Progress Energy

Serial: NPD-LNP-COC-2010-010
November 18, 2010

Florida Fish and Wildlife Conservation Commission
Office of Policy and Stakeholder Coordination
620 South Meridian Street
Tallahassee, FL 32399-1600

LEVY NUCLEAR PLANT, UNITS 1 AND 2
SITE CERTIFICATION NO. PA08-51A, CONDITIONS OF CERTIFICATION:
PLANT AND ASSOCIATED FACILITIES AND TRANSMISSION LINES
SUBMITTAL OF SURVEY AND MONITORING PLANS TO FWC

References:

1. Letter from Robert Kitchen (PEF) to Florida Fish and Wildlife Conservation Commission (FWC), dated February 3, 2010, "Levy Nuclear Plant Monitoring Plans Submittal", Serial: NPD-LNP-COC-2010-001

2. Letter from Mary Ann Poole (FWC) to Robert Kitchen (PEF), dated March 3, 2010, Re: Site Certification No. PA08-51A, Levy Nuclear Plant, Conditions of Certification: Plant and Associated Facilities and Transmission Lines, Levy Nuclear Plant Monitoring Plans Submittal to FWC, Levy County

3. Letter from Robert Kitchen (PEF) to Mary Ann Poole (FWC), dated June 24, 2010, "Site Certification No. PA-0851A, Conditions of Certification: Plant and Associated Facilities and Transmission Lines, Levy Nuclear Plant Monitoring Plans Submittal to FWC", Serial: NPD-MISC-2010-004

4. Letter from Mary Ann Poole (FWC) to Robert Kitchen (PEF), dated July 23, 2010, Re: Site Certification No. PA08-51A, Levy Nuclear Plant, Conditions of Certification: Plant and Associated Facilities and Transmission Lines, Levy Nuclear Plant Monitoring Plans; Progress Energy Response to FWC RAI#1

5. Letter from Robert Kitchen (PEF) to Mary Ann Poole (FWC), dated September 8, 2010, "Site Certification No. PA-0851A, Conditions of Certification: Plant and Associated Facilities and Transmission Lines, Levy Nuclear Plant Monitoring Plans Submittal to FWC", Serial: NPD-LNP-COC-2010-008

Ladies and Gentlemen:

Progress Energy Florida, Inc. (PEF) hereby submits the following revised survey and monitoring plans in support of the proposed Levy Nuclear Plant, Units 1 and 2:

- Cross Florida Barge Canal and Withlacoochee River Survey and Monitoring Plan
- Levy Nuclear Plant and Crystal River Energy Complex Combined Discharge Survey and Monitoring Plan

The attached plans address the requests for additional information and associated responses (References 2 through 5 above).

Progress Energy Florida, Inc.
P.O. Box 14042
St. Petersburg, FL 33733

If you have any further questions, or need additional information, please contact Paul Snead at (919) 546-2836, or me at (919) 546-6992.

Sincerely,

Robert Kitchen
Manager – Nuclear Plant Licensing
New Generation Programs & Projects

Attachments

cc : Mr. Mike Halpin, FDEP Siting Coordination Office
Ms. Mary Ann Poole, FWC Commenting Program Administrator

Tech Memo Approval Form

Tech Memo Number: 338884-TMEM-114
Revision: 2 (final)
Project: 338884
Review Date: 11/11/10

Tech Memo Title: Cross Florida Barge Canal and Withlacoochee River Survey and Monitoring Plan

Revision History:

Revision Number	Description	Approval Date	Affected Pages
0	Initial submittal for formal review.	12/31/09	All
1	Review based on OAR comments.	01/18/10	All
2 (final)	Response to Florida Fish and Wildlife Conservation Commission (FWC) comments; finalized negotiated plan.	11/11/10	All

Document Review and Approval

Originator:	John Martin/Project Scientist	11/11/10
	Name/Position	Date
		
	Signature	
Reviewer:	William Marsh/Technical Manager	11/11/10
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	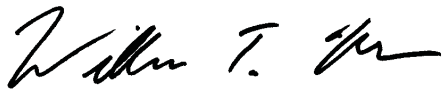	
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Project Manager:	Eric Woods/Project Manager	11/11/10
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	Signature	

Cross Florida Barge Canal and Withlacoochee River Survey and Monitoring Plan

Levy Nuclear Plant

Prepared for

Progress Energy Florida, Inc.

Prepared by

CH2MHILL

November 2010

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Acronyms and Abbreviations

°F	degree Fahrenheit
AWS	abundance weighted salinity
CFBC	Cross Florida Barge Canal
COA	center of abundance
COC	Condition of Certification
COF	center of frequency
CREC	Crystal River Energy Complex
CRSMP	Cross Florida Barge Canal and Withlacoochee River Baseline Survey and Monitoring Plan
CWA	Clean Water Act
CWIS	cooling water intake structure
DO	dissolved oxygen
ES	estuarine indicator
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FIM	Fisheries Independent Monitoring
fps	feet per second
ft	foot
FW	freshwater indicator
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
FWS	frequency weighted salinity
HBMP	hydrobiological monitoring plan
km	kilometer
km^2	square kilometer
LNP	Levy Nuclear Plant Units 1 and 2
LNP 1	Levy Nuclear Plant Unit 1
LNP 2	Levy Nuclear Plant Unit 2
m	meter
m^3	cubic meter
m/s	meter per second

Acronyms and Abbreviations, Continued

mgd	million gallons per day
mi	mile
mi^2	square mile
µ	micron
NA	not applicable
NGM	nearshore Gulf of Mexico
NPDES	National Pollutant Discharge Elimination System
OWR	Old Withlacoochee River
PBS&J	PBS&J, Inc.
PEF	Progress Energy Florida, Inc.
psu	practical salinity unit
QA	quality assurance
QC	quality control
RIS	representative important species
SOP	standard operating procedure
SW	saltwater indicator
SWFWMD	Southwest Florida Water Management District
USACE	U.S. Army Corps of Engineers

1.0 Introduction

Progress Energy Florida, Inc. (PEF) is proposing to build and operate a nuclear power generating facility, consisting of two generating units, in Levy County, Florida. The proposed facility, known as Levy Nuclear Plant Units 1 and 2 (LNP), will be located east of U.S. Highway 19 and north of the Levy County and Citrus County border. The LNP will withdraw cooling water from the Cross Florida Barge Canal (CFBC), which extends west from the Inglis Lock to the Gulf of Mexico. PEF has proposed to route the LNP discharge to the existing Crystal River Energy Complex (CREC) discharge canal, located southwest of the proposed LNP site.

Section B.XXIXB.1 of the Conditions of Certification (COCs) adopted by the "Final Order on Certification for the Progress Energy Levy Nuclear Power Plant Units 1 and 2," dated August 26, 2009, requires the development of a CFBC and Withlacoochee River Baseline Survey and Monitoring Plan (CRSMP).

1.1 Regulatory Requirements

COC Section B.XXIXB.1 requires the submittal of a CRSMP to the Florida Department of Environmental Protection (FDEP) Siting Coordination Office and the Florida Fish and Wildlife Conservation Commission (FWC) for approval by FWC in consultation with FDEP and the Southwest Florida Water Management District (SWFWMD). The following requirements of COC Section B.XXIXB.1 are addressed in this CRSMP in the sections identified.

- Section B.XXIX.B.1. CFBC and Withlacoochee River Survey and Monitoring

  Described in Sections 3.1 and 5.1, Table 3-4, and Attachment A of this CRSMP:

  a. *Within 180 days following certification of the Levy County Nuclear Facility, the Licensee shall submit to the DEP Siting Office and FWC a Cross Florida Barge Canal and Withlacoochee River Baseline Survey and Monitoring Plan (CRSMP). Unless otherwise agreed to by the Licensee and FWC, in consultation with DEP, the CRSMP shall include, at a minimum, the following components and may include additional components as proposed by either the FWC or Licensee:*

     i. *Nekton pre-operational survey and post-operational monitoring should be based on a stratified-random sampling design, with a minimum of 12 samples per month in the Cross Florida Barge Canal, a minimum of 6 samples per month in the Withlacoochee River downstream of Lake Rousseau, and a minimum of 6 samples per month in the area just off the entrance to the Cross Florida Barge Canal. Ideally the sampling effort would be divided between bag seines and otter trawls, with a ratio of two seine hauls to one trawl haul. This study design will allow comparison between monitoring results of nekton communities, and possible changes in these communities, in the CFBC and Withlacoochee River with systems north and south of the CFBC. Ideally the number of samples necessary per month would be based on preliminary sampling and subsequent power analysis (to determine*

power to detect change. If additional gear is deemed more appropriate, these should be provided in the nekton monitoring study design.

Described in Sections 3.1 and 5.2, Table 3-4, and Attachment A and B of this CRSMP:

ii. *Plankton (ichthyoplankton and meroplankton) preoperational survey and post-operational monitoring should be based on a stratified random sampling design, with a minimum of 12 samples per month in the Cross Florida Barge Canal, a minimum of 6 samples per month in the area just off the entrance to the Cross Florida Barge Canal, and in the Withlacoochee River. The surveys should employ standard plankton sampling gear. Ideally the number of samples necessary per month would be based on preliminary sampling and subsequent power analysis (to determine power to detect change). The plankton monitoring should, at a minimum, include sampling at night.*

Described in Section 3.2, Table 3-5, and Figure 3-4, and Attachment C of this CRSMP:

iii. *Additional hydrographic survey sites may be needed, depending on the data available from previous studies, to characterize circulation and flow from the Withlacoochee River south to the Barge Canal, across and into the Barge Canal, and south towards the Crystal River Energy Complex. Specific survey and monitoring locations, sampling frequencies and methods, and specific parameters to be surveyed and monitored shall be approved by the FWC, in consultation with DEP and SWFWMD.*

Described in Sections 3.1, 3.2, 3.3, and 3.4, and Attachment A of this CRSMP:

iv. *Pre-operational surveys and monitoring shall be conducted for a period of time to be determined by statistical analysis in coordination between the FWC and the Licensee in order to establish seasonal/climatological baseline, biological and water quality conditions. This timeframe will not exceed the period of time that is available prior to operation of the facility.*

Described in Sections 3.1, 3.2, 3.3, and 3.4, and Attachment A of this CRSMP:

v. *Pre-operational survey and post-operational monitoring shall be conducted for a period of time to be determined by statistical analysis in coordination between the FWC, in consultation with DEP, and the Licensee, utilizing the same pre-operational survey methodologies in order to identify and characterize biological and water quality impacts associated with the project for any needed mitigation purposes.*

Described in Sections 3.3, 5.3, and 5.4 of this CRSMP:

vi. *In accordance with federal regulations related to the project's intake structure, an impingement and entrainment study shall be developed and implemented for use during operations to validate the assumptions of limited or no impingement and entrainment of organisms.*

Described in Section 3.4 of this CRSMP:

vii. *An adaptive management approach shall be applied during pre-operational surveying and post-operational monitoring plan development in order to accommodate for less expensive data collection methodologies that may become available.*

Described in Section 6.0 of this CRSMP:

b. *The Licensee will prepare yearly progress reports, including all data and statistical analyses resulting from the survey and monitoring requirements, hydrographic analysis documenting*

the flow and circulation patterns in the nearshore areas, and a summary report at the end of the baseline period. These reports shall be submitted to the FWC, and DEP Siting Office for review. If the FWC, in consultation with DEP and SWFWMD, in their review of the yearly progress reports, determines inadequacies or the need to modify the CRSMP, FWC will notify DEP and the Licensee and a joint meeting will be held to discuss the findings. At the end of the baseline monitoring period, the Licensee will hold a joint meeting with the DEP and EWC [sic]to discuss the results. At that time, the FWC, in consultation with DEP and SWFWMD, and the Licensee will determine what, if any, modifications need to be made to the CRSMP for monitoring once the Plant begins operations. The FWC will transmit its findings to the DEP-Siting Office for coordination and transmittal to the licensee.

Described in Section 5.0 of this CRSMP:

d. *The Licensee will submit, after initiation of operations at the Levy Plant, an annual report, including all data and statistical analyses resulting from the monitoring requirements and an analysis comparing the current data to the preoperational survey (baseline) data to the FWC and the Siting Office. If the FWC, in consultation with DEP and SWFWMD, determines that the pre-operational survey and post-operational monitoring data indicate harm or potential harm to the ecological resources of the waters of the State and/or indicate exceedance of State water quality standards, or if these data are insufficient to evaluate changes, then additional measures shall be required to evaluate or to abate such impacts. Additional measures include but are not limited to: (i) Enhanced monitoring and/or modeling, and mitigative measures; (ii) Operational changes in the cooling water intake system to reduce any such impacts; (iii) Other measures to abate impacts as may be described in the Canal and River Monitoring Plan.*

Described in Section 6.0 of this CRSMP:

e. *The Licensee will submit a summary report, including all data and statistical analyses from the baseline monitoring and an analysis comparing the current data to the baseline data, to the FWC and the DEP Siting Office. The summary report should be submitted a minimum of 6 months before renewal of the* [National Pollutant Discharge Elimination System] *NPDES permit.*

2.0 Background and Site Description

This section provides relevant background information on the LNP and the study area.

2.1 LNP Cooling Water Intake and Discharge

The LNP will consist of two nominal 1,100-megawatt nuclear electrical generating units and will use a closed-cycle cooling water system that will withdraw cooling tower makeup water from the CFBC. The cooling water intake structure (CWIS) will be constructed on the canal bank at a location south of the LNP site and west of the Inglis Lock, approximately 6.9 miles (mi) inland from the Gulf of Mexico. Cooling water will be withdrawn at a flow rate of approximately 122 million gallons per day (mgd) through six intake bays. The CWIS will include 3/8-inch mesh dual-flow traveling water screens with a through-screen velocity of less than 0.5 foot per second (fps). The CWIS conforms to Clean Water Act (CWA) 316(b) design criteria to reduce the impingement and entrainment of aquatic life.

The LNP will have a combined wastewater discharge comprised of several wastewater streams, including approximately 98 percent blowdown cooling water. The combined blowdown of approximately 88 mgd will be piped to the CREC and discharged into the existing CREC discharge canal.

2.2 Aquatic Study Area Descriptions

COC Section B.XXIX.B.1 requires a survey and monitoring plan for nekton, plankton, hydrographic characteristics, and impingement and entrainment within areas potentially influenced by the operation of the LNP CWIS. The study areas included in this monitoring plan are the CFBC, Old Withlacoochee River (between the Inglis Dam and the CFBC), and the nearshore Gulf of Mexico (NGM) located between the Withlacoochee River and CREC (see Figure 2-1).

2.2.1 Cross Florida Barge Canal

The CFBC is a man-made canal that, in the project vicinity, extends between Lake Rousseau and the Gulf of Mexico. Lake Rousseau is a 3,400-acre impoundment formed by the construction of Inglis Dam in the Withlacoochee River. In the 1960s, the U.S. Army Corps of Engineers (USACE) built a portion of the CFBC, which bisects the Withlacoochee River below Lake Rousseau. Water released through the main spillway at Inglis Dam flows through the Old Withlacoochee River and then enters the CFBC en route to the Gulf of Mexico. USACE constructed the Inglis Lock bypass channel and spillway to control freshwater discharges from Lake Rousseau into the lower Withlacoochee River segment, thereby maintaining the connection between the upper and lower portions of the river. The Inglis Dam and the bypass channel spillway collectively control the water level in Lake Rousseau. The CFBC between Inglis Lock and the Gulf of Mexico is 7.4 mi long and approximately 12 feet deep with a surface width of approximately 200 feet, and side slopes over much of its length approximating the 3:1 (horizontal: vertical) canal design.

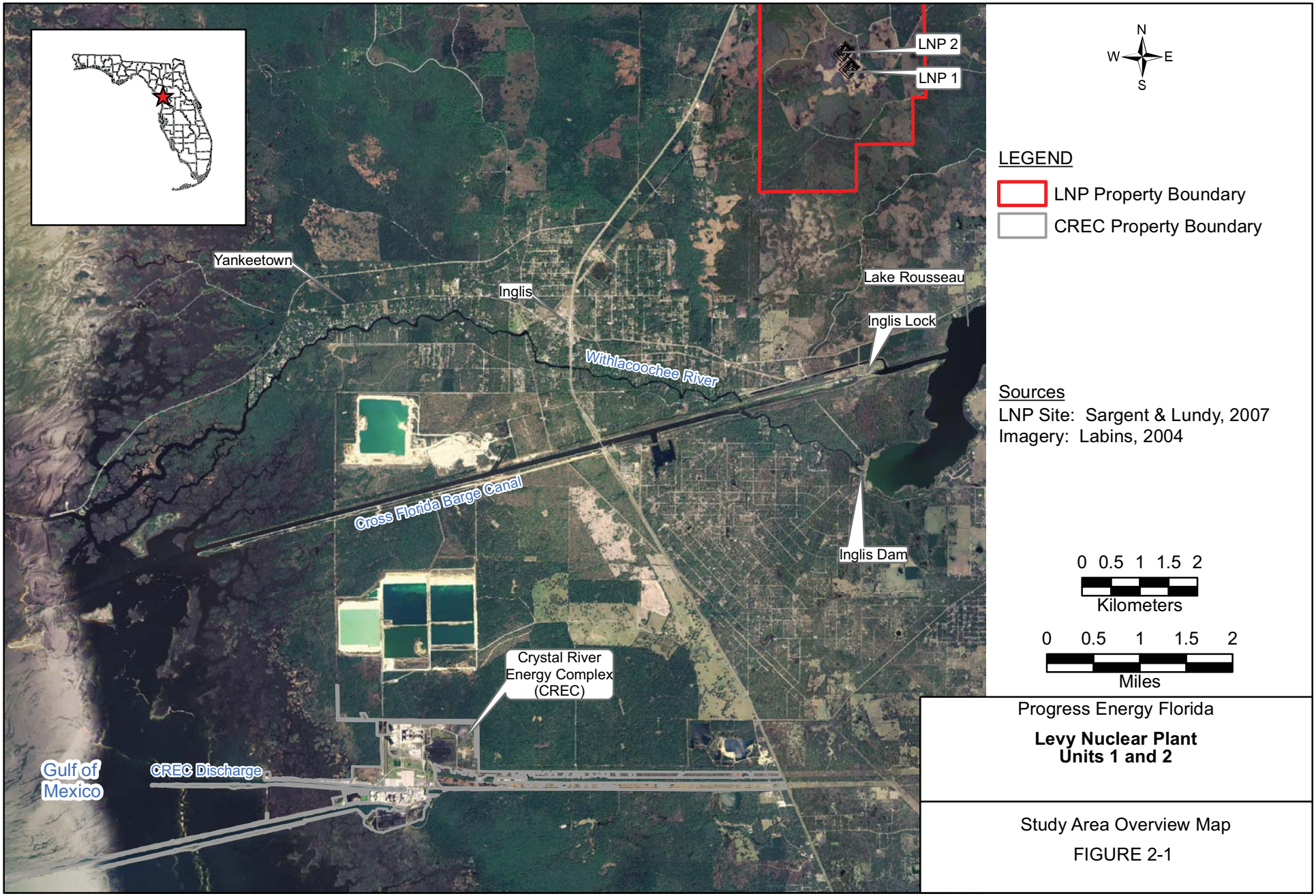
2.2.2 Old Withlacoochee River

The isolated segment of the Withlacoochee River, which runs 1.5 mi from the Inglis Dam to the CFBC, is referred to as the Old Withlacoochee River (OWR). The OWR is meandering and approximately 65 to 100 feet wide with variable depths ranging from 4 to 10 feet. Water flow is regulated at the Inglis Dam, and both flow and velocity within the OWR are highly variable, reflecting episodic releases from the Inglis Dam, as well as tidal fluctuations associated with the Gulf of Mexico. The pattern of flows is higher during the wet season and lower during the dry season. The channel bottom has areas of exposed limestone and sand in the central channel, and muddy bottoms along the shoreline. The water color is slightly tannic, reflecting organic inputs to the upstream Withlacoochee River.

2.2.3 Nearshore Gulf of Mexico

The NGM in the project vicinity is generally shallow, with depths of 10 feet or less within 3 mi of the shore and depths up to 20 feet approximately 6 mi from shore. Locally, deeper water is found in rivers and dredged canals. Saltmarsh and oyster reefs are common in the shallow nearshore environment and are exposed at low tide. During construction of the CFBC, a channel was dredged into the Gulf of Mexico, creating a series of spoil islands extending offshore for 5.5 mi along the southern boundary of the channel. This line of spoil islands restricts coastal flow north of the CREC discharge area.

