believe the water at the base of the aquifer is less saline than it really is.

Filter Pack: Grain size should be sufficient to keep the fine material in the aquifer from filling the well.

Depth Measurements: The depth of the well, the top of the screen should be carefully determined and recorded. The depth, to the top of the filter pack and the top of all annual seals, should be carefully measured. This is to ensure that no bridging occurred and that the screen is completely covered by the filter pack.

Well development: The well should be developed to clear and consolidate the filter pack. This also needs to be done to ensure that cement did not seep into the filter pack and clog it, and to verify that the well is not in an impermeable zone, which may happen if it is drilled below the base of the aquifer.

Station	Proposed or Existing Station	Automated Yes/No (Reporting Frequency)	Automated Sampling Parameters	Manual Sampling Parameters
Cooling Canal System (CCS)				
CCS-1 through CCS -7	Proposed	Yes (15-min intervals)	Specific conductance, temp, water level (pressure) at top and bottom at six stations and at bottom for one shallow station	Quarterly for field parameters, CCS tracer parameters, major ions, TDS, nutrients, silicate, chlorophyll-a and pheophytin. Also gross alpha semi-annually for one year.
CCS Thermal Anomaly (1 location)	Proposed	NA	NA	Initially once for field parameters, CCS tracer parameters, major ions, TDS, trace elements, nutrients, chlorophyll-a and pheophytin.
CCS	Proposed	Daily	Three meteorologic stations, three flow stations.	One-time bathymetry to be coupled to water levels, ions and elements for annual water budget calculations.
Canals Around Turkey Point				
TPCSW-1 through TPCSW-5	Proposed	Yes (15-min intervals)	Specific conductance, temp, water level (pressure) at top and bottom	Quarterly for field parameters, CCS tracer parameters, major ions, TDS, nutrients, silicate chlorophyll-a and pheophytin.
TPCSW-6	Proposed	NA	NA	
Biscayne Bay Surface Water				
BBSW-1 through BBSW-5	Proposed	Yes (15-min intervals)	Specific conductance, temp, water level (pressure) near bottom	Quarterly for field parameters, CCS tracer parameters, major ions, TDS, nutrients, silicate, chlorophyll-a and pheophytin.
BNP Stations – BISC08B, BISC12B, BISC13S	Existing	Yes (15-min intervals)	Specific conductance and temp collected by BNP.	NA
Groundwater Wells				
L-3,L-5, G-21 and G-28	Existing	No	NA	Quarterly for field parameters, CCS tracer parameters, major ions, and TDS. Also nutrients in all wells semi-annually.
USGS and FKAA Wells (note A below)	Existing	No	NA	Chloride data collected by others.

Docket No. 090007- EI
Turkey Point Plant- Summary of Proposed Monitoring
Exhibit RRL-7, Page 1 of 2

Station	Proposed or Existing Station	Automated Yes/No (Reporting Frequency)	Automated Sampling Parameters	Manual Sampling Parameters
Well Clusters (TPGW-1 through TPGW -14 (3 wells per cluster)	Proposed (11 on land and 3 in Bay)	Yes (15-min intervals)	Specific conductance, temp, water level (pressure) in each well	Quarterly for field parameters, CCS tracer parameters, major ions, TDS, Also trace elements initially in 4 well clusters semi annually for one year and nutrients in all wells semi-annually.
Geophysical Survey				
Wetlands west of CCS	Proposed	No	NA	One-time aerial resistivity survey.
CCS	Proposed	No	NA	
Biscayne Bay	Proposed	No	NA	One wet and dry season survey either via boat/aerially.
Interceptor Ditch				
ID-1 through ID-3	Existing	Yes (15-min intervals)	Specific conductance, temp, water level (pressure) at top and bottom	Quarterly for field parameters, CCS tracer parameters, major ions, TDS, nutrients, silicate, chlorophyll-a and pheophytin.
Ecological Monitoring				
Aerial mapping (all areas of interest)	Proposed	No	NA	Once pre-Uprate, once post-Uprate.
Freshwater Wetlands	7 transects (28 plots)	No	NA	Vegetation composition, canopy height, leaf nutrients, isotopes, productivity once to four times a year . Conductivity, temperature, stage and CCS tracer parameters measured 4x/year, nutrients measured 2x/year.
BB Mangroves	7 transects (14 plots)	No	NA	
Sub-tidal Zone	16 transects (640 25-cm^2 plots)	No	NA	Benthic, invertebrate and fish composition one to four times a year. Conductivity, temperature, stage and CCS tracer parameters measured 4x/year, seagrass nutrients and isotopes measured 2x/year.
CCS	15 sites	No	NA	Sediment cores collected for nutrients and select elements in porewater (2x/year) and bulk sediment (1x/year) at two depths.
Porewater survey	200 points proposed	No	NA	Temperature, conductivity for 100 points each in Freshwater Wetlands and Biscayne Bay (within 3 km of shore). Subset of 30 samples per location for CCS tracer parameters.

Key:
BB = Biscayne Bay
BBSW = Biscayne Bay Surface Water
BNP = Biscayne National Park
CCS = Cooling Canal System
FKAA = Florida Keys Aqueduct Authority
ID = Interceptor Ditch
SFWMD = South Florida Water Management District
TDS = Total Dissolved Solids
TPCSW = Turkey Point Canal Surface Water
TPGW = Turkey Point Groundwater
USGS = United States Geologic Survey

Notes: A – Supplemental wells include but are not necessarily limited to G-1251, G-1630, G3167, FKS-3, FKS-4, FKS-5, FKS-7, FKS-8, FKS-9, G-3342, G-3166, G-3164, G-3699, G-3698, G-1179, G-1180, G-3700, G-3615, G-3162 and were selected based on location and/or well depth and/or screen interval. Wells can be sampled for other parameters if deemed appropriate as part of adaptive monitoring.