Near the CREC, channels and berms border both the intake and discharge canals. The excavated discharge canal extends 1.2 mi west into the Gulf of Mexico with a dike along the southern side. Farther south, two berms border the intake canal, extending 2.7 mi into the Gulf of Mexico. Beyond these berms, a navigational channel extends an additional 3 mi offshore and has a spoil bank along the northern side. The berms along the intake and discharge canals restrict coastal flow south of the CREC discharge area.


LNP 2
LNP 1
N
W
E
S
LEGEND
LNP Property Boundary
CREC Property Boundary
Yankeetown
Inglis
Lake Rousseau
Inglis Lock
Withlacoochee River
Cross Florida Barge Canal
Inglis Dam
Crystal River Energy Complex (CREC)
Gulf of Mexico
CREC Discharge
Sources
LNP Site: Sargent & Lundy, 2007
Imagery: Labins, 2004
0 0.5 1 1.5 2
Kilometers
0 0.5 1 1.5 2
Miles
Progress Energy Florida
Levy Nuclear Plant
Units 1 and 2
Study Area Overview Map
FIGURE 2-1

3.0 CRSMP Monitoring

The purpose of this plan is to collect field data needed to determine if there are any impacts of the proposed withdrawals in the CFBC and OWR. Data collection includes the survey and monitoring of nekton and plankton, as well as a hydrographic survey. Nekton and plankton data will also be collected from the NGM, an area just off the entrance of the CFBC, to document background conditions and biological recruitment potential to the CFBC. In addition, an impingement and entrainment study shall be developed and implemented to validate the assumption of limited or no impact from the impingement and entrainment of organisms during operation of the CWIS.

This section provides an overview of the CRSMP monitoring locations, biological and hydrographic parameters to be sampled, and sampling approach.

3.1 Nekton and Plankton Survey and Monitoring

3.1.1 Sampling Locations

Nekton and plankton data will be collected in the CFBC and OWR study areas, as well as the NGM. Sampling locations within each study area are designed to support a stratified random sampling design as required by the COC. The number and position of locations are consistent with accepted biological monitoring designs in the nearshore and riverine/ stream environments along the Gulf of Mexico, including the Tampa Bay Water's Tampa Bypass Canal/Alafia River Water Supply Projects Hydrobiological Monitoring Program (HBMP) (PBS&J, Inc. [PBS&J], 2000), and the FWC/Fish and Wildlife Research Institute (FWRI) Fisheries Independent Monitoring (FIM) program (FWRI, 2009).

The CFBC aquatic study area extends west from the Inglis Lock to the interface of the canal with the Gulf of Mexico (see Figure 3-1) and is divided into four linear strata of equal length (1.85 mi [2.98 kilometers (km)). CFBC stratum spatial extents are defined in Table 3-1. These strata designations will be used for both nekton and plankton sampling.

Linear strata were selected for the CFBC aquatic study area in an effort to encompass the range of physiochemical and biological gradients that occur within the reporting unit. Linear strata boundaries were not assigned to specific physiochemical or biological values, but were divided evenly along the canal length so that the number of samples collected would be in keeping with the sample size requirements of the COCs. Within each of the CFBC strata, shallow and deep substrata were also identified. The shallow substratum includes shoreline areas equal to or less than 2 meters deep. The deeper substratum includes all portions of the canal greater than 2 meters in depth. Both shallow and deep substrata will be used for nekton sampling. Only deep strata will be used for plankton sampling.

TABLE 3-1
Cross Florida Barge Canal Linear Strata Spatial Extents

Stratum	Eastern Limit (km)	Western Limit (km)
CFBC Strata 1	0	2.98
CFBC Strata 2	2.98	5.96
CFBC Strata 3	5.96	8.94
CFBC Strata 4	8.94	11.82

Notes:
Distances are relative to the Inglis Lock.
CFBC = Cross Florida Barge Canal
km = kilometer

The OWR aquatic study area extends from the floating exclusion barrier below the Inglis Dam downstream to the convergence with the CFBC, a distance of 1.5 mi (2.4 km) (see Figure 3-2). The OWR aquatic study area is divided into three linear strata of equal length (0.5 mi [0.8 km]). OWR stratum spatial extents are defined in Table 3-2. These strata designations will be used for both nekton and plankton sampling.

Linear strata were selected for the OWR aquatic study area in an effort to encompass the range of physiochemical and biological gradients that occur within the reporting unit. As with the CFBC reporting unit, linear strata boundaries were not assigned to specific physiochemical or biological values but were divided evenly along the canal length so that the number of samples collected would be in keeping with the sample size requirements of the COCs. Within each OWR stratum, vegetated and non-vegetated shoreline substrata were also identified. Nekton sampling efforts will be divided between the identified substrata. Plankton sampling will be conducted along the centerline of each linear stratum included in Table 3-2.

TABLE 3-2
Old Withlacoochee River Strata Spatial Extents

Stratum	Eastern Limit (km)	Western Limit (km)
OWR Strata 1	0	0.80
OWR Strata 2	0.80	1.60
OWR Strata 3	1.60	2.40

Notes:
Distances are relative to the floating exclusion barrier downstream of Inglis Dam.
km = kilometer
OWR = Old Withlacoochee River

The NGM aquatic study area extends from the interface of the CFBC with the Gulf of Mexico to a point 1.91 mi (3.08 km) west (see Figure 3-3). This aquatic study area has two linear strata associated with the dredged channel, and two areal strata (nekton cells) associated with shallow mud flats and oyster reefs. The two NGM linear strata are of equal length of 0.96 mi (1.54 km), and were selected based on potential longitudinal

physiochemical and biological gradients. The two nekton cells are each 0.57 square mile (mi^2) (1.48 square kilometers [km^2]). These cells are finer in scale than those employed by FWRI at the nearby Cedar Key study area (3.43 km^2). The NGM stratum spatial extents are defined in Table 3-3. Sampling efforts for the nekton community in the NGM will be divided between linear strata (deep) and the areal cells (shallow). Sampling efforts for the plankton community will take place within the linear strata (deep) only.

TABLE 3-3
Nearshore Gulf of Mexico Strata Spatial Extents

Stratum	Eastern Limit (km)	Western Limit (km)	Area (km^2)
NGM Strata 1	0	1.54	NA
NGM Strata 2	1.54	3.08	NA
NGM Nekton Cell 1	0	1.54	1.48
NGM Nekton Cell 2	1.54	3.08	1.48

Notes:
Distances are relative to the mouth of CFBC.
km = kilometer
km^2 = square kilometer
NA = not applicable
NGM = nearshore Gulf of Mexico

Spatial Randomization

Locations of samples apportioned to each stratum within an individual study area will be selected at random. The use of spatial randomization in this monitoring plan is consistent with existing biological monitoring plans in the region (PBS&J, 2000; FWRI, 2009).

Linear strata will be subdivided into 3.2-foot (ft) (1-meter [m]) increments along a lengthwise center line, creating discrete locations from which samples will be randomly chosen. Approximately 2,980, 800, and 1,540 sampling loci along the center line will be available for sampling within each linear stratum of the CFBC, OWR, and the NGM, respectively.

The two areal cells associated with the NGM will each be subdivided into a 0.0016-mi^2 (0.0025-km^2) grid for random sample location selection. Approximately 592 sampling loci will be available for sampling within each areal stratum. The randomly selected loci will be sampled using a seine; trawling will not be conducted in the areal cells.

3.1.2 Sampling Parameters and Methods

Biological parameters to be sampled at each location include nekton and plankton communities. Field water quality parameters will also be collected.

Nekton

Nekton includes juvenile to adult fish and motile invertebrates. These organisms will be collected using seining and trawling techniques.

The seining and trawling techniques to be used for the CRSMP are based on standardized procedures presented in *The Fisheries-Independent Monitoring Program Procedure Manual* (FWRI, 2009). These procedures will be field tested and verified prior to implementation of the CRSMP survey. A field testing and verification event will serve to evaluate the FIM procedure relative to actual environments being sampled within each study area, which include the narrow limestone channel in the OWR, the deep, steep-sided channel of the CFBC, and the open water and mudflats of the NGM. Sampling procedures may need to be revised or adjusted to fit actual CRSMP study area field conditions.

Seine sampling will employ "river" and "bay" seining techniques. The river seining technique will be used for sampling along shorelines that drop off rapidly to deeper water. The seine is deployed from a boat as necessary where deeper water prevents traditional seine sets by wading. Study areas that will use the river seine technique include the CFBC, OWR, and the NGM. The bay seine technique, using a fixed pole and seine deployment and closure by wading or boat will be used for sampling shallow estuarine habitats away from shorelines. This technique will be used for areal strata in the NGM study area. These gears and field sampling protocols target fish populations; however, any motile invertebrates collected using these techniques will be retained for identification. A 69.9-ft (21.3-m) center-bag seine will be used for both of these techniques (FWRI, 2009).

An otter trawl will be used to sample deeper habitats within the study area not accessible to seines. These areas include the dredged canal of the CFBC and linear strata within the NGM. Trawling was not selected as a viable gear option for the OWR because of the narrowness, number of snags, and the non-uniformity of OWR limestone river bottom. A 20.0-ft (6.1-m) otter trawl targets epibenthic fish and motile invertebrates (FWRI, 2009).

All nekton samples will be processed according to the FIM standard set of protocols. These protocols ensure that an accurate representation of species size and number collected are recorded for each species in each sample and that the data taken reflect the entire catch. Processing will entail field identifications to lowest practicable taxonomic level, measurements for total length, and enumeration of organisms. The FIM protocols also detail the subsampling of large collections of organisms, the creation of a representative voucher sample collection, and appropriate documentation. Identification of any unknown specimens, verification of records, and maintenance of a sample reference collection will be conducted by an independent subcontractor with recognized expertise in fisheries taxonomy.

Plankton

Targeted plankton include meroplankton and ichthyoplankton, which will be sampled using a plankton net.

A 333-micron (μ) conical plankton net equipped with a flowmeter will be used to collect samples from the CFBC, OWR, and the NGM. For the CFBC and the NGM study areas, an oblique tow technique will be used. This technique divides the plankton tow into three depths (surface, middle, and bottom) among which tow times are divided evenly. Sampling will be conducted during flood tides and at nighttime only. This plankton sampling methodology is consistent with previous plankton sampling in the CFBC (PEF, 2008) and the HBMP study (PBS&J, 2000). Plankton sampling in the OWR will require a modified plankton tow or pump sampling technique due to the inability of performing standard

towing techniques in the narrow, sinuous channel, with irregular bottom contours, especially at night. Modifications to plankton standard operating procedures (SOPs) will be tested and verified in the field before initiation of the CRSMP surveys.

Plankton sample identification, enumeration, and maintenance of a sample reference collection will be conducted by an independent subcontractor with expertise in plankton taxonomy and regional experience.

Water Quality

Field water quality parameters will be measured at each nekton and plankton sampling location during each sampling event. A Yellow Springs Instruments multi-parameter sonde (or similar) will be used to measure depth profiles (1-m intervals) of dissolved oxygen (DO), temperature, pH, conductivity, salinity, and depth. Water transparency will be collected using a Secchi disk only in association with nekton sampling.

3.1.3 Sample Size and Frequency

Nekton and plankton sample size estimates were based on general statistical significance (that is, sample size of 30). Attachment A summarizes sample size analysis in more detail. The COC sample size (minimum of 12 samples per month in the CFBC, 6 samples per month in the OWR, and 6 samples per month in the NGM), is statistically appropriate for population comparisons on a semiannual and annual basis. This degree of sampling size is similar to the HBMP monitoring efforts and provides a reasonable statistical design to detect status and trends in nekton and plankton populations between pre operational surveys and post operational monitoring.

Nekton and plankton will be sampled monthly as per COC requirements (Section B.XXIX.B.1.a.i and ii). Plankton will be sampled during the nighttime during flood tides. Nighttime plankton sampling is consistent with established sampling protocols used in other monitoring programs (PBS&J, 2000) and warranted based on review of the plankton results from the CFBC during the 2007-2008 aquatic sampling program (CH2M HILL, 2009a) (see Attachment B).

Field Sampling Program Summary

Table 3-4 summarizes the study areas, parameters (nekton, plankton, field water quality), sampling locations (that is, strata), sampling techniques, and number of samples per strata on a monthly and annual basis.

TABLE 3-4
Annual Sampling Summary for Nekton, Plankton, and Field Water Quality

Sampling Parameter	Number of Study Area Spatial Strata	Month of the Year												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Cross Florida Barge Canal (CFBC)														
Nekton	4 Strata	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	2 seines[a]/stratum 1 trawl/stratum	**144**
	Sample Total	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	
Plankton	4 Strata	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	**144**
	Sample Total	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	
Field Water Quality	Concurrent	24 profiles	24 profiles	24 profiles	24 profiles	24 profiles	24 profiles	24 profiles	24 profiles	24 profiles	24 profiles	24 profiles	24 profiles	**288**
Old Withlacoochee River (OWR)														
Nekton	3 Strata	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	2 seines[a]/stratum	**72**
	Sample Total	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	
Plankton	3 Strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	2 hauls/strata	**72**
	Sample Total	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	
Field Water Quality	Concurrent	12 profiles	12 profiles	12 profiles	12 profiles	12 profiles	12 profiles	12 profiles	12 profiles	12 profiles	12 profiles	12 profiles	12 profiles	**144**
Nearshore Gulf of Mexico (NGM)														
Nekton	2 Cells – shallow 2 Strata – channel	2 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	1 seine[a,b]/cell 1 trawl/stratum	**72**
	Sample Total	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	
Plankton	2 Strata – channel	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	3 hauls/stratum	**72**
	Sample Total	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	
Field Water Quality	Concurrent	12 Profiles	12 Profiles	12 Profiles	12 Profiles	12 Profiles	12 Profiles	12 Profiles	12 Profiles	12 Profiles	12 Profiles	12 Profiles	12 Profiles	**144**

Notes:
[a]seine = 21.3 m (69.9 ft) center bag seine – river seine technique
[b]seine = 21.3 m (69.9 ft) center bag seine – bay seine technique
trawl = 6.1 m (20.0 ft) otter trawl
haul = 333 µ conical plankton net – oblique tow

3.1.4 Sampling Schedule

COC sections B.XXIX.B.1.a.iv and v require that pre-operational survey and post-operational monitoring be conducted for a period of time to be determined by statistical analysis. However, sufficient background data for nekton and plankton communities were not available to conduct such statistical analysis. The proposed sampling schedule duration described below is intended to capture seasonal variations and will incorporate an adaptive management approach.

The nekton and plankton survey and monitoring field data collection program will be undertaken during the pre-operational period and after the initiation of operations of Levy Nuclear Plant Unit 1 (LNP 1) and Levy Nuclear Plant Unit 2 (LNP 2). Monthly sampling will be conducted over each monitoring year. A summary of the nekton and plankton survey and monitoring field data collection schedule is as follows:

- Three years of pre-operational nekton and plankton survey and monitoring will be initiated 5 years before the scheduled operational date for LNP 1.
- The data collected for the first 3 years of monitoring will be statistically analyzed by Progress Energy and presented in a summary report to FWC within 180 days of sampling completion. Within 90 days FWC will review and make a final determination of whether additional monitoring for up to 2 years is required, for a maximum of 5 total years of monitoring. Progress Energy will continue the monthly sampling of nekton and plankton during the data analysis/reporting period and the 90-day FWC review and determination period.
- Post-operational nekton and plankton survey and monitoring will be conducted during the 3 years following the commencement of operation of LNP 1, or until the operational commencement of LNP 2.
- Post-operational nekton and plankton survey and monitoring will be conducted during the 3 years following the commencement of operation of LNP 2.

The sampling design will be reviewed upon completion of the 3-year pre-operational study. At that time, changes to the sampling design may be applied to the post-operational monitoring program to increase the ability to detect potential changes.

Following the completion of scheduled post-operational monitoring, the need for additional monitoring will be assessed based on results obtained, and the demonstrated potential for, adverse changes.

3.1.5 Data Analysis

This section provides methods to analyze the data collected under the CRSMP. These methods are consistent with standard protocols within existing regional biological monitoring plans.

Nekton

Nekton data will be analyzed by the following methods, which are similar to those used in the Tampa Bay Water HBMP (PBS&J, 2003). The following statistics will be calculated for indicator species to assess potential changes in the nekton community within the CFBC and

OWR resulting from the operation of the LNP: (1) the center of abundance (COA), center of frequency (COF), abundance weighted salinity (AWS), and frequency weighted salinity (FWS). For the NGM, general summary statistics including monthly and seasonal abundance and diversity, will be calculated for nekton data to support the description of background conditions and potential recruitment to the CFBC.

The COA and COF are statistics that describe the average position of occurrence for a given taxon over the sampling time period. For the CFBC, the COA and COF will be described in terms of river kilometers downstream from the Inglis Lock. For the OWR, the COA and COF will be described in terms of river kilometers downstream from the floating exclusion barrier adjacent to the Inglis Dam. COA is calculated by weighting the location of occurrence by the number of organisms of the given species collected at that location and is calculated as follows:

$$COA = \frac{\sum NK}{\sum N}$$

where N = the number of individuals collected per deployment

K = distance in kilometers upstream from the river mouth

COF is the unweighted average of the locations at which a species occurs and is calculated as follows:

$$COF = \frac{\sum K}{\sum f}$$

where K = distance in kilometers upstream from the river mouth for each sample in which the taxon has been collected

f = the number of samples in which the taxon has been collected

AWS and FWS are statistics that describe the salinity range in which a given taxon is found to be most abundant. AWS is calculated by weighting the salinity at each sample collection site by the number or density of organisms of the given species collected at that location and is calculated as follows:

$$\overline{S_N} = \frac{\sum NS}{\sum N}$$

where N = the number of individuals collected per sample

S = salinity at the sample point

FWS is the unweighted average of the salinities at which a species has been collected and is calculated as follows:

$$\overline{S_f} = \frac{\sum S}{\sum f}$$

where S = salinity at the sample point

f = the number of samples in which the taxon was collected

Tables and figures summarizing the results of each sampling event will be generated to provide COA, COF, AWS, and FWS per indicator species for each spatial stratum. Assessment of spatial and temporal variation will be accomplished using parametric or nonparametric statistics. Appropriate multivariate statistics will be used to identify correlations between biotic parameters (species abundance) and abiotic parameters (salinity, dissolved oxygen, temperature). Spatial and temporal trends in nekton will also be qualitatively analyzed in conjunction with rainfall and atmospheric data from existing nearby recording stations, to determine their potential influence on the nekton results. Climatic data sources will include SWFWMD monitoring stations at the Inglis Lock, including Inglis Lock #22959, which collects rainfall data, and Inglis II ET #22960, which collects air temperature, wind speed, and wind direction data (SWFWMD, 2009). Tidal cycle data will also be considered, as measured at U.S. Geological Survey Station #02313274 on the southeast corner of Chambers Island at the mouth of Bungalow Pass, just north of the CFBC.

Plankton

Plankton data for the CFBC and OWR will be analyzed by calculating the same metrics for nekton, with the following differences. Density will replace the number of individuals in the equations to calculate COA and AWS. Density is expressed as the number of individuals per 100 cubic meters (m^3) and is calculated as follows:

$$Density = \left(\frac{Number\ of\ Individuals}{Volume\left(100\,m^3\right)} \right)$$

COA is calculated by weighting the location of occurrence by the number of organisms of the given species collected at that location and is calculated as follows:

$$COA = \frac{\sum NK}{\sum N}$$

where N = the density of individuals collected per deployment

K = distance in kilometers upstream from the river mouth

COF is the unweighted average of the locations at which a species occurs and is calculated as follows:

$$COF = \frac{\sum K}{\sum f}$$

where K = distance in kilometers upstream from the river mouth for each sample in which the taxon has been collected

f = the number of samples in which the taxon has been collected

AWS is calculated by weighting the salinity at each sample collection site by the number or density of organisms of the given species collected at that location and is calculated as follows:

$$\overline{S_N} = \frac{\sum NS}{\sum N}$$

where N = the density of individuals collected per sample

S = salinity at the sample point

FWS is the unweighted average of the salinities at which a species has been collected and is calculated as follows:

$$\overline{S_f} = \frac{\sum S}{\sum f}$$

where S = salinity at the sample point

f = the number of samples in which the taxon was collected

Tables and figures summarizing the results of each sampling event will be generated to provide COA, COF, AWS, and FWS per indicator species and life stage for each spatial stratum. Assessment of spatial and temporal trends will be accomplished using parametric or nonparametric statistics. Appropriate multivariate statistics will be used to identify correlations between biotic parameters (species abundance) and abiotic parameters (salinity, dissolved oxygen, temperature). Spatial and temporal trends in plankton will also be qualitatively analyzed in conjunction with rainfall and atmospheric data from existing nearby recording stations, to determine their potential influence on the nekton results.

For the NGM, general summary statistics, including monthly and seasonal abundance and diversity, will be calculated for plankton data to support the description of background conditions and potential recruitment to the CFBC.

3.2 Hydrographic Survey

According to COC Section B.XXIX.B.1.a.iii, the CRSMP may include collection of hydrographic data to characterize circulation and flow from the Withlacoochee River south to the CFBC, across and into the CFBC, and south toward the CREC. This section presents the components of a proposed hydrographic study, including monitoring station locations, study parameters and methods, and schedule.

3.2.1 Monitoring Locations and Frequency

Figure 3-4 shows proposed locations for monitoring stations (C1 through C5) that will be used to collect model calibration and verification data. Stations are labeled with a prefix denoting the type of measurements that will be conducted: *C* for current probe locations, *T* for temperature probe locations, and *WL* for water level probe locations. The coordinates of the stations are listed in Attachment C. These survey locations may be altered slightly depending on the actual conditions found at each site. Any changes in locations will be

documented in the final report. In situ salinity and temperature data will be collected at all stations.

For each hydrographic monitoring year, two separate 1-month-long data collection periods are proposed to represent seasonally different conditions: one in winter (January/February) and the other in summer (July/August). All stations will be occupied three times over the course of each data collection period; once for deployment, once at the mid-point of the sampling period, and once at retrieval. In situ salinity and temperature readings will be collected at each station on each scheduled occupation to have independent meter readings to compare with the automated meters.

3.2.2 Survey Methods

Data to be collected for the hydrographic survey include bathymetric data, meteorological data, water level data, current velocities, water temperature, and salinity. Data will be obtained from field studies and historic and current data sources.

Depth data detailing the local bathymetry is necessary for proper description of the project area. Navigation charts and other literature sources, supplemented by field depth readings taken at all station locations, will be used to define the site bathymetry.

Monitoring will include the use of current, temperature, and water level probes. Based on locally gained experience, probes located in shallow conditions (near the coastline) will foul quickly. To limit potential data loss, all probes will be checked and, if necessary, cleaned near the mid-point of their scheduled deployment period (after approximately 2 weeks). The collected data will be reviewed, and any periods that show degraded performance will be discarded.

The forces driving local currents at the project site include tidal water level variations, local winds, river flows, and industrial flows (local intake and discharges). Current data collected at Stations C1 through C5, using either S-4 current meters or acoustic Doppler current profile meters as practicable (dependent on depth and mooring requirements per meter type), will be used to calibrate the model hydrodynamics.

Water level data at Stations WL1 through WL3 will be used to observe changes in tidal range as the tides propagate into the area. Automated depth pressure sensors will be anchored at these locations. Their data will be retrieved at the end of each sampling period and compared with local National Oceanic and Atmospheric Administration tidal data in the region.

Stations T1 through T12 will be used to monitor temperature in the study area. Single thermisters will be deployed at stations in shallow water. A string of two thermisters will be deployed in areas with sufficiently deep water to monitor both near surface and near bottom temperatures. Station T1 will monitor the plume discharge temperature; Station T11 will provide a background temperature reading away from the influence of the plume; and Stations T2 through T10 will monitor temperature variations within the NGM study area to provide information on potential transport and dispersion of the thermal plume.

Salinity and temperature measurements will be taken three times at each station: when probes are deployed, when they are checked/cleaned, and when they are retrieved. Water depth, obtained using a weighted measuring tape, will also be recorded when probes are

set. If the water depth is less than 4 feet, only one sample at mid-depth will be taken for the in situ parameters. In deeper waters, two samples (approximately 1 foot from the top and bottom) will be taken.

Local wind patterns are likely to have significant influence on local circulation patterns and thus are likely to influence the thermal plume. PEF maintains a meteorologic station near the terminus of the CREC discharge canal. Data from this station and other available and representative local weather data will be obtained and reported.

Table 3-5 summarizes the field parameters that will be monitored for the hydrographic survey.

TABLE 3-5
Hydrographic Survey Field Parameters

Parameter/Method	No. of Stations	Accuracy	Frequency	Measurements per Location
Temperature/probe	12	0.1°F	Continuously, 1-month period	1 or 2
Current (velocity)/meter	5	0.001 m/s	Continuously, 1-month period	1 or 2
Water Level/probe	3	0.1 m	Continuously, 1-month period	1
In situ temperature	20	0.1 psu	Deployment, mid-term, retrieval	1 or 2
In situ salinity	20	0.1 psu	Deployment, mid-term, retrieval	1 or 2
Depth/sounding line	20	0.1 m	Deployment	1

Notes:
Continuous sampling will be conducted for two 1-month periods per monitoring year.
Salinity and depth measurements listed above only occur during the survey periods.
Measurements per station depend on depth. Two samples (top and bottom) will be collected when depth exceeds 4 feet.
°F = degree Fahrenheit
m/s = meter per second
psu = practical salinity unit

3.2.3 Sampling Schedule

The hydrographic field data collection program will be undertaken during the pre-operational period and after the initiation of operations of LNP 1 and LNP 2. For each monitoring year, two separate 1-month-long data collection periods are proposed to represent seasonally different conditions: one in winter (January/February) and the other in summer (July/August). A summary of the schedule is as follows:

- Two years of pre-operational hydrographic monitoring will be conducted during the 3 years prior to the scheduled operational date for LNP 1.
- Two years of post-operational hydrographic monitoring will be conducted during the 3 years following the commencement of operation of LNP 1.
- Two years of post-operational hydrographic monitoring will be conducted during the 3 years following the commencement of operation of LNP 2.

3.3 Impingement and Entrainment Study

COC Section B, XXIX.B.1.a.vi requires that the CRSMP include the development and implementation of an impingement and entrainment study at the project's CWIS to validate the assumptions of limited or no impingement and entrainment of organisms. This section provides the individual components of the proposed impingement and entrainment study, including a description of the sampling locations, sampling parameters and methods, and the sampling frequency.

Impingement studies are designed to further characterize the juvenile and adult fishes and shellfishes that could impinged by the CWIS. Entrainment studies are designed to measure monthly variation in the species composition and abundance of larval fishes and shellfishes that could be entrained. The sampling program is designed to provide current estimates of the abundance, taxonomic composition, diel periodicity, and seasonality of organisms impinged in the CWIS.

3.3.1 Sampling Location

Impingement and entrainment sampling events will take place at the CWIS, constructed on the north CFBC canal bank at a site south of the LNP site and west of the Inglis Lock on the CFBC. Impingement samples will be collected from the screenwash troughs of the CWIS traveling screens. Entrainment samples will be collected immediately ahead of the CWIS intake screen by boat or at another accessible representative point in the intake system. If sampling is conducted by boat, samples will be collected at the nearest location considered both safe and representative of water flowing into the CWIS. This location will be determined in the field once the CWIS has become operational.

3.3.2 Sampling Parameters and Methods

Impingement samples will be collected in 0.95-centimeter (3/8-inch mesh) wire baskets fabricated to fit into the screen washwater trough. Baskets will be placed either beneath each rotating screen or within the screenwash trough common to all rotating screens to collect material washed from the screens and to ensure the collection of representative samples. Baskets will be inspected at regular intervals during each sampling event. All fish and shellfish collected during a sample will be identified and counted, and up to 25 individuals of each species will be individually measured (nearest millimeter), and weighed (nearest 0.1 gram). If more than 25 specimens of a given species are collected, then 25 individuals will be randomly selected, measured and weighed; if fewer than 25 specimens are collected, then all will be measured and weighed. Percent initial fish survival and injury of each species will be observed and documented on a data sheet. Water quality (temperature, DO, turbidity, and conductivity), water level, weather conditions, and plant operational data will be collected during each event.

Entrainment sampling will consist of the placement of a conical 1.6-ft (0.5-m)-diameter, 333-µ plankton net with a calibrated flowmeter. The plankton net will be attached to a rope and deployed by hand. Each sample will be collected throughout the water column to account for any differences in vertical distribution. Duplicate 333-µ plankton samples will be collected during the day and night of each sampling event. Samples will be timed with a stopwatch to ensure equal duration and similar flow. Water quality (temperature, DO,

turbidity, and conductivity), water level, weather conditions, and number of operating pumps will be recorded for during each event.

Plankton samples will be collected by environmental scientists with experience in calibration and deployment of plankton sampling equipment. Samples will be preserved in the field and delivered to a taxonomic laboratory experienced in the identification of plankton collected from the Gulf coast region representative of the study area. The laboratory will enumerate and identify plankton (ichthyoplankton and meroplankton) samples to the lowest practicable identification level.

Nekton will be identified to the lowest practicable taxonomic level. Most nekton will be identified onsite by professional ecologists and released. Specimens of uncertain identity will be retained, preserved, and identified to the lowest practicable taxon by a recognized professional taxonomic expert.

Sample archives will be held for a minimum of 5 years. Voucher collections for nekton and plankton will include preserved specimens and digital photographs. Nekton specimens that are too large for sample preservation will be recorded with digital photography in the field.

3.3.3 Sampling Frequency

Each impingement and entrainment sampling event will take place during the day and night over a 24-hour period. Impingement sampling frequency will be dependent upon rate of debris accumulation. If debris load is manageable, samples will be collected during 6-hour intervals with the traveling screens being rotated every 30 minutes. If debris load becomes problematic, a subset of the 6-hour intervals will be sampled during the day and night to account for diel differences in impingement species composition and abundance.

Entrainment sampling will be conducted concurrently with the impingement sampling. Two daytime and two nighttime samples will be collected during each monthly sampling event.

3.3.4 Sampling Schedule

Impingement and entrainment sampling will be conducted monthly during the first 3 years of LNP 1 operation, or until the operational commencement of LNP 2. Sampling will also be conducted monthly for 3 years following the commencement of LNP 2 operation. The need for additional monitoring will be assessed based on the results of this monitoring and the demonstrated potential for adverse impacts. Adaptive management approaches, discussed in Section 3.4, will be used to access the adequacy of the post-operational methodologies.

3.3.5 Data Analysis

Impingement

Impingement data will be used for quantitative determination of juvenile and adult fish losses caused by the operation of the LNP. Methods proposed are consistent with state-accepted impingement and entrainment characterization studies under Section 316(b) of the CWA.

Impingement rates will be calculated and expressed as the number of organisms impinged per collecting period. Tables and figures summarizing the results of each sampling event will be generated to provide the number of individuals per species and condition

(alive/dead). Numbers of fish and invertebrates impinged per 24 hours determined from the sampling intervals will be extrapolated to provide estimated monthly and annual impingement totals. The total number, mean length, and weight for each species will be calculated and reported in the species composition and length frequency data. Diurnal (night/day) and seasonal variation will be analyzed using a parametric or nonparametric statistics. Diurnal and seasonal variations will be qualitatively analyzed in conjunction with water quality results, as well as rainfall and atmospheric data from existing nearby recording stations.

Entrainment

Entrainment data will be used for quantitative determination of holoplankton, meroplankton, and ichthyoplankton losses resulting from the operation of the LNP. These methods are consistent with federally and state- approved impingement and entrainment characterization studies under Section 316(b) of the CWA.

Entrainment data will be subdivided into holoplankton, meroplankton, and ichthyoplankton. Holoplankton in all samples will be enumerated by major taxa, and in selected representative samples, will be identified to the lowest practicable taxon. Meroplankton and ichthyoplankton in all samples will be identified to the lowest practicable taxon and enumerated by life stage. Results will be expressed as density (numbers per 100 m^3).

Tables and figures detailing entrainment density, richness, and diversity of zooplankton will be developed and presented. Statistical analyses that will be considered in evaluating the data include the Shannon-Wiener index H', Margelef's richness, and Pielou's evenness J'. Plankton density temporal and seasonal variation will be analyzed using parametric or nonparametric statistics. Diurnal and seasonal variations will be qualitatively analyzed in conjunction with the water quality results, as well as rainfall and atmospheric data from existing nearby recording stations, to determine their potential influence on the nekton results. Entrainment density will also be compared between monitoring years and with plankton data collected in the CFBC and NGM spatial strata (see Section 3.1).

Annual entrainment losses will be calculated using the measured density of organisms and the LNP flow rate. Entrainment numbers for periods between sampling events will be estimated by interpolation. All entrained species will be evaluated; however, a detailed analysis of representative important species (Section 5.5) will be determined by an equivalent adult analysis using the Goodyear/Horst model (Goodyear, 1978; Horst, 1975).

Representative Important Species

Representative important species (RIS) are defined as those that are known to occur or could be encountered within the study areas and are ecologically, recreationally, or commercially important. A preliminary list of candidate RIS has been compiled based on several sources (see Table 3-6). Existing data were reviewed to provide a list of species inhabiting the study areas and to gain an understanding of the species relative abundance and spatial and temporal variation. Existing monitoring plans were included to provide insight into the role of these species in regional ecosystems and provide additional information as to their regional status and trends. Sources that were reviewed include the following: *Aquatic Ecology Sampling Report, Levy Nuclear Plant* (CH2M HILL, 2009a), *Supplemental 316(b)*

Information of Potential Impacts to Aquatic Biota at LNP (CH2M HILL, 2009b), *Crystal River 316 Studies* (Stone and Webster, 1985), *The Fisheries-Independent Monitoring Program Procedure Manual* (FWRI, 2009), and *Tampa Bypass Canal/Alafia River Water Supply Projects HBMP* (PBS&J, 2000). The list of candidate RIS may be refined based on the sampling results of the pre-operational period if some species are found to be absent or in low abundance during sampling events.

TABLE 3-6
Candidate Representative Important Species

Taxon	Scientific Name	Habitat Indicator	Level of ID needed
Fish – Juvenile, Adult, Ichthyoplankton			
Bay anchovy	*Anchoa mitchilli*	ES (some juveniles)	Genus or species
Black drum	*Pogonias cromis*	ES (juveniles)	Species
Centrarchids (Sunfish sp. black bass)	*Lepomis sp., Micropterus sp.*	FW	Genus or species
Cyprinodontids	*Cyprinodon variegatus, Floridichthys carpio*	NA	Species
Flounder	*Paralichthys sp.*	ES (juveniles)	Species
Ladyfish	*Elops saurus*	NA	Species
Menhaden	*Brevoortia sp.*	ES (juveniles)	Genus or species
Mojarras	*Eucinostomus harengulus, E. gula*	ES (juveniles)	Genus or species
Pinfish	*Lagodon rhomboides*	NA	Species
Killifish, mosquitofish, sailfin mollies	*Heterandria formosa, Gambusia holbrooki, Poecilia latipinna*	FW	Species
Red drum	*Sciaenops ocellatus*	ES (juveniles)	Species
Sand seatrout	*Cynoscion arenarius*	ES (juveniles)	Species
Sheepshead	*Archosargus probatocephalus*	NA	Species
Silversides	*Antherinopsidae*	ES (juveniles)	Genus or species
Silver perch	*Bairdiella chrysoura*	ES (juveniles)	Species
Spot	*Leiostomus xanthurus*	ES (juveniles)	Species
Spotted seatrout	*Cynoscion nebulosus*	NA	Species
Striped mullet	*Mugil cephalus*	ES (juveniles)	Species
Invertebrates – Juveniles, Adults, Meroplankton			
Pink shrimp	*Farfantepenaeus duorarum*	ES (juveniles)	Species
Blue crab	*Callinectes sapidus*	ES (juveniles)	Species
Atlantic brief squid	*Lolliguncula brevis*	NA	Species

Notes:
ES = estuarine indicator
FW = freshwater indicator
SW = saltwater indicator

3.4 Adaptive Management

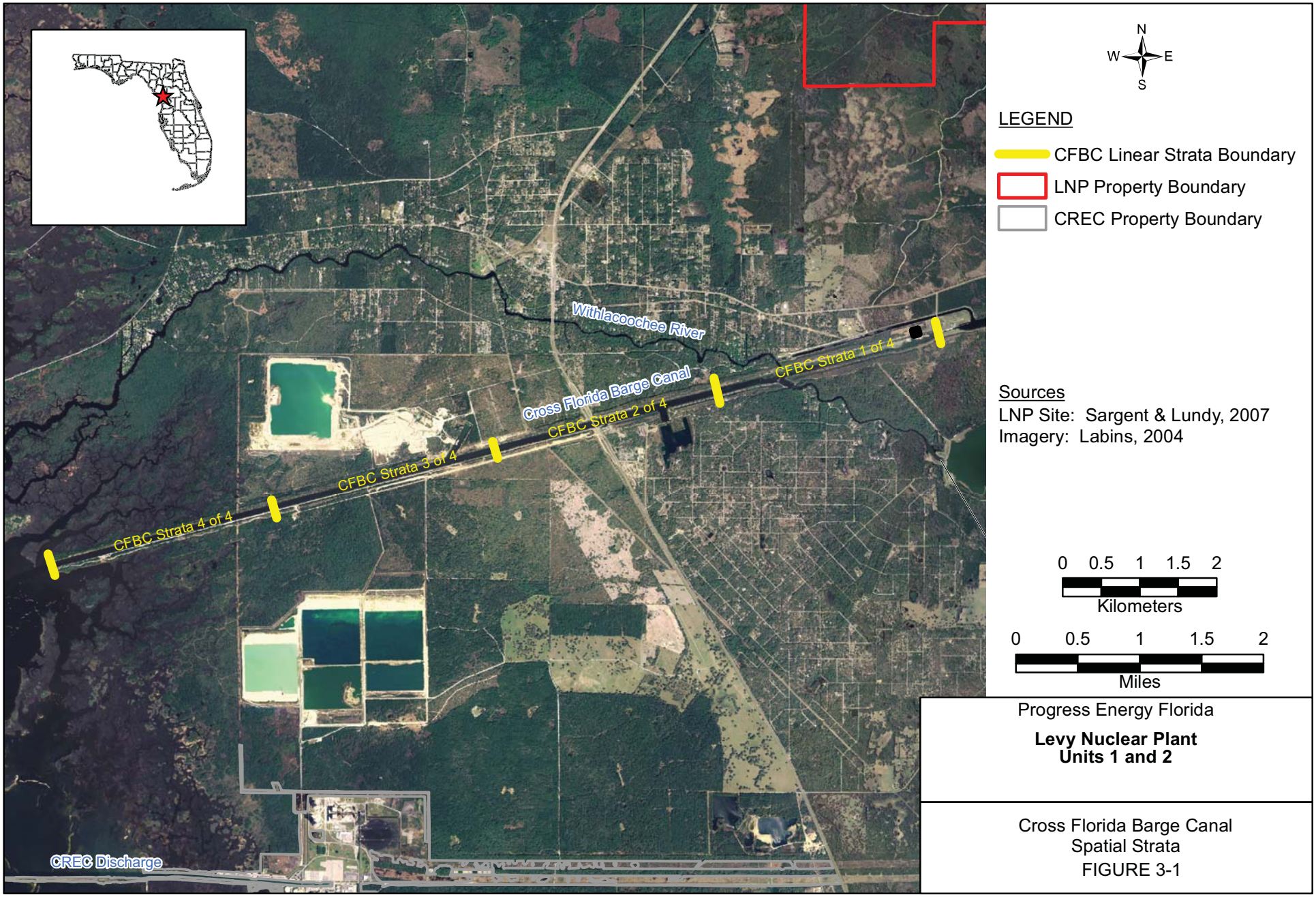
An adaptive management approach will be applied during implementation of the pre-operational survey and post-operational monitoring. Generally, the adaptive approach

would involve refining the monitoring plan based on information obtained. Adaptation may be used to improve technical methods, improve the capability to detect change, and/or explore alternative ways to more cost effectively meet the monitoring plan objectives.

A power analysis will be performed at the end of each pre-operational monitoring year on the nekton and plankton data sets to evaluate if sample size and frequency are adequate to detect change at the desired comparison scale. This information may be used to adjust monitoring efforts once estimates of the variability in these communities can be established.

Adaptive management focuses on learning and adapting, through partnerships between agency stakeholders and PEF managers. With the increasing body of knowledge about the monitored aquatic system, managers will ideally be able to refine the monitoring plan to more closely meet the original objectives.

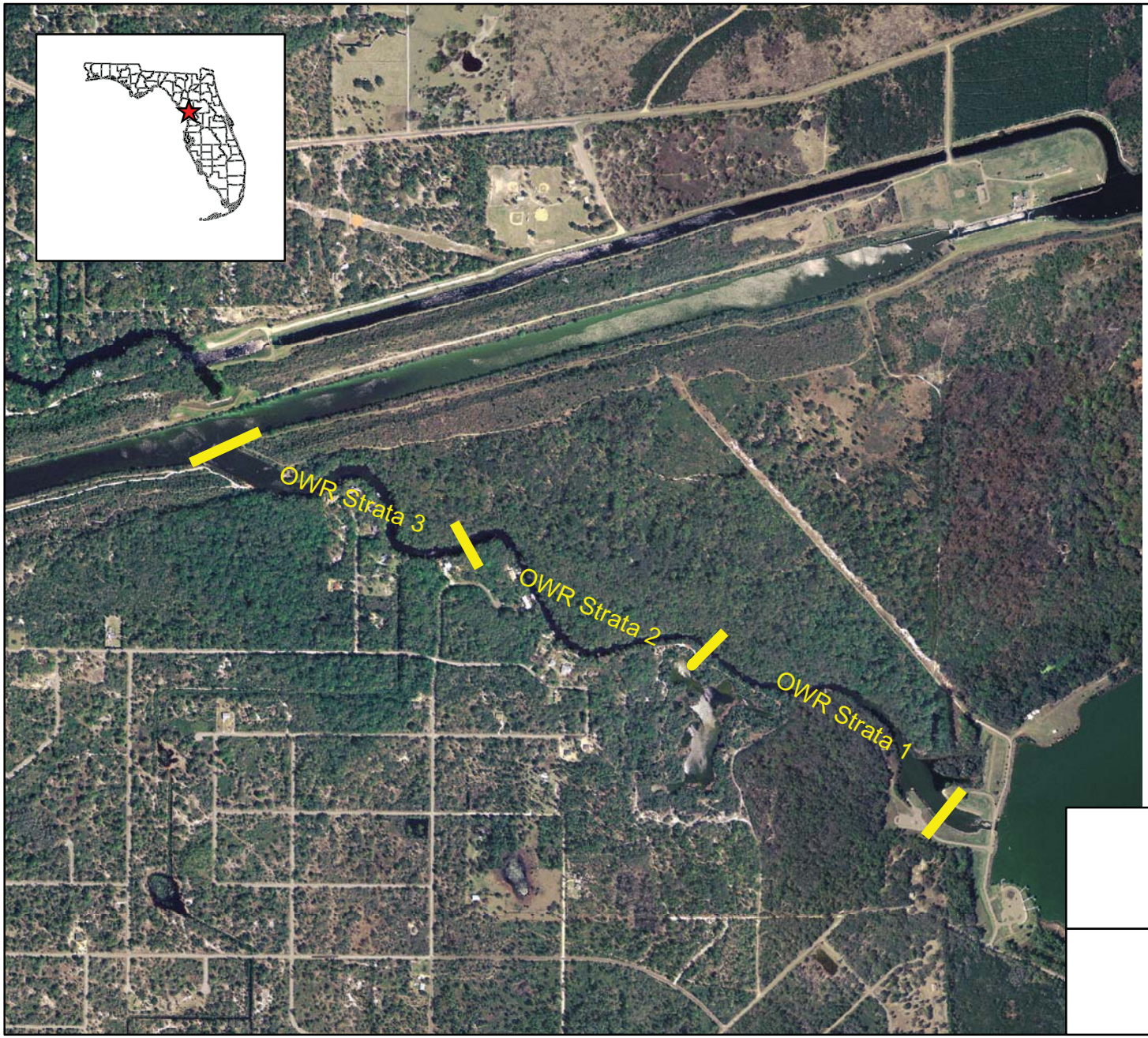
Progress Energy will conduct monthly sampling of nekton and plankton within the three study areas for a minimum of 3 years during the pre-operational period. The data collected for the first 3 years of monitoring will be statistically analyzed by Progress Energy and presented in a summary report to FWC. FWC will review the results within 90 days and determine whether additional monitoring for up to 2 years is required, for a maximum of 5 years of monitoring. As part of the adaptive management process, Progress Energy has agreed to continue the monthly sampling of nekton and plankton during the data analysis/reporting period and the FWC review period until a final determination regarding the necessity for, and duration of, any continued monitoring is made. This planned adaptation will prevent gaps in the data set should sampling beyond 3 years, and up to a maximum of 5 years, be required.



Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2

Cross Florida Barge Canal
Spatial Strata
FIGURE 3-1



N
W E
S

LEGEND

OWR Linear Strata Boundary

Sources
Imagery: Labins, 2004

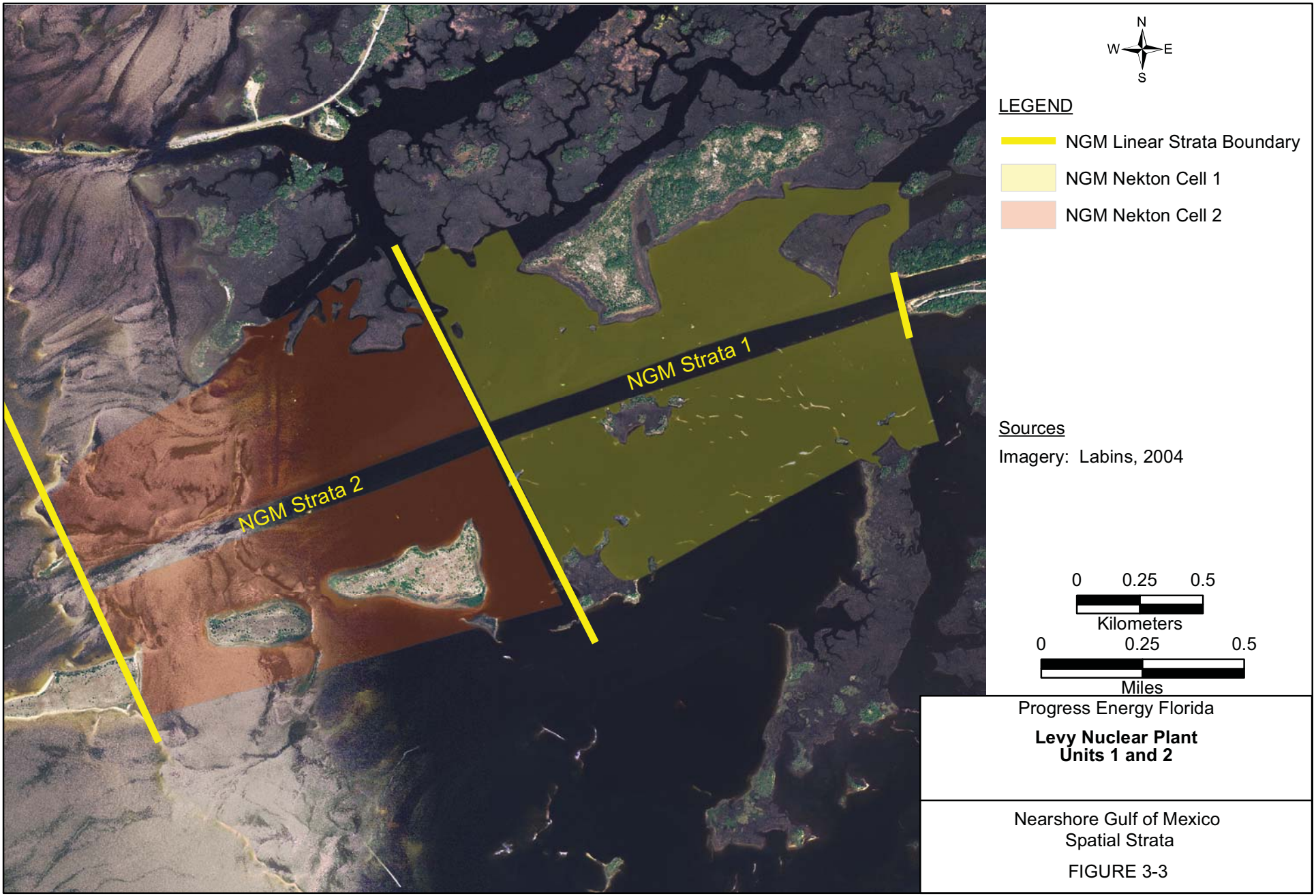
0 0.1 0.2 0.3 0.4
Kilometers

0 0.1 0.2 0.3 0.4
Miles

Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2

Old Withlacoochee River
Spatial Strata
FIGURE 3-2

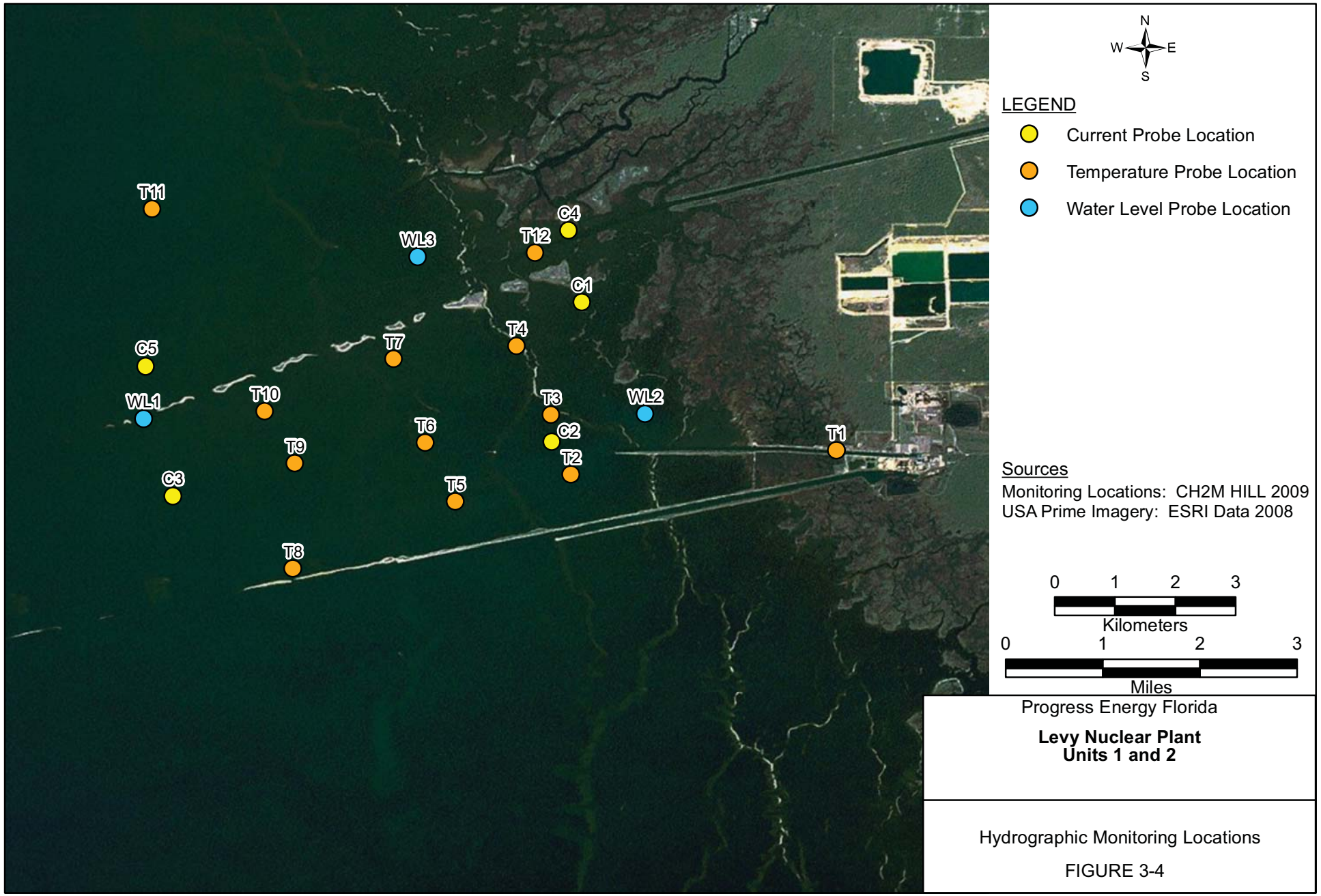


Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2

Nearshore Gulf of Mexico
Spatial Strata

FIGURE 3-3



Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2

Hydrographic Monitoring Locations

FIGURE 3-4

4.0 Quality Assurance / Quality Control and Data Management

The FDEP maintains SOPs for water quality data collection (Chapter 62-160, Florida Administrative Code [F.A.C.]). Water quality data collected for this program will conform to the quality assurance (QA) and quality control (QC) measures found in these SOPs (Chapter 62-4.246, F.A.C.). Table 4-1 contains a list of FDEP SOPs applicable to this CRSMP. In addition to compliance with FDEP protocols, health and safety, vessel operations, and manatee protection plan requirements will also be followed. Proposed deviations to FDEP water quality sampling protocols that are considered potentially beneficial to the program will be presented for FWC approval prior to implementation.

TABLE 4-1

FDEP SOPs Applicable to the CRSMP

Series	Description
FD 1000	Documentation
FM 1000	Field Mobilization
FS 1000	General Sampling
FT 1000	Field Testing General
FT 1100	Field pH
FT 1200	Field Specific Conductance
FT 1300	Field Salinity
FT 1400	Field Temperature
FT 1500	Field Dissolved Oxygen
FT 1700	Field Light Penetration
FT 11900	Field Continuous Monitoring

Notes:
CRSMP = Cross Florida Barge Canal and Withlacoochee River Baseline Survey and Monitoring Plan
FDEP = Florida Department of Environmental Protection
SOP = standard operating procedure

Source: FDEP, 2009

4.1 Field Team Management

A QA Officer will be assigned to oversee the training and documentation of the project. A QA/QC plan will be developed prior to initiation of work. Field safety plans will be developed prior to the program and distributed to field staff during their training. All field sampling staff will be trained in the proper use of the equipment and SOPs for field sample data collection before field work begins.

Because sampling will be conducted from a watercraft, proper water safety is essential. The field team will comply with U.S. Coast Guard vessel operation requirements. Two or more staff will be involved for every sampling event; typically two sampling members and a separate boat operator is the minimum crew. The watercraft must be of sufficient size to safely handle the crew and samples (weight and volume). The craft must be able to maintain its position at a site during the collection period. Poor weather conditions may require rescheduling sampling events.

4.2 Field Data Records

Data collected during field sampling events will be recorded on standardized field data sheets and electronically on water quality meters and geographic positioning system devices. Data sheets will be provided in a QA/QC plan developed and approved prior to implementation of the pre-operational survey. Field data sheets will include gear deployment records, nekton and plankton sample logs, field water quality profiles, instrument calibration logs, health and safety forms, sample chain of custody forms. Field data sheets will be controlled each month by performing QC checks prior to entry into an electronic database or being filed in project records.

Meters will be field calibrated at the beginning of each sampling day, and again following final measurements of the day. Field calibrations will be conducted in accordance with FDEP SOPs, or equipment manufacturer SOPs. Water transparency will be measured using a Secchi disk following the applicable portions of SOP FT 1700.

4.3 Electronic Database

An electronic database will be created, managed, and controlled to allow for data retrieval and analysis in a secure environment. All raw data collected under this monitoring plan will be integrated into the database. Access to the data will be controlled at both the server and database level. Data will be managed in a secure environment using Microsoft SQL Server or equivalent program. Project data reporting tools will be developed using a Microsoft Access 2003 interface or equivalent program. The database will support the generation of report deliverables through a standardized and automated approach. All data report deliverables generated from the database toolset will use queries and/or visual basic code. All queries will be reviewed and validated as accurate in both approach and calculation.

5.0 Reporting

Results from the monitoring activities will be reported in annual progress reports and will include all data and analyses resulting from the survey and monitoring requirements.

The reports will be submitted by April 1 of each year after the first pre-operational monitoring period. PEF will submit the final annual reports, with any required supporting information, to the FWC and the FDEP Siting Office for review.

As part of the CRSMP survey and monitoring program, the following reports will be produced:

Nekton and Plankton

- Annual reports of nekton and plankton surveys and associated field water quality parameters collected during each monitoring year. The reports will include raw data, descriptive statistics of results, a status update, and any recommended changes for future monitoring.
- A summary report of nekton and plankton surveys and associated field water quality parameters at the end of the baseline period. This report will be combined with the annual report for the final preoperational monitoring year. The report will include summary statistics, analyze spatial and temporal trends, and will include figures and tables summarizing the sampling results.
- Once the LNP is operational and the post-operational period begins, annual reports will include an analysis comparing current data to preoperational survey data. A summary report comparing current data to preoperational survey data will be submitted a minimum of 6 months prior to the renewal of the NPDES permit.

Hydrographic Survey

- A summary report of pre-operational hydrographic survey results. This report will include an analysis documenting the flow and circulation patterns in the nearshore areas during 2 years of pre-operational monitoring.
- Summary reports of post-operational hydrographic survey results following the commencement of operations of LNP 1 and LNP 2. Each report will include an analysis documenting the flow and circulation patterns in the nearshore areas during the 2 years of post-operational monitoring following the commencement of operation of each unit. The reports will also compare post-operational data to pre-operational survey data.

Impingement and Entrainment Study

- Annual reports of impingement and entrainment surveys and associated field water quality parameters for scheduled post-operational monitoring years. The reports will include raw data, descriptive statistics of results, a status update, and any recommended changes for future monitoring.

6.0 References

CH2M HILL. 2009a. Technical Memorandum 338884-TMEM-087, "Aquatic Ecology Sampling Report," Revision 1. Prepared for Progress Energy Florida, Inc. January.

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Southwest Florida Water Management District (SWFWMD). 2009. Water Management Information System. Available online at http://www8.swfwmd.state.fl.us/WMIS/ResourceData/ExtDefault.aspx. Accessed October 3, 2009.

Stone and Webster. 1985. Crystal River 316 Studies. Final Report. Prepared for Florida Power Corporation. January.

ATTACHMENT A

Sample Size Determinations for Nekton and Plankton

The Conditions of Certification (COCs) adopted by the "Final Order on Certification for the Progress Energy Levy Nuclear Power Plant Units 1 and 2," dated August 26, 2009, suggests a minimum of 12 samples per month in the Cross Florida Barge Canal (CFBC), 6 samples per month in the Old Withlacoochee River, and 6 samples per month in the nearshore Gulf of Mexico for both plankton and nekton. This level of sampling would be considered statistically significant (greater than 30 samples) when compared on a semiannual and annual basis (see Table A-1). In addition, the COC recommended minimum sampling effort would be enough to compare plankton and nekton populations in the CFBC on a quarterly basis, if desired.

TABLE A-1
Suggested Sample Sizes and Temporal Comparison Scales

Study Areas	COC Suggested Sampling Effort[a]	Population Comparison Scale		
		Quarterly	Semiannually	Annually
CFBC	12	36	72	144
Old Withlacoochee River	6	18	36	72
Nearshore Gulf of Mexico	6	18	36	72

Notes:
CFBC = Cross Florida Barge Canal
COC = Condition of Certification
[a]Monthly sampling effort for both nekton and plankton

A review of existing regional biological monitoring plans indicated that sampling intensities were also within the ranges shown in Table A-1 and were similar to the COC suggested minimums for the study areas. Comparison scales varied from quarterly to semiannually within the hydrobiological monitoring plan (HBMP) (PBS&J, Inc., 2000). The HBMP was designed to account for varied surface water withdrawal schedules and to collect a statistically significant number of samples (30 samples) per study area to compare populations because existing data was unavailable for a power analysis. Sample sizes were divided among defined spatial strata and a ratio of 2 seines to 1 trawl was used also in keeping with COC suggested efforts for the Cross Florida Barge Canal and Withlacoochee River Baseline Survey and Monitoring Plan (CRSMP).

The COC sample size request is considered appropriate for the design of the CRSMP for population comparisons on a semiannual basis. This degree of sampling size is similar with the HBMP monitoring efforts and provides a reasonable statistical design to detect status and trends in nekton and plankton populations between pre-operational surveys and post-operational monitoring.

ATTACHMENT B

Evaluation of Diurnal (Day/Night) Zooplankton Community Variations

Diurnal zooplankton variation was evaluated to determine if nighttime sampling alone would provide the necessary data to evaluate potential changes in the zooplankton community due to the proposed cooling water intake structure (CWIS) withdrawal.

Statistical Analyses

An Analysis of Variance (ANOVA) was used to examine differences of zooplankton abundance between night and day using the three replicates per station per date as the within station sampling error. ANOVA is a technique designed to determine whether the mean values of multiple groups are statistically different from one another. The probability that observed differences between the various effects could be due to random variability in the data was calculated and compared to a significance level of 0.05. If the calculated probability for an effect is less than 0.05, that effect is typically deemed significant. The lower the calculated probability, the more significant the effect is based on the ANOVA evaluation. Determining that an effect is significant indicates that all the groups considered are not equivalent (at least one is different from the others, or perhaps all are different from one another). ANOVA is often applied directly to measured data, but if that data is not normally distributed, the calculated probabilities can be biased. To avoid biased probabilities, a rank transformation was performed on the density data before the ANOVA was performed.

To determine which individual groups are significantly different from one another, a test of contrasts was performed. The *post hoc* test employed for this evaluation was the Tukey comparison ($p < 0.05$). For each constituent, the group with the largest mean value is assigned the letter A. If the mean values of all groups are statistically similar to one another, then they all are assigned the letter A. If the mean value of a group is statistically lower than the one designated as A, then it is designated as a B. If the mean value is not statistically different between two categories (A or B), it is given the designation AB.

Conclusions

The evaluation indicates that sampling during the nighttime only will provide the necessary data to evaluate changes in the zooplankton community due to the proposed CWIS withdrawal. The taxa that comprised the majority of the zooplankton community and had the highest percent composition during the day were found at relatively the same proportions at night. These abundant taxa include copepods, Panopeidae crab larvae, anchovy eggs and larvae and goby larvae. Furthermore, plankton abundance was either not statistically different during the day versus night or statistically higher during the night.

TABLE B-1
ANOVA Results

Plankton Type	Effect	Rank Transformed Results
Zooplankton	Day/Night	<0.0001
Holoplankton	Day/Night	<0.0001
Meroplankton	Day/Night	0.1035
Fish Eggs	Day/Night	0.8669
Fish Larvae	Day/Night	0.006

Notes:
Non-significant results are shaded gray.
ANOVA = Analysis of Variance

TABLE B-2
Tukey's Test Results

Plankton Type	Group	Rank Transformed Results
Zooplankton	Day	B
	Night	A
Holoplankton	Day	B
	Night	A
Fish Larvae	Day	A
	Night	A

Notes:
Tukey's test was not performed on meroplankton and fish egg abundances since there were no significant differences using an ANOVA.

ATTACHMENT C

Hydrographic Survey Monitoring Location Coordinates

TABLE C-1
Hydrographic Survey Monitoring Coordinates

Station	Latitude	Longitude
C1	28.981493	82.748633
C2	28.960661	82.753077
C3	28.952606	82.809599
C4	28.992186	82.750577
C5	28.979757	82.813280
T1	28.959411	82.710720
T10	28.965244	82.795851
T11	28.995380	82.812655
T12	28.988853	82.755577
T2	28.955801	82.750299
T3	28.964689	82.753216
T4	28.974965	82.758354
T5	28.951773	82.767520
T6	28.960522	82.771964
T7	28.973021	82.776686
T8	28.941774	82.791684
T9	28.957467	82.791407
WL1	28.964133	82.813905
WL2	28.964828	82.739189
WL3	28.988298	82.773075

Tech Memo Approval Form

Tech Memo Number: 338884-TMEM-115

Revision: 2 (Final)

Project: 338884

Review Date: 11/17/10

Tech Memo Title:
Levy Nuclear Plant and Crystal River Energy Complex Combined Discharge Survey and Monitoring Plan

Revision History:

Revision Number	Description	Approval Date	Affected Pages
0	Initial submittal for review.	12/31/09	All
1	Revised based on OAR comments.	01/19/10	All
2 (Final)	Revised based on FFWC comments	11/17/10	All

Document Review and Approval

Originator:	Mitchell L. Griffin/Task Leader	11/17/10
	Name/Position	Date
		
	Signature	
Reviewer	William T. Marsh/Task Manager	11/17/10
	Name/Position	Date
		
	Signature	
Project Manager:	Eric Woods/Project Manager	11/17/10
	Name/Position	Approval Date
	William E. Woods Digitally signed by William E. Woods DN: cn=William E. Woods, o=Environmental Services, ou=ESBG, email=eric_woods@ch2m.com, c=US Date: 2010.11.16 21:03:44 -05'00'	
	Signature	

Levy Nuclear Plant and Crystal River Energy Complex Combined Discharge Survey and Monitoring Plan

Prepared for

Progress Energy Florida, Inc.

Prepared by

November 2010

Contents

Attachments

Contents, Continued

Tables

Figures

Acronyms and Abbreviations

CB	Crystal Bay associated monitoring location
CFBC	Cross Florida Barge Canal
Chl a	chlorophyll a
cm	centimeter
COC	Condition of Certification
CREC	Crystal River Energy Complex
DMP	Discharge Monitoring Plan
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
ft	foot
FWC	Florida Fish and Wildlife Conservation Commission
GPS	Global Positioning System
LNP	Levy Nuclear Plant Units 1 and 2
LNP 1	Levy Nuclear Plant Unit 1
µg/L	microgram per liter
m^2	square meter
mg/L	milligram per liter
mgd	million gallons per day
NPDES	National Pollutant Discharge Elimination System
PEF	Progress Energy Florida, Inc.
psu	practical salinity units (equivalent to parts per thousand)
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
SOP	Standard Operating Procedure
SWFWMD	Southwest Florida Water Management District
TDN	total dissolved nitrogen
TDP	total dissolved phosphorus
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TP	total phosphorus
WITH	Withlacoochee Bay associated monitoring location
YSI	Yellow Springs Instruments

1.0 Introduction

Progress Energy Florida, Inc. (PEF) is proposing to build and operate a nuclear powered electric generating facility, consisting of two generating units, in Levy County, Florida. The proposed facility, known as Levy Nuclear Plant Units 1 and 2 (LNP), will be located east of U.S. Highway 19 and 4 miles north of the Levy County and Citrus County border. The LNP will withdraw cooling water from the Cross Florida Barge Canal (CFBC), which extends west from the Inglis Lock to the Gulf of Mexico. PEF has proposed to route the LNP discharge to the existing Crystal River Energy Complex (CREC) discharge canal, located 9.6 miles southwest of the proposed plant site.

The Florida Governor and Cabinet, sitting as the State of Florida Siting Board, approved the Final Order on Certification for the Progress Energy LNP on August 26, 2009. The Final Order included Conditions of Certification (COCs; Florida Department of Environmental Protection [FDEP], 2009a). The COC that is addressed by this monitoring plan is Condition SECTION B, XXIX.B.2, Levy Nuclear and Crystal River Energy Complex Combined Discharge Survey and Monitoring, which requires the development of a LNP Combined Discharge Survey and Monitoring Plan, referred to as the Discharge Monitoring Plan (DMP).

1.1 Regulatory Requirements

COC SECTION B, XXIX.B.2 requires the submittal of a DMP to the Florida Fish and Wildlife Conservation Commission (FWC) and the FDEP Siting Office for approval by FWC in consultation with FDEP and the Southwest Florida Water Management District (SWFWMD). The requirements of Condition SECTION B, XXIX.B.2 (FDEP, 2009a) as they relate to this DMP are addressed in this DMP, as described below.

SECTION B, XXIX.B 2. Levy Nuclear and Crystal River Energy Complex Combined Discharge Survey and Monitoring

a. Within 180 days following certification of the Levy County Nuclear Facility, the Licensee will submit to the FWC and the DEP Siting Office a LNP Combined Discharge Survey and Monitoring Plan (Discharge Monitoring Plan). Unless otherwise agreed to by the Licensee and FWC, in consultation with DEP, the Discharge Monitoring Plan shall include, at a minimum, the following components:

i. A broad-based, pre-operational survey and a post-operational monitoring plan, for a period of time to be determined by statistical analysis in coordination between the DEP, FWC and the Licensee, that is available prior to operation of the facility, that includes sites outside of the existing or predicted plume areas to allow for a comparison of the plume area sites to a "control site." This time frame will not exceed the period of time that is available prior to operation of the facility.

[Described in Sections 2.3, 3.0, 4.0 and 6.0, Tables 3-1 through 3-4 and 6-1, Figures 3-1 and 3-2, and Attachment A of this DMP]

ii. Specific survey and monitoring locations, sampling frequencies and methods, and specific parameters to be surveyed and monitored.

[Described in Sections 3.1 and 4.0, Tables 3-1 through 3-4, 4-1, 4-2, and 6-1; and Figures 3-1 and 3-2 of this DMP]

iii. The survey and monitoring will include, at minimum, protocols to monitor seagrass, oyster and hard bottom resources. Monitoring of physical and chemical parameters shall include, at minimum, surface and bottom temperature, salinity, dissolved oxygen (DO), total nitrogen [TN], total phosphate [TP], and water column transparency data collection.

[Described in Sections 3.1, 3.2, and 4.0, Tables 3-1 through 3-4, 4-1, and 4-2; and Figures 3-1 and 3-2 of this DMP]

iv. Intensive survey and monitoring of the central areas of the existing and future predicted plume areas during the first and second summers of the combined discharge. This should include measurements of DO at the surface and at the bottom measured on a regular schedule (quarterly at minimum, monthly if possible), and, within the zone of plume impact, DO at the bottom measured overnight 3 to 4 times during each summer.

[Described in Sections 3.3 and 6.0, Tables 3-1 and 6-1; and Figure 3-1 of this DMP]

b. The Discharge Monitoring Plan and results of monitoring data collected over the course of the previous and current CREC operating period and NPDES permits will be submitted to the DEP and FWC so as to provide a basis for developing the LNP Discharge Mitigation Plan, if needed.

[Described in Section 5.0 of this DMP.]

c. The Licensee will prepare yearly progress reports, including all data and statistical analyses resulting from the survey and monitoring requirements, and a summary report at the end of 5 years after approval of the Discharge Monitoring Plan of the Levy County Nuclear facility and submit the report to the FWC and DEP Siting Office for review. If in the review of the yearly progress reports, the FWC, in consultation with DEP and SWFWMD, determines inadequacies or the need to modify the Discharge Monitoring Plan, FWC will notify the DEP-Siting Office and the Licensee to discuss the findings. At the end of the baseline monitoring period, the Licensee will contact DEP and FWC to discuss the results. At that time, the FWC, in consultation with DEP and SWFWMD, and the Licensee will determine what if any modifications need to be made to the Discharge Monitoring Plan for monitoring once the Plant begins operations.

[Described in Sections 5.0 and 6.2 of this DMP]

e. The Licensee will submit, after initiation of operations at the Levy Plant, a yearly progress report, including all data and statistical analyses from the baseline surveys and monitoring and an analysis comparing the current data to the

baseline data, to the Agencies. If the FWC, in consultation with DEP and SWFWMD, determines that the preoperational survey and post-operational discharge monitoring data are insufficient to evaluate changes, indicate harm or potential harm to the ecological resources of the waters of the State and/or exceed State water quality standards, then additional measures shall be required to evaluate or to abate such impacts. Additional measures include but are not limited to:

i. Enhanced monitoring and/or modeling, and mitigative measures;

ii. Operational changes in the discharge or water cooling system to reduce any such impacts;

iii. Other measures to abate impacts as may be described in the Plan.

[Described in Section 5.0 of this DMP]

f. The Licensee will submit a summary report, including all data and statistical analyses from the baseline survey and an analysis comparing the current data to the baseline data to FWC and the DEP Siting Office. The summary report should be submitted a minimum of 6 months before renewal of the NPDES permit.

[Described in Section 5.0 of this DMP]

2.0 Background and Site Description

This section provides relevant background information on the LNP and the aquatic study area.

2.1 LNP Intake and Discharge Characteristics

The LNP will use a closed-cycle cooling water system that will withdraw cooling tower makeup water from the CFBC. Cooling tower makeup water will be withdrawn from the CFBC using pumps at a flow rate of approximately 122 million gallons per day (mgd).

The LNP will have a combined wastewater discharge comprised of several wastewater streams. The cooling system will utilize mechanical draft cooling towers and will have a blowdown capability that will comprise about 98 percent of the LNP wastewater. The combined LNP wastewater, as proposed by PEF in its pending National Pollutant Discharge Elimination System (NPDES) permit application, will be piped to the CREC and released into the existing CREC discharge canal which flows into the Gulf of Mexico. The maximum flow associated with the LNP, about 88 mgd, is equivalent to 4 to 5 percent of the existing permitted discharge from the CREC.

2.2 Study Area Description

The Gulf of Mexico near the CREC discharge is generally shallow, with depths of 10 feet or less within 3 miles of the shore. Locally, deeper water is found in rivers and dredged canals. Oyster reefs are common in the shallow nearshore environment and are exposed at low tide. During construction of the CFBC, a channel was dredged into the Gulf of Mexico creating a series of spoil islands extending offshore for 5.5 miles along the southern boundary of the channel (see Figure 2-1). This line of spoil islands restricts coastal flow north of the CREC discharge area.

By the CREC, channels and berms border both the intake and discharge canals. The excavated discharge canal extends 1.2 miles west into the Gulf of Mexico with a dike along the southern side. Farther south, two berms border the intake canal, extending 2.7 miles into the Gulf of Mexico. Beyond these berms, a navigational channel extends an additional 3 miles offshore and has a spoil bank along the northern side. The berms along the intake and discharge canals restrict coastal flow south of the CREC discharge area.

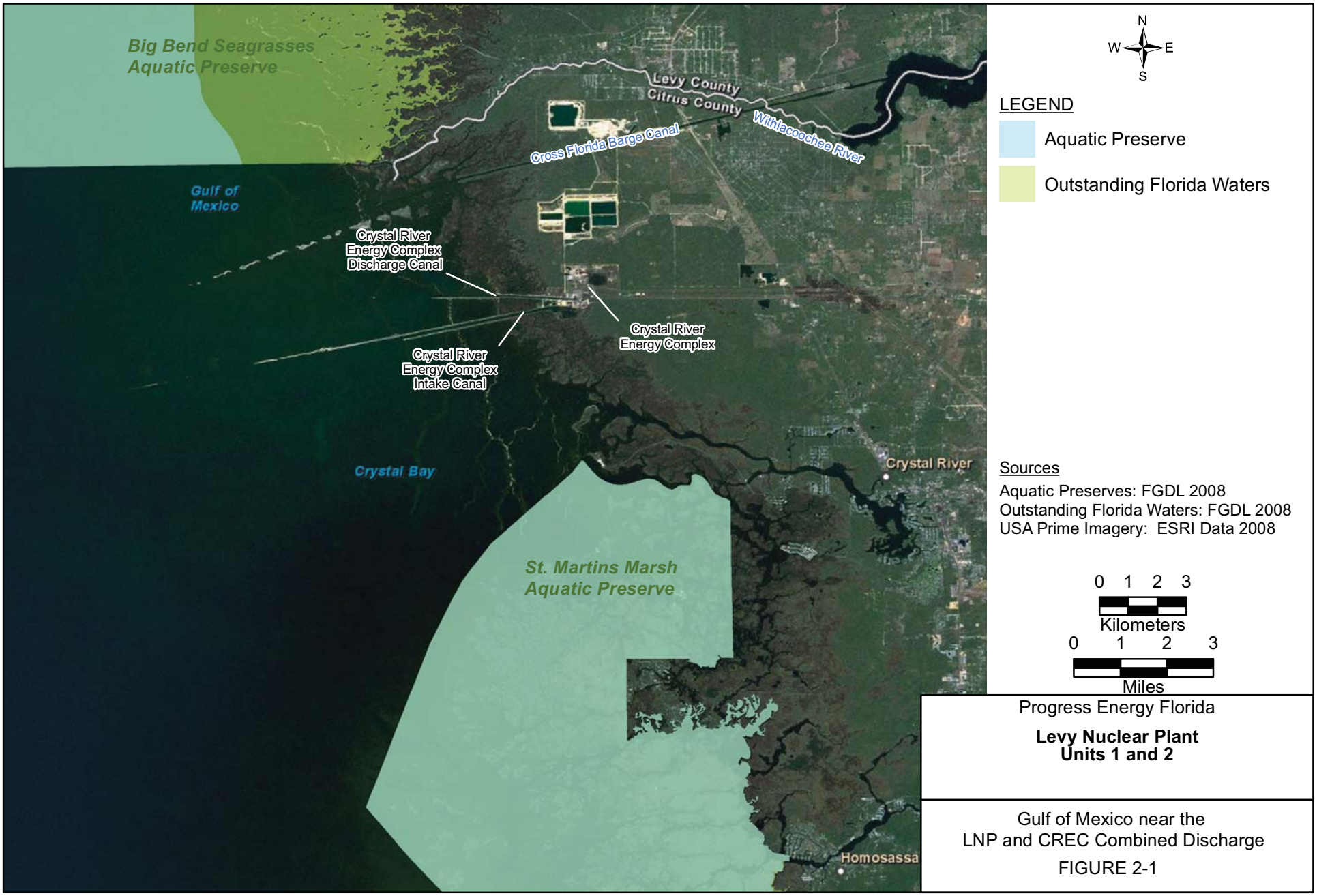
The predicted plume of the CREC discharge was estimated in a 316 analysis (Stone and Webster Engineering Corporation, 1985) for various seasons. This plume did not extend north of the spoil islands or beyond the intake canal berms.

2.3 Historical Data

Water quality sampling is conducted in this part of the Gulf of Mexico under Project COAST by the University of Florida and FDEP staff; the project is funded through SWFWMD's

Surface Water Improvement and Management program and Coastal Rivers Basin Board, and the state's Water Quality Assurance Trust Fund (Frazer et al., 2001). As part of Project COAST, monthly water quality monitoring has been conducted since 1997 at an array of stations along the Gulf of Mexico coast extending from southern Levy County through Citrus, Hernando, and Pasco counties and into northern Pinellas County (see Figure 2-2). The distribution of locations covers nearshore and open water habitats. Water quality results reported for these stations includes Secchi depth, temperature, salinity, DO, pH, TN, TP, chlorophyll, color, and light attenuation coefficient.

The COAST water quality data from January 1997 through June 2008 were obtained from the SWFWMD and evaluated to determine their representativeness to help guide the selection of DMP stations. Stations in proximity to the study area were extracted from the dataset for further analysis (see Attachment A). Relevant statistics for the selected COAST water quality data in the DMP study area are presented in Attachment A and are discussed further in Subsection 3.1.1 with the selection of DMP monitoring locations.

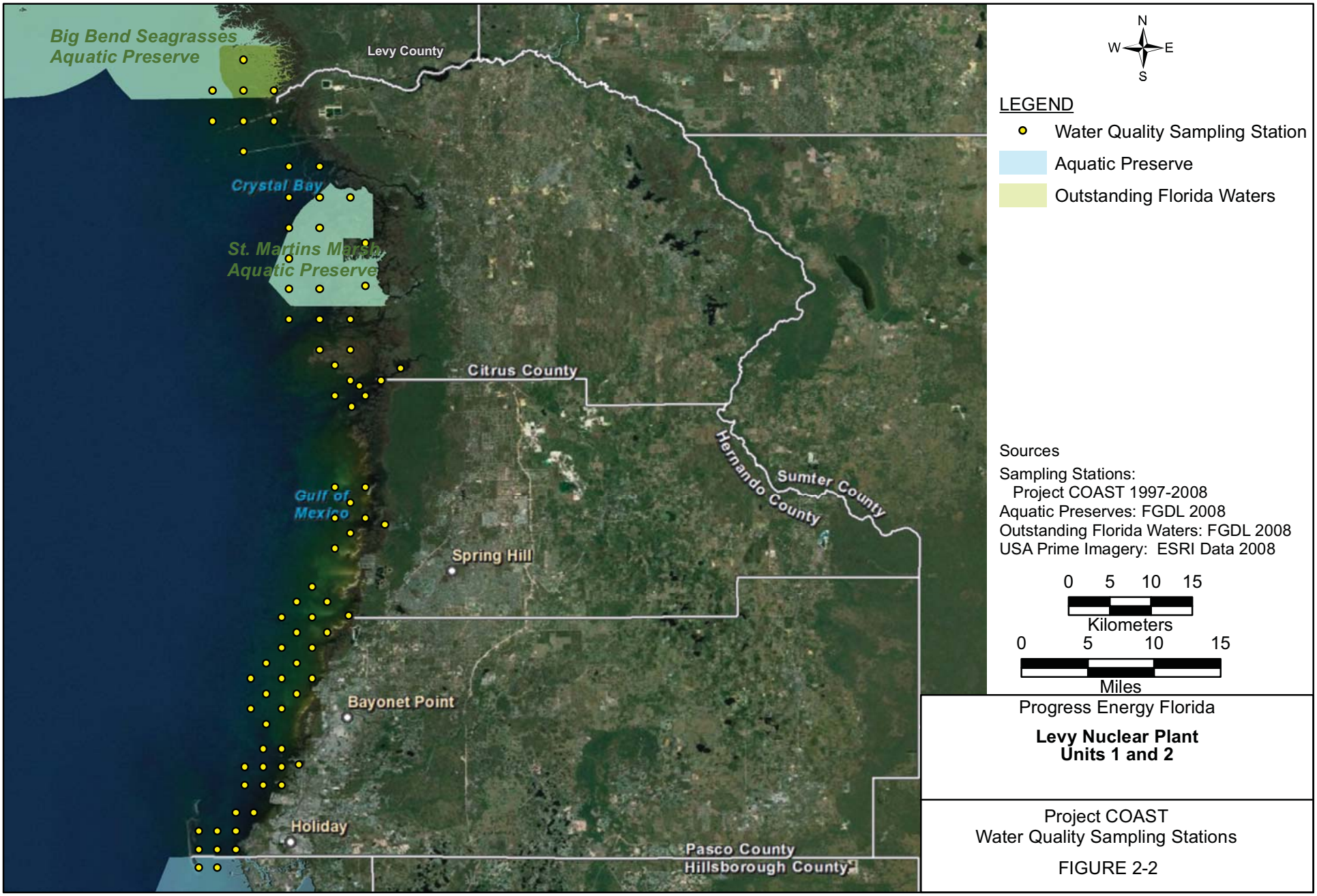


Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2

Gulf of Mexico near the
LNP and CREC Combined Discharge

FIGURE 2-1



Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2

Project COAST
Water Quality Sampling Stations

FIGURE 2-2

3.0 DMP Monitoring

The purpose of this plan is to monitor for potential adverse changes that may be related to the LNP discharge in surface water quality; physical properties (transparency, temperature, and dissolved oxygen); and seagrass, oyster, scallop, and hard bottom resources near the CREC facility. This section provides an overview of the DMP monitoring locations, parameters to be sampled, and sampling approach. Other sections of this plan discuss quality assurance (QA) sampling and procedures, scheduling, and reporting.

3.1 DMP Water Quality Monitoring

3.1.1 Water Quality Monitoring Locations

Project COAST covers the Gulf of Mexico to the north and south of the combined discharge location. This plan supplements this network to include more stations within the predicted plume. Several of the DMP water quality monitoring locations will be collocated with Project COAST stations. Collocating monitoring points will provide historical information that will allow for the statistical comparison of data over time, providing for both quality control (QC) and data augmentation.

A total of ten locations comprise the DMP water quality network (see Table 3-1 and Figure 3-1); three of these locations are collocated with existing Project COAST stations (see Figure A-1 in Attachment A). Table B-1 in Attachment B provides a list of sampling point latitude/longitude coordinates. The following bulleted list provides an overview of the DMP monitoring location distribution:

- Four DMP locations are in proximity to the LNP combined discharge at the CREC: CREC-3, CREC-4, CREC-7, and WITH-9. Of these, WITH-9 is collocated with an existing Project COAST station, the Withlacoochee Bay station. Three locations, CREC-8, WITH-8, and WITH-10, are established outside of the predicted plume area and will provide background monitoring data. WITH-8 and WITH-10 are collocated with existing Project COAST stations.
- CREC-3 is located at the point of discharge. CREC-4 is located along the main flow path of the dredged discharge canal at the end of the dike. CREC-7 and CREC-8 are located further out beyond the plume but in the same direction of the discharge. These last two stations are located in between other Project COAST stations in the vicinity.
- CREC-5, CREC-6, and CREC-9 are included as nearshore stations, with CREC-5 located close to the CREC discharge. These stations may present challenges in monitoring because of the shallowness and difficulty in reaching these locations during low tide. The positions shown on Figure 3-1 may be altered somewhat if access to these sites is not possible. If this occurs, then the annual reports will reflect any changes.

TABLE 3-1
Listing of DMP Water Quality Monitoring Locations

Location Group	Locations
LNP Discharge Vicinity	CREC-3, CREC-4, CREC-7, WITH-9
Outside of Predicted Plume	WITH-8, WITH-10, CREC-8
Nearshore Waters	CREC-5, CREC-6, CREC-9

From the results of the statistical analyses of the Project COAST data presented in Attachment A, the following observations have been made:

- Based on nutrient concentrations, the Project COAST stations can be divided into a northern group located in the Withlacoochee Bay vicinity and a southern group located in the Crystal Bay vicinity. WITH-6 was considered to be an outlier because it was significantly different from all other stations in the vicinity at the 95 percent confidence level (see Table A-1 in Attachment A).
- Most of the Project COAST stations have similar nutrient levels; however, higher levels were observed near the mouth of the Withlacoochee River (WITH-6). Table A-2 in Attachment A provides a summary of Project COAST water quality results for salinity, TN, and TP for the north group, south group, and WITH-6 stations. The DMP monitoring locations are south and west of the Withlacoochee River direct influence.
- The salinity data demonstrate a difference between stations located near freshwater sources (see Figure A-1 in Attachment A). The DMP will not include monitoring stations located near freshwater sources to the study area.
- Some latitudinal differences in TN values exist between Project COAST stations; with TN concentrations generally being slightly higher in the northern portion of the COAST sampling area (see Table A-2 and Figure A-2 in Attachment A). DMP stations generally have similar nutrient levels.

Based on these analyses, it appears that data collected by the Project COAST program are sufficient to define nutrient concentrations in the region and account for differences across the DMP study area.

3.1.2 Water Quality Parameters

Table 3-2 presents a summary of DMP water quality monitoring parameters. Field water quality parameters to be measured at each station include depth profiles (1-meter intervals) of DO, temperature, salinity, and Secchi depth (transparency). Analytical water samples for TN and TP will be collected at a 0.5-meter depth from the water surface. Additional information about water sampling procedures is detailed in Section 4.0.

TABLE 3-2
Summary of Water Quality Monitoring Parameters at DMP Locations

Parameter	Number of Locations	Test Method	Collection Points for Water Quality Parameters
Dissolved Oxygen	10	Field	Depth profile (1-meter intervals)
Temperature	10	Field	Depth profile (1-meter intervals)
Salinity	10	Field	Depth profile (1-meter intervals)
Turbidity	10	Field	Depth profile (1-meter intervals)
Secchi Disk	10	Field	Visual depth reading
Total Nitrogen	10	Lab	Surface (0.5-meter depth)
Total Dissolved Nitrogen	10	Lab	Surface (0.5-meter depth)
Total Phosphorus	10	Lab	Surface (0.5-meter depth)
Total Dissolved Phosphorus	10	Lab	Surface (0.5-meter depth)
Chlorophyll a (corrected)	10	Lab	Surface (0.5-meter depth)

3.2 Seagrass, Oyster, Scallop, and Hard Bottom Monitoring

3.2.1 Benthic Habitat Monitoring in the Vicinity of the CREC Discharge

The benthic habitat of the Gulf of Mexico in the vicinity of the CREC discharge will be surveyed by divers during the pre-operational and post-operational periods of the LNP. Diving at predetermined grid points will be performed to characterize the bottom type, percent cover, and species composition relative to the distance from the point of discharge in the discharge plume area. The point observation grid, spaced at 1,000-foot (ft) by 1,000-ft intervals, is provided on Figure 3-2. In areas further from the CREC discharge, the grid spacing will be wider (doubled) in areas of lower predicted temperature effect from the plume and in deeper waters. Available seagrass, oyster, and scallop community data collected by state agencies in the areas of Big Bend Seagrasses Aquatic Preserve to the north, and Chassahowitzka National Wildlife Refuge to the south, will also be considered when evaluating data collected from the CREC study area. The specific coordinates for each observation point are listed in Table B-2 in Attachment B.

At each station, percent cover of benthic habitats will be estimated at three randomly placed quadrats using a 0.25-square meter (m^2) polyvinyl chloride (PVC) quadrat frame subdivided into 10-centimeter (cm) by 10-cm (100-square centimeters) squares. Each observation point will be located using Global Positioning System (GPS) and three quadrats dropped from the sampling watercraft. Divers will follow buoy lines to each quadrat to make their survey. Where seagrass is observed, percent shoot basal area within each quadrat will be estimated using 1 percent increments between 0 and 10 percent, and by 10 percent increments between 10 and 100 percent. Where hardbottom is observed, the maximum vertical relief and percent cover of biota in each 0.25-m^2 quadrat will be recorded. Macroalgae, octocoral, sponge, or other biota present within each quadrat will be recorded for percent cover using the Braun-

Blanquet scale (see Table 3-3). Substrate classifications within each quadrat will be documented using the scale shown in Table 3-4. Notes on the substrate type, water depth, water/current conditions, and visibility will also be recorded by divers. When visibility allows, photographs of each quadrat at each observation point will be taken.

Oyster surveys will be conducted at five stations previously established during the 316 Studies (Stone and Webster, 1985) at the CREC. These five stations are in close proximity to Stations 37, 42, 47, 56, and 87 shown on Figure 3-2; actual sampling station locations may be adjusted in the field during the first pre-operational survey event so that monitoring stations occur at, or as close as possible, to the historical monitoring stations. Each station will be designated as "near-field" or "far-field" in relation to its respective distance from the CREC discharge. Oysters will be surveyed twice during each monitoring year; once in the spring before spawning season to determine spawning adult population, and once in the fall after spawning season to determine adult survival and recruitment. Oysters will be sampled from within three randomly placed 0.25-square-meter (m^2) quadrats per station. All oysters present within each quadrat will be harvested, counted, and assessed for condition (alive or dead). These data will be used to estimate oyster abundance (#/m^2), as well as percentage of live and dead oysters. Shell height (maximum linear distance from the umbo to the ventral shell margin) for all live oysters will be measured and used to estimate size frequency distributions.

Scallop surveys will be conducted in June (prior to open harvest season) at locations where monitoring station sampling has identified seagrass beds. Scallop surveys will be conducted along one 50-meter swim transect at each seagrass bed. Scallop monitoring will be initiated in the second year of monitoring; the location of the seagrass beds will be unavailable until after the July/August seagrass surveys in the first monitoring year. The need for continued scallop monitoring will be determined after the third year of monitoring. Two years of scallop monitoring data will be included in the analysis report submitted to FWC within 180 days of the completion of 3 years of scheduled pre-operational monitoring. Within 90 days of analysis submittal, FWC will review the analysis and issue a determination on whether additional monitoring, up to 2 years for a maximum of 5 monitoring years (four annual scallop monitoring events), is required.

Field water quality parameters will be measured during each sampling event at all stations associated with seagrass, oyster, scallop, and hard bottom monitoring. Parameters will include depth profiles (1-meter intervals) of DO, temperature, and salinity, and a measure of Secchi depth.

TABLE 3-3
Braun-Blanquet Scale for Benthic Habitat Percent Cover

Score	Description
0	Taxa absent
0.1	Solitary
0.5	Sparse
1	0% to 5% cover
2	5% to 25% cover
3	25% to 50% cover
4	50% to 75% cover
5	75% to 100% cover

TABLE 3-4
Substrate Classification Scale

Score	Description
1	Silty mud
2	Mud
3	Sandy mud
4	Muddy sand
5	Sand
6	Shell
7	Rubble
8	Rock

3.2.2 Supplemental Benthic Habitat Monitoring in Withlacoochee Bay

The benthic habitats located within Withlacoochee Bay, approximately 6 miles northwest of the CREC discharge, will also be surveyed by divers during the pre-operational and post-operational periods of the LNP. As described in Section 3.2, diving will be performed at seven predetermined points (W-1 through W-7) as shown on Figure 3-2. Points W-2 and W-4 correspond with Project COAST stations WITH-5 and WITH-4, respectively. The specific coordinates for each observation point are listed in Table B-3 in Attachment B.

At each station, percent cover of benthic habitats will be estimated at three randomly placed quadrats using a 0.25-m^2 PVC quadrat frame subdivided into 10-cm by 10-cm squares. Each observation point will be located using GPS and three quadrats dropped from the sampling watercraft. Where seagrass is observed, percent shoot basal area within each quadrat will be estimated using 1 percent increments between 0 and 10 percent, and by 10 percent increments between 10 and 100 percent. Substrate classifications within each quadrat will be documented using the scale shown in Table 3-4. Where hard bottom is observed, the

maximum vertical relief and percent cover of biota in each 0.25-m^2 quadrat will be recorded. Macroalgae, octocoral, sponge, or other biota present within each quadrat will be recorded for percent cover using the Braun-Blanquet scale (see Table 3-3). Substrate classifications within each quadrat will be documented using the scale shown in Table 3-4. Notes on the substrate type, water depth, water/current conditions, and visibility will also be recorded by divers. When visibility allows, photographs of each quadrat at each observation point will be taken.

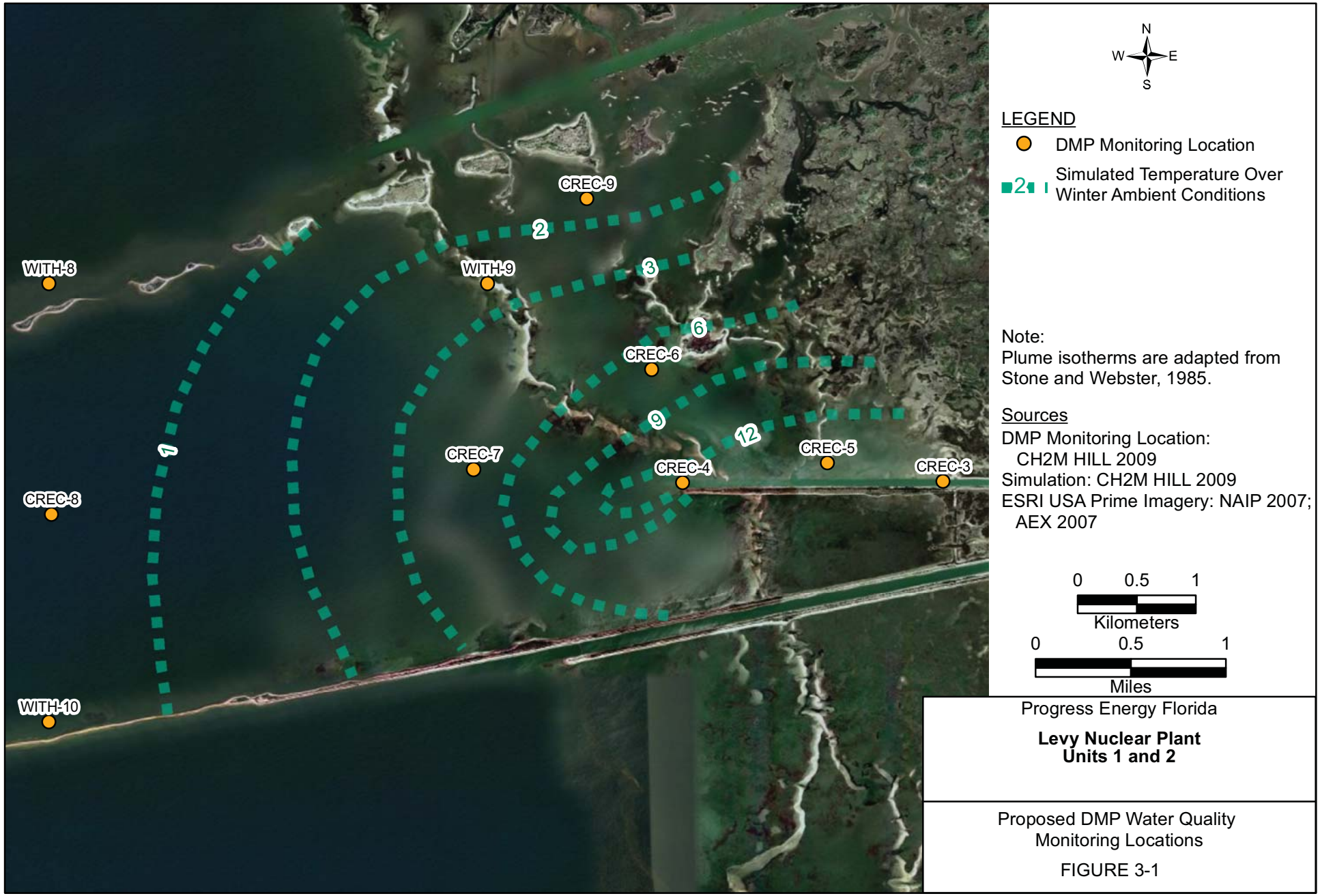
Field water quality parameters will be measured during each sampling event at all supplemental sampling stations. Parameters will include depth profiles (1-meter intervals) of DO, temperature, and salinity, and a measure of Secchi depth.

Data collected from this supplemental sampling will be used for informational purposes and as a qualitative indicator of regional trends.

3.3 Intensive Dissolved Oxygen Monitoring of Central Plume Area

An intensive DO survey and monitoring of the central area of the predicted combined discharge plume will be conducted during the first and second summers of the LNP operation, per COC SECTION B, XXIX.B.2.iv.

Locations CREC-3, CREC-4, and CREC-7 (see Figure 3-1) are in the area of the predicted thermal plume. Measurements of DO will be collected at these stations on a monthly basis between June and August during the first two LNP post-operational years. DO will be measured at the surface (0.5 meter) and bottom (0.5 meter from the bottom), as well as at 1-meter intervals, depending on total depth at each station. In addition, the DO near the bottom of the water column at CREC-7 will be monitored once per month between June and August from sunset to sunrise (at approximately 15-minute intervals using an automated sonde). CREC-7 represents a central location within the predicted thermal plume.


CREC-9
WITH-8
WITH-9
CREC-6
CREC-7
CREC-4
CREC-5
CREC-3
CREC-8
WITH-10
1
2
3
6
9
12
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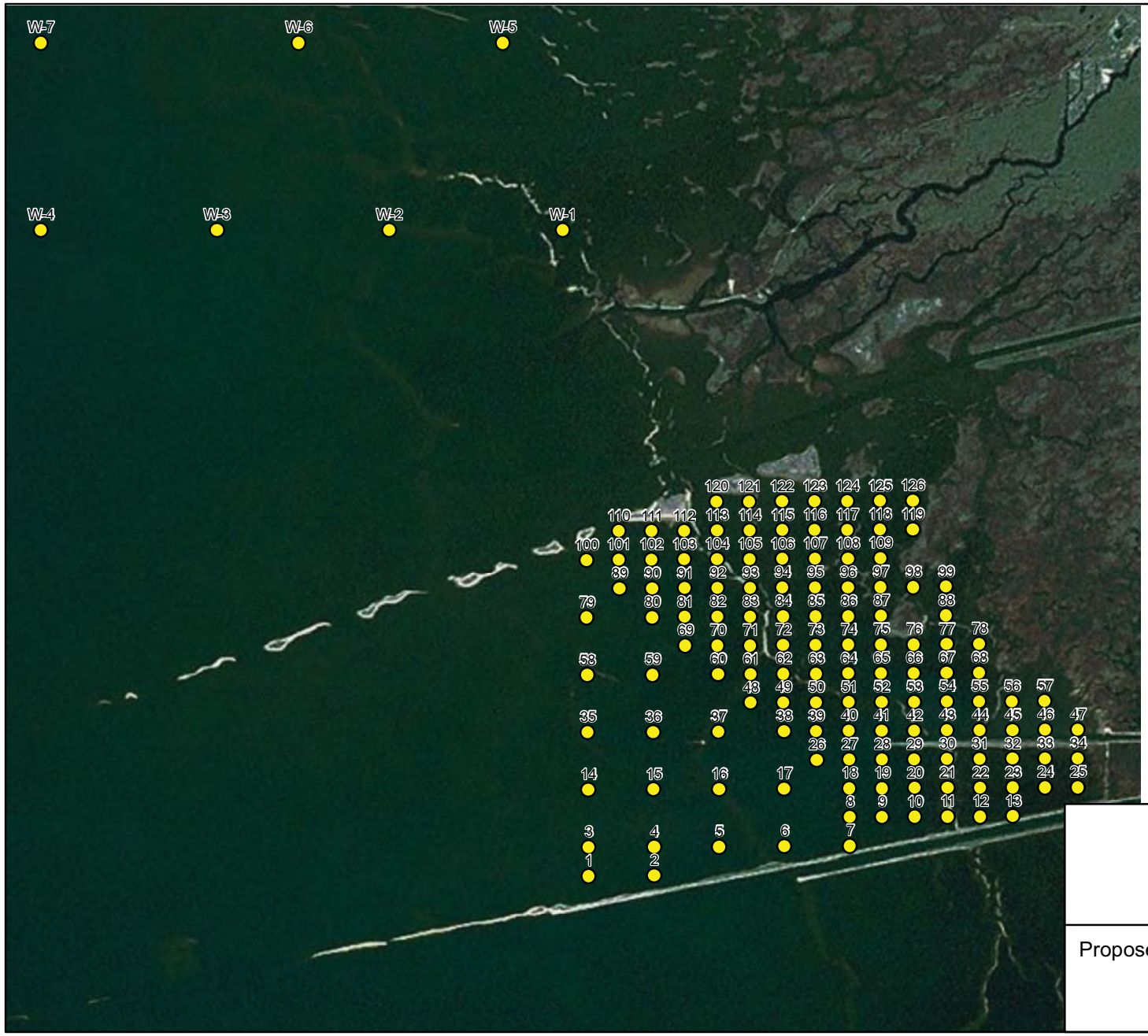
W
E
S
LEGEND
DMP Monitoring Location
Simulated Temperature Over Winter Ambient Conditions
Note:
Plume isotherms are adapted from Stone and Webster, 1985.
Sources
DMP Monitoring Location: CH2M HILL 2009
Simulation: CH2M HILL 2009
ESRI USA Prime Imagery: NAIP 2007; AEX 2007
0 0.5 1
Kilometers
0 0.5 1
Miles
Progress Energy Florida
Levy Nuclear Plant
Units 1 and 2
Proposed DMP Water Quality Monitoring Locations
FIGURE 3-1



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W E
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LEGEND

Survey Dive Location

Sources

Survey Dive Locations:
CH2M HILL 2010
ESRI USA Prime Imagery: NAIP 2007; AEX 2007

0 1 2
Kilometers

0 1 2
Miles

Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2

Proposed Seagrass, Oyster and Hard Bottom Monitoring Locations

FIGURE 3-2

4.0 Quality Assurance and Control

The FDEP maintains Standards Operating Procedures (SOPs) for field data collection (Chapter 62-160, Florida Administrative Code [F.A.C.]). Data collected for this plan will conform to the QA and control measures found in these SOPs (Chapter 62-4.246, F.A.C.). Table 4-1 contains a list of FDEP SOPs that are applicable to the DMP (FDEP, 2009b). A summary of some of the most common elements applicable to this plan are included in this section. In addition to compliance with FDEP protocols, the DMP monitoring team will need to comply with requirements that cover health and safety, vessel operations, and compliance with manatee protection plans.

TABLE 4-1

List of FDEP SOPs Applicable to the DMP

Series	Description
FC 1000	Field Decontamination
FD 1000	Documentation
FM 1000	Field Mobilization
FQ 1000	Quality Control
FS 1000	General Sampling
FS 2000	General Water Sampling
FS 2100	Surface Water Sampling
FT 1000	Field Testing General
FT 1300	Field Salinity
FT 1400	Field Temperature
FT 1500	Field Dissolved Oxygen
FT 1600	Field Turbidity
FT-1700	Field Light Penetration

Notes:
DMP = Discharge Monitoring Plan
FDEP = Florida Department of Environmental Protection
SOP = standard operating procedure

Source: http://www.floridadep.org/labs/qa/sops.htm, accessed 11/04/2009

4.1 Field Team Management

A QA Officer will be assigned to oversee the training and documentation of the project. A QA/QC plan will be developed prior to initiation of work. The field team will maintain its own administrative procedures, which will include company-specific training. Field safety

plans will be developed and distributed to field staff during their training. All field sampling staff will be trained in the proper use of the equipment and SOPs for field sample data collection before field work begins.

Because sampling will be conducted from a watercraft, proper water safety is essential. Two or more staff will be involved for every sampling event; the minimum crew is typically two sampling members and a separate boat operator. The watercraft must be of sufficient size to safely handle the crew and samples (weight and volume). The craft must be able to maintain its position at a site during the collection period.

4.2 Pre-Sampling Event Preparation

Pre-cleaned sample containers of the required size and type will be obtained from the laboratory. Chain-of-custody forms, which are to be maintained with the samples, will be partially filled out before leaving for the sampling event.

Water quality sampling will include inorganic, nonmetallic parameters and physical properties. No volatile substances are involved, so no special trip blanks are required (see Subsection 4.4.1). Sampling equipment will be decontaminated and prepared before the sampling event. The equipment for in-situ samples will be calibrated using standard methods according to FDEP SOPs. Operation of the field monitoring equipment will follow the manufacturer's recommended procedures and standards.

4.3 Sample Collection and Handling

The sampling stations are mapped and locations will be found in the field using standard GPS equipment (see Attachment B). Once the sampling team is at a monitoring point, the team may maintain their position by anchoring or by motor, depending upon conditions during sampling. Minor variation in actual sampling position may occur due to drift and sea conditions.

Field parameters (DO, temperature, and salinity) will be collected using a Yellow Springs Instruments (YSI) or equivalent multi-parameter sonde. Depth profile measurements will be made at 1-meter increments from the water surface to approximately 0.5 meter above the ocean bottom. The sonde will be weighted sufficiently to allow the probe to reach the bottom in strong tidal currents. Water column transparency will be recorded using a Secchi disk. Turbidity will be measured by a separate meter while onsite. It is possible that the multi-parameter sonde could be fitted with a turbidity probe, which will be determined immediately prior to the initiation of the sampling program and documented in the reports. Probe calibrations will be conducted in accordance with FDEP SOPs for each parameter.

Analytical water quality samples will be collected using a peristaltic pump with Teflon tubing at designated sampling depths. Clean sample collection practices will be maintained, but ultra-clean metal sampling is not a requirement of this plan because metals are not being monitored. Samples will be collected near the bow of the watercraft (away from gas engines). The pump tubing will be weighted to keep the end steady at the sample depth. A volume of water sufficient to purge the tubing will be flushed through the tubing prior to sampling. The tubing will not be inserted into the sample containers but held over the

container until an adequate volume is obtained. The container will be handled by a "clean hands" crew member who will seal and label each bottle prior to cooling samples on ice within 15 minutes of collection. Filter apparatuses, with 45-micrometer filters, will be used in the field to collect the dissolved nutrients samples for total dissolved nitrogen (TDN) and total dissolved phosphorus (TDP). The filter pump (syringe-type) will be operated by the "dirty hands" person, while the tip and sample will be handled only by the "clean hands" person. The "clean hands" field team member will use non-talc, latex gloves.

Water quality sample preservation and holding times will conform to FDEP SOPs. Two inorganic, nonmetallic parameters will be monitored: TN and TP. Per FDEP SOP FS 1000, the pH of the samples will be monitored to ensure samples are preserved appropriately. Coolers with ice will also be transported on the sampling watercraft to cool the samples as soon as they are collected and labeled. Extra sample bottles will be transported and used if needed.

FDEP currently has no SOPs for characterization of the seagrasses, oyster, scallop, and hard bottom resources. The proposed survey methodology consists primarily of recorded field observations and photographs as is typically done for this type of characterization. Records of field observations will be entered into a project database. Upon return from the field, results obtained in the field will be reviewed for accuracy and the analysis of photographs will be used to determine or verify observations made in the field.

Field data sheets will be used to record the activity at each site, including weather and general observations at each station. Chain-of-custody forms will be completed, kept with the coolers, and shipped to the laboratory. The laboratory will check and record the condition of the samples, including preservation, upon arrival.

4.4 Laboratory Sample Analysis

Water quality samples will be analyzed by a state-certified analytical laboratory using methods approved by the State of Florida. TN is calculated by adding the concentration results of total Kjeldahl nitrogen (TKN) and nitrate plus nitrite together. Similar computations will be done for dissolved nitrogen (TDN) by analyzing the field-filtered sample. Analytical methods include the U.S. Environmental Protection Agency (EPA) Method 351.32 (Rev 2.0, 1993) for TKN and EPA Method 353.32 (Rev 2.0, 1993) for nitrate plus nitrite. The analytical method for TP is EPA Method 365.2 (Rev 2.0, 1993). The analytical method for chlorophyll a (Chl a) is EPA Method 446.0 (Rev 1.2, 1997). These methods are applicable for fresh and saline waters.

4.4.1 Field Duplicates and Equipment Blanks

Equipment blank and field duplicate samples will be collected for TN, TP, TDN, TDP, and Chl a parameters as noted in Table 4-2. Trip blanks are not required for inorganic parameters or Chl a. One equipment blank of the pump and tubing will be collected using de-ionized water at least once per event. FDEP FQ 1000 requires the sampling organization to be responsible for ensuring that blanks, excluding trip blanks, are collected at a minimum of 5 percent of each reported test result/matrix combination for the life of a project. One equipment blank per event will satisfy this requirement. Field blanks are not required if equipment blanks are collected. In addition, one field duplicate will be collected per event at

a location to be selected by the field team (anonymously labeled for laboratory analysis) and varied between events.

TABLE 4-2
Quality Assurance Sampling Requirements for the DMP

Sample Type	Analysis	Number of Samples	Matrix
Monitoring Location	TN, TP, TDN, TDP, Chl a	10	Receiving Water
Equipment Blank	TN, TP, TDN, TDP, Chl a	1	De-ionized water, collected during the day and after first use.
Duplicate	TN, TP, TDN, TDP, Chl a	1	Receiving water, vary stations duplicated between sampling events.

Notes:
Each number of samples is per event.
Chl a = chlorophyll a, corrected
DMP = Discharge Monitoring Plan
TDN = total dissolved nitrogen
TDP = total dissolved phosphorus
TN = total nitrogen
TP = total phosphorus

5.0 Reporting

Data collected during field sampling events will be recorded on standardized field data sheets and electronically using water quality meters and GPS devices. The data sheets will be provided in the QA/QC plan. Field data sheets for each event will be controlled by performing checks before and after entering the information into an electronic database and also by filing the original form into project records. Results from the monitoring activities will be included in the reports described below.

- An annual report of the results of the water quality, intensive DO, and seagrass, oyster, and hard bottom resources survey during pre-operational monitoring for the LNP. This report will include raw data, descriptive statistics of results collected for this condition requirement, a status update, and any deviations or required changes for the past or coming year (COC SECTION B, XXIX.B.2.c). The reports will be submitted by April 1 of each year after the first pre-operational monitoring period.
- A yearly progress report of the post-operational DMP sampling and monitoring activity (COC SECTION B, XXIX.B.2.e). The annual report will include the same information described in the pre-operational report. The progress reports will be submitted by April 1 of each year after the first post-operational monitoring period.
- A 5-Year Discharge Monitoring Summary Report of the water quality monitoring conducted for the DMP (COC SECTION B, XXIX.B.2.c). The report will include an analysis of spatial and temporal differences, as well as tables and figures summarizing the sampling and analytical results. This summary report will be prepared and submitted by July 1 at 5-year intervals following the first submittal.
- COC SECTION B, XXIX.B.2.f requires a summary report that includes the DMP data and statistical analyses comparing the current data to the baseline data to be submitted 6 months prior to the renewal of the LNP NPDES permit. A water quality sampling summary report will be prepared for inclusion with the LNP permit application at a frequency tied to the NPDES permit renewal date. In the event that an LNP NPDES permit renewal occurs prior to completing 5 years of DMP monitoring, available DMP data will be reported.
- COC SECTION B, XXIX.B.2.b requires the DMP results and CREC NPDES permit monitoring results to be submitted to the FDEP and FWC as a basis for developing an LNP Discharge Mitigation Plan, if needed. The FDEP and FWC will receive all of the DMP data through the reports listed in this section. The FDEP already receives CREC data regularly and through the NPDES permit renewal.

6.0 Schedule for DMP Monitoring

The terms pre- and post- operational are used throughout the COC and monitoring plan. "Operational" is defined for purposes of the monitoring program as the date when the LNP facility starts consistent, commercial operation of a unit, discharging stable amounts of cooling tower blowdown plus other low volume wastes. The pre-operational period will include initial activities such as startup testing, factory acceptance, punchlist rundown, and other mandatory procedures that must be satisfied before normal commercial operation can begin.

6.1 Monitoring Frequency

A summary of the monitoring frequency is provided in Table 6-1. Water quality data will be sampled monthly. The intensive DO monitoring will be conducted in June, July, and August. Dates for the above events will typically be regularly spaced (for example, third week of the month), but may vary as a result of unforeseen delays or weather. The seagrass and hard bottom surveys will be conducted once per year near the peak of the growing season (between July and August). Oyster surveys will be conducted semiannually (once in the spring before spawning season, and once in the fall after the spawning season). Scallop surveys will be conducted in June (prior to the open harvest season).

A sensitivity analysis was done to see how many samples would be required to estimate a statistically significant change of approximately 0.05 mg/L TN and 0.005 mg/L TP (see Table A-3). These levels of change were considered sensitive enough because they are approximately 15 percent of the mean values of each parameter, and are small increments, about one-half of the smallest significant digit for reliable readings. Table A-3 indicates that 30 samples are needed to meet the target sensitivity. Post-operational data collected for at least 6 years, with 12 nutrient samples per year at each location for a total of 72 samples available from each station to estimate an effect from the LNP combined discharge. Similarly, the 4 monitoring locations outside the plume are collocated with the COAST program and they will provide additional data points annually. Pooling of data from stations located near the discharge and from background areas will yield a sample size well in excess of that required to ascertain change. Monthly sampling will yield sufficient data to allow for the evaluation of significant effects for the annual report.

TABLE 6-1
Summary of Monitoring Frequency

Parameter	Number of Locations	Frequency	
		Pre-Operational	Post-Operational
Dissolved Oxygen	10	Monthly	Monthly
Temperature	10	Monthly	Monthly
Salinity	10	Monthly	Monthly
Secchi Disk	10	Monthly	Monthly
Total Nitrogen	10	Monthly	Monthly
Total Dissolved Nitrogen	10	Monthly	Monthly
Total Phosphorus	10	Monthly	Monthly
Total Dissolved Phosphorus	10	Monthly	Monthly
Chlorophyll a	10	Monthly	Monthly
Oyster	5	Semiannually	Semiannually
Scallop	TBD	Annually	Annually
Seagrass and Hard Bottom	133	Annually	Annually
Intensive DO	3	None	Monthly in June, July, and August

Pre-operational means before the scheduled start of Levy Nuclear Plant Unit 1 (LNP 1).
Post-operational means after the actual start of wastewater discharge from LNP 1.
TBD = to be determined, the number of scallop transects will be unknown until after Year 1 sampling.

6.2 Monitoring Duration

Three years of pre-operational water quality data will be collected beginning 5 years before the scheduled startup (pre-operational) of LNP 1. Three pre-operational surveys of seagrasses, oyster, and hard bottom resources will be conducted beginning 5 years in advance of LNP 1 becoming operational. Scallop monitoring will be initiated in the second year of monitoring, after seagrass beds are identified. Progress Energy will provide FWC with program analysis within 180 days of the completion of the 3-year pre-operational program, and FWC will review this information and issue a determination within 90 days regarding the need for, and duration of, continued monitoring for up to an additional 2 years (for a maximum of 5 years of surveys, which would include up to four scallop surveys). Progress Energy will continue pre-operational sampling while the data are being analyzed and reviewed by the FWC.

Three years of water quality and two years of intensive DO sampling (per COC SECTION B XXIX.B.2.iv) will be conducted after LNP 1 begins discharging wastewater to the CREC (i.e., post-operational) or until LNP 2 becomes operational. Three more years of water quality

and two years of intensive DO sampling will be conducted after LNP 2 begins operation. Annual summer (between July and September) surveys of seagrass, oyster, and hard bottom resources will be conducted for 3 years after LNP 1 begins operation or until LNP 2 becomes operational and for an additional three years after LNP 2 begins operation.

7.0 References

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ATTACHMENT A

Summary Statistics for COAST Stations Selected near the LNP and CREC Combined Discharge

TABLE A-1
Tukey Test of Significance between Groups

	Station	Total Nitrogen Groupings	Station	Total Phosphorous Groupings	Station	Salinity Groupings
Individual Results, 0.05 Significance Level	WITH-6	A	WITH-6	A	WITH-10	A
	WITH-9	B	WITH-9	B	WITH-7	AB
	WITH-5	B	WITH-8	BC	WITH-4	ABC
	WITH-8	BC	WITH-5	CD	CB-5	BDC
	WITH4	BC	WITH-7	ED	WITH-8	EDC
	CB-8	CE	WITH-4	ED	CB-1	ED
	WITH-7	CFE	WITH-10	E	WITH-5	DEF
	WITH-10	FE	CB-2	E	CB-8	EF
	CB-5	FE	CB-1	EF	WITH-9	GF
	CB-1	FE	CB-6	FG	CB-6	G
	CB-6	F	CB-5	FG	CB-2	H
	CB-2	F	CB-8	G	WITH-6	I

Same analysis with only average annual values, demonstrates stability in the data between years

	Station	Total Nitrogen Groupings	Station	Total Phosphorous Groupings	Station	Salinity Groupings
Annual Averages, 0.05 Significance Level	WITH-6	A	WITH-6	A	WITH-10	A
	WITH-9	AB	WITH-9	AB	WITH-7	A
	WITH-5	AB	WITH-8	BC	WITH-4	A
	WITH-8	AB	WITH-5	BC	CB-5	AB
	WITH-4	BD	WITH-4	CD	WITH-8	AB
	CB-8	BED	WITH-7	CD	CB-1	AB
	WITH-7	BED	WITH-10	D	WITH-5	ABC
	WITH-10	ED	CB-2	D	CB-8	ABC
	CB-5	ED	CB-1	DE	WITH-9	BC
	CB-1	E	CB-6	FE	CB-6	CD
	CB-6	E	CB-5	FE	CB-2	D
	CB-2	E	CB-8	F	WITH-6	E

Notes:
Locations that could have their results combined together based on Tukey Test have same letter. Letters are organized by strength of difference (A = most different, I = least different). Comparison made at the alpha = 0.05 level (95% confidence level).

Project COAST stations are labeled by county, watershed, and station number. The data was coded for analysis using the watershed and station number. For example, W6 is Station 6 in the Withlacoochee Bay watershed in Levy County and is equivalent to WITH6. The Withlacoochee Bay spans across Levy and Citrus Counties. C and CB are associated with the Crystal Bay watershed locations in Citrus County.

A Tukey Multiple Comparison test is used to compare groups of means with each other simultaneously. The Tukey statistical test is usually more conservative in estimating significant differences than other alternative tests (Glantz, 2002).

Project COAST data included monthly results from January 1997 through June 2008.

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TABLE A-2
Summary Water Quality Statistics for COAST Station Groups used in the Tukey Analysis in the DMP Study Area

North Group: COAST Stations WITH-4, WITH-5, WITH-7, WITH-8, and WITH-9

South Group: COAST Stations WITH-10, CB-1, CB-2, CB-5, CB-6, and CB-8

Outlier: COAST Station WITH-6

					Percentiles						
Parameter	**Group**	**Mean (µg/L)**	**Standard Deviation**	**Number of Results**	**Min**	**5th**	**25th**	**Median**	**75th**	**95th**	**Max**
Salinity	North	24.3	4.91	735	3.0	15.0	21.7	25.0	27.7	30.9	37.0
Salinity	WITH-6	13.4	6.20	147	0.9	2.9	8.4	13.5	17.8	23.0	30.1
Salinity	South	22.7	5.33	881	3.4	12.9	19.8	23.2	26.5	30.6	34.3
Total Nitrogen	North	388	142.81	741	120	220	290	360	460	650	1170
Total Nitrogen	WITH-6	573	265.15	149	200	250	420	530	670	940	2000
Total Nitrogen	South	311	130.44	889	33	150	230	290	360	560	1490
Total Phosphorous	North	35	17.47	741	5	15	22	31	45	68	126
Total Phosphorous	WITH-6	66	45.34	148	17	28	41	54.5	75	128	379
Total Phosphorous	South	20	12.40	889	3	7	12	17	24	42	122

Notes:

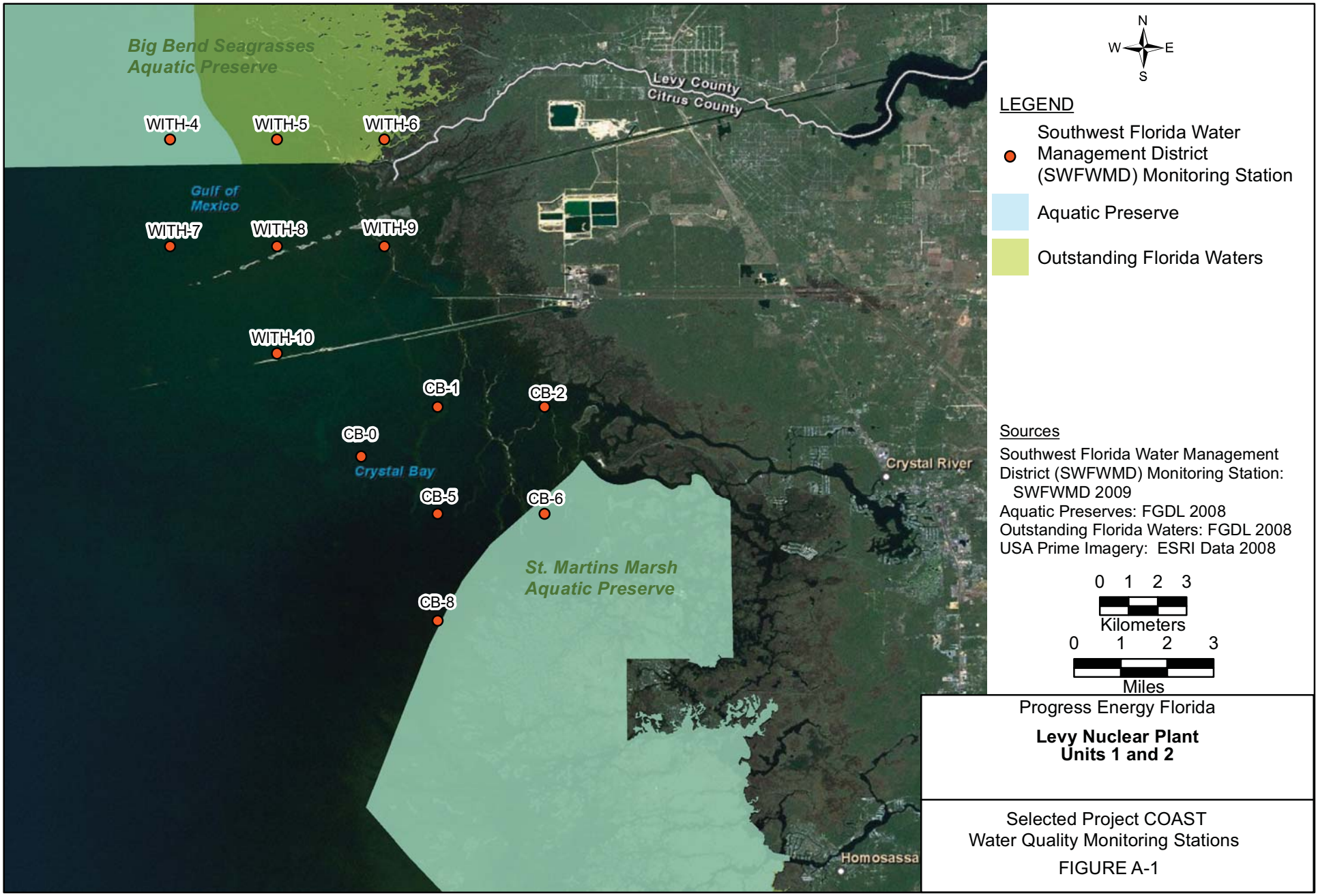
µg/L = microgram per liter
Project COAST data included monthly results from January 1997 through June 2008.

TABLE A-3
Sensitivity of Significant Difference with Given Sample Size Estimates

Parameter	Group	Units	Mean	Standard Deviation	Number of Results	Minimum No. of Proposed Samples	Sensitivity to Changes in Means (Alpha = 0.05)
Salinity	North	psu	24.3	4.91	735	30	1.8
Salinity	South	psu	22.7	5.33	881	30	1.9
Total Nitrogen	North	µg/L	388	142.81	741	30	51
Total Nitrogen	South	µg/L	311	130.44	889	30	47
Total Phosphorous	North	µg/L	35	17.47	741	30	6
Total Phosphorous	South	µg/L	20	12.40	889	30	4

Notes:

Analysis of COAST Data for the following stations and groups:
North = WITH-4, WITH-5, WITH-7, WITH-8, and WITH-9. WITH-6 was handled as an outlier and not included in the statistics.
South = WITH-10, CB-1, CB-2, CB-5, CB-6, and CB-8
psu = practical salinity units
µg/L = micrograms per liter



Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2

Selected Project COAST
Water Quality Monitoring Stations

FIGURE A-1

Figure A-2. Box and Whisker Plots for Total Nitrogen by Location and Quarter

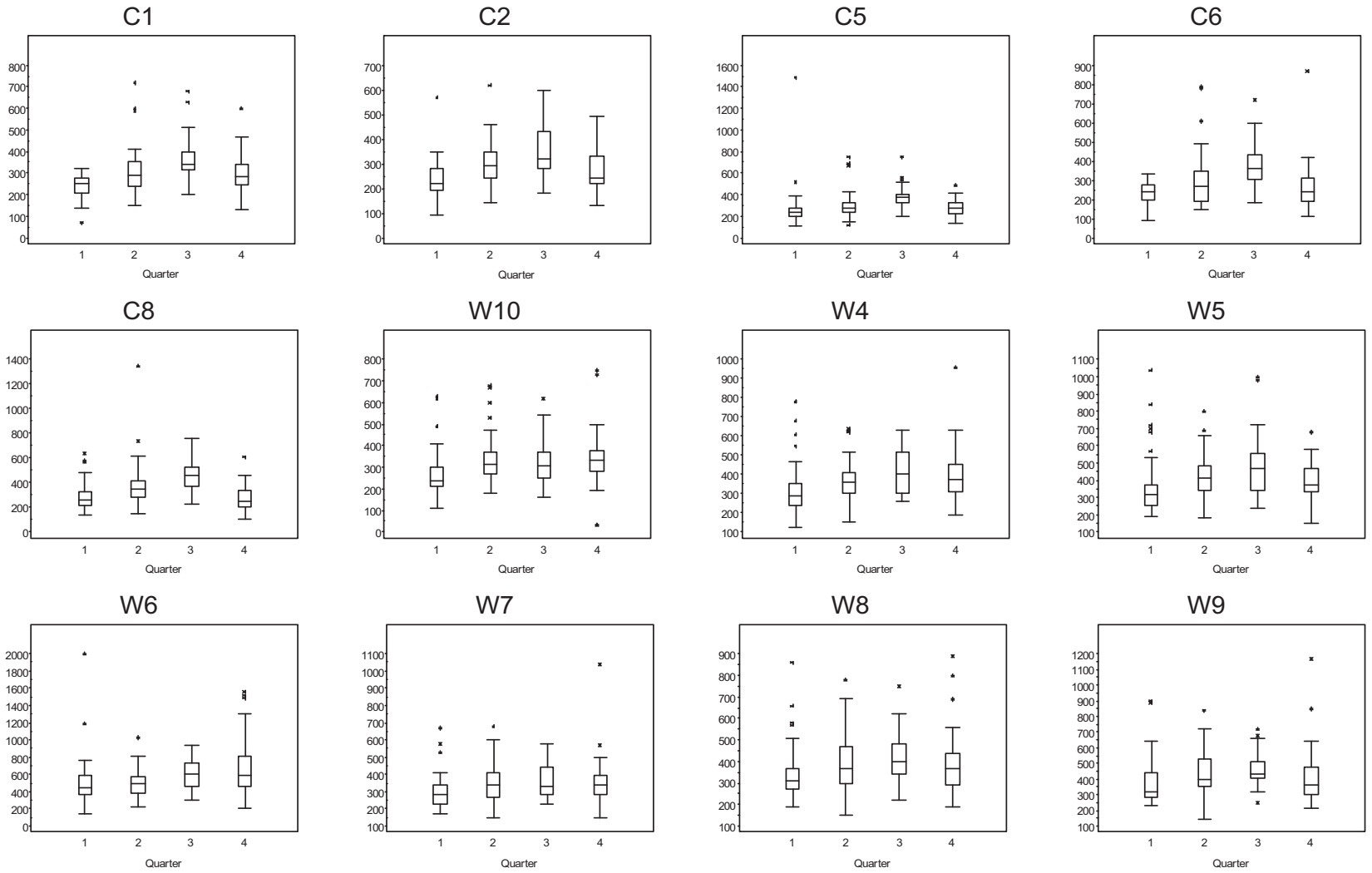


Figure A-3. Box and Whisker Plots for Total Phosphorus by Location and Quarter

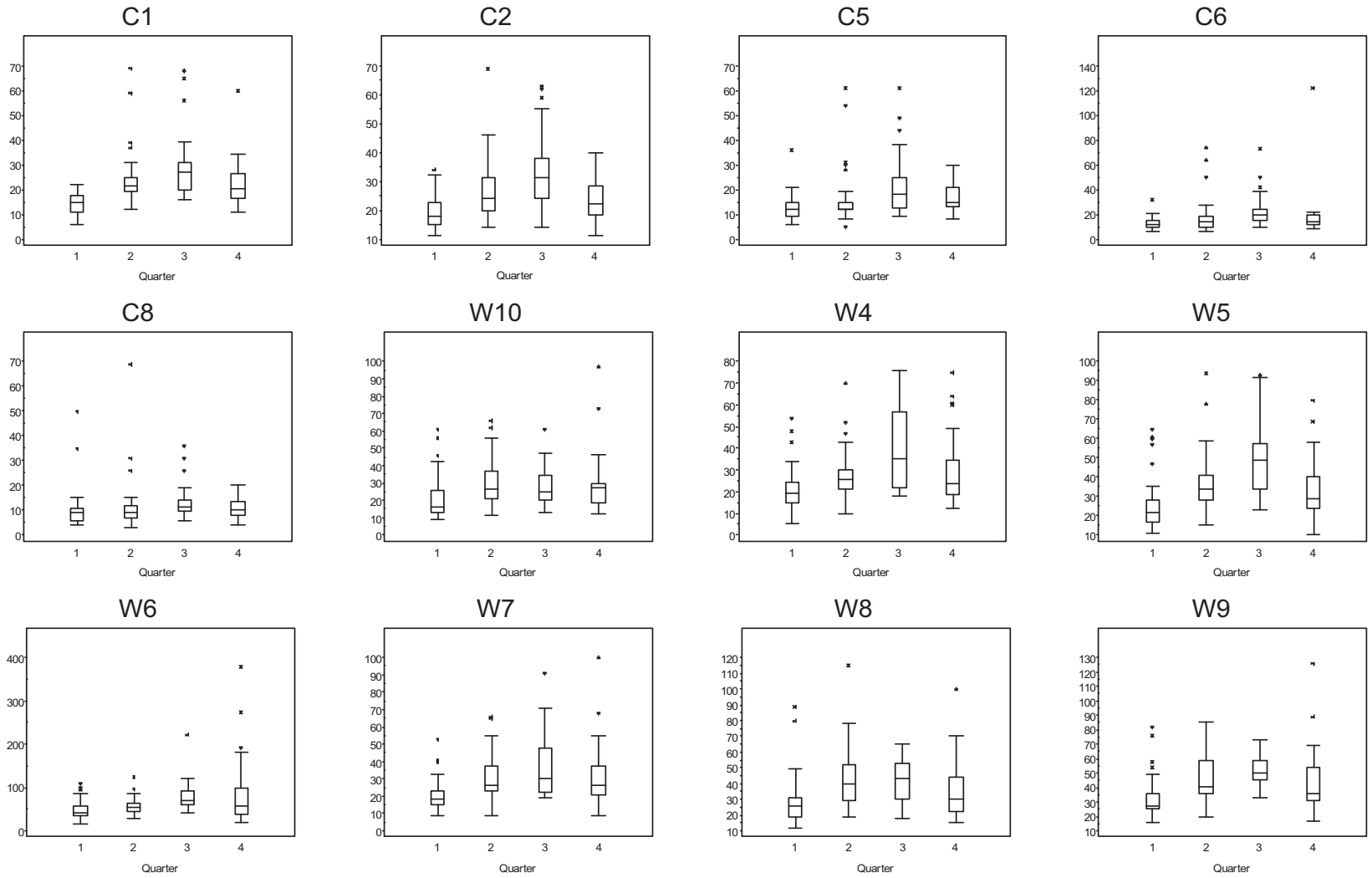
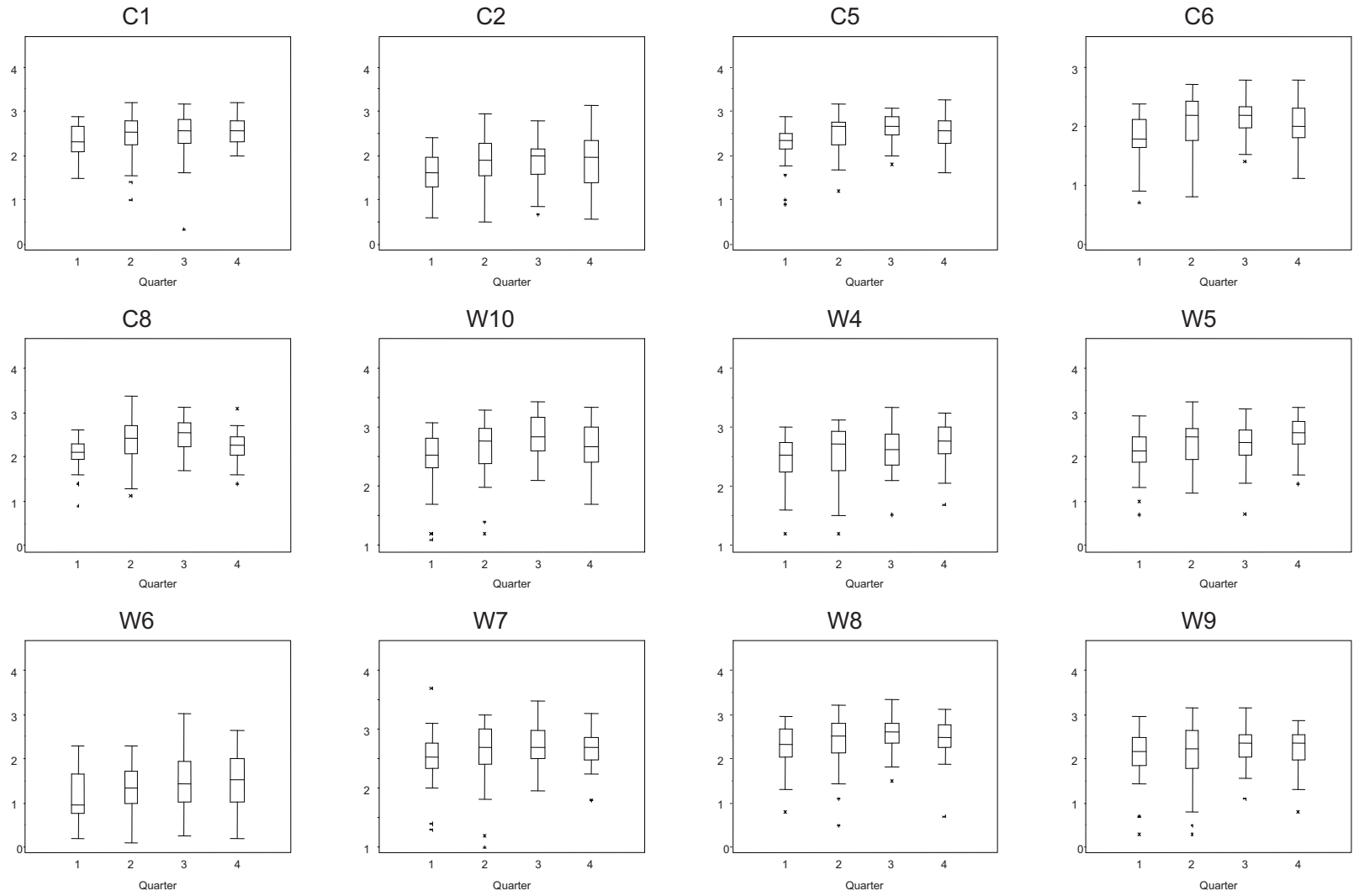


Figure A-4. Box and Whisker Plots for Salinity by Location and Quarter



ATTACHMENT B

Station Coordinate Tables

TABLE B-1
DMP Water Quality Monitoring Location Coordinates

Location Name	Latitude	Longitude
CREC-3	28.959941	82.723691
CREC-4	28.959856	82.743489
CREC-5	28.961344	82.732465
CREC-6	28.968468	82.745832
CREC-7	28.960875	82.759405
CREC-8	28.957422	82.791491
CREC-9	28.981448	82.750761
WITH-10	28.941670	82.791670
WITH-8	28.975000	82.791670
WITH-9	28.975000	82.758330

Notes:
CREC = Crystal River Energy Complex associated monitoring location
DMP = Discharge Monitoring Plan
WITH = Withlacoochee Bay associated monitoring location

TABLE B-2
DMP Seagrass, Oyster, and Hard Bottom Monitoring Location Coordinates

Location Name	Latitude	Longitude
1	28.946505	82.772560
2	28.946541	82.766307
3	28.949255	82.772580
4	28.949291	82.766327
5	28.949326	82.760074
6	28.949361	82.753821
7	28.949396	82.747568
8	28.952146	82.747588
9	28.952164	82.744461
10	28.952181	82.741335
11	28.952198	82.738208
12	28.952215	82.735082
13	28.952232	82.731955
14	28.954755	82.772621
15	28.954791	82.766368
16	28.954826	82.760114
17	28.954861	82.753861
18	28.954896	82.747608

TABLE B-2
DMP Seagrass, Oyster, and Hard Bottom Monitoring Location Coordinates

Location Name	Latitude	Longitude
19	28.954914	82.744481
20	28.954931	82.741354
21	28.954948	82.738228
22	28.954965	82.735101
23	28.954982	82.731974
24	28.954999	82.728848
25	28.955016	82.725721
26	28.957629	82.750754
27	28.957646	82.747628
28	28.957664	82.744501
29	28.957681	82.741374
30	28.957698	82.738247
31	28.957715	82.735120
32	28.957732	82.731994
33	28.957749	82.728867
34	28.957766	82.725740
35	28.960255	82.772662
36	28.960291	82.766408
37	28.960326	82.760155
38	28.960361	82.753901
39	28.960379	82.750774
40	28.960396	82.747647
41	28.960414	82.744520
42	28.960431	82.741394
43	28.960448	82.738267
44	28.960465	82.735140
45	28.960482	82.732013
46	28.960499	82.728886
47	28.960516	82.725759
48	28.963094	82.757048
49	28.963111	82.753921
50	28.963129	82.750794
51	28.963146	82.747667
52	28.963164	82.744540
53	28.963181	82.741413

TABLE B-2
DMP Seagrass, Oyster, and Hard Bottom Monitoring Location Coordinates

Location Name	Latitude	Longitude
54	28.963198	82.738286
55	28.963215	82.735159
56	28.963232	82.732032
57	28.963249	82.728905
58	28.965755	82.772703
59	28.965791	82.766449
60	28.965826	82.760195
61	28.965844	82.757068
62	28.965861	82.753941
63	28.965879	82.750814
64	28.965896	82.747687
65	28.965913	82.744560
66	28.965931	82.741433
67	28.965948	82.738306
68	28.965965	82.735179
69	28.968558	82.763342
70	28.968576	82.760215
71	28.968594	82.757088
72	28.968611	82.753961
73	28.968629	82.750834
74	28.968646	82.747707
75	28.968663	82.744579
76	28.968681	82.741452
77	28.968698	82.738325
78	28.968715	82.735198
79	28.971255	82.772744
80	28.971290	82.766489
81	28.971308	82.763362
82	28.971326	82.760235
83	28.971344	82.757108
84	28.971361	82.753981
85	28.971379	82.750854
86	28.971396	82.747726
87	28.971413	82.744599
88	28.971448	82.738345

TABLE B-2
DMP Seagrass, Oyster, and Hard Bottom Monitoring Location Coordinates

Location Name	Latitude	Longitude
89	28.974023	82.769637
90	28.974040	82.766510
91	28.974058	82.763382
92	28.974076	82.760255
93	28.974094	82.757128
94	28.974111	82.754001
95	28.974129	82.750873
96	28.974146	82.747746
97	28.974163	82.744619
98	28.974181	82.741492
99	28.974198	82.738364
100	28.976755	82.772785
101	28.976772	82.769657
102	28.976790	82.766530
103	28.976808	82.763403
104	28.976826	82.760275
105	28.976843	82.757148
106	28.976861	82.754021
107	28.976879	82.750893
108	28.976896	82.747766
109	28.976913	82.744639
110	28.979522	82.769678
111	28.979540	82.766550
112	28.979558	82.763423
113	28.979576	82.760295
114	28.979593	82.757168
115	28.979611	82.754041
116	28.979629	82.750913
117	28.979646	82.747786
118	28.979663	82.744658
119	28.979681	82.741531
120	28.982326	82.760315
121	28.982343	82.757188
122	28.982361	82.754060
123	28.982378	82.750933

TABLE B-2
DMP Seagrass, Oyster, and Hard Bottom Monitoring Location Coordinates

Location Name	Latitude	Longitude
124	28.982396	82.747805
125	28.982413	82.744678
126	28.982431	82.741550

Notes:
DMP = Discharge Monitoring Plan

TABLE B-3
DMP Supplemental Benthic Habitat Monitoring Location Coordinates

Location Name	Latitude	Longitude
W-1	29.008330	82.775064
W-2	29.008330	82.791670
W-3	29.008330	82.808187
W-4	29.008330	82.825000
W-5	29.026265	82.780777
W-6	29.026265	82.800344
W-7	29.026265	82.825000

Notes:
DMP = Discharge Monitoring Plan